

## Relationship between loneliness and the risk of malnutrition for elderly in Indonesian nursing homes

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### Abstract

Elderly persons' nutritional status is essential for their health in general. The factors associated with the nutritional status of the elderly in nursing homes are still inconclusive. The purpose of this study was to evaluate the association between loneliness and the risk of malnutrition in elderly persons. This cross-sectional analytical observational study was carried out between August and November 2024 in a nursing home in West Jakarta. A total of 78 respondents were selected using consecutive non-random sampling. Data were collected on age, sex, loneliness, and nutritional status. Loneliness and nutritional status were determined by means of the UCLA questionnaire on loneliness scale version 3 and the Mini Nutritional Assessment questionnaire, respectively. Chi-Squared and Fisher Exact tests were used in data analysis. Our study results showed that 37 (47.5%) of respondents were 70-79 years old, while 37 (47.5%) of respondents were females, and 63 (80.7%) of respondents were lonely. More than half of the respondents, or 46 (59.0%), were at risk of malnutrition. Malnutrition was present in 9 (11.5%) respondents. Older age ( $\geq 70$  years) (PR: 4.191; 95%CI: 1.495 – 11.794;  $p < 0.005$ ); female sex (PR: 3.657; 95%CI: 1.137 – 11.764;  $p < 0.032$ ); and loneliness (PR: 5.250; 95%CI: 1.595 – 17.284;  $p < 0.009$ ) were risk factors for risk of malnutrition/malnutrition. Lonely older elderly females were at high risk of risk of malnutrition/malnutrition. The strategy of early detection and early management should lead all stakeholders to follow up on the malnutrition risk for nursing homes' elderly.

**Keywords:** Elderly; Loneliness; Malnutrition; Nursing Home

### 1. Introduction

According to World Population, nearly all populations are aging, both in developed countries (USA, Japan) and in developing countries, such as Indonesia, with a relatively large elderly population, comprising persons aged 65 or older [1]. Statistics Indonesia reports a total of 29.3 million older persons or 10.82% of the total population, and this number is expected to grow to 11.6% in the year 2030 and to double by the year 2040 [2].

Nursing homes elderly are a vulnerable group in terms of nutrition, with low energy and protein intakes frequently resulting in malnutrition [3]. In older adults, malnutrition commonly relates to undernutrition rather than overweight or obesity, and is a challenge to elderly health, being associated with increased mortality, morbidity, and physical deterioration, which has acute implications on a wide scale for activities of daily living and quality of life in general [4].

There is little available data on the risk factors for poor nutritional status in older nursing home residents. Although the major risk factors for malnutrition in nursing homes are known, their prevalence of malnutrition is still high. An Italian study showed that 38.2% of nursing home elderly are at risk for malnutrition and 19.5% are actually malnourished [5]. Malnutrition and undernutrition are more common in nursing homes than in community-dwelling elderly, in the

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proportions of 29.6% and 14.1%, respectively, whereas 2.3% and 0.3%, respectively, were actually malnourished [6]. Differing results were found by the Trøndelag Health Study (HUNT4) in older elderly subjects aged 70 years and above from the HUNT4 70+ cohort, resulting in a higher prevalence of malnutrition in stay-at-home elderly (26.4%) as well as in nursing home elderly (23.6%), than in the elderly who resided in the community and were examined at field stations (13.5%) [7].

The nutritional status of nursing home elderly is affected by a number of factors, such as sex and age, that have been demonstrated to be independently associated with malnutrition. The prevalence of malnutrition differs between sexes, with males having a 47% lower probability for malnutrition than females (AOR: 0.53; 95%CI: 0.46–0.61) [7]. The prevalence of malnutrition may also differ with increasing age, because for each yearly increase in age, the prevalence risk of malnutrition increases by 4.0% (AOR: 1.04; 95%CI: 1.03–1.05) [7]. Diabetic elderly outpatients with loneliness had a 3.81 higher risk of undernutrition (AOR: 3.81; 95%CI: 1.27–11.39;  $p < 0.017$ ) [8]. Level of education, body fat, appetite, and poor dentition are significantly associated with malnutrition [9].

Loneliness is strongly subjective in nature because lonely persons view the difference between their imagined and actual relationships as being disturbing. Loneliness signifies both a lack of social contacts and inadequate satisfaction from those associations, implying that loneliness means feeling alone, not being alone [10]. The lonely elderly are at risk of significant adverse mental and physical health outcomes, such as CHD, CVA, T2DM, arthritis, depression, anxiety, dementia, and internet usage problems [11]. The study of Eskelinen et al. [12] showed that in the elderly, loneliness was frequently connected with poor nutrition. Because of its impacts on mood, cognition, and physical function, loneliness may result in anorexia and reduce dietary intake in the elderly [12].

The level of loneliness can be determined by several types of instruments [13]. The most frequently used instrument is the UCLA Loneliness Scale version 3 [14], a unidimensional measure of loneliness, because loneliness is a psychological condition that remains identical in form regardless of the situation and can therefore be measured with a single scale [14]. The UCLA Loneliness Scale version 3 has been adapted to the Indonesian context.

Although the elderly population in Indonesia is growing rapidly, there are limited data on the prevalence of malnutrition and low nutrient intake in nursing home elderly. It is essential to identify the risk factors of malnutrition for planning better intervention and prevention strategies. The factors that determine malnutrition should be characterized in all types of nursing homes, because more general intervention strategies may be required, with the emphasis both on improving the nursing home physical structure and the specific rehabilitation process of each resident. The purpose of this study was to evaluate the association between loneliness and the risk of malnutrition in nursing home elderly.

## 2. Materials and Methods

This cross-sectional observational analytical study was carried out on elderly residents of a private nursing home in West Jakarta between August and November 2024. Seventy-eight elderly nursing homes were consecutively selected by non-random sampling. Criteria for being included in the study comprised elderly status (age  $\geq 60$  years), good verbal communication skills, and signing informed consent. The criteria for exclusion from the study were immobilized elderly and elderly on external enteral or parenteral nutritional support.

The number of study subjects (sample size) was calculated by using (1) the formula for an infinite (unknown) population and (2) the formula for a finite (known) population:

$$n_0 = \frac{(Z_{\alpha/2})^2 \times p \times q}{d^2} \dots\dots\dots 1$$

Where  $n_0$ : required optimal sample size;  $Z_{\alpha/2}$ : 1.96;  $p$ : prevalence of malnutrition in elderly = 0.04 (8);  $q$ :  $(1-p) = 0.96$ . Accuracy of measured prevalence  $p = < 10\%$  equals  $\frac{1}{2} p$ , resulting in  $n_0 = 369$ .

$$n = n_0 / (1 + (n_0 / N)) \dots\dots (2)$$

At the meeting place for data collection, there were 82 elderly with malnutrition; therefore,  $N = 82$ . From formula (2) with the addition of 15 percent of  $N$  to compensate for potential dropouts, the final sample size was 78.

Data on age and sex were obtained from the national identity card (KTP) of the elderly. Age was categorized into  $< 70$  years and  $\geq 70$  years, based on the median age of the subjects, with sex categorized into male and female. This study used the UCLA loneliness scale version 3, which had been validated for the Indonesian language [15]. The UCLA

questionnaire consisted of 20 items, with 9 unfavorable items (items number 1, 5, 6, 9, 10, 15, 16, 19, and 20, reflecting the respondents' satisfaction with their social relations) and 11 favorable items (items number 2, 3, 4, 7, 8, 11, 12, 13, 14, 17, and 18 reflecting the respondents' dissatisfaction with their social relations, indicating loneliness). The scoring of the UCLA loneliness scale version 3,[14] used a 4-point Likert scale, ranging from 1 (never feeling lonely) up to and including 4 (always feeling lonely), the respective points being 1 (never), 2 (seldom), 3 (occasionally), and 4 (always). Loneliness was categorized into not feeling lonely (score 20-34) and feeling lonely (score 35-80) [14]. The questionnaire for the Mini Nutritional Assessment Short Form (MNA-SF)[16], comprised six items on appetite, weight loss, mobility, psychological illnesses, cognitive disorders, and either calf circumference or body mass index (BMI). The MNA-SF scores range from 0 to 14, with the categories of malnourished (0-7), at risk of malnutrition (8-11), and well-nourished (12-14) [16].

Data analysis was performed subsequent to data cleaning using consistency, range, and logical checks. Categorical data were reported as the number of respondents (n) and their percentage (%). The risk of loneliness and the relationship of age, gender, and loneliness with nutritional status as risk of malnutrition/malnutrition risk, was determined with the Chi-Squared test and Fisher's Exact test. Data were presented as prevalence ratio (PR) and 95% confidence interval (95%CI). A p-value of <0.05 was deemed to indicate a significant result. Data were processed using IBM SPSS version 25.

### 3. Results and Discussion

Table 1 shows the distribution of respondents' characteristics, the majority or 37 (47.5%) being in the age range of 70-79 years, with 63 (80.8%) being females, while 63 (80.7%) of respondents were lonely, and in regard to nutritional status, 46 (59.0%) of respondents were at risk of malnutrition.

**Table 1** Distribution of subject characteristics (n=78)

| Variables                 | Frequency (n) | Percentage (%) |
|---------------------------|---------------|----------------|
| <b>Age (years)</b>        |               |                |
| 60-69                     | 32            | 41.0           |
| 70-79                     | 37            | 47.5           |
| ≥80                       | 9             | 11.5           |
| <b>Sex</b>                |               |                |
| Male                      | 15            | 19.2           |
| Female                    | 63            | 80.8           |
| <b>Loneliness</b>         |               |                |
| Present                   | 15            | 19.2           |
| Absent                    | 63            | 80.7           |
| <b>Nutritional status</b> |               |                |
| Normal                    | 23            | 29.5           |
| At risk of malnutrition   | 46            | 59.0           |
| Malnutrition              | 9             | 11.5           |

Table 2 shows the relationship of age, gender, and loneliness with nutritional status in the elderly. Among the respondents aged 70 years and over, there were more individuals at risk of malnutrition/malnutrition risk than those of younger age (82.6% vs. 53.1%). Respondents aged ≥ 70 years had a 4.191-fold significantly higher risk of malnutrition/malnutrition risk than those of younger age (PR: 4.191; 95%CI: 1.495 – 11.794; p<0.005).

**Table 2** Relationship of age, gender, and loneliness with nutritional status in the elderly

| Variable    | Nutritional status of malnutrition/malnutrition risk |           | PR    | 95%CI          | p value  |
|-------------|------------------------------------------------------|-----------|-------|----------------|----------|
|             | No (n;%)                                             | Yes (n.%) |       |                |          |
| Age (years) |                                                      |           |       |                |          |
| <70         | 15 (46.9)                                            | 17 (53.1) | 1     |                |          |
| ≥70         | 8 (17.4)                                             | 38 (82.6) | 4.191 | 1.495 – 11.794 | 0.005*   |
| Sex         |                                                      |           |       |                |          |
| Male        | 8 (53.3)                                             | 7 (46.7)  | 1     |                |          |
| Female      | 15 (23.8)                                            | 48 (76.2) | 3.657 | 1.137 – 11.764 | 0.032*\$ |
| Loneliness  |                                                      |           |       |                |          |
| Present     | 9 (60.0)                                             | 6 (40.0)  | 1     |                |          |
| Absent      | 14 (20.2)                                            | 49 (77.8) | 5.250 | 1.595 – 17.284 | 0.009*\$ |

Data analysis using Chi-Squared test, \$ Fisher exact test; \*p<0.05=statistically significant. Loneliness was measured with the UCLA Loneliness Scale version 3 and was categorized into loneliness (score 35-80) and no loneliness (score 20-34); nutritional status was measured using the Mini Nutritional Assessment (MNA) and was categorized into no malnutrition/malnutrition risk (score 12-14) and malnutrition/malnutrition risk (score <12).

There were more females than males at risk of malnutrition/malnutrition risk (76.2% vs. 46.7%). Females had a 3.657-fold significantly higher risk of malnutrition/malnutrition risk than males (PR: 3.657; 95%CI: 1.137 – 11.764; p <0.032). Among the respondents with loneliness, there were more with malnutrition/malnutrition risk than those without loneliness (77.8% vs. 40.0%). Respondents with loneliness had a 5.250-fold higher risk of malnutrition/malnutrition risk than those without loneliness (PR: 5.250; 95%CI: 1.595 – 17.284; p <0.009).

#### 4. Discussion

The results of our study found a high prevalence of inadequate nutritional status in nursing home elderly in Indonesia, with more than half of the respondents, namely 46 (59%), being at risk of malnutrition (Table 1). The prevalence of the risk of malnutrition was higher in this study than in the studies conducted in nursing home elderly by Kolberg et al.[7](23.6%), Madeira et al.[6] (29.6%), Donini et al. [5] (38.2%), and Tuneu et al.[17] (53.75%). Our study also found that 9 respondents (11%) had malnutrition, which was higher than in the study of Madeira et al.[6] showing a prevalence of malnutrition of 2.3%, and in the study of Tuneu et al.[17] showing that 3.7% of the elderly were at risk of malnutrition, but these prevalence rates were lower than in the study of Donini et al.[5] in Italy, who found a prevalence of malnutrition of 19.5%.

These study results support the finding of a high prevalence of elderly with malnutrition and malnutrition risk in nursing homes. Institutionalization was shown by recent studies to also be a risk factor, with these studies reporting that nursing home elderly had a higher risk of malnutrition than community-dwelling elderly. The greater nursing home malnutrition prevalence is caused by both minimal dietary planning and lack of personnel and training. The prevalence of malnutrition in above-mentioned studies vary considerably, depending strongly on the setting, on underlying comorbid conditions, and on screening and assessment methods to detect malnutrition.[4, 18] Nevertheless, because of the high prevalence of malnutrition, the results stress the necessity of screening for nutritional status in older residents and of early intervention upon finding of cases with non-optimal nutritional status.

The majority or 46.2% of our study respondents, were from 70 to 79 years old, comprising the older elderly. In this age group loneliness is frequently found, being caused by various factors, such as low socio-economic status, limiting access to resources and social support. Chronic illness and decreased physical functioning as a result of aging may affect the ability of the elderly to consume nutritious foods, while problems of deglutition also may influence appetite, thus leading to malnutrition [19]. There is also an increased risk of social isolation and loneliness among the elderly, that is caused by factors such as the separation from a partner or close relatives, the problems of impaired mobility, vision, and

hearing, chronic illness, transportation problems, or inability to perform hobbies [20], which may be of greater impact for elderly residing in nursing homes far from their family.

Our study results showed that respondents aged  $\geq 70$  years are at 4.191-fold higher risk of malnutrition/malnutrition risk (Table 2). Our results are in line with those of Kolberg et al., who found that after adjustment for sex, there was a strong age-related difference in prevalence, and that for each year increase in age the prevalence of risk of malnutrition increased by 4.0% (AOR: 1.04, 95% CI: 1.03–1.05) [7].

The risk of malnutrition in the elderly is the result of multiple etiopathogenetic factors leading to a reduced intake or utilization of nutrients, a progressively reduced food-dependent functional autonomy, and psychological problems from economic or social isolation associated with poverty or loneliness [21]. The digestive apparatus of the elderly undergoes changes in mastication and motor function, in the movement of food through the digestive tract, in intestinal wall function, and in chemical digestion of food. These changes result in an inadequate nutrient supply to the body and ultimately in malnutrition [21]. Additionally, drug interactions and impaired subcellular zinc metabolism may result in low zinc absorption and availability, causing zinc deficiency and subsequent depression, loss of appetite, cachexia, and increased muscle catabolism from inflammatory cytokine activation [4]. Therefore, the older elderly is at the highest risk of malnutrition. However, the causes of malnutrition are multiple and complex, such that the development of malnutrition in elderly persons is most probably also facilitated by aging [4].

The results of our study showed that females had a 3.657-fold higher risk of malnutrition/malnutrition risk than males (Table 2). These results agree with those of other studies that found an independent association between sex and malnutrition, in that males were at a lower risk of 47% for malnutrition than were females (AOR: 0.53, 95% CI: 0.46–0.61)[7]. In one study, the risk of malnutrition was found to be significantly higher in females (PR: 1.19, 95%CI: 1.05 - 1.34) [22]. In a large number of cultures, females generally have lower earnings and less social support, which may become worse as they grow older [22]. The English Longitudinal Study of Ageing (ELSA), a cross-sectional study on sex differences in aging, showed that elderly males were less inclined to express feelings of loneliness than did elderly females, the differences holding true after controlling for UCLA score [23]. In the opinion of the ELSA investigators, the reasons for this reticence in males may have been due to cultural ideals of masculinity, to the fact that males may have poorer interpersonal relations, but greater dependency on partners/spouses, and to their dependency on alcohol [23]. Elderly males who remain severely isolated may report a lower score for loneliness on the UCLA scale and even on direct questioning [23].

In our study, we found loneliness among 63 respondents (80.7%), which indicates that there were more lonely respondents with malnutrition/malnutrition risk. Our study's prevalence of loneliness was greater than the corresponding figure in the nursing home study of Tuneu et al.[17]. We also found that lonely respondents were at a 5.250-fold greater risk for malnutrition/malnutrition risk than those who were not lonely (Table 2). Our study results agree with the study results of Eskelinen et al.[12] in Finland, showing that the occurrence of subjective feelings of loneliness was correlated with the risk of malnutrition/malnutrition risk in nursing home elderly (OR: 1.63; 95%CI: 1.09–2.45) [12].

In our respondents with loneliness, the a greater risk of malnutrition than was found by the study of Eskelinen et al.[12], may presumably have been caused by a difference in the type of study location and the characteristics of the country where the study was done. Our study location was a nursing home in Indonesia, whereas the study sample used by Eskelinen et al. consisted of a subgroup in the Geriatric Multidisciplinary Strategy for the Good Care of the Elderly, a population-based comparative study of community-dwelling elderly in Finland [12]. National policies in Finland, as a developed country, such as the Finnish Mental Health Strategy, designed for increased accessibility and effectiveness of their mental health services, result in Finland having an excellent mental healthcare system, which integrates psychological and medical services to provide comprehensive, holistic care [24]. On the other hand, the elderly in Indonesia, still a developing country, face significant limitations in accessing mental health services, because of various factors, such as the strong social stigma attached to mental health disorders, which causes many individuals and families to be reluctant to seek professional help, because they fear to be negatively labelled by the community [25]. In our study, the majority of the respondents resided in their nursing home with a low frequency of family visits. The minimal family interaction and support may render them susceptible to feelings of loneliness that ultimately may have affected their physical condition.

Pardal et al.[26] found that loneliness was not always associated with the risk of malnutrition or undernutrition in the elderly. In their study, the elderly who lived by themselves tended to be younger, more healthy, and more independent, therefore not dependent on others, which positively impacts their physical and mental health [26]. In line with previous

studies, Steptoe et al.[27] stated that loneliness may be associated with a certain dietary pattern, but other factors, such as social support and economic status, may play a larger role in the nutritional status of the elderly.

According to current European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines for geriatrics, the risk of malnutrition in nursing home residents should be reduced through early health examinations, promotion of oral nutrition, individual intervention, and management of dehydration [28]. It is also important to overcome the potential causes of malnutrition, such as social isolation, and to provide adequate social support. The energy intake guiding value in the elderly is 30 kcal/kg body weight per day, which should be individually adjusted for nutritional status, physical activity level, disease status, and tolerance. The minimum daily protein intake in the elderly should be 1 g protein per kg BW [28]. In the absence of a specific deficiency, the micronutrient intake of healthy elderly should be as recommended [28].

Institutionally established standard operating procedures for nutrition and hydration in nursing homes should be followed with clearly defined responsibilities for involved personnel. The institutional leadership should support the nutritional strategies with well-regulated responsibilities. Ideally, geriatric institutions with all of their professionals should cooperate with other geriatric institutions as a multidisciplinary team. Both health care professionals and informal caregivers should be given nutritional education to transfer basic nutritional knowledge and raise awareness of nutritional problems, thereby promoting adequate dietary intake in elderly with malnutrition or at risk of malnutrition [28].

According to a systematic review, the prevalence of malnutrition was between 2.1% and 14.6%, but the prevalence of those at risk for malnutrition was between 18% and 78% [29]. The study also found a high prevalence of nutrient inadequacies, particularly in regard to protein, calcium, vitamin D, and vitamin B<sub>12</sub> [29]. It has been postulated that the native ethnicities in Indonesia and Malaysia may possess vitamin D gene polymorphisms that are causing the high prevalence of vitamin D inadequacy, in spite of the abundant daily sunshine throughout most of the year in Indonesia, as a tropical country [30]. The effects of vitamin D deficiencies may include fractures, frequent falls, minimal physical performance, and age-related cognitive decline [29]. High intakes of vitamin D, either dietary or supplementary, should reverse vitamin D deficiencies and increase serum 25(OH)D levels in elderly residents of the community [29]. In addition to having low macro- and micronutrient intakes, the Indonesian community-dwelling elderly are at great risk of malnutrition. The above-mentioned facts constitute essential and strong proof of the malnutrition prevalence and nutrient inadequacy that stress the need for better nutrition, better public health policies, and prompt intervention [29].

The limitations of our study are as follows: (1) Because our study was of a cross-sectional design, we could not determine a cause-and-effect relationship between malnutrition and its associated factors. Therefore, it is necessary to confirm our results by further large-scale longitudinal studies to explore the factors contributing to malnutrition in the elderly; (2) The participants may have had recall bias, which tended to overestimate their nutritional status. Among the several established screening tools designed for specific use in the elderly, the most studied instrument in widespread use is the self-reported Mini Nutritional Assessment (MNA) questionnaire in both long and short formats. However, because it covers a broad range of topics, there are doubts about the specificity of the MNA results, in connection with the high risk of malnutrition over-diagnosis in the elderly [16]. In our study, the MNA was used to determine the nutritional status of elderly, because this instrument has been validated through a study of its reliability in the elderly population in Indonesia, showing that MNA-SF can be effectively used in nutritional screening in the elderly in Indonesia.

Based on our study results, the prevalence of loneliness and malnutrition that was found among our respondents provides an important picture of the health conditions of the elderly. These findings may be used as a basis in designing comprehensive intervention strategies that also comprise social and emotional support, apart from improving nutrient intake, as outlined in the policies of Permenkes No. 67 for 2015 regarding health services for the elderly in public health centers [31]. Our study showed that it is imperative for health personnel to play an active role in public health centers, hospitals, and health posts for the elderly, by conducting early detection of the risk of malnutrition and loneliness. An approach focused on the holistic aspects is expected to be able to increase the efficacy of health services for the elderly in Indonesia and to improve elderly health.

Other studies are still necessary to confirm our study results in nursing home elderly, because for the nutritional status to be complete, one should also consider other examinations, such as clinical assessment, nutrient absorption, nutrient utilization measured by biochemical status, use of micronutrient supplements, and potential differences in the nutrient requirements/recommendations that underlie the calculations of at-risk percentage [32].

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## 5. Conclusion

This study showed the elevated malnutrition risk in Indonesian nursing home elderly, especially elderly women. Strategies are called for in health policy design by the government, attention from health professionals, as well as family support, and personalized nutritional intervention and monitoring of nursing home residents.

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## Compliance with ethical standards

### *Acknowledgments*

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### *Disclosure of conflict of interest*

The authors do not have any conflicts of interest to declare.

### *Statement of ethical approval*

This study was approved for ethical clearance by the Research Ethics Committee of the Faculty of Medicine, Universitas Trisakti (059/KER/FK/08/2024).

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