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The relationship between frailty incidence and polypharmacy in the elderly age group in Melinggih Village, Gianyar Regency, Bali

Tjokorda Istri Ratih Pradnyandari Pemayun[1]*, I Gusti Putu Suka Aryana[2]

[1]Resident of Department of Internal Medicine, Faculty of Medicine, Udayana University/Prof. Dr. I.G.N.G. Ngoerah General Hospital, Denpasar, Bali, Indonesia, [2]Division of Heriatrics, Department of Internal Medicine, Faculty of Medicine, Udayana University/Prof. Dr. I.G.N.G. Ngoerah General Hospital, Denpasar, Bali, Indonesia

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ABSTRACT

The risk of the elderly population experiencing frailty is more significant in women than man. Several factors are associated with the frailty include the pattern of women's daily activities being more than men's, unbalanced nutrition needs, and women suffering more from comorbid diseases, such as osteoporosis, fractures of bone hip, and other degenerative diseases. This study aimed to investigate the relationship between frailty incidence and polypharmacy in the elderly group in Melinggih Village, Gianyar, Bali. This cross-sectional study used secondary data from interviews and questionnaires conducted in December 2022. Samples were collected using a total sampling method. The analysis was conducted using univariate and bivariate analysis, with Chi square tests applied using SPSS 25.0 for Windows. Ninety-five of the 97 patients involving this study had a history of treatment with < 2 types of drugs (non-polypharmacy), while 2 patients with more >2 types of drugs (polypharmacy). No significantly relationship between the number of drugs consumed and frailty status (p = 0.303). In conclusion, no relationship between frailty and polypharmacy is reported in Melinggih Village, Gianyar, Bali.

Keywords:
elderly;
frailty;
polypharmacy;
daily activities;
nutrition need

ABSTRACT

Risiko populasi usia lanjut mengalami kejadian kerapuhan lebih besar pada kelompok wanita daripada laki-laki. Beberapa faktor yang berpengaruh antara lain, pola aktivitas sehari-hari wanita lebih banyak daripada laki-laki, kebutuhan nutrisi yang tidak seimbang, serta wanita lebih banyak menderita penyakit komorbid, seperti osteoporosis, patah tulang panggul, dan penyakit degeneratif lain. Penelitian ini bertujuan untuk mengkaji hubungan kejadian kerapuhan dengan konsumsi polifarmasi pada kelompok lanjut usia di Desa Melinggih, Kabupaten Gianyar, Bali. Penelitian potong lintang ini menggunakan data sekunder dari wawancara dan kuesioner yang dilakukan pada bulan Desember 2022. Pengambilan sampel dilakukan dengan metode total sampling. Analisis dilakukan dengan metode univariat dan bivariat, dengan uji statistik Chi square menggunakan SPSS 25.0 for Windows. Sebanyak 95 dari 97 pasien memiliki riwayat pengobatan dengan <2 jenis obat (non polifarmasi), sedangkan 2 orang memiliki riwayat terapi dengan >2 jenis obat (polifarmasi). Tidak ada hubungan nyata antara kejadian kerapuhan dengan polifarmasi (p= 0,303). Simpulan, tidak hubungan antara kejadian kerapuah dengan pengobatan polifarmasi Desa Melinggih, Kabupaten Gianyar, Bali.

INTRODUCTION

Older adults often have geriatric syndromes like polypharmacy and frailty, which worsen health and quality of life. Polypharmacy, using more than one medication, usually results from overprescription, poor coordination, side effects, and self-medication. Polypharmacy is commonly observed in

*corresponding author: cokratih62@gmail.com

chronic conditions and it can increase the risks of side effects of drugs. About 30% of patients in home care experience side effects that lead to 106,000 deaths, of which 15-65% are preventable with better education and treatment.[1,2]

Frailty is a progressive condition characterized by a gradual decline in cognitive, emotional, and physical abilities due to deteriorating health. This decline often leads to frequent hospitalizations and ineffective treatments over time.[3,4] Frailty prevalence varies globally i.e. 31% in Oceania, 25% in Asia, 23% in the US, 22% in Europe, and 21% in Saudi Arabia. The frailty increases the risk of falls, hospitalizations, disability, and mortality. As chronic diseases rise, more treatments are needed, heightening the risk of side effects and worsening frailty.[1,3]

The incidence of polypharmacy and frailty often overlaps in the elderly population.[5] Polypharmacy can increase the risk of frailty, and frailty can lead to polypharmacy in older people, often due to inappropriate medication use and side effects. A cohort study showed that elderly individuals with both conditions are five times more likely to experience recurrent hospitalizations.[3] A study by Veronese *et al*.[6] in North America found that elderly individuals taking seven or more medications face a sixfold higher risk of knee osteoarthritis, underscoring the dangers of overtreatment and poor medication management.[6] Environmental factors like healthcare access and socioeconomic status significantly influence frailty in older adults. A 2018 study in England found that low socioeconomic status increased health risks. In Indonesia, older adults made up 16% of the population in 2019, with 26% experiencing chronic diseases and disabilities. The health risks are higher in rural areas due to limited healthcare access.[7,8] This is what causes older people in rural areas at risk to experience polypharmacy and frailty.

Several studies have indicated that the relationship between polypharmacy and frailty is not well-established, yet. This is often attributed to the limited number of studies, variability in data, and insufficient sample sizes, which can affect the reliability and generalizability of the findings.[1] This study aim to explored the relationship between risk factors, the amount of medication consumed, and the incidence of frailty in Melinggih Village, Gianyar Regency, Bali.

MATERIAL AND METHODS

Study design

This retrospective observational analytical study investigated the relationship between the polypharmacy and the incidence of frailty among the elderly population in Melinggih Village, Gianyar Regency, Bali. The study was conducted in December 2022 during a community service event at Melinggih Elementary School. Using a total sampling method, all elderly participants who attended the event were included in the study, allowing for a comprehensive analysis of the population in question.

Study population

The study population consisted of elderly individuals aged 57-84 y.o. who resided in Melinggih Village, Gianyar Regency, Bali and participated in a community service event at Melinggih Elementary School in December 2022. The inclusion criteria required participants to be within the specified age range, attend the event, and provide informed consent. Individuals who could not complete the questionnaire due to cognitive impairments or had incomplete data were excluded from the study.

Data collection

Data were collected through structured interviews and questionnaires administered during the community service event. These questionnaires gathered information on participants' demographic characteristics, medical history, and the number of medications they consumed. The study specifically focused on frailty assessment and medication consumption. Frailty was evaluated using Fried's criteria, which include fatigue, weight loss, weakness, decreased walking speed, and low physical activity levels. Participants were classified as frail if they met more than two of the five criteria, while those with a score of two or less were classified as pre-frail. Additionally, medication consumption was recorded, with polypharmacy defined as the regular use of more than four types of medications for at least three months. A total of 97 participants were included in the study, with data collection emphasizing their frailty status and medication consumption.

Statistical analysis

Data analysis used appropriate statistical methods to explore the relationship between medication consumption and frailty. Descriptive statistics were first employed to summarize the study population's demographic characteristics, frailty scores, and medication consumption patterns. Bivariate analyses were performed using Chi square or Fisher's exact tests to examine the association between frailty and polypharmacy. Additionally, multivariate analysis through logistic regression was conducted to control for potential confounding variables and determine the independent effect of polypharmacy on frailty. The strength of the association was quantified by calculating prevalence ratio (PR) with 95% confidence intervals (95% CI). A $p < 0.05$ was considered statistically significant.

RESULTS

The characteristics of the elderly in Melinggih Village, Gianyar Regency, Bali, including the frequency distribution and percentages of demographic data such as age, gender, number of medications consumed, and comorbidities (e.g., diabetes mellitus and hypertension), were collected. In this study, frailty incidence was the dependent variable, while age, gender, and the number of medications consumed were the independent variables.

TABLE 1 presents the characteristics of the elderly patients, including their age, gender, amount of medication, and comorbidities such as diabetes mellitus and hypertension. Most patients are women (63.9%), while men account for 36.1%. The ages of the patients range from 57 to 84 yr, with an average age of 68.54 yr and a standard deviation of 6.3 yr. None of the patients were experiencing polypharmacy, and 22.4% reported not taking any medication. Regarding comorbidities, 10 patients were found to have diabetes mellitus, and 28 had hypertension.

TABLE 2 demonstrates that frailty is more prevalent among women than men (59.8% vs. 32.9%). The risk of experiencing frailty for women is 0.977 times higher than for men. TABLE 3 shows that respondents aged ≥ 60 yr have a 0.938 times greater risk of experiencing frailty compared to those <60 yr.

TABLE 4 differentiates the amount of medication consumed into two groups: more than one medication and single medication. The data indicates that patients without polypharmacy have a 0.926 times higher risk of experiencing pre-frailty compared to those with polypharmacy. No significant relationship between the incidence of frailty and the amount of drug consumption ($p=0.303$) as presented in TABLE 5.

TABLE 1. Characteristics of the patients

Characteristics	Amount
Gender [n (%)]	
• Male	35 (36.1)
• Female	62 (63.9)
Age (mean ± SD yr)	68.54 ± 6.3
Medication consumed [n (%)]	
• No drug	65 (66.3)
• 1 drug	22 (22.4)
• 2 drugs	9 (9.2)
• 3 drugs	2 (2.0)
• 4 drugs	0 (0.0)
Diabetes mellitus [n (%)]	
• Yes	10 (10.3)
• No	87 (89.7)
Hypertension [n (%)]	
• Yes	28 (28.9)
• No	69 (71.1)

TABLE 2. The distribution of frailty events based on gender in Melinggih Village, Gianyar, Bali

Gender	Pre-frailty [n (%)]	Frailty [n (%)]	Prevalence ratio (PR)
Male	32 (32.9)	3 (3.1)	0.977
Female	58 (59.8)	4 (4.1)	

TABLE 3. The distribution of frailty events by age group in Melinggih Village, Gianyar, Bali

Age group	Pre-frailty [n (%)]	Frailty [n (%)]	Prevalence ratio (PR)
< 60 yr	7 (7.2)	1 (1)	0.938
≥ 60 yr	83 (85.6)	6 (6.2)	

TABLE 4. The distribution of frailty events based on drug consumption in Melinggih Village, Gianyar, Bali

Drug consumption	Pre-frailty [n (%)]	Frailty [n (%)]	Prevalence ratio (PR)
> One medication	2 (2.0)	0 (0.0)	0. 926
Single medication	88 (90.7)	7 (7.2)	

TABLE 5. The relationship between frailty events and drug consumption in Melinggih Village, Gianyar, Bali

Drug consumption	Frailty status		Total	p
	Pre-frailty	Frailty		
> One medication	2	0	2	
Single medication	88	7	95	0.303
Total	90	7	9 7	

DISCUSSION

Frailty is one of the most significant challenges experienced by the elderly population worldwide.[4,9] The prevalence of frailty in the general population is around 6.9% and tends to increase with age. As individuals age, the likelihood of frailty rises due to a combination of intrinsic factors (such as biological processes) and extrinsic factors (including lifestyle, environment, and social conditions). The incidence of frailty continues to grow steadily, with an increase observed every 12-15 yr.[10] Older adults with complex health issues and multiple risk factors tend to experience frailty more rapidly compared to their healthier counterparts. A meta-analysis by Wang *et al*.[4] explored the relationship between frailty and various underlying characteristics, lifestyle factors, and comorbidities. The study found that age, female sex, lifestyle factors, physical inactivity, polypharmacy, education level, smoking habits, alcohol consumption, malnutrition, and low vitamin D levels are significantly associated with frailty.[4]

A study by Chang *et al*.[11] suggested that among the elderly, men with frailty have a higher risk of mortality compared to women. This finding highlights a gender difference in how frailty impacts mortality risk. Frail men may has more significant health challenges or have different underlying conditions contributing to this increased risk.[11] The relationship between frailty and mortality risk across genders reveals some inconsistencies. For instance, the study by Chang *et al*.[11] found that older men with frailty has a higher risk of mortality compared to women. The discrepancies may arise from variations in study populations, methodologies, definitions of frailty, or underlying health conditions. A deeper examination of how frailty is assessed and the health contexts of the studied populations is needed to understand why mortality risk might differ by gender.[9]

In this study, a community in Melinggih Village, Gianyar Regency, Bali was found to have a higher risk of frailty among individuals aged 60 yr and older compared to those younger than 60 yr. Within this elderly group, women are at greater risk of experiencing frailty compared to men. This increased risk is attributed to age, activity patterns, nutrition, and comorbidities. Notably, osteoporosis, particularly pelvic fractures, is a common comorbidity among older women and contributes significantly to their frailty. These health issues can partly explain this higher prevalence of frailty among older women compared to men.[9]

Frailty in the elderly often results from the accumulation of age-related health problems that require treatment.[12] A significant factor contributing to frailty is polypharmacy, where the use

of multiple medications leads to a higher risk of adverse health issues. Although this research is not sufficient to be called polypharmacy, the accumulation of drugs may lead to the addition of other medications due to different complaints that may arise due to various factors. Polypharmacy can cause side effects and exacerbate health problems in older individuals. Global estimates suggest that between 44.2% and 57.7% of people aged 65 yr and older use at least five different types of medications, while 9.1% to 23.2% consume more than ten types of drugs. This widespread use of multiple medicines underscores the need for careful management to mitigate the risks associated with polypharmacy and its impact on frailty.[3] A cohort study by Ekram *et al*.[5] found a significant relationship between polypharmacy and frailty among healthy elderly individuals. This study highlights that the use of multiple medications is strongly associated with an increased risk of frailty, even in otherwise healthy populations. Bader Alqahtani's 2023 study found a significant connection between polypharmacy, specifically the consumption of six or more types of drugs, and frailty among elderly individuals aged 65 to 85 years in the United States.[1] A cohort study by Jamsen *et al*.[13] found that the use of four or more types of high-risk medications is associated with increased frailty and mortality among healthy elderly men.

In this study, polypharmacy was not observed among the elderly population in Melinggih Village, Gianyar Regency, Bali where most individuals consume an average of 1-2 medications daily. The elderly community was categorized into two groups: more than one medication and a single medication. Interestingly, the single medication group was found to be at a higher risk of pre-frailty. This increased risk in the single medication group is attributed to factors such as low medication adherence, potential drug interactions, and inappropriate prescriptions. A study by Arai *et al*.[14] supports this, highlighting that inappropriate drug prescribing and drug interactions can worsen patients' conditions, particularly in the elderly, and contribute to prolonged hospitalizations.

The pattern where the elderly population in rural areas is higher compared to urban areas has been observed for many years. This trend is mainly due to migration patterns, with younger individuals moving to urban areas for work. At the same time, older adults often migrate to rural areas to enjoy a more peaceful retirement. Consequently, the elderly population in rural areas has increased. However, this migration does not alleviate health issues faced by the elderly in either urban or rural settings. Both populations encounter similar health challenges, such as difficulty accessing healthcare facilities and topics related to social isolation and self-care.[15] A study by Ford *et al*.,[7] in England found that the maintenance of elderly individuals in rural areas is not optimal due to social interaction and limited access to primary care services. Social interaction factors affecting elderly individuals include their tendency to avoid seeking medical care for minor complaints, leading them to visit healthcare facilities only under more severe conditions. Additionally, healthcare access may arise from issues such as obtaining doctor appointments and transportation challenges. These barriers contribute to feeling unappreciated, unwanted, and marginalized, impacting their ability to receive optimal care.[7]

A study by Absor *et al*.[8] in Indonesia found that in rural areas, women predominantly shoulder the responsibility for elderly care. This creates a gender disparity in the maintenance of elderly individuals, with women playing a more significant role

than men. The heavy burden of elderly care often leads women to migrate to the city to escape these responsibilities. At the same time, men also migrate to urban areas in pursuit of better economic opportunities. This migration affects the provision of elderly care in rural areas, resulting in suboptimal care and a tendency toward undertreatment for older adults in these regions. The lack of adequate caregivers and resources in rural areas exacerbates the challenges faced by elderly individuals, impacting their overall well-being.

This study still has several limitations. The first limitation is the sample of the study which only consumed a maximum of two types of drugs so that this study cannot be fully said to be a study that discusses polypharmacy. In addition, this study has a distribution of sample proportions that are too unequal between groups that receive more than one treatment and those that only receive a single medication, thus affecting the results of the analysis produced.

CONCLUSION

In conclusion, no significant relationship between the frailty incidence and polypharmacy in elderly population in Melinggih Village, Gianyar, Bali. Further study should focus on a more comprehensive examination of these risk factors.

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