

Original Research

Improved Lung Cancer Prevention Knowledge Among Older Adults Through Structured Health Education

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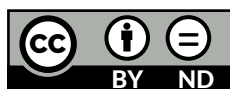
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ABSTRACT

Background: Lung cancer remains a major global public health problem and is one of the leading causes of cancer-related mortality, particularly among the elderly who are more vulnerable due to age-related physiological decline and prolonged exposure to risk factors such as smoking and environmental pollutants. Despite ongoing preventive efforts, limited knowledge and awareness regarding lung cancer prevention among older adults continue to hinder effective control strategies. This study aimed to determine the effect of booklet-based health education on the level of knowledge regarding lung cancer prevention among the elderly. **Methods:** This study employed a quantitative pre-experimental design using a one-group pretest–posttest approach. The study was conducted in the working area of UPTD Puskesmas I East Denpasar, Bali, Indonesia. The sample consisted of 103 elderly individuals selected through purposive sampling. Primary data were collected using a structured questionnaire measuring knowledge levels, while secondary data included respondent characteristics. Data were analyzed using descriptive statistics and the Wilcoxon signed-rank test. **Results:** The results showed that prior to the intervention, the majority of respondents had poor knowledge (59.2%), which decreased to 9.7% after the intervention. Conversely, the proportion of respondents with good knowledge increased from 11.7% to 47.6%. The mean knowledge score also increased from 49.26 to 74.39, with a statistically significant difference ($p = 0.001$). **Conclusions:** In conclusion, booklet-based health education was associated with a significant improvement in knowledge regarding lung cancer prevention among the elderly. This intervention can be considered a practical and effective strategy for enhancing health literacy in community settings.

Keywords: Health education; booklet; knowledge; lung cancer prevention; elderly

1. INTRODUCTION

Lung cancer remains one of the leading causes of morbidity and mortality worldwide, representing a significant public health burden, particularly in low- and middle-income countries. It is characterized by uncontrolled proliferation of abnormal cells in lung tissue, often associated with exposure to carcinogenic agents such as tobacco smoke, air pollution, and occupational hazards.⁽¹⁾ Globally, approximately 2.5 million new cases and more than 1.8 million deaths were reported in 2022, highlighting its substantial contribution to cancer-related mortality.^(2,3) In Indonesia, lung cancer

ranks among the top three most prevalent cancers, with an incidence of approximately 2.6% in women and 3.0% in men, and a mortality rate reaching 13.2% of total cancer deaths.⁽⁴⁾ This epidemiological profile underscores the urgent need for effective preventive strategies, particularly among vulnerable populations such as the elderly.^(5,6)

The elderly population is particularly susceptible to lung cancer due to age-related physiological decline, prolonged exposure to risk factors, and a high prevalence of smoking behavior.⁽⁷⁾ In Indonesia, approximately 11.75% of the population is aged 60 years and above, with nearly one-quarter of this group still actively smoking.⁽⁸⁾ This condition significantly increases the risk of developing lung cancer and other chronic diseases. Despite ongoing national efforts emphasizing promotive and preventive healthcare, such as early screening and health promotion programs, limited knowledge and awareness among the elderly remain a critical barrier to effective prevention.^(9,10) In primary healthcare settings, including community health centers (Puskesmas), educational interventions are often implemented; however, their effectiveness depends largely on the appropriateness of the educational media used.⁽¹¹⁾

Health education is a fundamental approach in public health interventions aimed at improving knowledge, attitudes, and behaviors related to disease prevention. Among various educational media, printed materials such as booklets have gained attention due to their ability to present structured, concise, and visually engaging information.⁽¹²⁾ Booklets allow repeated exposure to health messages, making them particularly suitable for elderly populations who may require reinforcement and simplified learning materials.⁽¹³⁾ Previous studies have demonstrated that booklet-based education significantly improves knowledge outcomes in various health contexts, including anemia prevention, chronic disease management, and first aid awareness. For instance, studies have reported statistically significant improvements in knowledge following booklet interventions ($p < 0.05$), indicating their effectiveness as an educational tool.

The current literature on the current state of affairs (SOTA) indicates that various educational media, including as audiovisual tools, videos, and print resources, are effective in raising awareness of health issues in the elderly community. However, previous research focused mostly on conditions including hypertension, diabetes, and reproductive health, with a

lesser emphasis on lung cancer prevention, particularly in elderly communities. Aside from this, there are research challenges that use booklet-based education that are specifically targeted at the development of lung cancer in Indonesia's primary healthcare environment. This deficiency is particularly evident in the area administered by UPTD Puskesmas I East Denpasar, where early participation in the health program for the elderly and knowledge of the methods of lung cancer prevention are encouraged.

This study is innovative because it focuses on using booklet-based health education as an intervention to increase older patients' understanding of lung cancer prevention in a primary healthcare setting in Bali, Indonesia. This research isolates the impact of booklet media and applies it to a high-risk, understudied group, in contrast to earlier studies that combine different media or concentrate on other diseases. Furthermore, it contributes to context-specific public health efforts by offering localized evidence from a community with a high smoking prevalence and little prior exposure to formal lung cancer education.

This study is extremely pertinent and important given the high incidence of lung cancer, the susceptibility of the senior population, and the current gaps in information and educational initiatives. To lower risk exposure and enhance health outcomes, preventative knowledge must be strengthened through efficient instructional techniques. Thus, the purpose of this study is to ascertain how health education through booklet medium affects the degree of lung cancer prevention knowledge among the elderly in the UPTD Puskesmas I East Denpasar, Bali, Indonesia working region.

2. METHODS

2.1 Study Setting and Period

This study was conducted in the working area of UPTD Puskesmas I East Denpasar, Bali Province, Indonesia, specifically in Banjar Kedaton, Sumerta Kelod Village, in 2025. The location was selected based on preliminary findings indicating low participation of the elderly in health programs and limited awareness regarding lung cancer prevention.

2.2 Study Design

The study employed a quantitative approach using a pre-experimental design with a one-group pretest–posttest format. This design was chosen to assess

changes in the level of knowledge among the same group of participants before and after the implementation of health education using booklet media. By comparing pretest and posttest results, the study aimed to determine the effectiveness of the intervention in improving knowledge.

2.3 Study Population and Sample

The population consisted of all elderly individuals aged 60–75 years living in Banjar Kedaton, totaling 120 individuals. From this population, 103 respondents were selected using a non-probability purposive sampling technique based on predefined inclusion and exclusion criteria. Eligible participants were those who were willing to participate, able to communicate effectively, and present during the data collection period.

2.4 Research Variables and Data Sources

The independent variable in this study was health education delivered through booklet media, while the dependent variable was the level of knowledge regarding lung cancer prevention among the elderly. Data were obtained from both primary and secondary sources. Primary data were collected directly from respondents using a structured questionnaire designed to measure knowledge levels, while secondary data included demographic information obtained from local health records.

2.5 Data Collection Procedure

Data collection was carried out using a questionnaire consisting of 15 items measured on a Likert scale, which had previously been tested for validity and reliability. The procedure began with the administration of a pretest to assess baseline knowledge levels. This was followed by the provision of health education using booklet media containing structured and easily understandable information tailored to the elderly population. After the intervention, a posttest was conducted to evaluate any changes in knowledge levels.

2.6 Data Analysis

Data analysis was performed using both univariate and bivariate approaches. Univariate analysis was used to describe respondent characteristics and the distribution of knowledge levels, which were presented in the form of frequencies, percentages, and mean scores. Bivariate analysis was conducted using the Wilcoxon signed-rank test, as the data were not normally distributed. This test was applied to determine the

statistical significance of differences in knowledge levels before and after the intervention, with a significance level set at $p < 0.05$. All statistical analyses were performed using IBM SPSS Statistics version 26.0

2.7 Data Presentation

The results were presented in both tabular and narrative forms to enhance clarity and facilitate interpretation. Tables were used to display respondent characteristics, knowledge distribution before and after the intervention, and the results of statistical testing, while the narrative descriptions provided detailed explanations of the findings.

2.8 Ethical Approval

This research has obtained ethical approval from the Health Research Ethics Commission of Denpasar Health Polytechnic, Ministry of Health through the Chair of the Ethics Commission with Ethics Approval Number: DP.04.02/F.XXXII.25/0314/2025.

3. RESULTS

3.1 Characteristics of Respondents

Table 1 presented the characteristics of respondents. A total of 103 elderly individuals participated in this study. Most respondents were aged 60–65 years (63.1%), indicating that the majority were in the early elderly stage. Females predominated (62.1%), suggesting greater participation of women in community health activities. In terms of education, most respondents had completed senior high school (52.4%), reflecting a relatively adequate level of literacy. Regarding occupation, the majority were engaged in light work (66.0%), which may facilitate their participation in health education activities.

Table 1. Characteristics of respondents (n = 103)

Variable	Frequency	Percentage
Age (years)		
60–65	65	63.1
66–70	25	24.3
71–75	13	12.6
Gender		
Male	39	37.9
Female	64	62.1
Education		
No formal education	3	2.9
Elementary school	10	9.7

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Table 1. (continued)

Variable	Frequency	Percentage
Junior high school	17	16.5
Senior high school	54	52.4
Higher education	19	18.4
Occupation		
Light work	68	66.0
Moderate work	23	22.3
Heavy work	12	11.7

3.2 Distribution of Knowledge Levels

Before the intervention, the majority of respondents (59.2%) had poor knowledge regarding lung cancer prevention, while only 11.7% demonstrated good knowledge. After the intervention, there was a substantial improvement, with the proportion of respondents with good knowledge increasing to 47.6% and those with poor knowledge decreasing to 9.7%. This indicates a clear shift toward higher knowledge categories following the health education intervention.

Table 2. Distribution of knowledge levels before and after the intervention (n = 103)

Knowledge level	Pre-test		Post-test	
	n	%	n	%
Poor	61	59.2	10	9.7
Moderate	30	29.1	44	42.7
Good	12	11.7	49	47.6
Total	103	100.0	103	100.0

3.3 Effect of Health Education on Knowledge

The mean knowledge score increased from 49.26 before the intervention to 74.39 after the intervention, indicating a substantial improvement in respondents' understanding of lung cancer prevention. The Wilcoxon signed-rank test showed a statistically significant difference between pretest and posttest scores ($p = 0.001$). This finding suggests that the booklet-based health education intervention was associated with a significant improvement in knowledge among the elderly.

Table 3. Effect of booklet-based health education on knowledge scores

Variable	Mean (pre-test)	Mean (post-test)	p-value
Knowledge level	49.26	74.39	0.000

4. DISCUSSION

The present study demonstrates a substantial improvement in knowledge regarding lung cancer prevention among the elderly following booklet-based health education. The shift from predominantly poor knowledge (59.2%) to higher levels of knowledge (good: 47.6%) reflects a meaningful transformation in cognitive outcomes. This improvement is further supported by the significant increase in mean scores and statistical testing, suggesting that structured educational interventions can effectively address knowledge gaps in vulnerable populations.

From a critical interpretative perspective, the initial low level of knowledge observed in this study is consistent with global evidence indicating that elderly populations often experience limited health literacy, particularly regarding complex diseases such as lung cancer. Older individuals frequently face challenges related to cognitive decline, reduced access to information, and limited exposure to preventive health messaging. As highlighted by recent evidence, inadequate health literacy among older adults significantly affects their ability to engage in preventive behaviors and make informed health decisions.⁽¹⁴⁾ This condition reinforces the urgency of targeted educational interventions tailored to the elderly.

The significant improvement observed after the intervention can be explained through cognitive learning theory and health behavior frameworks. According to Notoatmodjo's health education theory, knowledge acquisition is the foundational step toward behavior change. This is supported by contemporary models such as the Health Belief Model, which emphasizes that increased knowledge influences perceived susceptibility and benefits, ultimately shaping preventive actions. Empirical studies have confirmed that educational interventions significantly enhance knowledge and engagement in lung cancer-related behaviors.⁽¹⁵⁾

Importantly, the effectiveness of booklet-based education observed in this study aligns with growing global evidence on patient education strategies. A systematic review by Cooke et al. (2025) found that patient engagement interventions, including educational materials, significantly improve knowledge, decision-making, and health outcomes in individuals with lung cancer.⁽¹⁶⁾ Similarly, recent intervention studies demonstrate that structured educational materials can significantly enhance patient understanding and self-

management capabilities, particularly when information is presented in a clear, accessible format.⁽¹⁷⁾

The superiority of booklet media in this context can be attributed to its ability to support self-paced learning, repetition, and visual reinforcement. Unlike digital or audiovisual interventions, printed materials allow elderly individuals to revisit information multiple times, which is critical given age-related cognitive processing limitations. This finding is consistent with evidence showing that simple, structured educational tools improve comprehension and retention among older adults.⁽¹⁸⁾

From a clinical and epidemiological standpoint, the relevance of this intervention is underscored by the high burden of lung cancer among the elderly. Lung cancer remains the leading cause of cancer-related mortality worldwide, with incidence increasing significantly with age.⁽¹⁹⁾ Moreover, aging is associated with physiological vulnerability and increased exposure to risk factors such as smoking and environmental pollutants, making prevention strategies particularly critical for this population.^(7,20,21) The findings of this study therefore support the prioritization of preventive education as part of comprehensive geriatric care.

From a policy perspective, this study provides empirical support for strengthening promotive and preventive health strategies at the primary healthcare level. Many health systems, including Indonesia's, emphasize early detection and community-based education to reduce the burden of non-communicable diseases. However, implementation often faces challenges related to limited awareness and ineffective communication strategies. The results of this study suggest that booklet-based interventions could serve as a scalable, low-cost, and practical solution to enhance health literacy and support national cancer prevention programs.

Despite its strengths, this study has several limitations that should be critically acknowledged. First, the use of a one-group pretest–posttest design limits causal inference, as external factors such as prior exposure to information or peer interaction may have influenced the results. Second, the reliance on self-reported questionnaire data introduces the potential for response bias. Third, the study was conducted in a single community setting, which may limit the generalizability of the findings to broader populations. These limitations highlight the need for future research using more robust

designs, such as quasi-experimental or randomized controlled trials.

Nevertheless, the study also possesses notable strengths. The relatively adequate sample size enhances the reliability of findings, while the use of a validated instrument ensures measurement consistency. Importantly, the intervention itself is highly practical, low-cost, and easily replicable in real-world settings, making it particularly relevant for primary healthcare systems with limited resources.

The implications of this study are significant. Practically, the findings support the integration of booklet-based education into routine health promotion activities, particularly for elderly populations in community settings. Health workers and community cadres can utilize such materials to improve knowledge and potentially influence preventive behaviors. Theoretically, this study contributes to the growing body of evidence emphasizing the role of tailored educational media in improving health literacy among vulnerable populations. This study provides strong evidence that booklet-based health education is associated with a significant and meaningful improvement in knowledge of lung cancer prevention among the elderly. While further research is needed to strengthen causal inference, the findings highlight the critical role of simple, accessible educational interventions in addressing global public health challenges.

5. CONCLUSION

This study shows that elderly individuals initially had limited knowledge regarding lung cancer prevention, which improved noticeably after receiving booklet-based health education. The intervention was associated with a clear shift from low to higher levels of understanding, indicating that simple, structured, and accessible educational media can effectively enhance knowledge in this population. Overall, booklet-based health education appears to be a practical and feasible approach for strengthening preventive awareness among the elderly, particularly in community healthcare settings. Its use can support ongoing health promotion efforts by providing information that is easy to understand, revisit, and apply in daily life.

Ethical Approval

This research has obtained ethical approval from the Chairperson of the Health Research Ethics Commission

of Politeknik Kesehatan Kementerian Kesehatan Denpasar with Number: DP.04.02/F.XXXII.25/0314/2025.

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Competing Interests

All the authors declare that there are no conflicts of interest.

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No funds were received for this study.

Underlying Data

Derived data supporting the findings of this study are available from the corresponding author on request.

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