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Original Article

Functional Dependency and Its Associated Factors Among Older Adults in Indonesia

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ABSTRACT

Background/Purpose: This study aims to investigate dependency according to Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) indices and its associated risk and protective factors among Indonesian older adults.

Methods: The sociodemographic factors and health variables from the Indonesia Family Life Survey-5 (IFLS-5), the only large-scale longitudinal field survey in Indonesia, cross-sectional data of 4236 older adults aged 60 and over were used. ADL and IADL were assessed using the Katz and Lawton indices. Multivariate logistic regression analyses were conducted to assess the associations between dependency (measured by ADL and IADL) and sociodemographic, health variables, and other factors.

Results: Among older adults (mean age: 66.88±6.23), 12.7% and 25.6% were dependent based on ADLs and IADLs, respectively. ADL and IADL limitations were associated with older age, living in rural areas, low life satisfaction, self-perceived unhealthy, low social capital, depression, having one or more chronic conditions, having dementia, engaging low physical activities, being overweight/obese, having a history of falls and self-reported insomnia.

Conclusion: Improving physical and mental health, creating more age-friendly environment, and reducing chronic morbidities through increasing social capital and physical activity to maintain a healthy weight can all reduce the risk for dependency and are particularly important in rural areas. Effective and local government policy can support this.

1. INTRODUCTION

As the world advances in medicine, public health, and socioeconomic development, the aging population is increasing. There were 703 million persons aged 65 and over in the world in 2019 and it is estimated that this number will be doubled to 1.5 billion in 2050. Indonesia as the fourth country with the largest population has more than 16 million older adults (6.1%).[1] Although the increasing aging population is a success, it comes with several challenges, such as increasing functional disability, multimorbidity, and frailty.[2-4] Functional capacity is measured by the ability to do daily activities in a normal way, conversely, if the person fails to conduct daily activities, it is considered as a dependency where the activities cannot be

compensated by technical aids and help from others is needed.[5]

Previous studies show that functional capability is associated with age, sex, living in rural areas, education, pain, number of diseases, physical activities, presence of environmental barriers, social contacts and relatives' relations, lung capacity, depression, and dementia.[6-9] Factors associated with functional dependency include older age, female, living in the rural areas, lower education, higher pain level, having one or more diseases, and low physical activity.[6-8] Architectural, communication, and social barriers were also associated with dependency. Presence of diseases such as dementia, hypertension, heart failure, cancer, stroke, and Parkinson's disease all increase the likelihood of dependency in the older person.[5-8]

To our knowledge, only a few studies have examined the relationship between functional capability using ADL/IADL and its associated factors, especially with a large number of data sampled in many regions in Indonesia. Female comprise the majority of Indonesia's older population, based on 2010 Census, 54% of older population were female and this trend is projected to remain consistent in the future (feminization of ageing). Indonesia is a developing country, with deep-rooted tradition, cultural norms and custom; social activities were found to be the most common activity of older persons (16.6-18.1%).[10] Many opportunities for social activities exist including cultural activities, religious activities, funerals, and *arisan* (a practice, which members of a community contribute fixed amount of money each month, and each one individuals wins it every month until all members have won once). Older adults in Indonesia also cannot rely on pensions or savings because there was no universal pension scheme, combined with high inlfation rate and low interest rate of savings, the elderly could not fully rely on their children or relative for financial support.[11] Therefore, the need to remain working is common in order to support themselves. Health conditions among Indonesian older adults have not been explored and even fewer in the community-dwelling population. Even though many researches have been going on in other countries, epecially in developed countries, we think research involving Indonesian older adults might show new insights due to differences in sociodemography, geography, economy, access to healthcare, and cultures. This study aims to estimate the prevalence of disability using ADL and IADL index and the correlation towards other associated factors in older adults sampled through national cross-sectional data, Indonesia Family Life Survey in 2014-2015.

2. METHODS

2.1. Study Designs and Participant

Cross-sectional data from the Indonesian Family Life Survey-5 (IFLS-5) in 2014-2015 were used for analysis. The IFLS-5 sampling method was a multistage stratified sampling design.[12] A total of 4236 individuals aged 60 years and older were included with complete functional capability measurements. We followed the methods used by Pengpid et al., 2019.[13] IFLS-5 obtained data were input after interview by the trained interviewer in the field.

2.2. Measures

The functional capability was assessed by 6 items of the Katz Activity Daily Living (ADL), which includes items like bathing, dressing, toileting, transference, continence, and feeding; and 6 items of the Lawton Instrumental Activity of Daily Living (IADL), which includes item like shopping, food preparation, housekeeping, laundry, taking medications, and handling finance.[14,15] Functional capability is classified as being independent and dependent with having difficulty in at least one of the items indicating dependency.

Sociodemographic factors included age (in categories, see below), sex, marital status (in categories, see below), education (in level), residential status (urban or rural), region, and subjective economic status (in categories, see below). The age variable was grouped into 3 categories with 10-year intervals. Marital status was classified into (1) Married or coinhabiting, and (2) Never married, separated, widowed, or divorced. Educational status was classified into high (participant who finished at least high school) and low. Region variable was grouped into Sumatra, Java, and Other regions. Subjective economic status was assessed with the question "Please, imagine a six-step ladder where on the bottom stand the poorest people and on the highest step stand the richest people. On which economic step are you today?", which has options ranged from (1) poorest to (6) richest reclassified into poor (step 1 and 2), medium (step 3 and 4), and rich (step 5 and 6).

Body mass index was calculated using measured height and body weight taken using standard procedures and classified into underweight, normal, and overweight/obese according to the Asia Pacific Classification.[16]

Life satisfaction was assessed with the question "Please, think about your life as a whole. How satisfied are you with it?", which has options ranging from (1) completely satisfied to (5) not all satisfied. The option of not very or not at all satisfied was reclassified as low life satisfaction.

Subjective-health status was assessed with the question "In general, how is your health?", which has options ranging from (1) very healthy to (4) unhealthy and reclassified into healthy (1 and 2) and unhealthy (3 and 4).

Social capital was assessed with activities engaged in past 12-month, such as participation in a community meeting, doing voluntary labor, attending a program in the neighborhood, and taking part in religious activities. Those who answer yes at least one of the activities were considered to have high social capital and those who engaged in none being classified as having low social capital.

Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ) short version (IPAQ-S7S) from the question 'Do you regularly engage in physical activity?'. Physical activity was classified according to IPAQ protocol into low, moderate, and high over the last 7 days.[17]

Loneliness was assessed with the item in Center for Epidemiologic Studies Depression Scale (CES-D 10) "How often did you feel lonely in the past week?", which has options ranging from (1) rarely or none to (4) most of the time.[18] Loneliness was defined if the subject reported feeling lonely occasionally or most of the time.

Tobacco use was assessed with questions "Have you ever chewed tobacco, smoked a pipe, smoked self-enrolled cigarettes, or smoked cigarettes/cigar?" and "Do you still have the habit or have you quit?", which has option `yes' or `no' and `current smoker' or `past smoking'. The options were reclassified into (1) never, former and (2) current smoker.

Depression was assessed using the Centers for Epidemiologic Studies Depression Scale (CES-D 10) question items, with a score higher than 10 classified as having a clinical depression.[18]

Chronic conditions were assessed with the question "Has a doctor/paramedic/nurse/midwife ever told you that you had...? The chronic conditions listed included having been diagnosed with hypertension, diabetes, tuberculosis, chronic pulmonary disease, brain injury, psychological problems, memory problems, cardiac infarct, stroke, kidney disease, arthritis, cancer, hearing problems, visual problems, and high cholesterol." The options were classified into `none' and `one or more' chronic conditions.

Cognitive function/possible dementia was assessed with items from Telephone Survey Cognitive Status (TICS). The TICS included items of awareness of date and day of the week, self-reported memory question, subtraction of 7s from 100, immediate and delayed word recall of 10 nouns. The TICS total score was 34. Possible dementia was defined if the score was below 8.[13]

Falls were assessed with the question "In the last two years, have you ever fallen?", which has the option of `no' and `yes'.

Insomnia was assessed using the Patient-Reported Outcomes Measurement Information System (PROMIS) sleep disturbance measure and sleep impairment measure with a total score of 40.[19,20] Insomnia was assigned to participant with a score higher or equals to 21.

Frailty was assessed using Fried's scale phenotype of frailty, which consists of 5 items including shrinking or unintentional weight loss, self-reported exhaustion, weakness, slowness, and low physical activity. Each item was scored zero or one. The total scores were classified into robustness (score=0), being prefrail (score=1-2), or frail (score=3-5).[21] The item of shrinking was assessed using body mass index. Self-reported exhaustion was assessed from items in CES-D, "I felt everything that I did was an effort" and "I could not get going", which option ranged from (1) never or rarely to (4) most of the time.[18] The self-reported exhaustion item was assigned if the answer was occasionally or most of the time. Weakness item was assessed based on handgrip strength using a dynamometer on each hand twice and highest score were taken. The weakness was assigned if the handgrip strength was below 23.7 (mean). Slowness was assessed based on 4-m timed walk and classified slowness as the time needed for the 4-m walk was below 4.78 s. Low physical activity was assessed based on IPAQ-S7S protocol using the question `Do you regularly engage in physical activity?'.[17]

2.3. Statistical Analysis

IFLS-5 data were consisted of multiple sociodemographic health data among Indonesian households from children to older adult, we cleaned and extracted the individual data of the older adults only (we used books 3A and 3B of IFLS-5 questionnaire data). All variables were measured using self-reported data or standard measure. All continuous data gathered from the study were converted to categorical variable with validated cut-offs. Bivariate analysis was done using chi square to identify potential preditor variables. Due to the nature of the dependent variable (dependency), which is dichotomous, we decided to conduct binary logistic regression analysis for this study. Logistic regression require several assumptions, which were (1) dependent variable in dichotomous scale, (2) one or more independent variables in continous or categorical form, (3) the data have independence of observations, and (4) there were linear relationship between continuous independent variable and the the logit transformation of the dependent variable. All assumptions were met, none of the variables were in continuous scale, hence, there no linearity test needed. All independent variable were examined for colinearity using spearman correlation rank. Enter method was used by including all potential variables measured in bivariate analysis into the model to avoid dilution of true associations. The analyzed

data were presented with adjusted odds ratio (AOR), p-values ($p \leq 0.05$ were considered significant) and 95% confidence intervals (95% CI). Analyses were performed using the IBM SPSS software version 22 (IBM, New York, USA).

3. RESULTS

The total sample included in the analysis consisted of 4236 older adults aged 60 and over with mean age 66.99±6.23 years old (Table 1). In total, 12.7% of participants were dependent based on ADL and 25.6% based on IADL. The proportion of females was 50.3%. Around two-thirds (66.6%) of the participants were 'married/coinhabiting', while others were 'never married, separated, divorced, or widowed'. The educational status of 85% of participants was low, 49.2% lived in a rural area, 12.6% of participants reside in Sumatra, and 78.2% in Java. Most participants (39.9%) were in medium socioeconomic status and 33.7% were poor, 17.8% had low life satisfaction, 34.6% described themselves as unhealthy, and 16.3% suffered from depression. The proportion of obese/overweight participants was 33% and underweight was 26%. Participants having one or more chronic conditions contributed to 46.6% of the population, 14% had possible dementia or mild cognitive impairment, 47% had low physical activities, 57.9% were prefrail and 38.1% were frail. No significant colinearity was found.

Bivariate analyses show that ADL and IADL limitations were associated with age (*p*-value <0.001), sex (*p*-value <0.001), residential status (ADL, *p*-value=0.015; IADL, *p*-value <0.001), socioeconomic status (ADL, *p*-value=0.038; IADL, *p*-value <0.001), life satisfaction (*p*-value <0.001), subjective health status (*p*-value <0.001), social capital (*p*-value <0.001), loneliness (*p*-value <0.001), depression (*p*-value <0.001), having chronic conditions (*p*-value <0.001), dementia (*p*-value <0.001), physical activities (*p*-value <0.001), falls (*p*-value <0.001), insomnia (*p*-value <0.001), and frailty (ADL, *p*-value=0.022; IADL, *p*-value <0.001) (Table 2). Factors only associated with only ADL included marital status (*p*-value <0.001) and region (*p*-value <0.001), while factors only associated with IADL were education (*p*-value <0.001) and body mass index (*p*-value=0.001).

In multivariate logistic regression analyses, ADL and IADL were associated with older age (Age 70-79 [ADL, AOR: 1.56 (1.25-1.95); IADL, AOR: 1.52 (1.29-1.8)] and age ≥80 [ADL, AOR: 2.82 (1.91-4.17); IADL, AOR: 3.09 (2.23-4.29)]), unhealthy subjective health status [ADL, AOR: 1.72 (1.41-2.12); IADL, AOR: 1.55 (1.32-1.81)], low social capital [ADL, AOR: 1.3 (1.03-1.64); IADL, AOR: 1.33 (1.11-1.6)], depression [ADL, AOR: 1.65 (1.26-2.18); IADL, AOR: 1.96 (1.57-2.44)], having one or more chronic conditions [ADL, AOR: 1.26 (1.03-1.55); IADL, AOR: 1.33 (1.14-1.56)], dementia

Table 1. Variable characteristics

Variables	Categories	Frequency (%)
Total Samples		4236 (100)
Mean Age±*SD*		66.88±6.23
Age	60-69	2976 (70.3)
	70-79	1074 (25.3)
	≥80	186 (4.4)
Sex	Male	2105 (49.7)
	Female	2131 (50.3)
Marital Status	Married/Coinhabiting	2820 (66.6)
	Never married, separated, divorced, widowed	1416 (33.4)
Education	High	634 (15)
	Low	3602 (85)
Residential Status	Urban	2153 (50.8)
	Rural	2083 (49.2)
Region	Sumatera	535 (12.6)
	Jawa	3314 (78.2)
	Others	386 (9.1)
Socioeconomic Status	Rich	1120 (26.4)
	Medium	1690 (39.9)
	Poor	1426 (33.7)
ADL	Independent	3696 (87.3)
	Dependent	540 (12.7)
IADL	Independent	3153 (74.4)
	Dependent	1083 (25.6)
Body Mass Index	Underweight	1100 (26)
	Normal	1739 (41)
	Overweight/Obese	1397 (33)
Life Satisfaction	Yes	3481 (82.2)
	No	755 (17.8)
Subjective Health Status	Healthy	2770 (65.4)
	Unhealthy	1467 (34.6)
Social Capital	High	3488 (82.3)
	Low	748 (17.7)
Loneliness	No	3736 (88.2)
	Yes	500 (11.8)
Tobacco Use	Never, Former	2816 (66.5)
	Yes	1420 (33.5)
Depression	No	3545 (83.7)
	Yes	691 (16.3)
Chronic Condition	None	2261 (53.4)
	One or more	1975 (46.6)
Cognitive Function	Good	3642 (86)
	Dementia	594 (14)
Physical Activities	High	950 (22.4)
	Moderate	1286 (30.4)
	Low	2000 (47.2)
Falls	No	3728 (88)
	Yes	508 (12)
Insomnia	No	3793 (89.5)
	Yes	443 (10.5)
Frailty	Robust	128 (3)
	Prefrail	2454 (57.9)
	Frail	1654 (39.1)

[ADL, AOR: 1.37 (1.05-1.79); IADL, AOR: 1.49 (1.21-1.84)], low physical activities (ADL, AOR: 2.1 (1.57-2.81); IADL, AOR: 1.5 (1.22-1.84)), and a history of falls [ADL, AOR: 1.71 (1.33-2.21); IADL, AOR: 1.32 (1.07-1.63)] (Figure 1 and Figure 2). The female sex was positively associated with dependency based on the ADL [AOR: 1.35 (1.03-1.75)] but negatively associated with dependency based on the IADL [AOR: 0.64 (0.53-0.79)]. While low education was negatively associated with dependency based on the ADL [AOR: 0.66 (0.6-0.89)], it was positively associated with dependency based on the IADL [AOR: 1.28 (1-1.62)]. The factors only positively associated with only ADL were living in a rural area [AOR: 1.31 (1.07-1.61)], being overweight/obese [AOR: 1.26 (1-1.58)], having low life satisfaction [AOR: 1.41 (1.12-1.79)], and having insomnia [AOR: 1.52 (1.14-2.01)]. Participants residing in the Java region were negatively associated with dependency based on the ADL [AOR: 0.7 (0.54-0.92)].

4. DISCUSSION

The older adults population in Indonesia is growing each year along with its complexity in health and functioning. We found in our study that there were 12.7% older adults with dependency in ADL and 25.6% in IADL. This dependency was lower when compared to a Polish study, where there was 17.13% dependency in ALD and 35.75% in IADL.[7] An Irish study showed a higher percentage of dependency in ADL but a lower percentage based on IADL in individuals older than 65 years, which were 13% and 11%, respectively.[22] Data from a Spanish study involving more than 25 thousand individuals aged 65 and over showed 11.1% dependency based on ADL and higher dependency based on IADL (31.9%).[2] A study done in 18 countries exploring dependency in ADL and IADL, showed an average of 11.7% and 18.3%, respectively.[23] As the data show, there were various percentages of dependency within countries. By evaluating the associated factors to dependency in Indonesian older adult, it may help to predict the likelihood of Indonesian older adults to become dependent. The prevalence of frailty in our study was 38.1%, while 57.9% were prefrail, which is higher

Table 2. Prevalence and bivariate analysis of factors associated with dependency based on ADL and IADL

Variables	Categories	ADL		IADL	
		Dependency	Chi Square (*p*-value)	Dependency	Chi Square (*p*-value)
Age	60-69	319 (59.1)	<0.001	643 (59.4)	<0.001
	70-79	172 (31.9)		344 (31.8)	
	≥80	49 (9.1)		96 (8.9)	
Sex	Male	219 (40.6)	<0.001	586 (54.1)	0.001
	Female	321 (59.4)		497 (45.9)	
Marital Status	Married/ Coinhabiting	312 (57.8)	<0.001	710 (65.6)	0.143
	Never married, separated, divorced, widowed	228 (42.2)		373 (34.4)	
Education	High	82 (1.2)	0.187	121 (11.2)	<0.001
	Low	458 (84.8)		962 (88.8)	
Residential Status	Urban	248 (45.9)	0.015	500 (46.2)	<0.001
	Rural	292 (54.1)		583 (53.8)	
Region	Sumatera	88 (16.3)	<0.001	126 (11.6)	0.059
	Jawa	373 (69.1)		840 (77.6)	
	Others	79 (14.6)		117 (10.8)	
Socioeconomic Status	Rich	134 (24.8)	0.038	251 (23.2)	<0.001
	Medium	198 (36.7)		418 (38.6)	
	Poor	208 (38.5)		415 (38.3)	
Body Mass Index	Underweight	124 (23)	0.077	320 (29.5)	0.001
	Normal	217 (40.2)		452 (41.7)	
	Overweight/ Obese	199 (36.9)		311 (28.7)	
Life Satisfaction	Yes	398 (73.7)	<0.001	843 (77.8)	<0.001
	No	142 (26.3)		240 (22.2)	
Subjective Health Status	Healthy	259 (48)	<0.001	586 (54.1)	<0.001
	Unhealthy	281 (52)		497 (45.9)	
Social Capital	High	407 (75.4)	<0.001	840 (77.6)	<0.001
	Low	133 (24.6)		243 (22.4)	
Loneliness	No	443 (82)	<0.001	918 (84.7)	<0.001
	Yes	97 (18)		166 (15.3)	
Tobacco Use	Never, Former	379 (70.2)	0.051	678 (62.6)	<0.001
	Yes	161 (29.8)		405 (37.4)	
Depression	No	392 (72.6)	<0.001	810 (74.8)	<0.001
	Yes	148 (27.4)		273 (25.2)	
Chronic Condition	None	233 (43.1)	<0.001	524 (48.4)	<0.001
	One or more	307 (56.9)		559 (51.6)	
Cognitive Function	Good	428 (79.3)	<0.001	866 (79.9)	<0.001
	Dementia	112 (20.7)		218 (20.1)	
Physical Activities	High	77 (14.2)	<0.001	210 (19.4)	<0.001
	Moderate	132 (24.4)		298 (27.5)	
	Low	332 (61.4)		576 (53.1)	
Falls	No	437 (19.1)	<0.001	921 (85)	<0.001
	Yes	103 (80.9)		162 (15)	
Insomnia	No	442 (81.9)	<0.001	929 (85.8)	<0.001
	Yes	98 (18.1)		154 (14.2)	
Frailty	Robust	12 (2.2)	0.022	24 (2.2)	<0.001
	Prefrail	289 (53.5)		585 (54)	
	Frail	239 (44.3)		474 (43.8)	

compared to other studies. Meta-analysis by He et al. exploring studies from China showed that the prevalence of frailty ranged from 5.9% to 17.4%, with an overall frailty prevalence of 10% among community-dwelling Chinese older adults.[24] Meta-analysis by O'Caoimh et al. compromising studies from 62 countries showed a pooled prevalence of 12-24% of frailty.[25]

Our findings regarding older age to be an independent risk factor for dependency was also confirmed in other studies.[2,7,9,24,26] Older age has an increased risk of dependence due to multiple health problems,[2,3] but chronic conditions in these analyses were found to have separate associations with dependency as well. Being female increased the risk of being dependent based on ADL but decreased risk of being dependent based on IADL, some studies showed that the female was more at risk of dependency on both outcomes.[2,9] A higher percentage of women could be affected because of their higher life expectancy and increased risk of more morbidities,[2] but again in our analyses, these risk factors were independent of female gender factor. Alternatively, in Indonesia older women are more likely to live alone compared to older men,[27] and are thus more affected by not being able to feed and wash themselves, as there is nobody to help them with ADL. Conversely, they are also more likely to have always engaged with cooking, shopping and other IADL tasks, compared to older men who often live with relatives and of that generation have always been less likely to cook and clean for themselves.

An association between marital status and dependency among Indonesian older adults was not found, but an Irish study showed that being separated or divorced was associated with an increased likelihood of dependency.[22] This difference in outcomes maybe because we did not separate being single and not married into different sub-categories including being widowed, always single, etc. The association between having high educational status and dependency based on ADL was consistent

Figure 1. Multivariate logistic regression analysis of factors associated with ADL in older adult

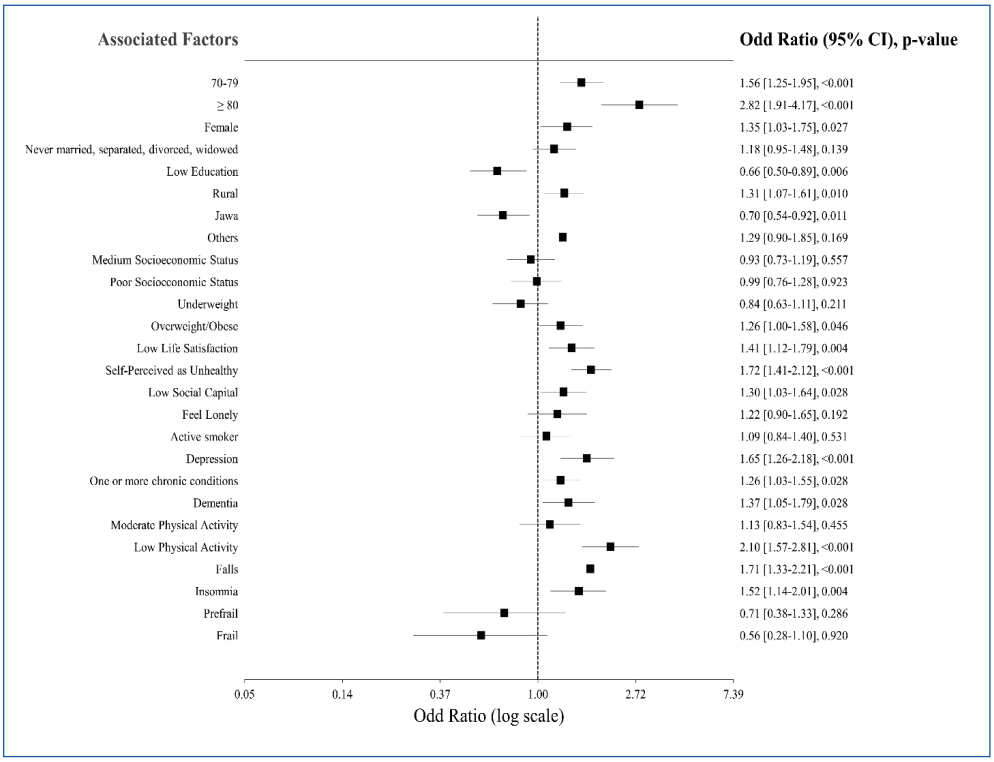
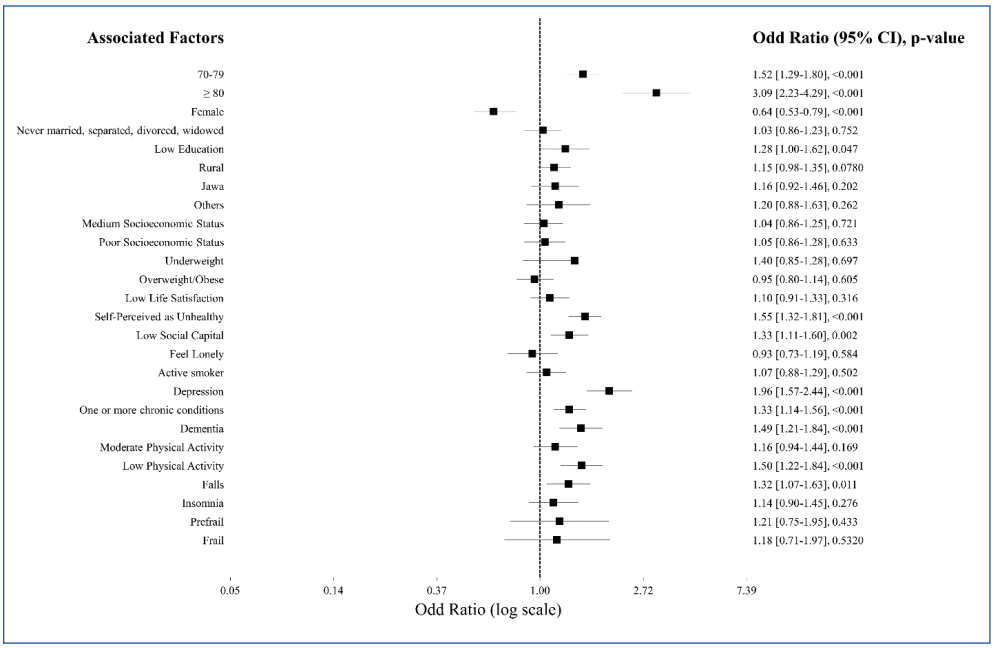


Figure 2. Multivariate logistic regression analysis of factors associated with IADL in older adult



with previous studies using IFLS-4 data including a Dutch study, but was different compared to a Spanish study, where low education increased the risk of dependency.[2,8,28] A study on education and IADL showed that having no formal education increased the risk of dependency in Indonesia. Having a lower risk of lower education on dependency based on ADL but an increased risk on IADL may due to large proportions of low education among the elderly (85%) and the IADL requiring more complex understandings of task compared to ADL which includes questions on daily self-care. The complexity of the IADL tasks (banking, travel) requires higher cognitive skills, which are influenced by education.[29] Living in a rural area was associated with a higher risk of dependency for unknown reasons but conversely, some studies have suggested that living in a rural area decreased the risk of dependency.[30,31] Rural areas tend to have more residential green space which could provide suitable environment for social engagement and physical activities.[30] In the terms of the effects of BMI on functional capability, the results were controversial. The higher BMI (overweight/obese) was associated with increased risk of dependency in our study which was consistent with several studies and a meta-analysis.[32-36] This can be explained by multiple reasons, such as obesity being related to osteoarthritis, diabetes mellitus, cardiovascular disease, decreased muscle tissue and increased adiposity.[35] In contrast, another study found that higher BMI was associated with decreased dependency.[37] Cultural differences could explain findings.

Associations between dependency and low life satisfaction, and no social capital share the same result as ours in many studies.[21,38-41] Dependency was related to low life satisfaction, social contact, and social activities in several ways. A decrease in the independency of doing daily activities, especially the items related to lower extremities, such as bathing, toileting, and transference create subjective symptoms of inconvenience, limit movement and decreases in participation in social activity and forming relations, which in turn cause lower life satisfaction.[23,39] But in our analyses, association between dependency and low life satisfaction was independent. Social activities may increase health benefits from physical activities and social relationships. They also reinforce neural networks and musculoskeletal function which sustains functional independence and helps creating meaningful social roles and integration provide a sense of value and increase a positive physiological response.[42] Older adults who participate in social activities also tend to be more active; higher physical activity also decreases the risk of disability or dependence[42] independently in our study. Subjective health status was a good predictor of dependency according to our study, which was also confirmed by several studies.[38,43]

Our study suggests that depression was associated with decreased functional capability, which aligned with other literature and the association between those two may have a bidirectional relationship.[9,23,44] The proportion of older adults with chronic conditions increases every year along with the proportion of older adults with dependency based on ADL and IADL.[44] Having one or more chronic conditions increased risk of dependency in our study, consistent with other literature.[6,23,38,45-50] Chronic conditions need to be treated to decrease the risk of dependency. The development of multiple chronic conditions may have resulted from a high degree of molecular damage that decreases physiological reserve, leading to a loss of homeostatic capacity. All those factors result in decreased physical and cognitive function causing disability and dependency.[48] Since chronic conditions may be accumulated from early life, interventions in earlier life may have better outcomes towards functional capability.[47] Cognitive impairment/possible dementia was positively and independently related to dependency in our study and several other studies.[5,23,51,52] Low physical activity increased the risk of dependency in our study as it did in several other studies and meta-analysis.[6,38,53,54] Physical activity has a beneficial effect on muscle strength, aerobic capacity, flexibility, and protection against chronic diseases, especially cardiovascular disease. Physical activity also has been shown to have a positive cognitive impact and favorable psychological effects, such as improved mood and increased self-efficacy.[53,54] Physical activity in our study had independent associations with dependency which could also be explained through its effects on neuronal health.[55,56] History of at least one fall increased the risk of dependency among older adults in our study which was consistent with the findings of others.[38,57,58] Falls can cause physical injuries, psychological consequences, and fear of falls, which in turn lead to activity limitations. Lower activity subsequently creates a negative impact on body function, physical fitness, muscle strength, and posture.[38] Insomnia may play role in decreased physical function as our study suggests that it increased the likelihood of dependency consistent with several study results.[59-61] The mechanism of this relationship may be due to impaired attention and fatigue, increasing the risk of physical and mental illness, and sleep-related maladaptation. The association may be confounded by other factors, such as dementia and chronic illness, which can result in physical dependency.[61]

A strength of this study was that it involves a nationally-representative data set and is one of the few recent studies that investigate the association between ADL, IADL, and several sociodemographic and health factors in Indonesian older adults. However, this study has several limitations. First, this study used self-reported measurements that tend to be more subjective. For some assessments, slightly different outcomes were also used. Second, the

study design was cross-sectional. Third, the causal relationships can not be determined clearly since the data were from cross-sectional survey. It may be, for instance, that people do not engage with physical activity because of reduced muscle mass, disability, etc. which by themselves also increased dependency.

5. CONCLUSION

This study provides data regarding functional dependency based on ADL and IADL questions and its associated risk and protective factors among older adults in Indonesia. The prevalence of dependency is still substantial among older adults with high dependency in IADL compared to ADL. Dependency was associated with older age, low life satisfaction, unhealthy subjective health status, low social capital, depression, having one or more chronic diseases, dementia, low physical activity, history of falls, and insomnia. The effect of the female sex and education toward dependency still show mixed results, and more research is needed to clarify this topic. Although the proportion of aging population is increasing, the functional dependency that comes with it still remains a significant problem that affects the quality of life of older adults.

The ability to identify the associated risk and protective factors may help in predicting and preventing decreased functional dependency, creating a better quality of life among older adults. Improving physical and mental health, creating more age-friendly environment, and reducing chronic morbidities including dementia through early medical interventions and by increasing social capital and physical activity to maintain a healthy weight can all reduce the risk for dependency and are particularly in rural areas. Effective national and local government policy can support this.

ETHICAL ISSUE

The IFLS surveys and procedures were reviewed and approved by Institutional Review Boards (IRBs) in the United States at RAND corporation and in Indonesia at the University of Gadjah Mada (UGM) for IFLS-3, IFLS-4, and IFLS-5. All requirements for consent for older adults were met and approved by those IRBs before the work could begin.

DATA AVAILABILITY

Data employed in this study are publicly available by registering request at RAND (https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS.html).

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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