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Original Article

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Prevalence and associated factors of loneliness among older adults in Indonesia: insights from the Indonesian family life survey (ifls-5)

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ABSTRACT

Introduction: Loneliness presents a significant threat to the mental and physical health of older adults in Indonesia, constituting a pressing public health concern. The study aims to determine the prevalence of loneliness and identify the factors associated with loneliness among older adults in Indonesia.

Methods: A cross-sectional analysis was conducted using data from the fifth wave of the Indonesian Family Life Survey (IFLS-5). Sociodemographic, loneliness, and health-related variables were examined through multivariate logistic regression to identify factors associated with loneliness.

Results: High levels of loneliness were reported by 11.2% of participants, while 88.8% experienced low levels. Significant factors included lower educational attainment (adjusted odds ratio [AOR] = 2.05, 95% confidence interval [CI] = 1.43–2.93, p < 0.001), life dissatisfaction (AOR = 1.55, 95% CI = 1.16–2.06, p = 0.003), and poor sleep quality (AOR = 2.32, 95% CI: 1.72–3.39, p < 0.001). Geographic location also emerged as a significant factor; participants residing in Sumatra were less likely to report loneliness (AOR = 0.64, 95% CI = 0.42–0.99, p = 0.049). Other variables, such as self-rated health, chronic conditions, religious participation, and cell phone ownership, showed significance in unadjusted models but were no longer statistically significant after adjustments were made

Conclusions: The findings underscore the necessity for targeted interventions to mitigate loneliness among older adults in Indonesia. Such interventions should focus on improving health, enhancing social support, and fostering connectivity, with the aim of elevating the quality of life and alleviating loneliness within this vulnerable population.

Keywords: loneliness, life satisfaction, sleep quality, cell phones, and older adults

Introduction

Loneliness, a subjective feeling of social disconnection, is increasingly being recognized as a public health issue among older adults (Andersson, 2010, Rico-Uribe *et al.*, 2018). It affects millions of individuals worldwide, and studies indicate that loneliness is highly prevalent in older populations (Hansen and Slagsvold, 2015, von Soest *et al.*, 2020, Hawkley *et al.*, 2022). Factors such as retirement, loss of a spouse, and limited social engagement contribute to the growing incidence of loneliness in this demographic, often intensifying with age (Hawkley and Kocherginsky, 2018, Barreto *et al.*, 2021). Research suggests that the prevalence of loneliness among older adults varies across regions and cultures and

is influenced by socio-demographic, environmental, and health-related factors (Dahlberg *et al.*, 2018, Menec *et al.*, 2019, Peltzer and Pengpid, 2019, Sunwoo, 2020).

The causes and effects of loneliness in older adults have been well documented. Social isolation, limited physical activity, poor health, and psychological factors contribute to feelings of loneliness, which can lead to a range of adverse health outcomes (Dahlberg *et al.*, 2018, Rico-Uribe *et al.*, 2018, Domenech-Abella *et al.*, 2019). Loneliness is associated with depression, anxiety, cardiovascular issues, cognitive decline, and unhealthy behaviors, such as smoking and poor sleep (Hedley *et al.*, 2018, Domenech-Abella *et al.*, 2019, Hajek and Konig, 2019, Lee *et al.*, 2019, Peltzer and Pengpid, 2019, Park *et al.*, 2020, Rafnsson *et al.*, 2020, Sutin *et al.*, 2020). In addition, social isolation and a lack of social networks are linked to poor life satisfaction and reduced well-being, making loneliness a significant concern for the aging population. Technology such as cell phones and social media has shown potential in mitigating loneliness by enabling older adults to maintain social connections and participate in virtual communities (Wilson, 2017, Barbosa Neves *et al.*, 2019, Stockwell *et al.*, 2020, Busch *et al.*, 2021).

However, despite extensive research on loneliness among older adults globally, studies focusing on Asian populations, particularly Indonesia, are limited (Domenech-Abella *et al.*, 2019, Lee *et al.*, 2019, Peltzer and Pengpid, 2019). Indonesia is undergoing rapid socioeconomic and demographic changes, including urbanization and an aging population, which may contribute to increasing levels of loneliness among older adults. Cultural factors such as strong family ties and community engagement play a critical role in shaping social interactions among older Indonesians. However, the migration of younger family members to urban areas or abroad often leaves older adults isolated, highlighting the need to understand loneliness in this unique cultural context (Menec *et al.*, 2019, Peltzer and Pengpid, 2019, Boyd *et al.*, 2021, Liu *et al.*, 2021). Additionally, stigma surrounding loneliness and barriers to accessing social support services further exacerbates this issue (Chen *et al.*, 2019, Ko *et al.*, 2019). This study aimed to address these gaps by assessing the prevalence of loneliness and identifying associated health-related factors among older adults in Indonesia. By examining variables such as self-rated health, chronic conditions, religious participation, and cell phone ownership, this study provides insight into the specific challenges faced by older adults in Indonesia. These findings are expected to contribute to the development of targeted interventions that can help reduce loneliness and enhance the well-being of this vulnerable population.

Materials and Methods

Design and Sample

This study used a cross-sectional design based on data from the fifth wave of the Indonesian Family Life Survey (IFLS-5) collected between 2014 and 2015. The IFLS-5 dataset was acquired from RAND Corporation (RAND, 2015), employed stratified sampling to ensure national representation. Strata were defined based on provinces and urban or rural locations to capture the diverse socioeconomic and geographic characteristics of the Indonesian population. Specifically, 13 of 27 provinces were selected to represent approximately 83% of the Indonesian population. Enumeration areas (EAs) were then randomly chosen within these strata, with a total of 321 EAs selected across 13 provinces. In each EA, 20 households were sampled from urban areas, and 30 households were sampled in rural areas. The final analysis focused on older adults aged 60 years and above, with 2,381 respondents included after excluding proxy respondents and those with incomplete data. To address potential non-response bias, the IFLS employed strategies to encourage high response rates, such as repeat visits to non-responding households. Additionally, comparisons were made between the respondents and the general population to ensure representativeness. However, the limitations due to non-response bias cannot be entirely eliminated and should be considered when interpreting the results.

Variables and Measurements

The study examined several demographic variables, including age, sex, education level, marital status, residence, and region.

Loneliness, the dependent variable, was assessed using a single question from the Center for Epidemiological Studies Depression scale (CESD-10) (Peltzer and Pengpid, 2019), "How often did you feel lonely in the past week?" The responses "rarely or none of the time" and "some or a little of the time" were categorized as "low" loneliness, while "occasionally or a moderate amount of time" and "all of the time" were categorized as "high" loneliness. Although the use of a single-item measure may limit the comprehensiveness of loneliness assessments, this item has been previously validated for application in older adult populations across diverse cultural contexts, thereby supporting its reliability in measuring loneliness within the Indonesian context(Peltzer and Pengpid, 2019).

The study also examined several independent variables, including current employment status, life satisfaction, self-rated health status, smoking behavior, sleep quality, number of chronic conditions, religious activity, and possession of a cell phone.

The number of chronic conditions was determined based on participants' doctor's diagnoses. This included hypertension, diabetes or high blood sugar, tuberculosis,

Table 1. Frequency distribution of characteristics (n = 2,381)

Variables	Frequency (n)	Percent (%)
Age (Years)		
60 ~ 64	1,090	45.8
65 ~ 69	613	25.7
70 ~ 74	424	17.8
≥ 75	254	10.7
Sex		
Male	1,296	54.4
Female	1,085	45.6
Education Level		
High School/Higher	764	32.1
None/Elementary	1,617	67.9
Marital Status		
Married	1,651	69.3
Divorced/Widow	730	30.7
Residence		
Urban	1,397	58.7
Rural	984	41.3
Region		
Java & Bali	1,667	70.0
Sumatra	347	14.6
Other Islands	367	15.4
Currently Working		
Yes	1,628	68.4
No	753	31.6
Life Satisfaction		
Satisfied	916	38.5
Unsatisfied	1,465	61.5
Self-rated Health		
Healthy	1,496	62.8
Unhealthy	885	37.2
Smoking Behavior		
No	1,244	52.2
Yes	1,137	47.8
Sleep Quality		
Good	2,237	89.8
Poor	244	10.2
Chronic Conditions		
None	683	28.7
1	332	13.9
≥ 2	1,366	57.4
Religious Activity		
Yes	1,720	72.2
No	661	27.8
Having Cell Phone		
Yes	878	36.9
No	1,530	63.1
Loneliness		
Low (Rarely or none and some days) < 3 days	2,114	88.8
High (Occasionally and most of the time) ≥ 3 days	267	11.2

Table 2. Statistical examination of loneliness using Chi-squared analysis (n = 2,381)

Variables	Loneliness		p-value
	Low [n (%)]	High [n (%)]	
Age (Years)			0.484
60 ~ 64	976 (41.0%)	114 (4.8%)	
65 ~ 69	538 (22.6%)	75 (3.1%)	
70 ~ 74	371 (15.6%)	53 (2.2%)	
≥ 75	229 (9.6%)	25 (1.0%)	
Sex			0.108
Male	1,163 (48.8%)	133 (5.6%)	
Female	951 (39.9%)	134 (5.6%)	
Education Level			<0.001*
High School/Higher	716 (30.1)	48 (2.0%)	
None/Elementary	1,398 (58.7%)	219 (19.2%)	
Marital Status			0.315
Married	1,473 (61.9%)	178 (7.5%)	
Divorced/Widow	641 (26.9%)	89 (3.7%)	
Residence			0.827
Urban	1,242 (52.2%)	155 (6.5%)	
Rural	872 (36.6%)	112 (4.7%)	
Region			0.100
Java & Bali	1,467 (61.6%)	200 (8.4%)	
Sumatra	319 (13.4%)	28 (1.2%)	
Other Islands	328 (13.8%)	39 (1.6%)	
Currently Working			0.631
Yes	1,442 (60.6%)	186 (7.8%)	
No	672 (28.2%)	81 (10.8%)	
Life Satisfaction			<0.001*
Satisfied	840 (35.3%)	76 (3.2%)	
Unsatisfied	1,274 (53.5%)	191 (8.0%)	
Self-rated Health			0.034*
Healthy	1,344 (56.4%)	152 (6.4%)	
Unhealthy	770 (32.3%)	115 (4.8%)	
Smoking Behavior			0.948
No	1,010 (42.4%)	127 (5.3%)	
Yes	1,104 (46.7%)	140 (5.9%)	
Sleep Quality			<0.001*
Good	1,922 (89.9%)	215 (9.0%)	
Poor	192 (8.1%)	52 (2.2%)	
Chronic Conditions			0.112
None	620 (26.0%)	63 (2.6%)	
1	296 (12.4%)	36 (1.5%)	
≥ 2	1,198 (50.3%)	168 (7.1%)	
Religious Activity			0.044*
Yes	1,541 (64.7%)	179 (7.5%)	
No	573 (24.1%)	88 (3.7%)	
Having Cell Phone			<0.001*
Yes	808 (33.9%)	70 (2.9%)	
No	1,306 (54.9%)	197 (8.3%)	

Note: * p < 0.05

asthma, other lung conditions, heart attack, coronary heart disease, angina or other heart problems, liver disease, stroke, cancer or malignant tumor, arthritis, high cholesterol, prostate illness, kidney disease, and stomach or other digestive diseases. Participation in religious activities was assessed with the question, "Have you participated in any religious activities in this village?" with a response of "Yes" or "No." Lastly, possession of a cell phone was assessed with the question, "Do you have a cell phone?" which corresponded to a "Yes" or "No."

Statistical Analysis

The data were analyzed using both univariate and multivariate techniques. Univariate analysis was employed to describe the basic characteristics of the participants, using frequency (n) and percentage (%). Bivariate analysis was conducted to examine the relationship between respondents' characteristics and loneliness, using a chi-square test to compare characteristics between older adults with low and high levels of loneliness. For multivariate analysis, logistic regression was used to identify the factors associated with loneliness. Prior to performing the logistic regression, multicollinearity among the independent variables was tested using variance inflation factors (VIFs). Statistical significance was determined at a p <

Table 3. Predictive variables in multivariate logistic regression analysis

Variables	Categories	Model 1: Unadjusted			Model 2: Adjusted		
		OR	95% CI	p-value	AOR	95% CI	p-value
Age (Years)	60 ~ 64	1.00	-	-	1.00	-	-
	65 ~ 69	1.19	0.87-1.72	0.263	1.13	0.82-1.56	0.442
	70 ~ 74	1.22	0.86-1.73	0.256	1.10	0.76-1.58	0.602
	≥ 75	0.93	0.59-1.47	0.772	0.77	0.47-1.25	0.296
Sex	Male	1.00	-	-	1.00	-	-
	Female	1.23	0.95-1.59	0.108	1.02	0.60-1.72	0.942
Education Level	High School/Higher	1.00	-	-	1.00	-	-
	None/Elementary	2.33	1.68-3.23	<0.001*	2.05	1.43-2.93	<0.001*
Marital Status	Married	1.00	-	-	1.00	-	-
	Divorced/Widow	1.14	0.86-1.50	0.315	1.06	0.77-1.45	0.707
Residence	Urban	1.00	-	-	1.00	-	-
	Rural	1.02	0.79-1.33	0.827	0.99	0.76-1.31	0.991
Region	Java & Bali	1.00	-	-	1.00	-	-
	Sumatra	0.64	0.42-0.97	0.037*	0.64	0.419-0.99	0.049*
	Other Islands	0.87	0.60-1.25	0.461	0.88	0.60-1.29	0.537
Currently Working	Yes	1.00	-	-	1.00	-	-
	No	0.93	0.70-1.23	0.630	0.98	0.73-1.32	0.924
Life Satisfaction	Satisfied	1.00	-	-	1.00	-	-
	Unsatisfied	1.65	1.25-2.19	<0.001*	1.55	1.16-2.06	0.003*
Self-rated Health	Healthy	1.00	-	-	1.00	-	-
	Unhealthy	1.32	1.02-1.70	0.035*	1.02	0.77-1.35	0.876
Smoking Behavior	No	1.00	-	-	1.00	-	-
	Yes	0.99	0.76-1.27	0.948	0.79	0.54-1.16	0.245
Sleep Quality	Good	1.00	-	-	1.00	-	-
	Poor	2.42	1.72-3.39	<0.001*	2.32	-	<0.001*
Chronic Condition	None	1.00	-	-	1.00	-	-
	1	1.19	0.77-1.84	0.415	1.19	0.76-1.87	0.430
	≥ 2	1.38	1,01-1.87	0.039*	1.47	0.91-2.35	0.107
Religious Activity	Yes	1.00	-	-	1.00	-	-
	No	1.32	1.00-1.73	0.045*	1.26	0.95-1.67	0.106
Having Cell Phone	Yes	1.00	-	-	1.00	-	-
	No	1.74	1.30-2.31	<0.001*	1.31	0.95-1.80	0.089

Note: * p < 0.05

0.05. The odds ratio (OR) was reported with a 95% confidence interval (CI). The data were analyzed using SPSS version 25.0 (Corp. in Armonk, NY, USA).

Ethical Consideration

The IFLS-5 questionnaires and procedures received approval from the Institutional Review Board (IRB) at the RAND Corporation with United States and Universitas Gadjah Mada (UGM) in Indonesia (Sikoki *et al.*, 2016). Prior to their involvement, all participants provided written informed consent. The study strictly adhered to protocols ensuring the confidentiality and anonymity of participants' personal information.

Results

Characteristics of Study Participants

The characteristics of the 2,381 older adult respondents are displayed in Table 1. Within the sample, 45.8% belonged to the 60-64 age group, 54.4% were female, and the majority (67.9%) had received either elementary or no education. Moreover, 69.3% were married, 58.7% resided in urban areas, and 38.5% expressed satisfaction with their lives. In terms of health status, 62.8% considered themselves to be in good health, and 47.8% reported engaging in smoking behavior. With regard to sleep quality, 89.8% reported experiencing good sleep quality. Additionally, 57.4% had more than two chronic conditions, 72.2% engaged in religious activities, and 36.9% owned a cell phone. In relation to loneliness, 11.2% of participants reported experiencing high levels of loneliness (occasionally or most of the time, ≥ 3 days), while 88.8% reported low levels of loneliness (rarely or none and some days, <3 days).

Bivariate Statistics

The bivariate associations between loneliness and various sociodemographic and health-related factors among older adults (see Table 2) were analyzed utilizing chi-squared tests. A significant association was identified between loneliness and education level ($p < 0.001$), with participants lacking formal education or possessing only elementary education exhibiting a higher rate of loneliness (19.2%) compared to those with at least a high school education (2.0%). Additionally, life satisfaction demonstrated a significant relationship with loneliness ($p < 0.001$), wherein individuals reporting dissatisfaction experienced a higher prevalence of loneliness (8.0%) than those expressing satisfaction (3.2%). Furthermore, self-rated health status was associated with loneliness ($p = 0.034$), with individuals self-reporting poor health experiencing greater loneliness (4.8%) relative to those in good health (6.4%). Sleep quality was significantly correlated with loneliness ($p < 0.001$); individuals reporting poor sleep quality exhibited increased loneliness (9.0%) compared to those reporting good sleep quality (2.2%).

Religious activity and cell phone ownership were identified as additional significant factors influencing loneliness. Participants not engaged in religious activities

(p = 0.044) and those lacking cell phones (p < 0.001) demonstrated higher rates of loneliness. Conversely, factors such as age, sex, marital status, and employment status did not reveal significant associations with loneliness. The confidence intervals and p-values associated with these findings underscore the statistical significance of the observed associations.

Multivariate Analysis

In the unadjusted model (Model 1), high levels of loneliness were significantly associated with several factors (Table 3). Lower educational attainment was a notable predictor, with older adults possessing less education being more than twice as likely to report feelings of loneliness compared to their counterparts with higher education levels (OR = 2.33; 95% CI = 1.68–3.23). Life dissatisfaction emerged as another strong indicator, with dissatisfied individuals being 65% more likely to experience loneliness (OR = 1.65; 95% CI = 1.25–2.19). Poor self-rated health increased the likelihood of loneliness by 32% (OR = 1.32; 95% CI = 1.02–1.70), whereas poor sleep quality more than doubled this risk (OR = 2.42; 95% CI = 1.72–3.39). Participants with two or more chronic conditions were 38% more likely to report feelings of loneliness (OR = 1.38; 95% CI = 1.01–1.87), suggesting that health-related restrictions play a significant role. Low engagement in religious activities was another contributing factor, with less engaged individuals being 32% more likely to report loneliness (OR = 1.32; 95% CI = 1.00–1.73), underscoring the importance of community and spiritual connections. Lack of cell phone ownership also emerged as significant, with individuals without cell phones being 74% more likely to feel lonely (OR = 1.74; 95% CI = 1.30–2.31), highlighting the role of technology in maintaining social ties. Geographic location further influenced loneliness, as older adults residing in Sumatra were 36% less likely to report feelings of loneliness compared to those in Java or Bali (OR = 0.64; 95% CI = 0.42–0.97).

In the adjusted model (Model 2), after controlling for confounding variables, several associations remained statistically significant (Table 3). Lower educational attainment continued to be a strong predictor, with older adults with less education remaining twice as likely to report loneliness (OR = 2.05; 95% CI = 1.43–2.93). The protective effect of residing in Sumatra persisted, with individuals in this region still being 36% less likely to experience loneliness (OR = 0.64; 95% CI = 0.42–0.99), possibly reflecting stronger social cohesion. Life dissatisfaction remained a robust predictor, increasing the likelihood of loneliness by 55% (OR = 1.55; 95% CI = 1.16–2.06), emphasizing the importance of psychological and emotional well-being. Poor sleep quality continued to be strongly associated with loneliness, with participants being over twice as likely to report loneliness even after adjustments (OR = 2.32; 95% CI = 1.72–3.39). These findings underscore the multifactorial nature of loneliness among older adults, highlighting the roles of educational, psychological, social, and health-related factors.

Discussions

The prevalence of loneliness and its associations with health-related and sociodemographic factors among older adults in Indonesia were assessed. The findings indicate significant associations between loneliness and variables such as educational attainment, geographic location, life satisfaction, and sleep quality. In contrast, self-rated health, chronic conditions, religious activity, and cell phone ownership exhibited initial associations that did not maintain significance after adjustment. These results provide valuable insights into the multifaceted nature of loneliness and underscore its implications for public health interventions targeting older adults. Unlike previous research, which primarily focused on the general population in Indonesia (Peltzer and Pengpid, 2019), this study uniquely examines a national sample of older adults, identifying specific factors associated with loneliness within this demographic.

The study revealed that 88.8% of older adults experienced low levels of loneliness (rarely or some days), while 11.2% experienced high levels (occasionally or mostly). This prevalence is higher than that reported in English-speaking countries (Smith and Victor, 2018), Poland and Spain (Domenech-Abella *et al.*, 2019), and Florida (Burris *et al.*, 2019), but lower than rates observed in Ireland (Domenech-Abella *et al.*, 2019) and Sweden (Dahlberg *et al.*, 2018). The findings align with studies from Germany (Hajek and Konig, 2019), Europe (Domenech-Abella *et al.*, 2017), the United States (Hawkley and Kocherginsky, 2018), and other English-speaking countries (Kobayashi and Steptoe, 2018, Petersen *et al.*, 2022), reflecting broader trends and evidence on loneliness among older populations.

The strong association between lower educational attainment and loneliness highlights the critical role of education in shaping social and psychological outcomes. Lower education levels may limit cognitive and social skills necessary to navigate modern societal demands, such as technology use and social participation. Education enhances individuals' ability to build and maintain social networks, while limited education can create barriers to accessing resources and engaging in social activities, increasing vulnerability to loneliness. These findings align with prior research linking digital illiteracy and limited social capital to lower education levels (Kobayashi and Steptoe, 2018, Domenech-Abella *et al.*, 2020, Petersen *et al.*, 2022). Addressing this issue necessitates strategies that focus on improving education, providing health and social services, and promoting inclusive social activities to mitigate loneliness effectively.

Geographic differences, particularly the lower prevalence of loneliness in Sumatra, underscore the significance of cultural and community structures. Collective activities such as "gotong royong" (mutual assistance) and traditional events cultivate robust social bonds, contributing to reduced levels of loneliness in this region. Furthermore, the rural environment in Sumatra facilitates closer social interactions, in contrast to the urbanized areas of Java and Bali, where individualism and limited opportunities for meaningful interactions are more pronounced. Strengthening community-based initiatives and integrating traditional practices into urban environments could mitigate loneliness among older adults in these locales.

Life satisfaction and sleep quality were consistently associated with loneliness, both in unadjusted and adjusted models. Dissatisfaction with life often reflects unmet needs, loss of social roles, or reduced engagement, which can lead to withdrawal and isolation (Tomida *et al.*, 2023). Poor sleep quality further compounds loneliness by impairing mental and physical health, reducing energy levels, and limiting social participation. The interplay between loneliness, life dissatisfaction, and poor sleep creates a feedback loop that exacerbates both physical and emotional well-being. These findings are consistent with the research conducted by Peltzer and Pengpid (2019), Szczesniak *et al.* (2020), and Wakefield *et al.* (2020). Strategies aimed at enhancing life satisfaction and sleep quality should prioritize bolstering social support, fostering meaningful activities, and addressing health-related barriers to social engagement.

Self-rated health, chronic conditions, religious activity, and cell phone use were initially correlated with loneliness but lost significance after adjustment. Older adults with poor health often experience physical limitations that hinder social participation, while chronic illnesses intensify feelings of isolation. Although cell phone ownership demonstrated initial significance, it became non-significant after adjustment, indicating that digital literacy and meaningful utilization are essential for reducing loneliness. Advocating for digital inclusion and equipping older adults with the skills to effectively use technology for social purposes may enhance the potential of technology in alleviating loneliness. Religious activities, while losing statistical significance following adjustment, continue to hold cultural importance in Indonesia, providing emotional and social support in less urbanized contexts.

This study underscores the necessity for a multifaceted approach to addressing loneliness among older adults. Interventions should prioritize the management of chronic conditions, enhancement of sleep quality, encouragement of community engagement, promotion of digital literacy, and augmentation of life satisfaction. Moreover, policies should focus on fortifying communal bonds, fostering cultural practices, and expanding access to healthcare and technology in reducing loneliness (Batra *et al.*, 2024). Programs specifically tailored to the socio-cultural context of Indonesia, including community-based initiatives and affordable technology access, may significantly alleviate loneliness and enhance the quality of life for older adults.

As previously highlighted, the prevalence of loneliness among older adults in Indonesia was examined, identifying significant associations with educational attainment, geographic location, life satisfaction, and sleep quality (Mancuso and Lorona, 2022, Perez and Rohde, 2022). Religious involvement remains an essential aspect of Indonesian culture and can provide emotional and social support to older adults. Therefore, promoting inclusive and accessible religious activities could still be a valuable strategy for addressing loneliness, particularly in rural or less-urbanized settings. In contrast, factors such as self-rated health, chronic conditions, religious activity, and cell phone ownership demonstrated initial associations but lost significance after adjustment (Wang *et al.*, 2024, Yeo *et al.*, 2024). Lower educational attainment emerged as a critical factor, as older adults with less education often face barriers in accessing resources, building social networks, and adapting to technological and societal changes, thereby increasing their vulnerability to loneliness (Balki *et al.*, 2023). Geographic differences, particularly the lower prevalence of loneliness in Sumatra, underscore the role of cultural and community structures, such as collective activities and extended family networks, which foster strong social bonds. Life satisfaction and sleep quality consistently predicted loneliness, highlighting the interplay between emotional well-being, physical health, and social participation. Poor sleep quality, in particular, creates a feedback loop that exacerbates isolation and reduces energy levels, further limiting social engagement (Holt-Lunstad, 2024). Although self-rated health, chronic conditions, religious activity, and cell phone ownership were initially significant, their diminished impact after adjustment suggests overlapping contributions with other variables. Importantly, while technology and religious participation offer potential for mitigating loneliness, their efficacy depends on meaningful use and access. This study underscores the need for multifaceted interventions that address educational disparities, enhance digital literacy, promote community-based activities, and improve access to healthcare and social services. Future research should adopt longitudinal designs and inclusive sampling to capture the broader context of loneliness, particularly in underserved or remote populations. These findings provide valuable insights for developing culturally tailored strategies to improve the quality of life among older adults in Indonesia.

Nonetheless, the study's cross-sectional design limits causal inference, and reliance on self-reported data introduces potential biases. The use of a single-item measure to assess loneliness, while correlated with other variables, may not capture the full breadth of the phenomenon. Additionally, the exclusion of remote populations, who may experience heightened isolation, could lead to an underestimation of loneliness prevalence. Future research should adopt inclusive sampling strategies and longitudinal designs to better understand causal relationships and the broader context of loneliness in Indonesia.

Conclusion

This study identifies key factors associated with loneliness among older adults in Indonesia, providing critical insights for public health interventions. Health-related factors, including poor self-rated health, chronic conditions, and inadequate sleep quality, demonstrate significant associations with loneliness. Addressing these health challenges through improved healthcare access, healthy aging programs, and mental health support initiatives may mitigate loneliness within this population. Socioeconomic and lifestyle factors, such as lower educational attainment, low life satisfaction, limited religious engagement, and lack of cell phone ownership, also correlate with elevated levels of loneliness. These findings suggest that programs promoting digital literacy, expanding educational opportunities, and supporting social engagement may effectively reduce loneliness. Culturally sensitive programs that encourage religious and community involvement can strengthen social bonds and provide emotional support, particularly in Indonesia, where family and community ties are foundational. Public health authorities, including the Ministry of Health, local governments, and social service organizations, should prioritize policies that enhance social support networks, improve healthcare accessibility, and promote digital inclusion among older adults. By comprehensively addressing both health-related and socioeconomic factors, policymakers can create supportive environments that enhance quality of life and alleviate loneliness among the elderly in Indonesia.

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Availability of data and materials

The data used in this study were obtained from the Indonesian Family Life Survey (IFLS), conducted by the RAND Corporation. The IFLS is a publicly available dataset accessible online. Access to the dataset requires registration and is restricted to legitimate research purposes. Detailed instructions on how to apply for dataset access can be found at: https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS.html.

Authors' contributions

YA, AH, AM, and JJK contributed to the conception and design of the study. YA, AH, and AM were responsible for data access, scrutiny, and initial analysis. YA and YBM conducted further statistical analyses and interpreted the results. YBM provided critical revisions and supervised the overall research process. All authors contributed to the writing of the manuscript, reviewed it, and approved the final version for submission.

Declaration of Interest

The author(s) declared no potential conflicts of interest to this article's research, authorship, or publication.

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