Majalah Ilmiah Fisioterapi Indonesia
Indonesian Scientific Journal of Physiotherapy

Original Research Articles
ISSN (Print): 2303-1921
ISSN (Online): 2722-0443
Volume 13, Number 01, Pages 149–154 (2025)
DOI: https://doi.org/10.248437mifi.000634

Association Between Cognitive Function and Daily Living Activities in Elderly Women: A Cross-Sectional Study

Putu Divayani Darmika[1*], Ni Komang Ayu Juni Antari[2], Anak Agung Gede Angga Puspa Negara[3], Anak Ayu Nyoman Trisna Narta Dewi[4]

[1]Undergraduate and Professional Physiotherapy Program, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia
[2,3,4]Department of Physiotherapy, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia

*Correspondence author:
E-mail address: putudivayanidarmika@gmail.com

Received 20 November 2024; Revised in revised form 23 December 2024; Accepted 25 December 2024; Published 01 January 2025

Abstract

Introduction: Aging can lead to physical, psychological, and social decline, including impaired cognitive function. Cognitive function refers to the ability to orient, decide, think, remember, assess, and perceive. Declines in cognitive function may reduce independence in performing activities of daily living (ADLs). This study aimed to investigate the relationship between cognitive function and ADL performance in elderly women.

Methods: This analytical observational study used a cross-sectional design. A total of 47 elderly women were recruited through purposive sampling based on predefined inclusion and exclusion criteria. Cognitive function was measured using the Mini-Mental State Examination (MMSE), and the level of independence in ADLs was assessed using the Barthel Index. Data analysis was conducted using the chi-square correlation test.

Results: The study was conducted in Banjar Lambing, Sibang Kaja Village, Badung Regency. The results showed a statistically significant association between cognitive function and the ability to perform ADLs, with a p-value of 0.006 ($p < 0.05$).

Conclusion: There is a significant relationship between cognitive function and activities of daily living in elderly women. These findings highlight the importance of early cognitive assessments and interventions to maintain functional independence among the elderly.

Keywords: cognitive function, activities of daily living, elderly women, cross-sectional study

Introduction

The healthcare sector continues to face significant challenges, particularly in addressing the needs of the aging population. Older adults, commonly referred to as the elderly, are defined as individuals who have reached the final stage of the human life cycle. Aging is a natural, lifelong process, and with increasing age comes a corresponding rise in the elderly population. According to the World Health Organization (WHO), individuals aged 60 years or older are classified as elderly. Indonesia is among the top five countries globally with the largest elderly populations, as reported by WHO. In 2016, Bali alone recorded a population of 4.2 million, with approximately 440,000 classified as elderly individuals.[1,2]

The increasing elderly population poses a risk of surging health issues, especially if not accompanied by healthy lifestyle practices. This trend challenges healthcare professionals to maintain the quality of life in the elderly to support longevity and improve life expectancy in Indonesia.[3] Aging is characterized by progressive physiological changes that are inevitable and largely uncontrollable.[4] One prominent theory, the Genetic Clock Theory, proposes that aging is genetically programmed, wherein cell nuclei have a fixed replication timeline that declines with age. Aging affects physical, psychological, and social aspects of life, including deterioration in skeletal structures, nerves, muscles, and joints, ultimately impacting the elderly's quality of life.[5]

The nervous system is notably affected in aging individuals, contributing to a decline in brain function of approximately 10%–20% between the ages of 30 and 70. This includes reductions in brain mass and cerebral blood flow, as well as astrocyte proliferation and alterations in neurotransmitters. These changes increase monoamine oxidase enzyme activity, leading to slower central processing and reaction times.[6]

Neurodegenerative diseases may alter brain structure as age progresses, while cerebrovascular pathologies are associated with cognitive decline.[7] Cognitive function encompasses orientation, decision-making, reasoning, memory, judgment, and perception. In Indonesia, cognitive impairment in the elderly is prevalent in approximately 32.4% of the population, with 14.7% among men and 47% among women.[8] One in three older adults experiences some level of cognitive impairment, a figure that is expected to rise with increasing age. Additionally, it is estimated that for every 100 young individuals aged 14–55 years, there are 14 elderly individuals requiring support.[9]

Elderly women are particularly susceptible to cognitive decline due to decreased endogenous sex hormone levels, which can impair sensory and motor functions, potentially contributing to self-deprecating attitudes and cognitive

dysfunction.[10] Cognitive function has a direct impact on the level of independence in performing Activities of Daily Living (ADLs). Independence in ADLs reflects the quality of life and functional status of elderly individuals. ADLs refer to one's ability to carry out routine daily tasks.[11] Impairments in ADLs contribute to reduced quality of life among older adults. A study by Novia Trihayati found that cognitive function significantly influences elderly individuals' ability to perform ADLs.[12] However, a contrasting finding was reported by Akbar, who found no association between cognitive function and ADLs in the elderly.[13]

Preliminary observations in Sibang Kaja Village—the selected site for this study—show that the village comprises seven community units (*banjar*) with a well-documented elderly population: Banjar Sintrig (female = 48, male = 12), Banjar Lambing (female = 60, male = 32), Banjar Saren (female = 49, male = 11), Banjar Piakan (female = 50, male = 10), Banjar Tengah (female = 39, male = 21), Banjar Sangging (female = 53, male = 14), and Banjar Lateng (female = 45, male = 15). Considering the varied findings in previous studies regarding the relationship between cognitive function and ADL performance, this study seeks to explore this relationship specifically among elderly women.

This study aims to examine the correlation between cognitive function and ADL performance in elderly women, grounded in theoretical frameworks and empirical evidence. The findings are expected to support healthcare professionals in conducting further research on cognitive function and ADLs in the Indonesian elderly population and serve as an early detection measure to prevent cognitive decline and functional dependency, ultimately contributing to the well-being of the aging population.

Methods

The study employed an observational analytic design with a cross-sectional approach. The research was conducted in Banjar Lambing, Sibang Kaja Village, Badung Regency, from December 2022 to January 2023. The subjects were selected using a purposive sampling method based on specified inclusion and exclusion criteria.

The inclusion criteria were: elderly women aged 60–80 years, not diagnosed with any severe illness, having a normal Body Mass Index (BMI), literate (able to read, write, and calculate), and willing to participate by signing an informed consent form. The exclusion criteria were: motor disturbances such as tremors (as diagnosed by a physician or physiotherapist), use of walking aids (e.g., canes), musculoskeletal injuries, or a history of head trauma, also as confirmed by a physician or physiotherapist.

A total of 47 participants were included, with the sample size calculated using the cross-sectional sampling formula proposed by Notoatmodjo.[14] The independent variable in this study was cognitive function, and the dependent variable was Activities of Daily Living (ADL). Control variables included age and gender.

Cognitive function was measured using the Mini-Mental State Examination (MMSE) questionnaire. The MMSE has a sensitivity of 18% and specificity of 100%, indicating that it provides high diagnostic accuracy for memory impairment.[15] The questionnaire assesses domains such as orientation, registration, attention and calculation, recall, and language.

ADL was assessed using the Barthel Index, which evaluates basic functional mobility and independence in daily activities such as eating, bathing, and transferring. Based on the score, the level of independence can be determined. The Barthel Index has a sensitivity of 83% and specificity of 87%, making it a reliable tool for assessing functional independence.[16]

To minimize confounding factors that may influence the variables under study, the research controlled for BMI and gender. Only participants with a normal BMI were included, as BMI has been identified as a risk factor for cognitive decline; individuals who are overweight are more likely to experience cognitive dysfunction.[17] BMI was calculated by dividing weight (kg) by height squared (m^2).[18] Furthermore, only female participants were included, as gender is also a contributing factor to ADL performance levels.[19]

The statistical analyses employed were univariate and bivariate analyses. Univariate analysis was used to describe the distribution of variables such as age, BMI, cognitive function, and ADL status. Bivariate analysis was conducted using the Chi-square test to assess the association between cognitive function and ADL. This study received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Udayana University/Sanglah General Hospital Denpasar, with ethical clearance number: 2688/UN14.2.2.VII.14/LT/2022.

Results

The research was conducted through a series of systematic stages to ensure methodological rigor and data accuracy. These stages are outlined in the following research flow diagram (Figure 1), which provides a visual representation of the study process. Subsequently, the characteristics of the research subjects, including age, body mass index (BMI), cognitive function, and activities of daily living (ADL), are summarized in Table 1. The relationship between cognitive function and ADL is further analyzed and presented in Table 2 using Chi-square statistical testing.

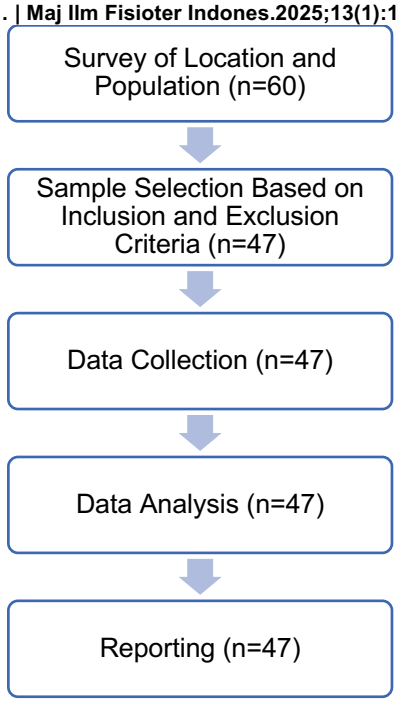

Figure 1. Research Flow Diagram

Table 1. Characteristics of Research Subjects Based on Age, BMI, Cognitive Function, and ADL (n = 47)

Variable	Frequency (n)	Percentage (%)
Age (mean ± SD)	(67.81 ± 5.75)	
BMI (mean ± SD)	(22.74 ± 1.75)	
Cognitive Function (mean ± SD)	(20.72 ± 6.96)	
Severe Cognitive Impairment	16	34.0
Mild Cognitive Impairment	11	23.4
Normal Cognitive Function	20	42.6
ADL (mean ± SD)	(89.26 ± 10.27)	
Mild Dependence	22	46.8
Independent	25	53.2

Table 1 shows that the subjects were aged between 60–80 years, consistent with the previously defined inclusion criteria. The most common age among participants was 65 years, reported by 6 respondents (12.8%). The mean age of participants was 67.81 years with a standard deviation of 5.75.

Body Mass Index (BMI) ranged from 19.0 to 25.0, corresponding to the normal BMI range. The most frequently reported BMI value was 25.0, noted in 4 respondents (8.5%). The mean BMI among the subjects was 22.74 with a standard deviation of 1.75. The mean cognitive function score among participants was 20.72 ± 6.96. A total of 20 respondents (42.6%) had normal cognitive function, 11 respondents (23.4%) had mild cognitive impairment, and 16 respondents (34.0%) had severe cognitive impairment. The mean score for Activities of Daily Living (ADL) was 89.26 ± 10.27. A higher proportion of respondents were classified as independent in performing ADLs (53.2%) compared to those with mild dependence (46.8%).

Table 2. Chi-Square Analysis of the Relationship Between Cognitive Function and Activities of Daily Living

Variable	ADL Status				Chi-Square Value	p value
	Mild Dependence		Independent			
	n	%	n	%		
Cognitive Function						
Severe Cognitive Impairment	10	62.5	6	37.5		
Mild Cognitive Impairment	8	72.7	3	27.3	10.323	0.006
Normal Cognitive Function	4	20.0	16	80.0		

As presented in Table 2, the highest proportion of independent older women was found in the group with normal cognitive function (80.0%). The results of the Chi-square analysis indicated a significant association between cognitive function and activities of daily living (ADL) among older women in Sibang Kaja Village, Badung Regency, with a *p* value of 0.006 ($p < 0.05$).

Discussion

Profile of Research Subjects

This study was conducted in Banjar Lambing, Sibangkaja Village, Badung Regency. The research was carried out from September 2022 to January 2023, encompassing the thesis proposal development, data collection, and data

analysis. Respondents were selected using non-probability sampling with a purposive sampling technique, which involved selecting individuals who met predetermined inclusion and exclusion criteria.

Data collection was conducted by gathering elderly women in Banjar Lambing on December 28 and 30, 2022. A total of 47 respondents met the eligibility criteria at the time of the study. On the first day, data collection coincided with the community's routine monthly health checkup. The process was supported by the local community health center (Puskesmas) and elderly health volunteers. Thirty-five respondents were recruited during the community gathering, and an additional 12 were recruited through a door-to-door approach.

The participants ranged in age from 60 to 80 years, with the highest proportion being 65 years old (12.8%). Based on the cognitive function assessment results, 20 respondents (42.6%) had normal cognitive function, 11 respondents (23.4%) had mild cognitive impairment, and 16 respondents (34.0%) had severe cognitive impairment. Thus, most elderly women in Banjar Lambing demonstrated normal cognitive function.

Regarding Activities of Daily Living (ADL), the analysis showed that 25 respondents (53.2%) were categorized as independent, while 22 respondents (46.8%) were classified as having mild dependency. This suggests that the majority of elderly women in Banjar Lambing were able to carry out daily activities independently. A similar finding was reported by Marlina, who found that 57.6% of elderly individuals in Tunggul Wulung, Malang, were categorized as independent.[20] Likewise, Trihayati's study of elderly residents in a nursing home in Yogyakarta found that 58.8% were independent in performing ADLs.[12]

The ADL assessment instrument used in this study was the Barthel Index questionnaire, which evaluates a person's independence, particularly in mobility and self-care.[16] This study focused on elderly female respondents due to their higher risk of experiencing cognitive decline and reduced ADL performance compared to males. This vulnerability is linked to endogenous sex hormone levels, particularly estradiol. Decreased levels of estradiol, which has numerous receptors in the brain, can impair cognitive function.[19]

The Relationship Between Cognitive Function and Activities of Daily Living in Elderly Women

Chi-square analysis revealed a statistically significant relationship between cognitive function and ADL performance ($p = 0.006$), indicating that cognitive function is significantly associated with the ability to perform ADLs. Nazari found that higher cognitive ability in the elderly is associated with better ADL performance; individuals with intact cognitive functions tend to be more independent, capable of understanding and managing their physical condition, and thus appear less frail.[21]

Previous studies have supported these findings. Marlina reported that 57.6% of respondents (19 out of 33) demonstrated independence in ADLs and found a statistically significant association ($p = 0.018$) between cognitive function and ADL performance.[20] Suspiyanti also found a positive correlation ($r = 0.321$, $p = 0.003$), suggesting that elderly individuals with better cognitive function are more likely to be independent in their daily activities.[9]

Aging causes structural and functional changes in the body, including cognitive decline. These changes can be attributed to natural aging or to health conditions experienced by the elderly. Reduced organ function results from anatomical cell loss, inadequate nutrition, and decreased physical activity, contributing to physiological deterioration and increased risk of cognitive impairment.[6]

Cognitive decline in the elderly is associated with age-related changes in the brain and other organs, including decreased blood flow and altered neurotransmitter activity.[22] Aging leads to reduced cerebral blood flow and brain mass, which increases astrocyte activity and alters neurotransmitter levels. These changes, including increased monoamine oxidase (MAO) activity, may negatively impact ADL performance.[6] Preventive measures should be taken to preserve cognitive function and enhance ADL capability in older adults.[23]

Cognitive decline negatively affects the quality of life in the elderly, as it impairs memory, intellectual capacity, decision-making, and the ability to carry out ADLs. Good cognitive function is essential for fulfilling daily needs, and its maintenance is vital for achieving a high quality of life in old age.[24] In this study, many respondents with mild to severe cognitive impairment experienced attention deficits, making it difficult to process information and respond to relevant stimuli. This difficulty in maintaining focus affects their ability to manage daily tasks effectively.

Cognitive function can be preserved through regular physical activity, such as elderly exercise programs aimed at enhancing brain plasticity and stimulating brain cells. Brain gym exercises also improve cerebral blood circulation and activate both hemispheres of the brain.[25] In the ADL evaluation, several respondents in Banjar Lambing exhibited difficulty climbing stairs, indicating mild dependency. This limitation may be attributed to joint changes related to aging, including degeneration of ligaments, fascia, tendons, and cartilage, which reduce joint flexibility and range of motion (ROM). Declining ROM can lead to joint stiffness, pain, and difficulty performing activities such as stair climbing.

Another contributing factor is the reduction in muscle strength and flexibility, especially in postural muscles that are essential for maintaining stability. Targeted balance exercises can improve muscle strength and prevent falls during tasks such as stair climbing. Healthy elderly individuals can remain productive by engaging in activities that generate goods or services. However, older adults face greater health risks than younger individuals, including cognitive, physical, and sensory decline, and chronic diseases such as diabetes and heart disease. A healthy lifestyle—regular physical exercise, balanced nutrition to prevent obesity, and avoiding harmful habits like smoking and alcohol consumption—is crucial in minimizing these risks. Suitable activities include walking, cycling, yoga, crafting (e.g., knitting or weaving), gardening, reading, and writing.[26]

This study has several limitations. The research coincided with other community activities such as Posyandu sessions, which limited the time available for measurements and may have introduced bias. Moreover, external factors such as economic status and family environment were not controlled or analyzed as influencing variables. Future studies

should consider allocating dedicated research time, avoiding overlap with other activities, and including socioeconomic and environmental variables as control factors. Expanding the sample size and transparently documenting limitations will enhance the study's validity.

This study found a significant relationship between cognitive function and the ability to perform ADLs in elderly women. The findings underscore the importance of maintaining cognitive function to support independence in daily life. However, these results are specific to the study population in Banjar Lambing and may not be generalizable to other elderly populations. These insights highlight the need for public awareness of cognitive health in aging and encourage early cognitive development and education as long-term strategies to improve quality of life in old age.[27]

Conclusion

Based on the results and discussion, it can be concluded that there is a significant relationship between cognitive function and activities of daily living (ADL) among elderly women in Banjar Lambing, Sibangkaja Village, Badung Regency. Greater attention should be directed toward the cognitive function of elderly women in this area. To improve their quality of life, it is essential to maintain and enhance cognitive function through appropriate interventions. Improvements in cognitive function may also have a positive impact on their ability to perform daily activities, thereby promoting greater independence and engagement in everyday life. These findings have important implications for the development of tailored care programs and interventions aimed at supporting cognitive health and daily functioning among elderly women in this region.

Author Contribution

Putu Divayani Darmika: Conceptualization, methodology, data collection, data analysis, and manuscript drafting.

Ni Komang Ayu Juni Antari: Supervision, guidance on research design, and critical review of the manuscript.

Anak Agung Gede Angga Puspa Negara: Supervision, validation, and manuscript editing.

Anak Ayu Nyoman Trisna Narta Dewi: Supervision, methodological consultation, and final manuscript review.

Acknowledgments

The authors would like to express their gratitude to the Faculty of Medicine, Universitas Udayana, for providing the academic support and facilities necessary for conducting this study.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

Funding Sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethics Statement

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was not required as the study involved only non-invasive procedures (blood pressure measurement and questionnaire surveys) and posed minimal risk to participants. Informed consent was obtained from all participants prior to their inclusion in the study, and confidentiality was strictly maintained.

References

1. Ewys CBRP, Kiswanto, Yunita J, Mitra, Zaman K. Faktor-faktor yang berhubungan dengan keaktifan lansia (active aging) di Puskesmas Payung Sekaki Kota Pekanbaru. J Kesehat Komunitas. 2021;7(2):208–13.
2. Badan Pusat Statistik Provinsi Bali. Provinsi Bali dalam angka. Denpasar: BPS Provinsi Bali; 2016.
3. Putri M. Faktor-faktor yang berpengaruh terhadap niat keaktifan lansia dalam mengikuti posyandu lansia. J Promkes. 2018;6(2):213–25.
4. Putri DE. Hubungan fungsi kognitif dengan kualitas hidup lansia. J Inov Penelit. 2021;2(4):1147–52.
5. Jamrern R, Singnoy C, Suwanna P, Somsongkul V. The effect of a PARA rubber ball training program on the hand and arm strength and the hand-eye coordination of older adults. J Health Sci. 2019;9(1):12–8.
6. Amarya S, Singh K, Sabharwal M. Ageing process and physiological changes. Gerontology. 2018;3–24.
7. Ramli R, Fadhillah MN. Faktor yang mempengaruhi fungsi kognitif pada lansia. Window Nurs J. 2020;1(1):22–30.
8. Rahayu P. Hubungan fungsi kognitif dengan risiko jatuh pada lanjut usia di PSTW Unit Budhi Luhur Yogyakarta. Yogyakarta: STIKES 'Aisyiyah Yogyakarta; 2014. p. 1–10.
9. Suspiyanti D, Huriah T, Lestari R. Fungsi kognitif memiliki hubungan dengan kemandirian activity daily living lansia. Media Ilmu Kesehat. 2014;3(1):6–13.
10. Handayani T, Hidayati MM, Rachma N. Pesantren lansia sebagai upaya meminimalkan risiko penurunan fungsi kognitif pada lansia di Balai Rehabilitasi Sosial Lansia Unit II Pucang Gading Semarang. J Keperawatan Komunitas. 2013;1(1):1–9.
11. Sonza T, Badri IA, Erda R. Hubungan tingkat kecemasan dengan tingkat kemandirian activities of daily living pada lansia. Human Care J. 2020;5(3):688.

12. Trihayati N, Salmiyati S. Hubungan fungsi kognitif dengan tingkat kemandirian aktivitas sehari-hari pada lansia di UPT Panti Wredha Budhi Dharma Ponggalan Yogyakarta. Yogyakarta: Universitas 'Aisyiyah Yogyakarta; 2016.
13. Akbar RR, Pitra DAH, Anissa M, Anggraini D. Hubungan tingkat kemandirian dan gangguan kognitif pada lansia. Human Care J. 2020;5(3):671.
14. Sinaga D. Statistik dasar. Jakarta: UKI Press; 2014.
15. Luthfiana A, Harliansyah H. Pemeriksaan indeks memori, MMSE (Mini Mental State Examination) dan MoCA-Ina (Montreal Cognitive Assessment Versi Indonesia) pada karyawan Universitas Yarsi. J Kedokt YARSI. 2019;27(2):62–8.
16. Pongantung H, Lorica J, Rosdewi S, Solon M. Construct validity Indonesian version of Barthel Index for post stroke. Indian J Public Health Res Dev. 2020;11(3):2007–11.
17. Sari DK. Hubungan indeks massa tubuh dengan fungsi kognitif pada pasien diabetes mellitus di ruang rawat inap RSD dr. Loekmono Hadi Kudus. Pros HEFA. 2017;53(9):116–25.
18. Situmorang M. Penentuan indeks massa tubuh (IMT) melalui pengukuran berat dan tinggi badan berbasis mikrokontroler AT89S51 dan PC. J Teor Apl Fis. 2017;3(2):102–10.
19. Yoga A, Umiyarni D, Kusnandar. Hubungan jenis kelamin, aktivitas fisik dan status gizi dengan kesegaran jasmani anak sekolah dasar. J Kesmasindo. 2014;7(1):31–8.
20. Marlina, Mudayati S, Sutriningsih A. Hubungan fungsi kognitif dengan tingkat kemandirian lansia dalam melakukan aktivitas sehari-hari di Kelurahan Tunggul Wulung Kota Malang. J Nurs News. 2017;2(1):380–90.
21. Nazari H, Rashedi V, Mohammadi H. Relationship between cognitive status and activities of daily living among the elderly of nursing homes. J Kermanshah Univ Med Sci. 2015;18(12):744–6.
22. Boros K, Freemont T. Physiology of ageing of the musculoskeletal system. Best Pract Res Clin Rheumatol. 2017;31(2):203–17.
23. Sauliyusta M, Rekawati E. Aktivitas fisik memengaruhi fungsi kognitif lansia. J Keperawatan Indones. 2016;19(2):71–7.
24. Frontera WR. Physiologic changes of the musculoskeletal system with aging: a brief review. Phys Med Rehabil Clin N Am. 2017;28(4):705–11.
25. Farrow M, Ellis K. Physical activity for brain health and fighting dementia. Alzheimer's Australia. 2013;Paper 36(Sept).
26. Munawwarah M, Nindya P. Pemberian latihan pada lansia dapat meningkatkan keseimbangan dan mengurangi risiko jatuh lansia. Fakultas Fisioterapi Univ Esa Unggul. 2015;15(Apr):38–44.
27. Setyowati L. Hubungan tingkat pendidikan terhadap pemenuhan kemandirian ADL (activity daily living) pada lansia di RW 10 Dinoyo, Malang. Res Rep. 2017;:126–32.