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Determinant of functional disability in instrumental activities of daily living among elderly living in a rural area in Bali: a cross-sectional study

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ABSTRACT

Introduction: Little do we understand factors associated with functional disability in instrumental activities of daily living among the elderly living at home. This study aimed to explore determinants of functional disability in instrumental activities of daily living (IADL) among the elderly living in a rural area in Bali.

Methods: This cross-sectional study involved 1,053 elderly aged 60 years and above living in a rural area in Bali. A structured interview by trained data collectors was conducted. Questionnaires used were the Lawton IADL Scale, the 5-item of Geriatric Depression Scale, and the adoption of questionnaires for vision, hearing, and communication problems from the Washington Group Short Set of Questions on Disability. A logistic regression model was applied to explore determinant factors.

Results: Findings indicated that 26.1% of participants aged 75+ and 52.3% were female. Eight percent experienced functional disability in IADL, 1.9% lived alone, 11.8% indicated depression, 5.1%, 4.7%, and 1.6% had vision loss, hearing impairment, and communication problems, respectively. The strongest determinant factor for functional disability in IADL was depression (OR 7.869; 95% CI 4.657-13.296), followed by age (OR 4.602; 95% CI 2.764-7.663), and hearing impairment (OR 2.903; 95% CI 1.190-7.083).

Conclusions: Depression is the strongest determinant for functional disability in IADL. Nurses in rural areas should actively screen for depression to increase the ability of the elderly to fulfill their IADLs.

Keywords: aged, depression, epidemiology, Indonesia

Introduction

The number of elderly in Indonesia has increased significantly by 11 million in the last decade. In 2010, the number was 18 million (7.6% of the total population), and, in 2020, the number reached 29 million or 10.5 % of the total population (Badan Pusat Statistik, 2022). Consequently, Indonesia now faces an increase in degenerative diseases, higher independency, and higher healthcare system usage. Bali is among the three highest percentages of elderly in Indonesia, with 13.5% (Badan Pusat Statistik, 2022). Therefore, conducting a study on elderly in Bali is essential. Forty-four percent of the elderly in Indonesia live in rural areas (Badan Pusat Statistik, 2022). The elderly living in rural areas face several problems where access to healthcare services and social support is more limited than in urban areas (Banerjee, 2021). Likewise, the usage of health facilities in rural areas is lower than in urban areas (Wulandari et al., 2022). In addition, there is a tendency for social changes due to more young people moving from rural

areas to urban areas for economic reasons. Consequently, maintaining independence is essential for the elderly living in rural areas, especially in fulfilling instrumental activities of daily living (IADL).

IADLs are crucial activities necessary to maintain the elderly' independence, such as their capacity to use a phone, travel, shop, prepare their food, clean their homes, do their laundry, manage their medications, and manage their finances (Lawton & Brody, 1969). However, little has been done to explore the functional disability of IADL and its determinant factors in rural areas. A study conducted in Southeastern Poland reports a high prevalence of IADL disability (35.8%), with age, environmental factors, lack of social contact, increased pain, and multimorbidity as determinant factors (Ćwirlej-Sozańska et al., 2019). Depressive symptoms are evident as having a significant association with IADL decline in a study in Japan (Kiyoshige et al., 2019). A study in China and Europe reports that the elderly with IADL disability are at risk of developing multimorbidity, disability, and chronic diseases (Qiao et al., 2021). Another study in India reports 6% of elderly experience severe IADL disability (Chauhan et al., 2022). A recent systematic review shows the prevalence of IADL disability in ASEAN countries is 46.8% (Yau et al., 2022). However, the review also reveals that no study is included from the Indonesian perspective, highlighting the importance of the current study in the Indonesian context.

Similar studies focusing on elderly living in rural areas are currently absent in Indonesia, although a recent study indicates that living in rural areas is associated with a higher risk of dependency in fulfilling their activity daily living (Handajani et al., 2022). Handajani et al. (2022) also report that age, gender, and depression are associated with limitations in IADL. Another study reports some functional disability in IADL among the elderly living in an institutional aged care facility in Indonesia (Fitriana et al., 2019). With the absence of a similar study, this current study will be the first in Indonesia to explore determinants of functional disability in instrumental activities of daily living (IADL) among the elderly, focusing only on those living in a rural area. Determinant factors include age, gender, depression, living arrangement, vision loss, hearing impairment, and communication problems. Findings from this study will contribute to science and nursing practice by providing data and information on determinant factors of IADL disability.

Materials and Methods

Research design

This study employed a cross-sectional design. The setting of the study was a village in a rural area of Bali, Indonesia. This village was chosen because the number of elderly was high, 1,118, and it is classified as a rural area (Badan Pusat Statistik, 2023). Data collection was from August-October 2022. A structured interview by trained data collectors was conducted for data collection in this study. Prior to data collection, all data collectors attended a 2-day training session. During the data collection, data collectors read all questions and filled out the questionnaire. We allowed the presence of family during the interview if it was necessary. The independent variable of this study was IADL, and the dependent variables were age, gender, depression, living arrangement, vision loss, hearing impairment, and communication problems.

Population, samples, and sampling

The population of this study was 1,118 elderly living at home in a rural area of Bali, Indonesia. During data collection, all potential participants were approached in their own homes. Inclusion criteria were elderly aged 60 years and above and living in Melinggih village. We excluded those who were hospitalized and critically ill during data collection. Among 1,118 elderly, 1,053 were willing to participate in the study (response rate 94.2%). A convenience sampling technique was applied for the study.

Instruments

Questionnaires used to measure IADL were the Lawton IADL Scale (Lawton & Brody, 1969). Scores of 2 or less were considered functional disability in IADL (Table 1). Depression was measured using the 5-item Geriatric Depression Scale (Hoyl et al., 1999). Scores of 2 and above were considered depression (Table 2). For vision loss, hearing impairment, and communication problems, the Washington Group Short Set of Questions on Disability was adopted (Washington Group on Disability Statistics, 2020). Respondents were considered as having vision loss, hearing impairment, and communication problems if they answered either "Yes – a lot of difficulty" or "Cannot do at all" in three related questions (Table 3). All instruments measured all participants' current condition at the present time. In addition, all instruments have been tested and widely used in Indonesia (Kementerian Kesehatan, 2017).

Data analysis

Statistical analyses for this study were conducted using SPSS version 20. Bivariate analyses were conducted using a chi-square test with Fisher's test as an alternative when appropriate. All statistical analyses were two-tailed, with statistical significance defined as $p < 0.05$. Effect sizes were calculated and reported as phi coefficient. All variables with $p < 0.25$ in bivariate analysis were entered into a logistic regression to find the determinant (Bursac et al., 2008).

Ethical consideration

Statistical analyses for this study were conducted using SPSS version 20. Bivariate analyses were conducted using a chi-square.

Results

Missing Data

There were no missing data in this study. With structured interviews conducted by trained data collectors, all respondents were willing to answer all questions.

Prevalence of functional disability in iadl, depression, vision loss, hearing impairment, and communication problems

About 20.5% of respondents could use a phone, 23.6% could travel alone, 65.8% could handle all of their shopping needs alone, 65.2% could prepare adequate meals alone, 40.4% could maintain their home alone or with occasional help, 66% could do their laundry, 84.5% could take their medications in the correct dosages at the correct times, and 27% could handle financial matters alone (Table 1). Around 10.3% of respondents were unsatisfied with their life, and 36.1% preferred staying home (Table 2). Eighty-five out of 1,053 elderly (8%) experienced functional disability in IADL, 11.8% indicated depression, and 5.1%, 4.7%, and 1.6% of them had vision loss, hearing impairment, and communication problems, respectively (Table 4).

Determinant factors of functional disability in IADL

The bivariate analyses (Table 4) indicated that factors potentially associated with the functional disability of IADL were age, depression, vision loss, hearing impairment, and communication problems ($P < 0.001$). However, it is essential to highlight that the effect size of age, vision loss, hearing impairment, and communication problems were low (less than 0.3). Only depression showed a medium association with an effect size of 0.3 (Cohen, 1988). Gender and living arrangement were not significantly associated with the functional disability of IADL.

Table 1. Frequency of functional disability in IADL among elderly living in rural area in Bali (n=1,053)

Description (Score)	n	%
Ability to Use Telephone		
Independently uses a phone (1)	216	20.5
Makes a couple of standard phone calls (1)	31	2.9
Answers the phone but doesn't make a call (1)	146	13.9
Not at all a telephone user (0)	660	62.7
Mode of Transportation		
Independently uses public transport or has a vehicle (1)	248	23.6
Taxi is arranged for personal travel; other than that, no public transit is used (1)	377	35.8
Uses a companion when using public transit (1)	273	25.9
Doesn't go anywhere at all (0)	155	14.7
Shopping		
Independently takes care of all shopping (1)	693	65.8
Uses a companion when shopping (0)	212	20.1
Unable to shop (0)	148	14.1
Food Preparation		
Independently creates, prepares, and serves a sufficient meal (1)	687	65.2
Provides adequate meals if given the necessary components (0)	103	9.8
Makes meals, or prepares meals but does not keep a sufficient diet (0)	126	12.0
Needs to have meals prepared and served (0)	137	13.0
Housekeeping		
Maintains home alone or sporadically with aid (1)	425	40.4
Carries out minor daily activities like making the bed and washing the dishes (1)	372	35.3
Needs assistance with all household upkeep jobs (1)	181	17.2
Does not assist with any cleaning duties (0)	75	7.1
Laundry		
Completes personal laundry (1)	695	66.0
Launders small items-rinses stockings, etc. (1)	210	19.9
The others must do all the laundry (0)	148	14.1
Responsibility for Own Medications		
Is in charge of taking medication at the proper times and in the proper dosages (1)	890	84.5
Is unable to dispense his or her own medication (0)	163	15.5
Ability to Handle Finances		
Independently manages financial matters (1)	284	27.0
Organizes daily purchases but need assistance with banking, large purchases (1)	515	48.9
Unable to manage money (0)	254	24.1

We applied logistic regression to determine the impact of various factors on the likelihood that respondents will have an IADL functional disability. The model contained seven independent variables (age, gender, depression, living arrangement, vision loss, hearing impairment, and communication problems). Chi-square (7, N = 1,053) = 144.371, P 0.001, suggesting that the whole model, including predictors, was statistically significant and could distinguish between respondents who had and did not experience functional disability of IADL. The whole model explained between 12.7% (Cox & Snell R Square) and 29.6% (Nagelkerke R Square) of the variance in functional disability of IADL and correctly classified 92.5% of cases. The strongest predictors for functional disability in IADL were depression (OR 7.869; 95% CI 4.657-13.296), followed by age (OR 4.602; 95% CI 2.764-7.663) and hearing

Table 2. Frequency of depression among elderly living in rural area in Bali (n=1,053)

Question (in the last week)	Yes n(%)	No n(%)
Satisfaction with own life	945(89.7)	108(10.3)
Feel bored	95(9.0)	958(91.0)
Feel helpless	74(7.0)	979(93.0)
Prefer to stay at home, rather than going out and doing new things	380(36.1)	673(63.9)
Feel pretty worthless the way you are now	31(2.9)	1,022(97.1)

impairment (OR 2.903; 95% CI 1.190-7.083). The findings indicated that elderly living in rural areas and experiencing depression were 7.869 times more likely to experience functional disability of IADL (Table 5).

Discussions

In the last decade in Indonesia and other countries, life expectancy has significantly increased the number of elderly. With aging, some anatomical and physiological changes in the normal aging process may decrease the intrinsic capacity and functional ability of the elderly (Michel et al., 2021). Our current study provides determinant factors and the prevalence of functional disability in IADL. Functional ability is a significant predictive variable of IADL (Tornero-Quiñones et al., 2020). In our study, we found a lower prevalence of functional disability of IADL (8%) compared to an 11% prevalence in a study in Ireland and a 35.8% prevalence in a study in Poland (Ćwirlej-Sozańska et al., 2019). In Germany, the prevalence rate of disability in IADL is even higher, 45.8%, but the mean age of the study in Germany is 80.7 years (Beltz et al., 2022), compared to the mean age of 70 years in our study. Among eight items of Lawton IADL, the inability to use a phone (62.7%) and being incapable to handle money (24.1%) were two distinguished disabilities found in our study. These inabilities may be related to the nature of the study setting where people in rural areas do not necessarily use phones and or manage their own finances, as evidenced by current data where, in Bali, only 34% of the elderly in rural areas use phones (Badan Pusat Statistik, 2022). These responsibilities are given to other family members. It was found in this study that only 1.9% of the elderly lived alone, while others lived with family members or other extended families.

Although prevalence rates are different between studies, our current study and previous studies in Ireland, Poland, and Germany indicated similarity in terms of advancing age and its association with disability in IADL (Beltz et al., 2022; Ćwirlej-Sozańska et al., 2019; Ismail et al., 2021; Tornero-Quiñones et al., 2020). Our logistic regression indicated that the elderly aged 75 years and above were 4.602 times more likely to experience disability in IADL than those aged below 75. Our study also found 2.9% disability in IADL in age 60-74 vs. 5.1% in age 75 years and above. Compared to previous studies, in Poland, the elderly aged 65 years and above reported 42.4% of disability in IADL (Ćwirlej-Sozańska et al., 2019). In Malaysia, the elderly aged 70 and above are 3.52 more likely to experience functional disability in IADL (Ismail et al., 2021). The finding of this current study is also in line with previous studies that age is a determinant factor for disability in IADL (Yau et al., 2022). This finding also highlights the importance of conducting our current study, especially in the Indonesian setting; as life expectancy increases, the number of elderly in the advanced age group may potentially experience an increased disability in IADL. This finding implies that nurses, other health workers, and other parties must address this issue and primarily assist especially those with IADL problems.

Table 3. Frequency of vision loss, hearing impairment and communication problem among elderly living in rural area in Bali (n=1,053)

Description and Score	n	%
Difficulty seeing, even if wearing glasses		
Cannot do at all (1)	2	0.2
Yes – a lot of difficulty (1)	52	4.9
Yes – some difficulty (0)	405	38.5
No – no difficulty (0)	594	56.4
Difficulty hearing, even if using a hearing aid		
Cannot do at all (1)	5	0.5
Yes – a lot of difficulty (1)	45	4.3
Yes – some difficulty (0)	197	18.7
No – no difficulty (0)	806	76.5
Difficulty in communication		
Cannot do at all (1)	2	0.2
Yes – a lot of difficulty (1)	15	1.4
Yes – some difficulty (0)	82	7.8
No – no difficulty (0)	954	90.6

Previous studies indicate that IADL problems link to poor quality of life (Beltz et al., 2022;Fumes-Ghantous et al., 2020). Although our study did not measure the relationship between quality of life and IADL, previous studies in India focusing on functional status as indicated by disability in IADL found a significant effect on the quality of life of the elderly (Sharma, 2020). Therefore, to maintain and increase the quality of life of the elderly, maintaining adequate IADL is imperative. A further study exploring IADL and quality of life in the Indonesian context is also necessary.

Hearing impairments are also common among the elderly. Several causes include cerumen occlusion, middle ear ossification, viruses, and bacteria (Patel & McKinnon, 2018; Sahoo et al., 2020). There are some concerns reported by previous studies that hearing impairment reduces the social relationship of the elderly (Ogawa et al., 2019) and is associated with cognitive

Table 4. Bivariate analyses of disability in IADLs (n=1,053)

Variable	Categories	Disability in IADL			*p*-value	Effect size (ϕ)
		Yes n (%)	No n (%)	Overall n (%)		
Age	60-74	31(2.9)	747(70.9)	778(73.9)	**0.000**§	0.252
	75+	54(5.1)	221(21.0)	275(26.1)		
Gender	Male	34(3.2)	468(44.4)	502(47.7)	0.173§	0.046
	Female	51(4.8)	500(47.5)	551(52.3)		
Living alone	Yes	3(0.3)	17(1.6)	20(1.9)	0.215¶	0.035
	No	82(7.8)	951(90.3)	1,033(98.1)		
Depression	Yes	41(3.9)	83(7.9)	124(11.8)	**0.000**§	0.335
	No	44(4.2)	885(84.0)	929(88.2)		
Vision loss	Yes	13(1.2)	41(3.9)	54(5.1)	**0.000**¶	0.137
	No	72(6.8)	927(88.0)	999(94.9)		
Hearing impairment	Yes	18(1.7)	32(3.0)	50(4.7)	**0.000**¶	0.229
	No	67(6.4)	936(88.9)	1,003(95.3)		
Communication problem	Yes	7(0.7)	10(0.9)	17(1.6)	**0.000**¶	0.156
	No	78(7.4)	958(91.0)	1,036(98.4)		

§Chi square; ¶Fischer exact test

impairment (Saji et al., 2021). Our current study found that hearing impairment is a determinant factor of IADL problems. This finding aligns with a previous study in China that hearing loss is associated with difficulties in performing IADL (Heine et al., 2019). Another study also supports our finding in that, in Turkey, the probability of experiencing functional disability in IADL is around five times higher in elderly with hearing impairments than in those without (Mercan et al., 2021). With the support from findings that align with our current study, caring for the elderly with a hearing impairment needs to be strengthened as it affects their functional ability to perform IADL. Strengthening caring could be made by using effective communication strategies such as appropriate verbal tones, eye contact, and nonverbal communication strategies when communicating with the elderly.

Depression among the elderly is a common issue. According to a systematic review and meta-analysis, depression affects 13.3% of seniors globally (Abdoli et al., 2022). Another systematic review and meta-analysis also found that 34.4% of the elderly in India experience depression (Pilania et al., 2019). Our current study found a lower prevalence (11.8%) of elderly in rural areas experiencing depression. The two most common symptoms of depression were not satisfied with own life and the preference to stay home more than usual. In further logistic regression analyses, depression was found as the strongest determinant factor for functional disability in IADL. A study in China also reveals a similar finding that depressive symptoms among low-income elderly families in urban areas are associated with being three times more likely to experience problems with IADL (Zhao et al., 2022). Depression and disability in IADL are not new issues, as some previous studies also indicate similar findings (Ćwirlej-Sozańska et al., 2019; Hossain et al., 2021; Sharma, 2020; Zhao et al., 2022). Depression decreases mood and motivation to activity and reduces the physical functioning of the elderly (Sharma, 2020). Physical activities and mobility affect depressive symptoms levels. These symptoms may be due to the fact that the elderly begin to depend on other family members for everyday tasks and it is believed that limitations in their activities further stimulate psychological distress (Hossain et al., 2021). Considering that depression affects the elderly's functional ability in rural areas in fulfilling their IADL, nurses should consider this in their practice setting by conducting active screening and applying further assessment, nursing intervention, and further referral as necessary.

This study is the first in the Indonesian context to provide evidence around the determinant of disability in IADL among the elderly in a rural area in Indonesia. This study has some limitations. First, it was conducted only in one rural area in Bali. However, this study managed to recruit a large number of elderly to participate in the

Table 5. Logistic regression determinant factors of functional disability in IADL among elderly living in rural area in Bali (n=1,053)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	1.527	0.260	34.449	1	**0.000**	**4.602**	2.764	7.663
Gender	0.280	0.263	1.136	1	0.287	1.323	0.791	2.213
Living alone	0.792	0.743	1.136	1	0.287	2.207	0.515	9.465
Depression	2.063	0.268	59.426	1	**0.000**	**7.869**	4.657	13.296
Vision loss	0.760	0.425	3.198	1	0.074	2.139	0.930	4.922
Hearing impairment	1.066	0.455	5.484	1	**0.019**	**2.903**	1.190	7.083
Communication problem	0.721	0.664	1.177	1	0.278	2.056	0.559	7.563
Constant	-3.256	1.006	10.481	1	0.001	0.039	NA	NA

NA=Not applicable

study, making the sample size adequate. In addition, the final logistic regression model correctly classified 92.5% of cases of functional disability in IADL. Secondly, our study only measured seven dependent variables: age, gender, depression, living arrangement, vision loss, hearing impairment, and communication problems. Some potential determinant factors found in previous studies, such as cognitive function, social support, nutritional status, pain, and multimorbidity (Beltz et al., 2022; Ćwirlej-Sozańska et al., 2019; Tornero-Quiñones et al., 2020) were not measured because we considered the need to manage the appropriate length of time for interviews with participants. Thirdly, our study did not explore the quality of life among those with IADL disability. A further study exploring this is essential.

Conclusions

Depression is the strongest predictor for functional disability in IADL. Nurses in rural areas should actively screen for depression to increase the ability of the elderly to fulfill their IADL and assist their IADL accordingly. Increasing age and hearing impairment are the other predictors. Effective communication among the elderly with hearing problems and their caregivers is also essential in increasing the ability to fulfill the IADL of the elderly. Nurses should also train in effective communication with family caregivers, especially for the elderly with hearing problems. Future studies are suggested to expand the research settings in more than one rural area and add potential determinants such as cognitive function, social support, nutritional status, pain, and multimorbidity. Another study exploring the quality of life among those with IADL disability is also essential.

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Conflict of Interest

All authors have no conflict of interest related to this study.

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