Patient Preference and Adherence

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ORIGINAL RESEARCH

Factors Influencing Medication Non-Adherence in Patients with Chronic Diseases and Disabilities: Insights from a National Survey in Indonesia

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Purpose: Medication non-adherence remains a problem in the long-term management of chronic disease among patients with disabilities. This study aimed to assess the prevalence of medication non-adherence among patients with chronic diseases and disabilities in Indonesia and to identify the factors associated with medication non-adherence among these patients.

Patients and Methods: This cross-sectional analysis was conducted using national data from the 2014 Indonesian Family Survey (IFLS-5). A self-report questionnaire was used to collect information on all chronic diseases, disability, medication non-adherence, and sociodemographic characteristics. Logistic regression analysis was carried out to identify factors contributing to medication non-adherence. Odds ratios (ORs) with 95% confidence intervals (CIs) were presented.

Results: The study included 1908 patients with chronic diseases and disabilities, with 66.3% identified as non-adherent to medication. Factors associated with medication non-adherence included being aged 15 to 30 years (OR = 1.65; 95% CI = 1.19–2.30) and 31 to 45 years (OR = 1.36; 95% CI = 1.01–1.84), self-perceived health status as somewhat healthy (OR = 1.36; 95% CI = 1.09–1.69) or very unhealthy (OR = 1.73; 95% CI = 1.08–2.77), had no active days missed due to poor health (OR = 1.51; 95% CI = 1.09–2.10), and non-use of any hearing, visual, or walking aids (OR = 1.24; 95% CI = 1.01–1.52).

Conclusion: More than half of the patients (66.3%) with chronic diseases and disabilities were non-adherent to their medication. Therefore, interventions designed to improve medication adherence in this population should consider specific patient-related factors.

Keywords: Disability, chronic disease, medication adherence, IFLS-5

Introduction

According to a nationwide research conducted by the Indonesian Ministry of Health, the older adults with disabilities and chronic diseases account for approximately 2.6% of the total population. [1] The 2023 national Survey conducted in Indonesia reported that the prevalence of disability varied across specific types, including visual disabilities (0.6%), intellectual disabilities (1%), mental disabilities (0.8%), sensory disabilities (0.2%), and communication disabilities (0.5%).[2] Additionally, it is estimated that between 2.5% to 5% of Indonesians living with disabilities are at risk for suffering from chronic diseases.[3] Individuals with disability are particularly vulnerable to a range of illnesses, largely due to poorer medication adherence (54.5%) within this population compared to those without disabilities (57.5%).[4] Disability can hinder medication adherence due to various factors, including physical limitations, cognitive challenges to comprehend prescribed treatment, insufficient access to healthcare resources, and inadequate caregiver support in managing medication routines.[5–10] These factors have been widely identified in studies as key contributors to non-adherence among patients with disabilities.[5]

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Non-adherence to medication is commonly observed among patients with chronic diseases as they are required to follow a long-term treatment plan.[11] Prior research has identified potential factors linked to non-adherence among patients with chronic diseases, including socioeconomic factors,[12] therapy-related factors,[13] medical professionals and health system-related factors,[12] and patient-related factors, such as gender,[14] treatments beliefs,[15] and the presence of a disability.[5–7] However, there is still a lack of research on the factors contributing to medication non-adherence in patients with chronic diseases and disabilities. These patients may face different challenges that affect adherence compared to those without disabilities.

Moreover, studies examining the link between disability and medication non-adherence remain limited. In some cases, populations with disabilities have been excluded from medication adherence studies, leaving them unobserved.[16] Relevant studies in Indonesia are still limited concerning the factors associated with medication non-adherence among patients with chronic diseases[17] and treatment approaches specifically for chronic disease patients with disabilities,[18] leaving the relationship between being physically or mentally impaired and medication non-adherence largely unexplored. A previous study in Indonesia found that individuals with disabilities and low physical activity were at greater risk of chronic diseases compared to disabled adults with moderate or high activity levels.[18] Given the rising prevalence of chronic diseases in Indonesia[19] and the increasing focus on inclusive healthcare, investigating how disability impacts medication adherence is particularly critical.[20] Such understanding is essential for optimizing treatment effectiveness for patients with disability and chronic disease through appropriate strategy.[21] Therefore, this study aimed to assess the prevalence of medication non-adherence among patients with chronic diseases and disabilities in Indonesia and to identify the factors associated with medication non-adherence among these patients.

Material and Methods

This study is presented in accordance with the guideline for cross-sectional studies: Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[22] [See Table S1].

Study Design and Data Source

Data were analyzed using the cross-sectional study design from a national longitudinal survey from the fifth wave of the Indonesian Family Life Survey (IFLS-5), which was collected from 2014 to 2015. The IFLS is a comprehensive health and socioeconomic survey conducted at both individual and community levels by the RAND Corporation.[23] The IFLS 5 survey was conducted through face-to-face interviews and covers a substantial portion of the population, representing 83% of Indonesians across thirteen provinces (North Sumatra, West Sumatra, South Sumatra, Lampung, DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java, Bali, West Nusa Tenggara, South Kalimantan, and South Sulawesi). Moreover, the survey has been conducted since 1993 and achieved a response rate of over 90%.[23] The IFLS study received approval from the ethical review boards of the RAND's Human Subjects Protection Committee (No. s0064-06-01-CR01), and informed consent was obtained from respondents prior to the study. According to the 2022 Standard Operating Procedures of the Research Ethics Committee at Universitas Padjadjaran, Indonesia (No. POB/08/KEP), research involving existing data, publicly available documents, or pathological and diagnostic specimens that protect participants' identities is exempt from ethical review requirements.

Study Population

Data were analyzed from a national IFLS 5 database selecting individuals who were at least 15 years old at the time of the interview and had been diagnosed with a chronic disease. Chronic disease was measured using a self-report questionnaire with the question, "Has a doctor, paramedic, nurse, or midwife ever told you that you had any of the following chronic diseases?". The available options included diabetes, hypertension, asthma, long-term respiratory illnesses, cardiovascular diseases (heart attack, coronary heart disease, angina, or other heart health issues), liver disorders, stroke, cancer or malignancies, arthritis, uric acid, gout, high cholesterol levels, prostate disease, kidney disorders, stomach or other digestive disorders, mental health issues, and diseases related to memory. Respondents who answered "yes" to any of the chronic diseases were classified as having a chronic disease. Respondents without available data on disability and medication adherence were excluded.

Disability Measures

Disability is defined as any impaired condition of the body or mind that limits a person's ability to perform certain activities and interact with their environment. Disability was assessed through a self-report interview with the question, "Has a doctor, paramedic, nurse, or midwife ever told you that you had any of the following disabilities?". The response options included physical disabilities, brain or cognitive damage, vision problems, hearing problems, speech impediments, mental retardation, and autism. Respondents who answered "yes" to at least one of the options were classified into the disability group.

Outcome Measures

Medication non-adherence was assessed with the question, "Are you taking [types of medication] to treat [types of chronic disease] and its complications?". Respondents who reported no medication for any of the chronic diseases were classified as non-adherent.

Potential Factors Associated with Medication Non-Adherence

Potential factors in this study were included based on previous studies.[5,24,25] Sociodemographic information was obtained through a self-reported questionnaire, which included gender (female or male), age (15–65 or over 65), formal educational background (unschooled/elementary/junior high/senior high/higher education), ethnicity (Javanese or non-Javanese), geographical residence (Java or non-Java), demographic residence (rural or urban), household size (1 person/ 2–6 people/more than 6 people).

Socioeconomic factors were assessed based on annual income categories (not working or having no income/less than 12 million rupiah/12–40 million rupiah/40–100 million rupiah/over 100 million rupiah, with approximately USD conversions of around 770 USD/770–2600 USD/2600 – 6405 USD/over 6405 USD).

Health-related factors were measured by variables such as health insurance ownership (yes or no), self-perceived health status (very healthy/somewhat healthy/somewhat unhealthy/very unhealthy), days of primary activities (eg, work, education, caregiving) missed due to poor health during the last month (1–7 days or more than 7 days),[26] body mass index (underweight [< 18.5 kg/m^2], normal [18.5–22.9 kg/m^2], overweight [23–24.9 kg/m^2], and obesity [≥ 25 kg/m^2]),[27] smoking behavior (non-smoker/former smoker/active smoker), the need for assistance with daily tasks based on basic Activities of Daily Living (ADLs), such as bathing, dressing, and eating, as well as Instrumental Activities of Daily Living (IADLs), including using transportation and preparing meals (yes or no),[28,29] and the use of aids such as glasses or corrective lenses, hearing aids, or walking aids (yes or no).

Data Analysis

Descriptive statistics were used to summarize the respondents' sociodemographic, economic, and health-related characteristics, as well as the types of chronic diseases, disabilities, and aids utilized. Binary logistic regression analyses were conducted to evaluate potential factors associated with medication non-adherence among patients with chronic diseases and disabilities. Factors that showed a significant association with the outcome at a significance level of $p < 0.25$ were included in the multivariate analysis.[30] Multivariate logistic regression was performed to calculate the odds ratios (ORs) and 95% confidence intervals (95% CIs), with significant levels set at $p < 0.05$. The Hosmer-Lemeshow and R-Squared tests were used to assess the model's fit. All statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) software version 27.0.

Results

Respondent's Characteristics

A total of 74,251 respondents participated in the IFLS 5 survey (Figure 1). Respondents under 15 years of age and those with no available information on chronic diseases were excluded, resulting in a total of 11,419 respondents. After further excluding those with missing data, we included 1908 respondents with disabilities in the study. Among these 1908 participants, 1265 (66.3%) were non-adherent to medication (Table 1).

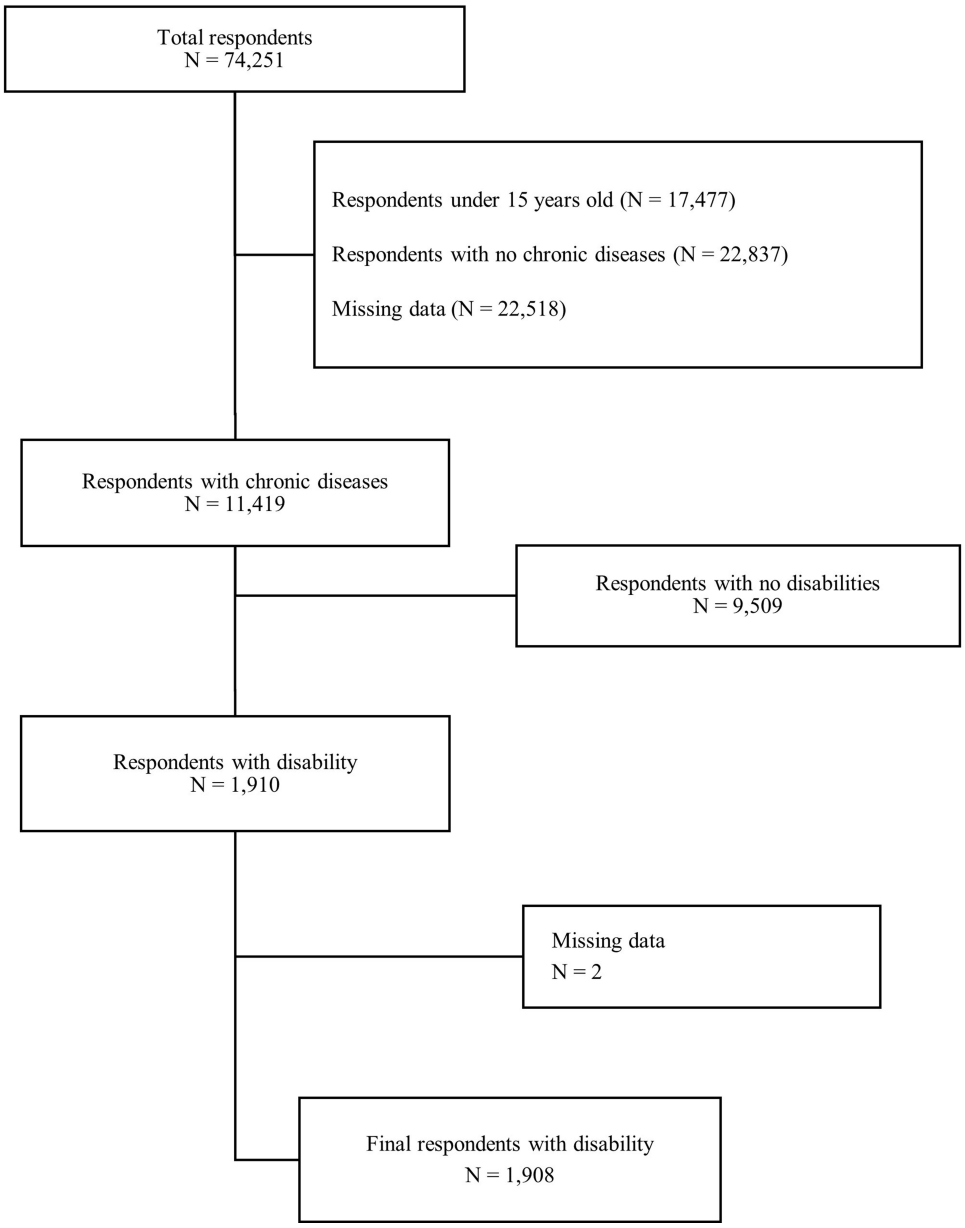

Figure 1 Selection process of study respondents.

Table 1 shows that the majority of respondents with chronic diseases and disabilities were female (62.7%), aged between 46 to 65 years (35.4%), graduated from senior high school (29.7%), non-Javanese (55.7%), resident of Java Island (57.3%), living in urban areas (72.3%), belonging to households of 2 to 6 people (58.6%), unemployed or without

Table 1 Characteristics of Respondents with Chronic Diseases and Disabilities (N = 1908)

No	Characteristics	N (%)[a]
1	**Sex**	
	Female	1196 (62.7)
	Male	710 (37.2)
	Missing	2 (0.1)

(*Continued*)

Table 1 (Continued).

No	Characteristics	N (%)[a]
2	**Age (in years)**	
	46–65	675 (35.4)
	31–45	531 (27.8)
	15–30	372 (19.5)
	> 65	330 (17.3)
	Missing	0 (0)
3	**Formal education**	
	Senior high	566 (29.7)
	Elementary	531 (27.8)
	Higher education	423 (22.2)
	Junior high	259 (13.6)
	Unschooled	114 (6.0)
	Missing	15 (0.8)
4	**Ethnicity**	
	Non-Javanese	1062 (55.7)
	Javanese	834 (43.7)
	Missing	12 (0.6)
5	**Geographical residence**	
	Java	1094 (57.3)
	Non-Java	812 (42.6)
	Missing	2 (0.1)
6	**Demographical residence**	
	Urban	1379 (72.3)
	Rural	527 (27.6)
	Missing	2 (0.1)
7	**Household size**	
	2–6 people	1118 (58.6)
	> 6 people	725 (38.0)
	1 person	65 (3.4)
	Missing	0 (0)

(*Continued*)

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Table 1 (Continued).

No	Characteristics	N (%)[a]
8	**Annual income[b]**	
	Not working	782 (41)
	< 12 mil	492 (25.8)
	12 mil–40 mil	401 (21.0)
	40 mil–100 mil	166 (8.7)
	> 100 mil	47 (2.5)
	Missing	20 (1)
9	**Health insurance ownership**	
	Yes	1160 (60.8)
	No	741 (38.8)
	Missing	7 (0.4)
10	**Self-perceived health status**	
	Somewhat healthy	933 (48.9)
	Somewhat unhealthy	696 (36.5)
	Very healthy	173 (9.1)
	Very unhealthy	106 (5.6)
	Missing	0 (0)
11	**Active days missed in the last month**	
	1–7 days	873 (45.8)
	Did not miss	762 (39.9)
	> 7 days	271 (14.2)
	Missing	2 (0.1)
12	**Body mass index**	
	Normal weight	875 (45.9)
	Overweight	497 (26.0)
	Obesity	202 (10.6)
	Underweight	192 (10.1)
	Missing	142 (7.4)
13	**Smoking behavior**	
	Non-smoker	1325 (69.4)
	Active smoker	384 (20.1)
	Former smoker	199 (10.4)
	Missing	0 (0)

(*Continued*)

Table 1 (Continued).

No	Characteristics	N (%)[a]
14	**Need someone to assist**	
	No	1394 (73.1)
	Yes	512 (26.8)
	Missing	2 (0.1)
15	**Use any aids**	
	Yes	1184 (62.1)
	No	724 (37.9)
	Missing	0 (0)

Notes: [a]N (%) values are presented in descending order. [b] in USD would be approximately around 770 USD; 770–2600 USD; 2600–6405 USD; over 6405 USD.

income (41%), having health insurance (60.8%), perceiving their health as somewhat healthy (48.9%), missing 1 to 7 days of activity due to poor health in the last month (45.8%). In addition, 45.9% had a normal body weight, 69.4% were non-smokers, 73.1% did not need assistance with daily tasks, and 62.1% used aids for daily activities.

Hypertension was the most prevalent chronic disease among respondents with disability (40.5%) (Table 2), followed by stomach or digestive diseases (42%), arthritis or rheumatism (20.1%), and high cholesterol (18.3%). Among 1908 respondents, the most common disabilities were visual impairment (82.1%), hearing problems (13.5%), and physical disabilities (7.2%). Other disabilities included brain impairment (4%), speech impediment (3.5%), mental retardation (1.2%), and autism (0.1%) (Table 3). Furthermore, most of the respondents wore glasses or corrective lenses to aid their

Table 2 Prevalence of Chronic Diseases Among Respondents with Disability (N = 1908)

No	Type of Chronic Disease	N (%)[a,b]
1	Stomach/digestive disease	801 (42.0)
2	Hypertension	773 (40.5)
3	Arthritis/rheumatism	384 (20.1)
4	High cholesterol	350 (18.3)
5	Diabetes	188 (9.9)
6	Asthma	173 (9.1)
7	Cardiovascular disease	126 (6.6)
8	Other lung conditions	114 (6.0)
9	Stroke	115 (6.0)
10	Kidney disease	84 (4.4)
11	Tuberculosis	53 (2.8)
12	Cancer	52 (2.7)
13	Memory-related disease	52 (2.7)

(*Continued*)

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Table 2 (Continued).

No	Type of Chronic Disease	N (%)[a,b]
14	Liver disease	45 (2.4)
15	Emotional, nervous, or psychiatric problems	35 (1.8)
16	Prostate illness	33 (1.7)

Notes: [a]Patients may experience multiple types of chronic diseases. [b]N (%) values are presented in descending order.

vision (60%), while 0.6% used hearing aids (Table 2). Additionally, some reported using walking aids, including a walking cane (3.1%), walker (0.6%), manual wheelchair (1.6%), or electric wheelchair (0.1%) (Table 3).

Factors Associated with Medication Non-Adherence Among Respondents with Chronic Diseases and Disabilities

According to the bivariate analysis of potential factors (Table 4), variables including age, gender, education, residence, household size, annual income, health insurance ownership, self-perceived health status, active days missed, and use of aids were selected as potential factors associated with medication non-adherence. In the multivariate analysis, the following factors showed significant associations with medication non-adherence: being aged 15–30 years (OR = 1.65; 95% CI = 1.19–2.30) and aged 31–45 years (OR = 1.36; 95% CI = 1.01–1.84), self-perception of health as somewhat healthy (OR =

Table 3 Prevalence of Types of Disabilities and Aids Used Among Respondents (N = 1908)

No	Characteristics	N (%)[a,b]
	Types of disability	
1	Vision problem	1567 (82.1)
2	Hearing problem	257 (13.5)
3	Physical	138 (7.2)
4	Brain damage	76 (4.0)
5	Speech impediment	66 (3.5)
6	Mental retardation	23 (1.2)
7	Autism	2 (0.1)
	Types of aids used	
1	Glasses/corrective lenses	1145 (60.0)
2	Walking cane	59 (3.1)
3	Manual wheelchair	30 (1.6)
4	Hearing aid	11 (0.6)
5	Walker	12 (0.6)
6	Electrical wheelchair	1 (0.1)

Note: [a]Patients may experience multiple disabilities and use multiple types of aids. [b]N (%) values are presented in descending order.

Table 4 Regression Logistic Analysis Between Characteristics and Medication Adherence Among Respondents with Disability

No	Variables	Bivariate			Multivariate[d]	
		Adherence, N = 643, N (%)[a]	Non Adherence, N = 1265, N (%)[a]	p-Value	Odds Ratio (95% CI)	P-Value
1	**Sex**			0.069[b]		
	Female	421 (65.5)	775 (61.3)			
	Male	221 (34.4)	489 (38.7)			
	Missing	1 (0.2)	1 (0.1)			
2	**Age (in years)**			0.002[b]		
	15–30	103 (16.0)	269 (21.3)		1.65 (1.19–2.30)	0.003[c]
	31–45	164 (25.5)	367 (29.0)		1.36 (1.01–1.84)	0.042[c]
	46–65	245 (38.1)	439 (34.0)		1.16 (0.88–1.52)	0.304
	> 65	131 (20.4)	199 (15.7)		Ref.	
	Missing	0 (0)	0 (0)			
3	**Formal education**			0.089[b]		
	Unschooled	37 (5.8)	77 (6.1)			
	Elementary	194 (30.2)	337 (26.6)			
	Junior high	100 (15.6)	159 (12.6)			
	Senior high	181 (28.1)	385 (30.4)			
	Higher education	127 (19.8)	296 (23.4)			
	Missing	4 (0.6)	11 (0.9)			
4	**Ethnicity**			0.650		
	Non-Javanese	362 (56.3)	700 (55.3)			
	Javanese	276 (42.9)	558 (44.1)			
	Missing	5 (0.8)	7 (0.6)			
5	**Geographical residence**			0.463		
	Non-Java	281 (43.7)	531 (42.0)			
	Java	361 (56.1)	733 (57.9)			
	Missing	1 (0.2)	1 (0.1)			
6	**Demographical residence**			0.212[b]		
	Rural	166 (25.8)	361 (28.5)			
	Urban	476 (74.0)	903 (71.4)			
	Missing	1 (0.2)	1 (0.1)			

(*Continued*)

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Table 4 (Continued).

No	Variables	Bivariate			Multivariate[d]	
		Adherence, N = 643, N (%)[a]	Non Adherence, N = 1265, N (%)[a]	p-Value	Odds Ratio (95% CI)	P-Value
7	**Household size**			0.091[b]		
	1 person	22 (3.4)	43 (3.4)			
	2–6 people	355 (55.2)	763 (60.3)			
	> 6 people	266 (41.4)	459 (36.3)			
	Missing	0 (0)	0 (0)			
8	**Annual income**			0.075[b]		
	Not working	275 (42.8)	507 (40.1)			
	< 12 mil	180 (28.0)	312 (24.7)			
	12 mil–40 mil	122 (19.0)	279 (22.1)			
	40 mil–100 mil	45 (7.0)	121 (9.6)			
	> 100 mil	13 (2.0)	34 (2.7)			
	Missing	8 (1.2)	12 (0.9)			
9	**Health insurance ownership**			0.092		
	No	266 (41.4)	475 (37.5)			
	Yes	373 (58.0)	787 (62.2)			
	Missing	4 (0.6)	3 (0.2)			
10	**Self-perceived health status**			0.000[b]		
	Very healthy	53 (8.2)	120 (9.5)		1.27 (0.88–1.83)	0.208
	Somewhat healthy	279 (43.4)	654 (51.7)		1.36 (1.09–1.69)	0.007[c]
	Somewhat unhealthy	279 (43.4)	417 (33.0)		Ref.	
	Very unhealthy	32 (5.0)	74 (5.8)		1.73 (1.08–2.77)	0.021[c]
	Missing	0 (0)	0 (0)			
11	**Active days missed in the last month**			0.001[b]		
	Did not miss	221 (34.4)	541 (42.8)		1.51 (1.09–2.10)	0.014[c]
	1–7 days	312 (48.5)	561 (44.3)		1.11 (0.82–1.52)	0.494
	> 7 days	109 (17.0)	162 (12.8)		Ref.	
	Missing	1 (0.2)	1 (0.1)			

(*Continued*)

Table 4 (Continued).

No	Variables	Bivariate			Multivariate[d]	
		Adherence, N = 643, N (%)[a]	Non Adherence, N = 1265, N (%)[a]	p-Value	Odds Ratio (95% CI)	P-Value
12	**Body mass index**			0.960		
	Underweight	68 (10.6)	124 (9.8)			
	Normal weight	292 (45.4)	583 (46.1)			
	Overweight	167 (26.0)	330 (26.1)			
	Obesity	68 (10.6)	134 (10.6)			
	Missing	48 (7.5)	94 (7.4)			
13	**Smoking behavior**			0.456		
	Non-smoker	458 (71.2)	867 (68.5)			
	Former smoker	65 (10.1)	134 (10.6)			
	Active smoker	120 (18.7)	264 (20.9)			
	Missing	0 (0)	0 (0)			
14	**Need someone to assist**			0.720		
	No	467 (72.6)	927 (73.3)			
	Yes	176 (27.4)	336 (26.6)			
	Missing	0 (0)	2 (0.2)			
15	**Use any aids**			0.046[b]		
	No	224 (34.8)	500 (39.5)		1.24 (1.01–1.52)	0.036[c]
	Yes	419 (65.2)	765 (60.5)		Ref.	
	Missing	0 (0)	0 (0)			

Note: [a]Data is presented as column percentages. [b]Significant factor ($p < 0.25$). [c] Significant factor ($p < 0.05$). [d]Pseudo R-square test: 0.0181; Hosmer-Lemeshow test: sig = 0.3481.
Abbreviations: OR, odds ratios; CI, confidence intervals.

1.36; 95% CI = 1.09–1.69) or very unhealthy (OR = 1.73; 95% CI = 1.08–2.77), having no missed days of daily activities (OR = 1.51; 95% CI = 1.09–2.10), and did not use any visual/hearing/walking aids (OR = 1.24; 95% CI = 1.01–1.52) (Table 4).

The results of the Hosmer-Lemeshow test showed a p-value of 0.3481, indicating that the multivariable analysis was viable and met the model's objectives. In addition, the pseudo-R-Squared test yielded a value of 0.0181, indicating that 1.81% of the variability in medication non-adherence was explained by the model.

Discussion

More than half of the patients with chronic diseases and disabilities in this study were non-adherent to their medication. We observed that key factors associated with medication non-adherence included being aged 15 to 45 years, having a self-perception of health as somewhat healthy or very unhealthy, not missing any active days due to poor health, and non-use of any aids.

We observed that the majority of respondents were non-adherent to medication. This finding aligns with previous research conducted among the older adults with physical and visual disabilities in Taiwan.[31] One possible explanation may be due to the inverse correlation between medication adherence and disability. Patients with chronic diseases may

face a higher prevalence of disability due to medication non-adherence. Our study contributes to the existing body of knowledge by highlighting how non-adherence can exacerbate chronic conditions and potentially lead to disability.[32] Previous studies have shown that non-adherence to treatment for conditions like multiple sclerosis can worsen patients' ability to perform daily activities.[33] Similarly, a recent study observed a decline in medication adherence among patients with diabetes following the onset of disability.[8] Another possible explanation for our findings is that patients with disabilities face greater challenges, as their conditions often require more complex treatments which may hinder their ability to adhere to medication.[5,24]

In our study, respondents aged 15 to 45 years showed a significant tendency for medication non-adherence compared to the older groups. This finding is consistent with previous studies that reported older age is positively associated with better medication adherence among both disabled and non-disabled patients with multiple sclerosis.[34] Although there is a lack of consensus on why age influences medication adherence, factors such as more frequent healthcare visits, higher insurance coverage, and increased family support in older adults may explain this correlation. This underlines the need for individuals with disabilities to receive adequate family support and access to healthcare services. Previous study has shown that these populations often face significant barriers to healthcare access and experience lower levels of social support.[35] Conversely, other studies suggest that older adults may experience lower adherence due to physical and cognitive decline,[36] leading to disabilities.[5]

Respondents who perceived themselves as "very unhealthy" were more likely to be non-adherent to medication compared to those who viewed their health as "somewhat unhealthy". This finding is supported by previous study demonstrated that functional limitations commonly experienced by individuals with disability are correlated with poor self-perceived health.[37] Individuals with disabilities often perceive their health more negatively compared to those without disabilities.[38] Moreover, patients' perceptions and attitudes toward their health have been identified as significant challenges to medication adherence.[39] Poor health perception may indicate belief in one's limited ability to manage their chronic disease, consequently limiting adherence.[40] Interestingly, respondents who considered themselves "somewhat healthy" also exhibited a likelihood of non-adherence. This could be attributed to the possibility that a positive self-image of health may stem from a lack of awareness and perception regarding the seriousness of their chronic diseases. Moreover, prior study has shown that patients with chronic diseases and disabilities who maintain a positive and comprehensive perception of their health tend to be more adherent to their medication.[41] This underscores the important role of healthcare professionals in enhancing patients' understanding of their illness, which can empower them to better manage their conditions and adhere to their treatment plans, particularly among those with disabilities. Another study revealed that lower cognitive function and less functional limitations may lead individuals to have a more positive evaluation of their health status.[42] This pattern may explain why our respondents perceived their health positively, especially as many noted they did not require assistance with daily activities and nearly 40% reported no difficulties in performing daily tasks. Therefore, assessing patients' understanding of their condition could provide valuable insights into this correlation.

In line with our previous finding, we further observed that respondents who did not miss any active days due to poor health were more likely to be non-adherent to medication compared to those who missed more than seven active days. Although prior research has identified a significant correlation between restricted performance in daily activities and medication non-adherence,[43] this finding could be attributed to a higher tendency for those feeling burdened by their condition or illnesses to adhere more closely to their medication regimen.[5] A reduced restriction in performing daily activities can foster a sense of well-being, even in the presence of chronic illness and disability, which may lead individuals to perceive their medication as unnecessary.[44] However, chronic illnesses typically require long-term therapy and medication adherence, regardless of perceived health status. This misperception can ultimately result in poor medication adherence.

We also observed a higher likelihood of medication non-adherence among respondents who did not use aids to support their daily activities. The use of aids may reflect an individual's worsening symptoms, which could prompt them to continue their medication to alleviate the burden of their conditions.[42] Additionally, the use of aids may indicate greater family support, which could help respondents adhere better to their medication. It is important to note that respondents may refrain from using assistive aids due to financial barrier, leading most of them to rely on either self-

made or purchased aids; as the government supplies only a limited number of aids.[45] This lack of access to assistive devices can negatively impact their ability to perform daily activities, which may hinder their adherence to medication.

Our study highlights the need for a customized approach and policy to improve medication adherence for patients with chronic diseases and disabilities.[46,47]

Given that individuals with disability in Indonesia often face discrimination,[48] there is an urgent need for action from the community, healthcare providers, and the government to ensure that individuals with disability have equal access to medical care, thereby optimizing their medication adherence. Providing specialized care for patients with chronic diseases and disabilities through medication therapy management could also be an effective strategy for improving chronic illness management. However, it is important to ensure that pharmacists' knowledge, attitudes, and practices are adequately assessed prior to implementation.[49,50]

Furthermore, the economic implications of medication non-adherence in this population should not be overlooked. Medication non-adherence in chronic diseases can lead to increased risk of mortality and elevated healthcare cost.[51,52] Future research should explore the potential cost savings associated with improving medication adherence among patients with disabilities and chronic diseases, which could be useful for developing targeted interventions.

To the best of our knowledge, this study is the first to utilize a nationwide population-based survey in Indonesia to examine factors associated with non-adherence to medication among patients with chronic diseases and disabilities. However, this study has several limitations. Data on chronic diseases, disabilities, and medication adherence were obtained through self-report which may have introduced recall bias and misclassification. Furthermore, the cross-sectional design complicates establishing absolute causality or directional associations. The low pseudo-R-squared value suggests that several unmeasured factors, such as family and social support,[25] the number of medications used,[16] and healthcare provider-patient communication,[8,53] were not captured in the database. In addition, we could not include the specific types of disabilities as a potential factor, as patients may experience multiple disabilities simultaneously. Furthermore, the data used in this study may be considered outdated, as it captured only a specific time period. This limitation could result in some inconsistencies with current situations, underscoring the need for further research utilizing more recent data. However, the findings from this study can serve as a valuable baseline for future investigations. Furthermore, future longitudinal research should investigate the contributing factors to medication non-adherence in populations with chronic diseases and disabilities, taking sampling weights into account and including a more diverse demographic background. Additionally, targeted and tailored interventions are needed to enhance medication adherence for patients with chronic diseases and disabilities.

Conclusion

More than half of the patients with chronic diseases and disabilities were non-adherent to their medication. Factors associated with medication non-adherence included being aged 15 to 45 years, self-perceived health status as somewhat healthy or very unhealthy, not missing any active days due to poor health, and non-use of any aids. Therefore, interventions designed to improve medication adherence in this population should consider specific patient-related factors. Further research should explore practical strategies to improve medication adherence among patients with chronic diseases and disabilities, such as developing specific clinical guidelines to integrate adherence programs into routine care for these patients, digital medication reminder systems, community-based support, and caregiver involvement strategies.

Data Sharing Statement

The data used in this study are publicly available from the Fifth Indonesian Family Life Survey (IFLS-5). The data can be accessed at https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/access.html.

Ethics Approval and Consent to Participate

The study adhered to ethical standards, data, and procedures, including questionnaires, were reviewed and approved by ethical review boards of the RAND's Human Subjects Protection Committee (No. s0064-06-01-CR01). Informed consents were obtained from respondents upon interview. According to the 2022 Standard Operating Procedures of the

Research Ethics Committee at Universitas Padjadjaran, Indonesia (No. POB/08/KEP), research involving existing data, publicly available documents, or pathological and diagnostic specimens that protect participants' identities is exempt from ethical review requirements.

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Disclosure

The authors declare that there are no conflicts of interest in this work.

References

1. Indonesian Ministry of Health. Hasil Utama RISKESDAS 2018 [Internet]. 2018. Available from: https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-riskesdas-2018_1274.pdf. Accessed September 26, 2021.
2. Indonesian Ministry of Health. Laporan Survei Kesehatan Indonesia (SKI) 2023 [Internet]. 2023. Available from: https://layanandata.kemkes.go.id/katalog-data/ski/ketersediaan-data/ski-2023. Accessed October 12, 2024.
3. Australia Indonesia Partnership for Economic Governance. Disability in Indonesia: what can we learn from the data? [Internet]. 2017. Available from: https://www.monash.edu/__data/assets/pdf_file/0003/1107138/Disability-in-Indonesia.pdf. Accessed August 24, 2024.
4. Park JH, Park JH, Lee SY, Kim SY, Shin Y, Kim SY. Disparities in Antihypertensive Medication Adherence in Persons With Disabilities and Without Disabilities: results of a Korean Population-Based Study. *Arch Phys Med Rehabil*. 2008;89(8):1460–1467. doi:10.1016/j.apmr.2007.12.045
5. Hou CH, Pu C. Medication Adherence in Patients With Glaucoma and Disability. *JAMA Ophthalmol*. 2021;139(12):1292. doi:10.1001/jamaophthalmol.2021.4415
6. Sheerin F, Eustace-Cook J, Wuytack F, Doyle C. Medication management in intellectual disability settings: a systematic review. *J Intellect Disabil*. 2021;25(2):242–276. doi:10.1177/1744629519886184
7. Smith D, Lovell J, Weller C, et al. A systematic review of medication non-adherence in persons with dementia or cognitive impairment. *PLoS One*. 2017;12(2):e0170651. doi:10.1371/journal.pone.0170651
8. Chen SH, Lee MC, Pu C. Medication adherence in patients with type 2 diabetes after disability onset: a difference-in-differences analysis using nationwide data. *BMC Med*. 2024;22(1):102. doi:10.1186/s12916-024-03324-z
9. Dysch C, Chung MC, Fox J. How do people with intellectual disabilities and diabetes experience and perceive their illness? *J Appl Res Intellect Disabil*. 2012;25(1):39–49. doi:10.1111/j.1468-3148.2011.00641.x
10. Centers for Disease Control and Prevention (CDC). Physical activity among adults with a disability--United States, 2005. *MMWR Morb Mortal Wkly Rep*. 2007;56(39):1021–1024.
11. Burnier M. The role of adherence in patients with chronic diseases. *Eur J Intern Med*. 2024;119:1–5. doi:10.1016/j.ejim.2023.07.008
12. van der Laan DM, Elders PJM, Boons CCLM, Beckeringh JJ, Nijpels G, Hugtenburg JG. Factors associated with antihypertensive medication non-adherence: a systematic review. *J Hum Hypertens*. 2017;31(11):687–694. doi:10.1038/jhh.2017.48
13. Alfian SD, Denig P, Coelho A, Hak E. Pharmacy-based predictors of non-adherence, non-persistence and reinitiation of antihypertensive drugs among patients on oral diabetes drugs in the Netherlands. *PLoS One*. 2019;14(11):e0225390. doi:10.1371/journal.pone.0225390
14. Abegaz TM, Shehab A, Gebreyohannes EA, Bhagavathula AS, Elnour AA. Nonadherence to antihypertensive drugs. *Medicine*. 2017;96(4):e5641. doi:10.1097/MD.0000000000005641
15. Alfian SD, Annisa N, Fajriansyah F, et al. Modifiable Factors Associated with Non-adherence to Antihypertensive or Antihyperlipidemic Drugs Are Dissimilar: a Multicenter Study Among Patients with Diabetes in Indonesia. *J Gen Intern Med*. 2020;35(10):2897–2906. doi:10.1007/s11606-020-05809-y
16. Schwartz JK, Unni E. Inclusion of People with Disabilities in Research to Improve Medication Adherence: a Systematic Review. *Patient Prefer Adherence*. 2021;15:1671–1677. doi:10.2147/PPA.S314135
17. Pradipta IS, Aprilio K, Ningsih YF, Pratama MAA, Alfian SD, Abdulah R. Treatment Nonadherence among Multimorbid Chronic Disease Patients: evidence from 3515 Subjects in Indonesia. *Medicina B*. 2024;60(4):634. doi:10.3390/medicina60040634
18. Tama TD, Astutik E. Physical inactivity and chronic diseases among disabled adults in Indonesia. *J Public Health Afr*. 2022;13(2):4. doi:10.4081/jphia.2022.2421
19. Griselda M, Alfian SD, Wicaksono IA, Wawruch M, Abdulah R. Findings from the Indonesian family life survey on patterns and factors associated with multimorbidity. *Sci Rep*. 2023;13(1):1–16. doi:10.1038/s41598-023-42603-2
20. Husnayain A, Ekadinata N, Sulistiawan D, Chia-Yu Su E. Multimorbidity Patterns of Chronic Diseases among Indonesians: insights from Indonesian National Health Insurance (INHI) Sample Data. *Int J Environ Res Public Health*. 2020;17(23):8900. doi:10.3390/ijerph17238900
21. Yuliandani Y, Alfian SD, Puspitasari IM. Patient satisfaction with clinical pharmacy services and the affecting factors: a literature review. *Pharmacia*. 2022;69(1):227–236. doi:10.3897/pharmacia.69.e80261
22. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbrouckef JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies [Internet]. Bulletin of the World Health Organization. World Health Organization; 2007 Accessed March 23, 2021.
23. RAND. The IFLS Study Design. 2014. Available from: https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/study.html. Accessed October 15, 2021.

24. Hou CH, Lin KK, Lee JS, Pu C. Medication Adherence in Patients With Glaucoma After Cancer Diagnosis. *Am J Ophthalmol*. 2020;213:88–96. doi:10.1016/j.ajo.2020.01.004
25. Huang J, Jiang Z, Zhang T, et al. Which Matters More for Medication Adherence Among Disabled People in Shanghai, China: family Support or Primary Health Care? *Inquiry*. 2019;56. doi:10.1177/0046958019883175.
26. Mitchell RJ, Bates P. Measuring health-related productivity loss. *Popul Health Manag*. 2011;14(2):93–98. doi:10.1089/pop.2010.0014
27. Indonesian Ministry of Health. Klasifikasi Obesitas Setelah Pengukuran IMT [Internet]. 2018. Available from: http://p2ptm.kemkes.go.id/infographic-p2ptm/obesitas/klasifikasi-obesitas-setelah-pengukuran-imt. Accessed December 1, 2021.
28. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist*. 1969;9(3):179–186. doi:10.1093/geront/9.3_Part_1.179
29. Katz S. Assessing self-maintenance: activities of daily living, mobility, and instrumental activities of daily living. *J Am Geriatr Soc*. 1983;31(12):721–727. doi:10.1111/j.1532-5415.1983.tb03391.x
30. Chowdhury MZI, Turin TC. Variable selection strategies and its importance in clinical prediction modelling. *Fam Med Comm Health*. 2020;8(1):e000262. doi:10.1136/fmch-2019-000262
31. Fang YT, Chen LK, Liu CY, et al. The association between physical disability and eye care utilization among elderly population in Taiwan: a nationwide cohort study. *Arch Gerontol Geriatr*. 2012;54(2):e181–6. doi:10.1016/j.archger.2011.10.020
32. Thirthalli J, V BK, N MN, et al. Do Antipsychotics Limit Disability in Schizophrenia? A Naturalistic Comparative Study in the Community. *Indian J Psychol Med*. 2006;28(2):14–19. doi:10.1177/0975156420060205
33. Higuera L, Carlin CS, Anderson S. Adherence to Disease-Modifying Therapies for Multiple Sclerosis. *J Manag Care Spec Pharm*. 2016;22(12):1394–1401. doi:10.18553/jmcp.2016.22.12.1394
34. Paolicelli D, Cocco E, Di Lecce V, et al. Exploratory analysis of predictors of patient adherence to subcutaneous interferon beta-1a in multiple sclerosis: TRACER study. *Expert Opin Drug Deliv*. 2016;13(6):799–805. doi:10.1517/17425247.2016.1158161
35. Dehghankar L, Valinezhad S, Amerzadeh M, Zarabadi Poor F, Hosseinkhani Z, Motalebi SA. Relationship between perceived social support and disability with the mediating role of perceived stress among older adults. *BMC Geriatr*. 2024;24(1):276. doi:10.1186/s12877-024-04871-z
36. Allaham K, Feyasa MB, Govender RD, et al. Medication Adherence Among Patients with Multimorbidity in the United Arab Emirates. *Patient Prefer Adherence*. 2022;16:1187–1200. doi:10.2147/PPA.S355891
37. Shaaban AN, Martins MRO, Peleteiro B. Factors associated with self-perceived health status in Portugal: results from the National Health Survey 2014. *Front Public Health*. 2022;10. doi:10.3389/fpubh.2022.879432
38. Krahn GL, Robinson A, Murray AJ, et al. It's time to reconsider how we define health: perspective from disability and chronic condition. *Disabil Health J*. 2021;14(4):101129. doi:10.1016/j.dhjo.2021.101129
39. Osterberg L, Blaschke T. Adherence to Medication. *N Engl J Med*. 2005;353(5):487–497. doi:10.1056/NEJMra050100
40. De Las Cuevas C. Psychiatric Patients' Perceived Health Control and Reactance: implications for Medication Adherence. *Patient Prefer Adherence*. 2023;17:1591–1601. doi:10.2147/PPA.S417608
41. Kragting M, Pool-Goudzwaard AL, Coppieters MW, O'Sullivan PB, Voogt L. Illness perceptions in people with chronic and disabling non-specific neck pain seeking primary healthcare: a qualitative study. *BMC Musculoskelet Disord*. 2024;25(1):179. doi:10.1186/s12891-024-07302-7
42. Kim SJ, Jung DU, Moon JJ, et al. Relationship between disability self-awareness and cognitive and daily living function in schizophrenia. *Schizophr Res Cogn*. 2021;23:100192. doi:10.1016/j.scog.2020.100192
43. Saqlain M, Riaz A, Malik MN, et al. Medication Adherence and Its Association with Health Literacy and Performance in Activities of Daily Livings among Elderly Hypertensive Patients in Islamabad, Pakistan. *Medicina B*. 2019;55(5):163. doi:10.3390/medicina55050163
44. Mobini S, Allahbakhshian A, Shabanloei R, Sarbakhsh P. Illness Perception, Self-Efficacy, and Medication Adherence in Patients With Coronary Artery Disease: a Path Analysis of Conceptual Model. *SAGE Open Nurs*. 2023;9. doi:10.1177/23779608231171772
45. Adioetomo SM, Mont D, Irwanto. Persons with Disabilities in Indonesia: empirical Facts and Implications for Social Protection Policies [Internet]. Tim Nasional Percepatan Penanggulangan Kemiskinan (TNP2K). 2014. Available from: https://www.tnp2k.go.id/images/uploads/downloads/DisabilitiesreportFinalsept2014.pdf. Accessed November 14, 2024.
46. Korenhof SA, Rouwet EV, Elstgeest LEM, et al. The effect of a community-based group intervention on chronic disease self-management in a vulnerable population. *Front Public Health*. 2023;11:1221675. doi:10.3389/fpubh.2023.1221675
47. Espírito-Santo M, Santos S, Estêvão MD. Digital Solutions Available to Be Used by Informal Caregivers, Contributing to Medication Adherence: a Scoping Review. *Pharmacy*. 2024;12(1). doi:10.3390/pharmacy12010020
48. International Labor Organization. Labour market inclusion of people with disabilities [Internet]. 2018. Available from: https://www.ilo.org/publications/labour-market-inclusion-people-disabilities-0. Accessed August 24, 2024.
49. Rendrayani F, Alfian SD, Wahyudin W, Puspitasari IM. Pharmacists' Knowledge, Attitude, and Practice of Medication Therapy Management: a Systematic Review. *Healthcare*. 2022;10(12):2513. doi:10.3390/healthcare10122513
50. Rendrayani F, Alfian SD, Wahyudin W, Puspitasari IM. Knowledge, attitude, and practice of medication therapy management: a national survey among pharmacists in Indonesia. *Front Public Health*. 2023;11. doi:10.3389/fpubh.2023.1213520
51. Lloyd JT, Maresh S, Powers CA, Shrank WH, Alley DE. How Much Does Medication Nonadherence Cost the Medicare Fee-for-Service Program? *Med Care*. 2019;57(3):218–224. doi:10.1097/MLR.0000000000001067
52. Van Alsten SC, Harris JK. Cost-Related Nonadherence and Mortality in Patients With Chronic Disease: a Multiyear Investigation, National Health Interview Survey, 2000-2014. *Prev Chronic Dis*. 2020;17:E151. doi:10.5888/pcd17.200244
53. Smith DL. Disparities in patient-physician communication for persons with a disability from the 2006 Medical Expenditure Panel Survey (MEPS). *Disabil Health J*. 2009;2(4):206–215. doi:10.1016/j.dhjo.2009.06.002