

EFFECTIVENESS OF EDUCATIONAL VIDEO AND LEAFLET ON IMPROVING MOTHERS' KNOWLEDGE ABOUT THE IMPACT OF CIGARETTE SMOKE AND PNEUMONIA PREVENTION IN TODDLERS IN THE WORKING AREA OF UPTD PUSKESMAS JOHAN PAHLAWAN

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Abstract

Background: Pneumonia is a leading cause of death in toddlers, especially in developing countries. Exposure to cigarette smoke increases the risk of respiratory disorders in children. Education using appropriate media can improve mothers' understanding of the dangers of cigarette smoke. **Objective:** To determine the effectiveness of educational video and leaflet on improving mothers' knowledge about the impact of cigarette smoke and pneumonia prevention in toddlers in the working area of UPTD Puskesmas Johan Pahlawan. **Methods:** A quasi-experimental study with a two-group pretest-posttest design involving 40 mothers of toddlers. The sample was divided into two groups (video = 20; leaflet = 20). The instrument used was a 15-item questionnaire that was valid ($r = 0.71-0.94$) and reliable ($\alpha = 0.986$). Analysis was performed using paired t-test and independent t-test. **Results:** Both video and leaflet significantly increased knowledge ($p < 0.001$). The increase in the video group was higher (MD = 22.75; 95% CI -27.76 to -17.74) compared to the leaflet group (MD = 17.75; 95% CI -23.46 to -12.04). Comparison between groups showed that video was more effective (MD = 6.25; $p = 0.030$; 95% CI 0.63-11.87).

Keywords: Video, Leaflet, Knowledge, Pneumonia

Introduction

Pneumonia continues to be a major cause of mortality among children under five years of age worldwide. According to the 2023 Child Mortality Report from the United Nations Inter-agency Group for Child Mortality Estimation, an estimated 4.9 million children under five died in 2022. Of these deaths, about 2.3 million occurred during the neonatal period (0-27 days), while 2.6 million deaths were recorded among children aged 1-59 months. Pneumonia, also referred to as a lower respiratory tract infection, is the second leading cause of death in young children after preterm birth, accounting for approximately 14% of all global under-five deaths. The majority of these fatalities occur in low- and middle-income countries, particularly in Sub-Saharan Africa and South Asia, which together contribute to over 80% of global under-five mortality. Key contributing factors include insufficient immunization coverage, delayed access to healthcare services, poor nutritional status, and exposure to indoor air pollution, including cigarette smoke (UNICEF, 2023).

In Indonesia, pneumonia detection coverage among toddlers has fluctuated over the past eleven years. In 2023, pneumonia detection decreased to 36.95%, with the highest provincial rates recorded in West Papua (75%), DKI Jakarta (72.4%), and Bali (71.6%) (Kementrian Kesehatan, 2023).

One of the main risk factors for pneumonia is exposure to cigarette smoke. This disease is caused by bacterial, viral, fungal, and other microbial infections that attack lung tissue, resulting in inflammation and respiratory impairment (Junaidi et al., 2021). Exposure to cigarette smoke is the

most influential external factor affecting children's respiratory health. Indonesia is the country with the third-largest smoking population in the world after China and India (Simanungkalit et al., 2021). Although Law No. 36 of 2009 Article 199 prohibits smoking in smoke-free areas with fines up to Rp 50,000,000.00, (Undang-Undang Republik Indonesia Nomor 36 Tahun 2009, Pasal 199) this regulation has not been effective in changing public behavior. Many parents still smoke inside the house, exposing children to cigarette smoke and making them passive smokers (Lathifah et al., 2020). Mothers' lack of knowledge regarding the dangers of cigarette smoke may hinder early detection of pneumonia in toddlers (Lempoy J J, 2021).

To prevent pneumonia, changes in individual health behavior are required. Alyafei dan Easton-Car (2024) explain that a person's health behavior is influenced by their beliefs about the risks and consequences of a disease through six main components: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

In Aceh Province, the average detection rate of pneumonia cases in toddlers reached 22.62%, while Aceh Barat District recorded 0.99%, indicating a significant gap in early detection (Profil Kesehatan Aceh, 2022) This low detection rate suggests delays in parents seeking medical help, which is closely related to limited knowledge about pneumonia. Furthermore, case detection data in Aceh Barat show unstable fluctuations from year to year. Pneumonia cases in toddlers increased from 2 cases in 2022 to 175 cases in 2023, then declined to 67 cases in 2024. Meanwhile, in Johan Pahlawan Subdistrict, pneumonia cases increased from 0% in 2022 to 70.1% in 2023, then dropped to 7.2% in 2024 (Dinas Kesehatan Aceh Barat, 2022-2024). These fluctuations indicate instability in prevention and management efforts, which may relate to community knowledge levels.

To overcome the decline in pneumonia prevention in toddlers, efforts are needed to increase mothers' knowledge about the dangers of cigarette smoke through educational interventions that are attractive and easy to understand. Educational videos are effective because they present a combination of sound, images, and animation that enhances comprehension and memory retention. Meanwhile, leaflets are flexible, easy to carry, and can be read repeatedly, allowing the community to understand the information according to their reading ability. The combination of these two media becomes an effective educational strategy to reach communities from various socioeconomic backgrounds. Theoretically, the use of videos and leaflets is supported by the Cognitive Theory of Multimedia Learning (Mayer, 2024), which emphasizes the importance of presenting visual-verbal information, as well as Cognitive Load Theory (Baxter et al., 2025) which recommends simple and structured information delivery to facilitate understanding.

Method

This research applied a quantitative approach with a quasi-experimental design, incorporating two groups assessed before and after the intervention (Mulansari et al., 2024). In this design, two groups were given different interventions to assess changes in mothers' knowledge regarding the dangers of cigarette smoke exposure to toddlers' respiratory health. Measurements were conducted twice: the pretest before the intervention and the posttest three days afterward to evaluate changes in respondents' knowledge. The sampling technique used was purposive sampling with criteria of mothers who had toddlers and whose last education was senior high school; these criteria were chosen to maintain uniform comprehension levels and reduce research bias (Muthahharah, 2023). The study included 40 respondents from four villages in the working area of UPTD Puskesmas Johan Pahlawan, Aceh Barat District, namely Lapang, Rundeng, and Gampong Darat. Respondents were evenly divided into two intervention groups, each consisting of 20 participants.

This study used two types of interventions to increase the knowledge of housewives regarding the dangers of cigarette smoke exposure to toddlers' respiratory systems, namely educational video

and leaflet. The educational video provided to Group A had a duration of 2 minutes and 11 seconds, ensuring that information was delivered clearly yet not monotonously for respondents. The video discussed the dangers of cigarette smoke exposure to pneumonia in toddlers, including its impacts and preventive measures. The video was created by the researchers under the supervision of academic advisors, using animations, voice narration, and supporting text. Group B was given a leaflet containing explanations about the dangers of cigarette smoke exposure to pneumonia in toddlers and preventive measures. This leaflet was created by the researchers with supervisory guidance, using simple language and attractive illustrations.

The study was conducted in May 2025 in two sessions with a three-day interval, in accordance with the principles of the Cognitive Theory of Multimedia Learning (Mayer, 2024), which states that time intervals are required to allow optimal internalization of information in memory without causing forgetting. A closed-ended questionnaire was used to measure mothers' knowledge about the dangers of cigarette smoke exposure related to pneumonia in toddlers.

Validity testing was carried out using the Pearson Product Moment correlation technique on 15 mothers of toddlers who were not included in the study sample. The results showed that all question items exceeded the r-table value (0.51), with calculated r-values ranging from 0.71 to 0.94, indicating that all items were valid and suitable for use in the study. Reliability testing was conducted using the Cronbach's Alpha method. The obtained alpha value was 0.986, far above the minimum required value of 0.60, demonstrating that the questionnaire had very high internal consistency and was considered reliable.

Results

Based on the data collection and analysis obtained, the researcher can present the research results below:

Table 1. Distribution of Respondents

Characteristics	Frequency	Percentage (%)
Age		
25-30 years	14	35
31-35 years	14	35
36-40 years	5	12,5
41-45 years	7	17,5
Total	40	100
Education		
Senior High School	40	100.0

Source: Primary Data (2025)

Table 1 presents the distribution of respondents according to their age and educational background. Based on the age categories, the majority of respondents were in the age range of 25-30 years, totaling 14 people (35%), followed by the age group 36-40 years with 14 people (35%), 5 people (12.5%) in the age group 31-35 years, and 7 people in the age group 41-45 years. In terms of education level, all respondents (100%) were Senior High School graduates.

Table 2. Normality Test Results

Variable	Test Of Normality			Keterangan
	Shapiro-Wilk			
	Statistic	df	Sig.	
Pre Test Video	0.918	20	0.91	Normal
Post Test Video	0.928	20	0.141	Normal
Pre Test Leaflet	0.911	20	0.066	Normal
Post Test Leaflet	0.921	20	0.104	Normal

Source: Primary Data (2025)

The normality test aims to determine whether the data in each group are normally distributed, which is one of the requirements for conducting parametric statistical tests. In this study, the normality test was carried out using the Shapiro-Wilk test on the pre-test and post-test data in the video and leaflet media groups. The analysis results showed that all significance (Sig.) values were > 0.05, namely 0.910 for the Pre-Test Video, 0.141 for the Post-Test Video, 0.066 for the Pre-Test Leaflet, and 0.104 for the Post-Test Leaflet. Thus, it can be concluded that all data were normally distributed and met the basic assumptions for further analysis.

Table 3. Changes in Pretest and Posttest Scores by Age Group

Age	Leaflet				Video				n	%
	+		-		+		-			
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest		
25 – 30	-	6	-	-	-	8	-	-	14	35
31 – 35	-	7	-	1	-	6	-	-	14	35
36 – 40	-	2	-	-	-	3	-	-	5	12,5
41 – 45	-	4	-	-	-	3	-	-	7	17,5
Total									40	100

Source: Primary Data (2025)

Based on the age group analysis presented in Table 3, the 25–30 year age group demonstrated the greatest improvement, with 8 respondents in the video group and 6 respondents in the leaflet group showing increased posttest scores. In the 31–35 year age group, an increase also occurred in most respondents, namely 7 people in the video group and 6 people in the leaflet group. Meanwhile, the 36–40 year and 41–45 year age groups showed fewer increases. This shows that the younger the respondents are, the greater the tendency for an increase in knowledge after being given educational media.

Table 4. Paired Sample t-test Results

Variable	Mean Difference	SD	Std.Error	95% CI (Lower-Upper)	t	df	p
Pre-post Video	-22.750	10.696	2.392	-27.756 -17.744	-	19	p<0.001
Pre-post leaflet	-17.750	12.191	2.726	-23.456 -12.044	-	19	p<0.001

Source: Primary Data (2025)

The Paired Sample t-Test was used to assess whether a significant difference existed between pre-test and post-test scores within the same group, specifically the video media group and the leaflet group. The results indicated that the video media group experienced a significant improvement in knowledge. The mean difference showed an increase of -22.750 with a significance value (p-value) of $P < 0.001$. The CI range did not cross zero, so the change can be considered real.

An increase in knowledge also occurred in the leaflet group with a mean difference of -17.750, and the value of $P < 0.001$ indicated significant results. The CI did not cross zero, confirming a real increase after the intervention. The significance values smaller than 0.05 in both groups indicated that there was a highly significant difference between the pre-test and post-test scores after the educational intervention was given.

The negative value shown in the difference indicates that the post-test score was higher than the pre-test score, so it can be concluded that there was an increase in knowledge scores after the respondents received education, both through video media and leaflet. This indicates that both educational media were able to significantly improve mothers' understanding.

Table 5. Independent Sample t-test Results

Variable	Mean Video	Mean leaflet	Mean difference	t	df	p	95%CI(Lower-Upper)
Mothers' Knowledge	62,75	56,50	6,250	2,251	38	0,030	0.630-11.870

Source: Primary Data (2025)

The Independent Sample t-Test was used to assess whether a statistically significant difference existed between two independent groups, namely mothers who received educational media in the form of videos and those who received leaflet-based media. The results of the analysis indicated a t-value of 2.251 with 38 degrees of freedom (df) and a two-tailed significance value of 0.030. Because the significance value was below 0.05 ($p < 0.05$), it can be concluded that a statistically significant difference existed between the two groups after the educational intervention. This difference can also be seen from the average knowledge scores, where the video group had a higher average score of 62.75 compared to the leaflet group, which had an average score of 56.50. The mean difference of 6.250 indicates that education through video media provided better understanding to mothers compared to leaflet-based education.

Statistically, the high t value accompanied by the significant p-value shows that the difference between the two groups did not occur by chance, but was the result of the real influence of the educational media used. In other words, video media was proven to have a greater impact on increasing mothers' knowledge compared to leaflet media.

This significant difference can be explained by the characteristics of each media. Video media, which is audio-visual, stimulates two senses at once-vision and hearing-making the information delivery more engaging, easier to understand, and easier to remember. Meanwhile, leaflet media is visual in nature and depends on an individual's literacy ability to read and understand the material. Therefore, mothers who received education through videos tended to obtain more optimal understanding, which was clearly reflected in the higher knowledge scores after the intervention.

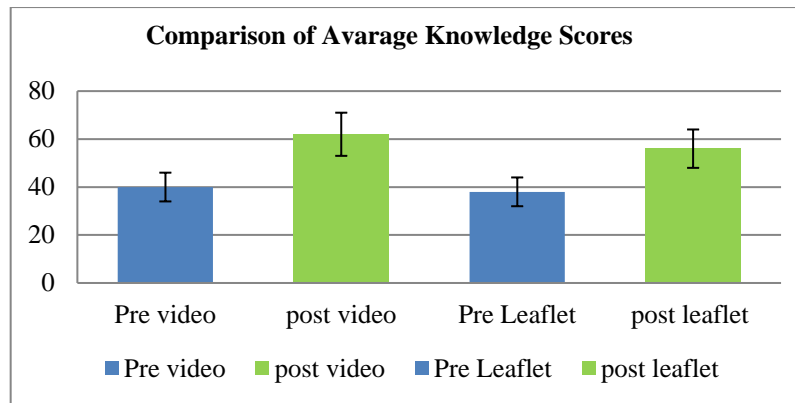


Figure 1. Comparison of Average Knowledge Scores

The graph above shows the average knowledge scores of respondents before and after being given education using video and leaflet. The displayed error bars represent the standard deviation (SD) values. It can be seen that both in the video group and the leaflet group, the knowledge scores increased at the time of the post-test. The group that received education through video showed a score increase from 40.00 to 62.75. Meanwhile, the leaflet group also experienced an increase from 38.75 to 56.50. The highest increase was seen in the video group, indicating the effectiveness of this media in conveying information. This visualization shows the differences in the impact between the media. Videos, with a combination of sound and visual elements, provide a more interactive learning experience, while leaflets, which are static in nature, still provide a positive impact although not as strong as audiovisual media.

Discussion

This study aims to evaluate the effectiveness of health education videos and leaflets in increasing mothers' knowledge about the dangers of cigarette smoke exposure to pneumonia in toddlers, as well as to compare the level of effectiveness of the two media. The study results showed that both educational media were effective in increasing mothers' knowledge, but with different levels of effectiveness. Through statistical and theoretical discussions, a clear picture was obtained regarding the strengths and limitations of each medium in delivering health messages to the community, particularly mothers who have toddlers.

Effectiveness of educational videos

Educational intervention using video media resulted in a significant improvement in mothers' knowledge. This finding is supported by the Paired Sample t-test, which produced a p-value < 0.001, indicating a statistically significant difference between pre-test and post-test scores. This increase shows that video media is effective in delivering educational messages about the dangers of cigarette smoke exposure to the health of toddlers. The advantages of video can be explained through the Cognitive Theory of Multimedia Learning (Mayer, 2024), which emphasizes that videos optimize two information processing channels, namely the combination of visual and verbal elements (dual coding), thus helping the brain process information more efficiently. For example, when a video displays an illustration of a toddler's lungs damaged by cigarette smoke along with a narration, viewers build a stronger conceptual understanding compared to only reading text.

Video media that combines visual and audio elements also encourages active audience engagement. They do not only listen, but also see concrete illustrations that clarify the message. When moving images and audio are presented clearly, learning focus increases because distractions from

irrelevant elements are reduced. Conversely, videos that are not aligned, for example using distracting background music or irrelevant animations, can reduce learning effectiveness. By arranging the right elements, videos are able to create a strong learning experience and help mothers remember the material in the long term. (Navarrete et al., 2025) also supports this finding by stating that alignment between visuals, audio, text, and video design has a significant effect on audience appeal and knowledge retention.

Another advantage of video media is its flexibility and ability to be repeated according to the mothers' time and needs. In today's digital era, people can easily access videos through mobile devices, so learning can be done anytime. However, the effectiveness of videos is also influenced by external factors such as socioeconomic conditions and respondents' digital literacy. Not all individuals have adequate digital devices or good internet connections to access video materials. Although all respondents in this study were Senior High School graduates, their comfort levels and ability to use technology varied. (Bhoyar et al., 2024) emphasized that the digital divide, including limited access to devices, internet connections, and technological literacy, becomes a real barrier in digital media-based health education. Therefore, the implementation of video-based education needs to be adjusted to community conditions, for example by providing offline versions or group screenings by health workers.

Effectiveness of leaflet

Education through leaflets was also proven to be effective in increasing mothers knowledge. As shown by the results of the Paired Sample t-test for the leaflet group, the p value = 0.000 indicates a significant change in knowledge from pre-test to post-test. Leaflets have advantages in language simplicity, concise design, and ease of distribution. This result is supported by (Nurlaelah, 2024), who stated that leaflets as structured health promotion media are able to deliver information in a way that is easy to understand, thus increasing knowledge and actions of the educational target. The attractive presentation structure helps readers focus on the core message without having to read long and complex text.

However, the effectiveness of leaflets cannot be separated from the influence of the community's level of health literacy. In Indonesia, the ability of the community to understand and apply health information is still a serious challenge in efforts to increase public health awareness. (Muthahharah, 2023) found that most respondents in Gowa Regency had low health literacy, which affected the suboptimal management of health independently. In addition, low reading interest also becomes an obstacle and influences how well written information can be absorbed. The study of (Suryanti & Megawanti, 2022) showed that lack of reading motivation, limited access to quality reading materials, and the dominance of entertainment media contribute to the weak reading culture in Indonesia. This condition also affects the effectiveness of written educational media such as leaflets because the information presented risks not being read or not being fully understood.

These findings are in line with the study by (Aira et al., 2025), which showed that leaflets are sometimes less effective because low reading interest causes the material not to be optimally read. Nevertheless, leaflets still have educational potential if prepared by considering the community's literacy limitations. The use of simple language, short sentences, and attractive images can increase readability and the appeal of leaflets. (Jansen et al., 2021) also stated that leaflets with attractive designs and visual narratives such as pictorial stories are able to increase audience attention and facilitate the processing of health information. With this approach, leaflets remain relevant as educational media in communities with limited access to digital technology.

Comparison of educational video and leaflet

The Independent Sample t-test results indicated a significant difference between mothers who received education through video media and those who were provided with leaflet-based education. ($p = 0.030$). The mean value of the video group was 62.75 and the mean value of the leaflet group was 56.50, indicating that a greater increase in knowledge occurred in the video group. The scientific explanation for this finding is that videos provide more complete audiovisual stimulation compared to leaflets, which consist only of text and images. Audiovisual communication in videos can be more attention-grabbing, increase understanding, and improve knowledge retention, while leaflets have limitations in terms of interactivity and completeness of information. The study by (Harahap, 2021) showed similar results, where video media had a greater effect on the caregiving behavior of mothers with toddlers suffering from pneumonia compared to leaflets. The combination of visuals and audio in videos makes the audience more focused, interested, and able to understand the message more easily.

The findings of this study are also in line with (Wahyuningsih et al., 2024), which showed a significant effect of video-based health education on increasing mothers' knowledge about pneumonia prevention at Puskesmas Lubuk Begalung Padang. Meanwhile, (Nurlaelah, 2024) showed that leaflet media was also effective in increasing mothers' knowledge about ARI at Harahap Anak Indonesia Foundation, North Jakarta. However, the results of this study indicate that video media has a higher level of effectiveness compared to leaflets. This is consistent with the findings of (Herlinadiyaningsih, 2021), which showed that interventions using video media were more effective than leaflets in improving the knowledge of breastfeeding mothers at Datah Kotou Health Center, Murung Raya Regency.

These findings are also reinforced by global research highlighting the advantages of audiovisual media in health education. A study by (Maharjan et al., 2022) published in *Women's Health* showed that culturally adapted educational video media successfully increased the knowledge of mothers and female community health volunteers in Nepal. In addition, research by (Adam et al., 2023) in the *Journal of Medical Internet Research* found that educational animated videos increased satisfaction and understanding among pregnant women in South Africa regarding perinatal health materials. These results show that video media with integrated visual and audio combinations are efficient and attractive tools for health education in the community.

The increase in pneumonia cases among toddlers in West Aceh illustrates that significant challenges remain in preventing this disease. The findings of this study provide evidence that health education through video media and leaflets is both effective in increasing mothers' knowledge about the dangers of cigarette smoke exposure. However, because videos are proven to be superior in attracting attention and increasing understanding, a combination of both media or a focus on audiovisual media can serve as an educational strategy, increase community learning motivation, and help reduce pneumonia rates among toddlers in Indonesia.

Several threats to validity need to be considered in this study. Selection bias may occur because the sample was limited to housewives with Senior High School education, which limits the generalizability of the research results. In addition, the quasi-experimental design limits the ability to control confounding variables, such as external information that may influence mothers' knowledge. Knowledge measurements were only carried out three days after the intervention, so they cannot assess the long-term sustainability of knowledge improvements. Other limitations include the small sample size (40 people) and educational homogeneity, which may affect the extent to which the findings can be applied to a broader population.

Conclusion

This study shows that educational videos are more effective in increasing mothers' knowledge about the dangers of cigarette smoke exposure to pneumonia in toddlers compared to leaflets. The advantages of videos are supported by the principles of the Cognitive Theory Of Multimedia Learning (Mayer, 2024), which states that the combination of visual and audio elements can help understanding and information retention well. However, the effectiveness of videos depends on technological accessibility, which needs to be considered in implementation in various communities. Although leaflets are also effective, especially in areas with limited access to technology, the results of this study support the use of audiovisual media in health education programs, or a combination of videos and leaflets can be an effective strategy to increase public awareness about the dangers of cigarette smoke on toddlers' respiratory health.

Based on these findings. Educational videos can be used as the main media to increase mothers' understanding of the dangers of cigarette smoke exposure to pneumonia in toddlers, by considering technological accessibility. A combination of videos and leaflets can also be used to reach a wider audience. Video-based educational programs can be distributed through digital platforms or offline versions for areas with limited technology. For leaflets, efforts are needed to improve health literacy and public reading interest. The use of simple language and attractive design will help convey the message more effectively, especially in areas that are less reached by digital technology.

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