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# Are Abbreviated Mental Test (AMT) and Ascertain Dementia 8 Indonesia (AD8-INA) Questionnaires More Superior than Mini-Mental State Examination (MMSE) as Dementia Screening Instrument among Elderly in Rural Areas?

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**ABSTRACT**

**Introduction:** Dementia screening provides numerous benefits to its users. However, current screening methods have several limitations regarding applicability and accuracy, making it difficult to accommodate the results. **Objective**: To describe whether the Abbreviated Mental Test (AMT) and Ascertain Dementia 8 Indonesia (AD8-INA) questionnaire is superior to Mini-Mental State Examination (MMSE) questionnaire as a dementia screening instrument for the elderly in rural areas. **Methods**: A cross-sectional study was conducted in February 2020 at Banyuwangi residence. Dementia screening was conducted among elderly respondents using MMSE, AMT, and AD8-INA questionnaires. Sensitivity and specificity of AMT, AD8-INA and combined AMT+AD8-INA were compared with the MMSE questionnaire using crosstabs. Comparison of time required to complete each questionnaire was analyzed using Wilcoxon Signed Rank Test. **Results**: Mean age among 59 respondents was 68.44 years. The average MMSE score was 24.54. Compared with MMSE, the AMT questionnaire had a sensitivity of 47.37% and specificity of 100% ($\chi 2$ = 22.36, p <0.001). Meanwhile, the AD8-INA questionnaire had a sensitivity of 63.16% and specificity of 45% ($\chi 2$ = 24.64, p <0.001). The combined AMT+AD8-INA questionnaire had a sensitivity of 73.68% and specificity of 90% ($\chi 2$=11.52, p=0.01). The average questionnaire completion time of AMT, AD8-INA, and combined AMT+AD8-INA each was significantly shorter than MMSE (122.59, 121.17, and 243.76 seconds vs 319.83 seconds, p<0.001, <0.001, and <0.001, respectively). **Conclusion**: This study found that the combined AMT+AD8-INA questionnaire could be used as a dementia screening instrument among the elderly in rural areas with considerable sensitivity and shorter administration time.

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## INTRODUCTION

Dementia is the leading cause of disability and dependence among the elderly. In 2020, more than 50 million people live with dementia, whereas the majority of them lived in developing countries.[1] Data regarding the prevalence of dementia in Indonesia remains scarce. One study estimates about 1.3 million cases of dementia in Indonesia.[2] Dementia screening provides benefits to patients, families, and the community. Early and concise intervention is made possible through screening, either pharmacological approach or lifestyle modification. However, dementia would often go unnoticed by both the patient and physician. Most of the time, the diagnosis of dementia was made when the disease is at severe stages.[3]

Currently, there are several instruments used for dementia screening. Questionnaires remain one of the most practical methods to be used. Mini-Mental State Examination (MMSE) is the most common and widely used questionnaire in daily practice.[4] However, MMSE has several limitations such as compatibility issues for illiterate populations, biased results due to the subject's socioeconomic condition and education level, and the need for standardization for test result interpretation in a certain population.[5] Considering these limitations, it is reasonable to find alternative screening instruments that are both accurate and applicable for a wider population.

The Abbreviated Mental Test (AMT) and Ascertain Dementia 8 Indonesia (AD8-INA) questionnaires are alternative screening tools for dementia. Several studies reported that both questionnaires are simple, easy to use, and yield similar accuracy compared with MMSE.[6,7,8]

## OBJECTIVE

This study would like to determine whether AMT and AD8-INA could be dementia screening instruments for the elderly in rural areas.

## METHODS

A cross-sectional study was conducted in February 2020 in Banyuwangi Residence, East Java. The respondents were local villagers aged 60 years old and above. This study was conducted under the Community Medicine Education training program and organized by the Faculty of Medicine, Universitas Airlangga. Using sample size calculation, the minimum required sample for this study was 57 respondents. Consecutive sampling was used until the minimum number was fulfilled. Before the questionnaire administration, the authors had provided standardized training programs to all interviewers.

Respondents in this study were screened for dementia using 3 questionnaires, namely MMSE, AMT, and AD8-INA. All the questionnaires were given in the Indonesian language. The MMSE and AD8-INA questionnaires were adopted from *Panduan Praktik Klinis Diagnosis dan Penatalaksanaan Demensia* (Dementia Clinical Practice Guideline and Management) in 2015 published by PERDOSSI (INA – Indonesia Neurological Association) while the AMT questionnaire was adopted from Indonesia Minister of Health Technical Guidance Regulation Number 4, the Year 2019. The time required to complete each questionnaire was recorded using a stopwatch. Questionnaire completion time was measured from the first question asked by the interviewer until the last response provided by the respondent.

Data acquired will be further analyzed using SPSS Statistics for Windows ver. 23 (IBM Corp, Armonk, USA). The score obtained from each questionnaire will be recorded and categorized into dementia or non-dementia. Based on previous studies, we use a cut-off score of 24 points for MMSE, 7 points for AMT, and 3 or more YES for AD8-INA. Grouped data will be compared with MMSE and analyzed for sensitivity and specificity using crosstabs. The time required to complete each AMT and AD8-INA questionnaire will be compared with MMSE using Wilcoxon Signed Rank Test. A p-value of $<0.05$ is considered statistically significant.

## RESULTS

### Demographic Data

A total of 59 respondents (29 male and 30 female) participated in this study. The mean age of respondents was 68.44±6.73 years. Most of the respondents worked as farmers. Regarding the education level, most respondents did not finish elementary school. It was also observed that most of them were married and had a caregiver. The demographic data in this study are presented in Table 1.

### Dementia Screening Result

The mean MMSE score of respondents was 24.54±5.10, with a range of 13-30 points. Respondents were categorized as dementia and non-dementia using a 24 points cut-off. A total of 19 (32.20%) respondents were categorized as dementia, and 40 (67.80%) respondents were categorized as non-dementia.

Using the AMT questionnaire, we obtained an average of 8.31±1.98 with a range of 2-10 points. Respondents were categorized as dementia and non-dementia using a 7 points cut-off. We obtained 9

(15.25%) respondents categorized as dementia and 50 (84.75%) respondents as non-dementia. The result from the crosstab between MMSE and AMT was shown in Table 2. We obtained a 47.37% sensitivity and 100% specificity for AMT ($\chi^2 = 22.36$, $p < 0.001$).

Using the AD8-INA questionnaire, we obtained an average score of 2.07±1.66 with a range of 0-6. Using the cut-off of 3 points, 23 (38.98%) respondents were categorized as dementia while 36 (61.02%) respondents were categorized as non-dementia. Crosstab result between MMSE and AD8-INA was presented in Table 3. We obtained a 63.16% sensitivity and 45% specificity for AD8-INA ($\chi^2 = 24.64$, $p < 0.001$).

In this study, we combined the results of AMT and AD8-INA and compared them with MMSE. Respondents were categorized as dementia when either AMT or AD8-INA result falls into the dementia category. Using this combined questionnaire, we obtained 18 (30.51%) respondents categorized as dementia and 41 (69.49%) respondents categorized as non-dementia. Crosstab result between MMSE and AMT+AD8-INA was shown in Table 4. We obtained a sensitivity of 73.68% and specificity of 90% for the combined AMT+AD8-INA questionnaire ($\chi^2 = 11.52$, $p = 0.01$).

### Questionnaire Completion Time

The mean time required to complete the MMSE, AMT, AD8-INA, and combined AMT+AD8-INA questionnaire was 319.83±107.77, 122.59±37.12, 121.17±53.67, and 243.76±80.01 seconds respectively. Using Wilcoxon Signed Rank Test, we found the completion time of AMT, AD8-INA, and combined AMT+AD8-INA questionnaire each was significantly shorter than MMSE (AMT vs MMSE *Mean Rank* 30.00 vs 0.00, $p < 0.001$; AD8-INA vs MMSE *Mean Rank* 30.07 vs 26.00, $p < 0.001$; AMT+AD8-INA vs MMSE *Mean Rank* 32.71 vs 20.41, $p < 0.001$).

## DISCUSSION

This is the first study ever conducted in Indonesia to compare the sensitivity and specificity of AMT and AD8-INA with MMSE. We specifically choose rural areas as the study location with several considerations. These include the higher prevalence of dementia than urban areas, low dementia screening coverage in rural areas, and results from preliminary studies points out dementia as the most common geriatric problem in rural areas.[9,10,11]

We obtained a low sensitivity and high specificity for the AMT questionnaire. This finding was similar to previous studies, which observed a wide sensitivity variation (12.8-99%) but consistently high specificity (84-100%) for AMT.[6,12-15] It was suggested that AMT is an excellent instrument to exclude dementia due to its high specificity.[12]

Regarding the AD8-INA questionnaire, we found higher sensitivity than its specificity. Based on prior studies, we used a 3 points cut-off to diagnose mild dementias and obtain the best combination of sensitivity and specificity for this instrument.[16] However, this study's sensitivity and specificity were lower than previous studies (sensitivity 72-100%, specificity 67-96.3%).[16–20] This finding may be attributed to high subjective bias and the perception of rural communities in considering problems only if they are unable to carry out these activities.

The combination of AMT and AD8-INA in this study increased the rate of detection in dementia. This could be observed from sensitivity increase (73.68%) without a significant drop in specificity (90.00%). These results align with the study by Emery et al. (2020), where AMT has an excellent specificity but lacks the sensitivity needed for detecting dementia. Therefore, AMT results should be supported with high-sensitivity instruments.[14]

Regarding the questionnaire completion time, we found the average time needed to complete the MMSE questionnaire was significantly longer than the time required to complete AMT, AD8-INA, and combined AMT+AD8-INA questionnaire. These results were in-line with previous studies that observed the mean time to complete MMSE is 6-10 minutes, while for AMT and AD8 questionnaires were each less than 3 minutes.[3,6,15,18] These results suggest AMT and AD8-INA questionnaires are superior to MMSE in primary healthcare settings due to shorter administration time, less complex instructions, and little to no training required.

This study has several limitations. Firstly, the possibility of diagnosis bias due to dementia categorization was based on questionnaire results. Secondly, the diverse socioeconomic conditions among respondents may require a standardization of instrument cut-off values. Thirdly, using a single district may not represent rural areas in other provinces or islands in Indonesia. Therefore, further studies on the validity and reliability of dementia screening tools are required to provide more accurate results that represent the Indonesian population.

## CONCLUSION

The combined AMT+AD8-INA questionnaire could be used as a dementia screening tool for the elderly in rural areas with good sensitivity and shorter administration time. Further studies are required to assess the superiority of this combined questionnaire to MMSE with more accurate diagnostic criteria.

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## REFERENCES

1. Alzheimer's Disease International, Guerchet M, Prince M, Prina M. Numbers of people with dementia worldwide [Internet]. 2020. Available from: https://www.alzint.org/resource/numbers-of-people-with-dementia-worldwide/
2. de Langavant L, Bayen E, Bachoud-Levi A, Yaffe K. Approximating dementia prevalence in population-based surveys of aging worldwide: An unsupervised machine learning approach. *Alzheimers Dement (N Y)*. 2020;6(1):e12074.
3. Isaacson R, Saif N. A Missed Opportunity for Dementia Prevention? Current Challenges for Early Detection and Modern-Day Solutions. *J Prev Alzheimers Dis*. 2020;7(4):291–3.
4. Arevalo-Rodriguez I, Smailagic N, Figuls M, CIapponi A, Sanchez-Perez E, Giannakou A, et al. Mini-Mental State Examination (MMSE) for the detection of Alzheimer's disease and other dementias in people with mild cognitive impairment (MCI). *Cochrane Database Sys Rev*. 2015;(3):CD010783.
5. Carnero-Pardo C. Should the Mini-Mental State Examination be retired? *Neurologia*. 2014;29(8):473–81.
6. Piotrowicz K, Wojciech R, Skalska A, Gryglewska B, Szczerbinska K, Derejczyk J, et al. The comparison of the 1972 Hodkinson's Abbreviated Mental Test Score (AMTS) and its variants in screening for cognitive impairment. *Aging Clin Exp Res*. 2019;31(4):561–6.
7. Galvin J, Goodyear M. Brief informant interviews to screen for dementia: The AD8 and quick dementia rating system. In: Larner A, editor. Cognitive screening instruments A practical approach. 2nd ed. London: Springer; 2017. p. 297–312.
8. Aji B, Larner A. Cognitive assessment in an epilepsy clinic using the AD8 questionnaire. *Epilepsy Behav*. 2018;85:234–6.
9. Rahman M, White E, Thomas K, Jutkowitz E. Assessment of Rural-Urban differences in health care use and survival among medicare beneficiaries with Alzheimer disease and related Dementia. JAMA Netw Open. 2020;3(10):e2022111.
10. Jia J, Wang F, Wei C, Zhou A, Jia X, Li F, et al. The prevalence of dementia in urban and rural areas of China. *Alzheimers Dement*. 2014;10(1):1–9.
11. Pramudita A, Putra P, Ermawati S, Dwi A, JA I, Zahira F, et al. Profil of dementia in rural area of Indonesia. *Eurasia J Biosci*. 2020;14:1851–5.
12. Tanglakmankhong K, Hampstead B, Ploutz-Snyder R, Potempa K. Does the Abbreviated Mental Test accurately predict cognitive impairment in Thai older adults? A retrospective study. *PRIJNR*. 2021;25(1):23–32.
13. Incalzi R, Cesari M, Pedone C, Carosella L, Carbonin P. Construct validity of the abbreviated mental test in older medical inpatients. *Dement Geriatr Cogn Disord*. 2003;15:199–206.
14. Emery A, Wells J, Klaus S, Mather M, Pessoa A, Pendlebury S. Underestimation of cognitive impairment in older inpatients by the Abbreviated Mental Test Score versus the Montreal Cognitive Assessment: Cross-sectional observational study. *Dement Geriatr Cogn Disord Extra*. 2020;10:205–15.
15. Froughan M, Wahlund L, Jafari Z, Rahgozar M, Farahani I, Rashedi V. Validity and reliability of Abbreviated Mental Test Score (AMTS) among older Iranian. *Psychogeriatrics*. 2017;17(6):460–5.
16. Correia C, Lima F, Junqueira F, Compos M, Bastos O, Petribu K, et al. AD8-Brazil: Cross-cultural validation of the ascertaining dementia interview in Portuguese. *J Alzheimers Dis*. 2011;27(1):177–85.
17. Karam G, Khandakji M, Sahakian N, Dandan J, Karam E. Validation into Arabic versions of Dementia Rating Scales, Dementia Caregivers Scales, and Dementia Research Instruments. *Alzheimers Dement (Amst)*. 2018;10(1):796–801.
18. Chen H, Sun F, Yeh T, Liu H, Huang H, Kuo B, et al. The diagnostic accuracy of the Ascertain Dementia 8 questionnaire for detecting cognitive impairment in primary care in the community, clinics and hospitals: a systematic review and meta-analysis. *Fam Pr*. 2018;35(3):239–46.
19. Usarel C, Dokuzlar O, Aydin A, Soysal P, Isik A. The AD8 (Dementia Screening Interview) is a valid and reliable screening scale not only for dementia but also for mild cognitive impairment in the Turkish geriatric outpatients. *Int Psychogeriatr*. 2019;31(2):223–9.
20. Galvin J, Roe C, Coats M, Morris J. Patient's rating of cognitive ability: Using the AD8, a brief informant interview, as a self-rating tool to detect dementia. *Arch Neurol*. 2007;64(5):725-30.

## ATTACHMENT

Table 1. Demographic Data of Respondents

| Demographic Data (n=59) | N(%) |
|---|---|
| Gender | |
| - Male | 29 (49.16) |
| - Female | 30 (50.84) |
| Age | |
| - Range | 60 – 86 |
| - Mean | 68.44±6.73 |
| Occupation | |
| - Farming | 33 (55.93) |
| - Self-employee / Subsistence | 5 (8.48) |
| - Civil Servant / Non-government employee | 4 (6.78) |
| - Unemployed / Retired | 17 (28.81) |
| Education Level | |
| - Did not have any formal education | 8 (13.56) |

cont…

Table 1. Demographic Data of Respondents

| Demographic Data (n=59) | N(%) |
|---|---|
| - Did not completed elementary school | 17 (28.81) |
| - Completed elementary school | 16 (27.12) |
| - Completed junior high school | 6 (10.17) |
| - Completed senior high school or higher | 12 (20.33) |
| Marital Status | |
| - Married | 42 (71.19) |
| - Divorced | 17 (28.81) |
| Having a caregiver | |
| - Yes | 50 (84.75) |
| - No | 9 (15.25) |

Table 2. Crosstabulation of MMSE and AMT

| | | MMSE | | Total | *p*-value |
|---|---|---|---|---|---|
| | | Dementia | Non-Dementia | | |
| **AMT** | Dementia | 9 | 0 | 9 | $\chi^2 = 22.36$ $p < 0.001$ |
| | Non-Dementia | 10 | 40 | 50 | |
| | Total | 19 | 40 | 59 | |

Table 3. Crosstabulation of MMSE and AD8-INA

| | | MMSE | | Total | *p*-value |
|---|---|---|---|---|---|
| | | Dementia | Non-Dementia | | |
| **AD8-INA** | Dementia | 12 | 11 | 23 | $\chi^2 = 24.64$ $p < 0.001$ |
| | Non-Dementia | 7 | 29 | 36 | |
| | Total | 19 | 40 | 59 | |

Table 4. Crosstabulation of MMSE and AMT+AD8-INA

| | | MMSE | | Total | *p*-value |
|---|---|---|---|---|---|
| | | Dementia | Non-Dementia | | |
| **AMT + AD8** | Dementia | 14 | 4 | 18 | $\chi^2 = 11.52$ $p = 0.01$ |
| | Non-Dementia | 5 | 36 | 41 | |
| | Total | 19 | 40 | 59 | |