

RESEARCH ARTICLE

OPEN ACCESS

Manuscript received April 24, 2025; revised May 14, 2025; accepted May 15, 2025; date of publication June 1, 2025.

Digital Object Identifier (DOI): <https://doi.org/10.35882/ijahst.v5i3.459>

Copyright © 2025 by the authors. This work is an open-access article and licensed under a Creative Commons Attribution-ShareAlike 4.0 International License (CC BY-SA 4.0)

How to cite: Enung Mardiyana Hidayat, Zakiyyatus Salsabilah, Miadi, Adin Mu`afiro, "Effectiveness of Audiovisual Media vs Leaflets in Improving Mothers' Knowledge of Diphtheria in Toddlers in Mojo Health Center, Surabaya", International Journal of Advanced Health Science and Technology, vol. 5, no. 3, pp. 161-165, June 2025

Effectiveness of Audiovisual Media vs Leaflets in Improving Mothers' Knowledge of Diphtheria in Toddlers in Mojo Health Center, Surabaya

Enung Mardiyana Hidayat, Zakiyyatus Salsabilah, Miadi, Adin Mu`afiro

Department of Nursing, Poltekkes Kemenkes Surabaya, Indonesia

Corresponding author: Enung Mardiyana Hidayat (e-mail: mardiyana.hidayat@gmail.com).

ABSTRACT Diphtheria is a contagious disease that can lead to airway obstruction and death. Maternal knowledge about diphtheria is crucial for preventing the disease, and health education is essential in increasing this knowledge. This study aims to compare the Effectiveness of Audiovisual Media vs Leaflets in Improving Mothers' Knowledge of Diphtheria in Toddlers in Mojo Health Center, Surabaya. This study employed a quasi-experimental design with a two-group pretest-posttest approach to compare the effectiveness of audiovisual media and leaflets in improving maternal knowledge about diphtheria. The sample consisted of 198 mothers of children aged 1-5 years at Posyandu Kartini 12 Jojoran, selected through cluster random sampling. The independent variables were the type of health education delivered through audiovisual media and leaflets, while the dependent variable was maternal knowledge regarding diphtheria, measured using a questionnaire. The data were analyzed using the Wilcoxon and Mann-Whitney tests. The mothers' knowledge before receiving health education using audiovisual media was mostly inadequate 60%. However, after the education, there was a significant improvement, with 76% showing good knowledge, with a p-value of 0.000. Similarly, before health education using leaflets, the majority 58% had inadequate knowledge, but after the education, most 59% showed sufficient knowledge, with a p-value of 0.000, as analyzed using the Wilcoxon test. The results showed that audiovisual media was more effective in improving mothers' knowledge compared to leaflets, with a p-value of 0.000 in the Mann-Whitney test. Health education using audiovisual media and leaflets significantly improves maternal knowledge. Audiovisual media proved to be more effective in enhancing maternal knowledge about diphtheria in children under five years of age at Mojo Health Center, Surabaya.

INDEX TERMS Toddlers, Maternal Knowledge, Leaflet, Health Education, Diphtheria, Audiovisual.

I. INTRODUCTION

Diphtheria is a contagious disease that can cause airway obstruction due to the formation of a thick pseudomembranous layer in the nose, pharynx, and larynx [1][2]. If not treated promptly and appropriately, diphtheria can lead to death[3][4]. Although it affects all age groups, children under the age of five are at the highest risk [2]. Their heightened susceptibility to infection stems from their immature immune systems. Furthermore, mothers' limited understanding and awareness of the dangers of diphtheria exacerbate the risk of the disease spreading. Enhancing maternal knowledge not only raises awareness but also fosters tangible preventive actions, such as ensuring full immunization, identifying early symptoms, and promptly

seeking medical care, all crucial for minimizing the spread and impact of diphtheria.

According to the World Health Organization (WHO), there were 55,800 diphtheria cases globally in 2021, with 21.8% occurring in the Southeast Asia region, including Indonesia. Indonesia placed fifth among countries in the region for diphtheria cases, with 235 reported infections and 25 deaths in 2021. These numbers rose to 540 cases and 46 deaths in 2022 [2]. In East Java, diphtheria remains a serious public health concern due to its widespread transmission. In 2022, 163 cases and 6 deaths were reported across 34 districts/cities [5]. Surabaya experienced a significant increase, from only 1 case in 2021 to 13 cases in 2022, including two districts classified as experiencing an outbreak [6].

Diphtheria is highly dangerous as it spreads through both direct and indirect contact. The bacterium *Corynebacterium diphtheriae* is transmitted through airborne droplets that are expelled when an infected individual talks, coughs, or sneezes, potentially entering the respiratory tract of others [2][7][8]. This bacterium produces toxins that form a white membrane in the throat, leading to respiratory failure and complications such as heart muscle damage, nerve damage, and kidney failure [7].

One of the contributing factors to diphtheria outbreaks is the lack of maternal knowledge about the disease in young children. Therefore, health education plays a vital role [9][10][11][12]. It seeks to improve societal awareness and comprehension regarding the significance of health [13][14]. Health education directed specifically at mothers plays a vital role in encouraging informed choices and preventive actions in childcare. When mothers are provided with accurate and relevant information, they are more inclined to implement behaviors that help prevent diphtheria in their children, such as completing immunizations, upholding hygiene, and accessing medical care promptly.

The Ministry of Health of the Republic of Indonesia has taken steps to educate the public especially mothers about diphtheria in children under five [15][4]. This education can be delivered through various media formats, such as audiovisual tools and leaflets. Audiovisual media is dynamic and can be seen and heard using electronic devices, while leaflets are appealing due to their concise combination of text and images, effectively complementing verbal communication. These methods are not only intended to increase maternal knowledge but also to encourage behavioral changes that contribute to the prevention of diphtheria, particularly in children under five. Based on this background, the researchers deemed it necessary to conduct a study on the effectiveness of Audiovisual Media vs. Leaflets in Improving Mothers' Knowledge of Diphtheria in Toddlers in Mojo Health Center, Surabaya.

II. METHOD

This study employed a quasi-experimental design with a two-group pretest-posttest format. The population consisted of all mothers with children aged 1 to 5 years residing in RW 12 of the Mojo Subdistrict, within the working area of the Mojo Community Health Center, totaling 391 individuals. RW 12 is divided into eight integrated health posts (posyandu), which function as community-based service units and were used as the basis for forming sampling clusters.

The sampling technique used in this study was cluster random sampling, chosen due to both logistical considerations and the natural grouping of the population within the eight posyandu. Each posyandu was considered a cluster, and these clusters were selected randomly. Mothers within the selected clusters were then randomly chosen to ensure internal validity and enhance the representativeness of the sample.

The sample size was determined using Slovin's formula:

$$n = \frac{N}{1 + N(d)^2}$$

Explanation:

n = Sample size

N = Population size

d = Significance level (p=0,05)

$$\begin{aligned} n &= \frac{391}{1 + 391(0,05)^2} \\ n &= \frac{391}{1 + 0,9775} \\ n &= \frac{391}{1,9775} \\ n &= 197,7 \end{aligned}$$

Based on the calculation using Slovin's formula, the required sample size was 197.7, which was rounded up to 198 mothers of children under five in the working area of Mojo Community Health Center, specifically in RW 12 of Mojo Subdistrict.

The independent variable in this study was mothers' knowledge about diphtheria, while the dependent variable was the type of health education media used, either audiovisual media or leaflets. Knowledge was measured using a structured questionnaire administered twice: once as a pretest before the intervention and again as a posttest after the intervention, using the same set of questions to assess changes in knowledge.

To ensure standardization of the intervention, the content for both media types was developed based on diphtheria prevention guidelines from the Ministry of Health and reviewed by public health experts. In the audiovisual group, participants watched a 10-minute educational video, followed by a 5-minute discussion session for clarification and reinforcement of understanding. In the leaflet group, participants received printed materials, which were explained in a 5-minute briefing, followed by a 10-minute interactive discussion session. The message content and learning objectives were kept consistent across both formats to ensure comparability.

The knowledge questionnaire was developed independently by summarizing the material found in the literature and underwent both validity and reliability testing. Validity and reliability testing were carried out through a pilot study involving 20 mothers with characteristics similar to the study population. The results of the validity test indicated that all questionnaire items were valid, as the calculated $r_{hit} > r_{table}$ (0.444). Reliability testing yielded a Cronbach's alpha of 0.82, demonstrating strong internal consistency.

Data obtained from the completed questionnaires underwent editing, coding, scoring, and tabulation. Univariate analysis was used to describe participant characteristics and knowledge levels, while bivariate analysis was used to assess the effects of the intervention. The Wilcoxon Signed Rank Test was used to measure changes in knowledge within each group, and the Mann-Whitney U Test was used to compare the effectiveness

between the audiovisual and leaflet groups. All statistical analyses were conducted using SPSS software.

III. RESULT

A. RESPONDENT CHARACTERISTICS

TABLE 1

Distribution of Characteristics of Mothers with Children Under Five in RW 12 Jojoran, Mojo Subdistrict, Working Area of Mojo Community Health Center, Surabaya

Intervention Group audiovisual (n = 101)			Intervention Group leaflet (n = 97)	
Mother's Age	Frequency	(%)	Frequency	(%)
19-24	10	9,9	0	0
25-35	56	55,4	63	64,9
36-45	35	34,7	34	35,1
Child's Age	Frequency	(%)	Frequency	(%)
0-1	26	25,7	29	29,9
>1-3	33	32,7	39	40,2
>3-5	42	41,6	29	29,9
Education	Frequency	(%)	Frequency	(%)
No Schooling	0	0,0	0	0,0
Elementary School	4	4,0	4	4,1
Junior High School	14	13,9	12	12,4
Senior High School	65	64,4	66	68,0
Bachelor's Degree	18	17,8	15	15,5
Work	Frequency	(%)	Frequency	(%)
Tidak bekerja	74	73,3	71	73,2
PNS	3	3,0	2	2,1
Pegawai swasta	13	12,9	13	13,4
Wirausaha	7	6,9	9	9,3
Buruh	4	4,0	2	2,1

Based on Table 1. The age data of mothers with children under five in RW 12 Jojoran, within the audiovisual media intervention group, are aged 25-35 years (55.4%). Meanwhile, in the leaflet media intervention group, the majority of mothers (64.9%) are also aged 25-35 years. Overall, the 25-35 age group dominates in both the audiovisual and leaflet intervention groups. The audiovisual media intervention group, nearly half (41.6%) of the mothers have children aged >3-5 years. In contrast, in the leaflet media intervention group, nearly half (40.2%) of the mothers have children aged >1-3 years. The audiovisual media intervention group, the majority (64.4%) of mothers have a high school (SMA) education. Similarly, in the leaflet media intervention group, the majority (68.0%) of mothers also have a high school (SMA) education. The audiovisual media intervention group, the majority (73.3%) of mothers do not have a job. The audiovisual media intervention group, the majority (64.4%) of mothers have a high school (SMA) education. Similarly, in the leaflet media intervention group, the majority (68.0%) of mothers also have a high school (SMA) education. The audiovisual media intervention group, the majority (73.3%) of mothers do not have a job. In the leaflet media intervention group, the majority (73.2%) of mothers also do not have a job. In the leaflet media intervention group, the majority (73.2%) of mothers also do not have a job. Overall, the results show that the majority of mothers are not employed in both the audiovisual and leaflet

intervention groups. The audiovisual media intervention group, the majority (73.3%) of mothers do not have a job. In the leaflet media intervention group, the majority (73.2%) of mothers also do not have a job. In the leaflet media intervention group, the majority (73.2%) of mothers also do not have a job. Overall, the results show that the majority of mothers are not employed in both the audiovisual and leaflet intervention groups.

B. THE EFFECT OF AUDIOVISUAL-BASED HEALTH EDUCATION ON MOTHERS' KNOWLEDGE ABOUT DIPHTHERIA

TABLE 2

The impact of Audiovisual Media Health Education before and after on Mothers' Knowledge about Diphtheria in Toddlers

Maternal knowledge regarding diphtheria	Audiovisual group			
	Pre-test frequency (f)	%	Post-test frequency (f)	%
Poor	61	60	6	6
Sufficient	27	27	18	18
Good	13	13	77	76
Total	101	100	101	100

TABLE 3

Results of the Wilcoxon Signed Rank Test on Mothers' Knowledge About Diphtheria in Toddlers

	N	Mean	Median	SD	P Value
Pre-Test Audiovisual	101	1.54	1.00	.723	0.000
Post-Test Audiovisual	101	2.69	3.00	.584	

The Wilcoxon Signed Rank Test yielded a p-value of 0.000 ($p \leq 0.05$), suggesting a statistically significant effect of audiovisual-based health education on mothers' knowledge before and after the intervention.

C. THE INFLUENCE OF LEAFLET-BASED HEALTH EDUCATION ON MATERNAL KNOWLEDGE REGARDING DIPHTHERIA

TABLE 4

The impact of Leaflet Media Health Education before and after on Mothers' Knowledge about Diphtheria in Toddlers

Maternal knowledge regarding diphtheria	Leaflet group			
	Pre-test frequency (f)	%	Post-test frequency (f)	%
Poor	56	58	7	7
Sufficient	23	24	57	59
Good	18	19	33	34
Total	97	100	97	100

TABLE 5

Results of the Wilcoxon Signed Rank Test on Mothers' Knowledge About Diphtheria in Toddlers

	N	Mean	Median	SD	P Value
Pre-Test Leaflet	97	1.61	1.00	.785	0.000
Post-Test Leaflet	97	2.27	2.00	.587	

The Wilcoxon Signed Rank Test revealed a p-value of 0.000 ($p \leq 0.05$), suggesting a statistically significant effect of leaflet-based health education on mothers' knowledge before and after the intervention.

D. THE DIFFERENCE IN EFFECTIVENESS OF HEALTH EDUCATION USING AUDIOVISUAL MEDIA VERSUS LEAFLETS ON MOTHERS' KNOWLEDGE ABOUT DIPHTHERIA IN TODDLERS

TABLE 6
The Results of the Effectiveness Comparison Test of Health Education Using Audiovisual Media and Leaflets on Mothers' Knowledge about Diphtheria

Uji	Intervention group	N	Mean Rank	Asymp.Sig (S-tailed)
Mann	Audiovisual	101	118.39	.000
Whitney	Leaflet	97	79.83	

Based on the results of the non-parametric statistical test using the Mann-Whitney test, an Asymp. Sig value of 0.000 was obtained, which is less than 0.05. Therefore, H1 is accepted, indicating that there is a significant difference in the effectiveness of health education between audiovisual media and leaflets on mothers' knowledge about diphtheria in toddlers. Based on the Mean Rank values, audiovisual media was found to be more effective than leaflet media in delivering health education aimed at increasing maternal knowledge about diphtheria in toddlers.

IV. DISCUSSION

A. THE EFFECT OF AUDIOVISUAL MEDIA HEALTH EDUCATION ON MOTHERS' KNOWLEDGE

Based on the data collected before and after the health education intervention using audiovisual media, there was a significant increase in mothers' knowledge regarding diphtheria in toddlers. Before receiving health education about diphtheria in toddlers, most (60%) of the mothers had limited knowledge, while after receiving the education, almost all (76%) had good knowledge. The Wilcoxon Signed Rank Test yielded a p-value of 0.000, which is below the threshold of $\alpha = 0.05$. This result demonstrates that audiovisual media-based health education effectively enhanced maternal knowledge about diphtheria in toddlers within the Mojo Health Center area, Surabaya.

The findings of this study are consistent with research conducted by Azki & Rokhaidah on the impact of health education using the brainstorming method and audiovisual media, which was found to influence mothers' knowledge about diphtheria prevention [10]. This study utilized a one-group pretest-posttest design with 42 participating mothers. The Wilcoxon Signed Rank Test was employed to assess changes in knowledge, revealing a significant increase in maternal understanding of diphtheria following the health education intervention. The statistical analysis yielded a p-value below 0.05, indicating a statistically significant improvement in mothers' knowledge post-intervention.

The Wilcoxon Signed Rank Test used in Wea's study also revealed a significant difference in knowledge levels before and after the health education intervention, indicating that audiovisual media had a substantial impact on improving mothers' knowledge about diphtheria in toddlers [16]. The researchers chose mothers of toddlers as the intervention group because a study by Salsabila revealed that the highest number of diphtheria cases occurred in children aged 1-5 years [2]. This finding aligns with research by Noer Endah, which also showed that children in the 1-5 year age group are the most vulnerable to diphtheria infection. This vulnerability is due to the fact that children i

n this age range tend to interact more frequently with others, such as family members, neighbors, schoolmates, and teachers, increasing their likelihood of exposure to the diphtheria-causing virus. Moreover, children aged 1-5 years are in a phase of rapid development, during which their immune system is still maturing and not fully capable of defending against viruses. Therefore, this age group requires more attention in efforts to prevent and educate about diphtheria [9].

According to a study by Septianingsih and Pangestu, there was a significant difference in knowledge levels before and after the delivery of health education using video media. The Wilcoxon test resulted in a p-value of 0.001, indicating that H0 was rejected. As a result, the alternative hypothesis was accepted, proving that audiovisual media had an impact on increasing mothers' knowledge about stunting at the Pontianak Saigon Health Center, East Pontianak District [17].

Audiovisual media is an effective learning method because it combines auditory and visual elements, allowing the delivery of messages both verbally (through audio) and non-verbally (through visuals) [18][19]. This finding aligns with the research by Choirunisa and Rindu, who stated that the use of audiovisual media in health education can lead to a significant increase in individuals' knowledge. Therefore, audiovisual media is highly effective for use as a learning method that supports deeper understanding in the information delivery process [20].

The researcher assumes that the lack of knowledge among mothers about diphtheria in toddlers is caused by several factors, such as limited prior experience, limited information received, and low awareness about the importance of diphtheria prevention. Additionally, the lack of education provided to mothers regarding diphtheria in toddlers, as well as limited access to direct information, contributes to this insufficient understanding. Additional potential confounding factors such as maternal education level, socio-economic status, digital literacy, and prior access to audiovisual materials were not controlled and may have influenced the intervention's effectiveness. Future research should explore the comparative effectiveness of audiovisual media versus other educational tools, involve larger and more diverse populations, and incorporate strategies to control for these confounding factors. This will provide stronger evidence on the unique benefits and

practical applications of audiovisual media in public health education. Improved maternal knowledge can be achieved through audiovisual media, as this medium is capable of attracting the attention of mothers, making the learning process more interactive and engaging. Another advantage of audiovisual media is its ability to clearly illustrate processes and allow mothers to revisit the material anytime, which ultimately helps reinforce their understanding of diphtheria in toddlers.

In the video presented, mothers of toddlers were given explanations about the definition, causes, transmission process, symptoms, complications, and types of diphtheria. This explanation successfully influenced mothers to improve their knowledge about diphtheria in toddlers. The increase in knowledge occurred because they had a strong desire to learn when the education was delivered through audiovisual media. By learning with audiovisual media, mothers gained new information they were previously unaware of, encouraging them to correct their previous knowledge gaps. With the increase in knowledge and the habit of continuous learning and seeking information, it is hoped that the incidence of diphtheria in their children will be prevented.

B. THE EFFECT OF LEAFLET-BASED HEALTH EDUCATION ON MOTHERS' KNOWLEDGE

Based on the data collected before and after the health education intervention using leaflet media, there was a significant increase in mothers' knowledge about diphtheria in toddlers. Prior to receiving health education on diphtheria in toddlers, the majority (58%) of respondents had poor knowledge. After the intervention, most mothers (59%) had a moderate level of knowledge, and nearly half (34%) showed good knowledge levels. The Wilcoxon Signed Rank Test yielded a p-value of 0.000, which is below the threshold of $\alpha = 0.05$. This result demonstrates that leaflet-based health education effectively enhanced maternal knowledge about diphtheria in toddlers within the Mojo Health Center area, Surabaya.

These findings are consistent with a study by Rimadeni, which investigated the effect of health education on mothers' readiness to confront diphtheria outbreaks through the use of leaflet media in Lam Blang Trieng Village, Darul Imarah Subdistrict, Aceh Besar. Their study demonstrated that leaflet-based health education increased the knowledge of 50 mothers with toddlers. The average score on the pre-test was 5.7, which increased to 9.8 following the intervention. The difference between the pre-test and post-test scores was statistically significant, with a p-value of $0.000 < 0.05$ [14].

Another study by Alya & Apriani stated that leaflet media is an effective method for providing health education. Their findings showed that the knowledge level of mothers with toddlers significantly improved after receiving leaflet-based education. Before the intervention, the majority (88%) had poor knowledge, while after the intervention, 100% demonstrated good knowledge. This indicates that leaflets are effective in improving maternal understanding of health

topics, particularly diphtheria in toddlers. The increase in knowledge suggests that leaflets can deliver health information in a clear and accessible way, making them a good choice for health education efforts[21].

This result is also supported by research from Pratiwi, which demonstrated the effectiveness of leaflet media in improving public understanding of healthy living behaviors. Their study found that leaflets could reach diverse audiences, including those with limited access to technology and those more familiar with printed information. They also emphasized the importance of using simple language and attractive designs to ensure the information is well received. In their study, an increase in maternal knowledge regarding child development was observed following health education using leaflet media. A total of 33 positive ranks were recorded, indicating. The study found a significant difference in mothers' knowledge levels before and after the intervention. With a mean rank of 17.00 and a p-value of 0.000 ($p < 0.05$), the results indicated that leaflet-based health education had a significant impact on improving mothers' knowledge. This shows that leaflets are not only effective in general health communication but also in delivering specific knowledge such as child development[22].

Providing information through leaflet media can stimulate a person's interest in paying attention to the presented content. The information in the leaflets is enhanced with text and images, allowing readers to better understand and retain the message. This improvement in knowledge is attributed to the readers' ability to both see and read the content, which helps enhance memory retention [20].

The researcher assumes that mothers who initially had limited understanding could experience an increase in knowledge about diphtheria in toddlers after receiving health education via leaflets. The results showed that the mothers were able to sufficiently understand the information conveyed. To maximize knowledge improvement, it is recommended that mothers read the leaflets repeatedly in a comfortable environment. Since leaflets have the advantage of presenting information in a concise, clear, and visually engaging format, they are highly effective. Their simple design also makes them easy to distribute during health promotions or educational sessions, and allows the recipients to quickly grasp the key messages without requiring much time. Despite these promising results, several potential confounding factors should be taken into account. Variables such as maternal education level and prior exposure to health information could have influenced the extent of knowledge improvement among the participants. These factors may affect how well mothers comprehend and retain the information provided through leaflets. Acknowledging and addressing these variables is essential to provide a more nuanced interpretation of the intervention's effectiveness. In addition, this study has several limitations that may affect the generalizability and validity of the findings. It was conducted in a single geographic location with a relatively small sample

size, limiting the applicability of the results to broader populations. The absence of randomization and a control group also introduces potential bias and reduces the ability to draw causal conclusions regarding the effectiveness of the leaflet intervention.

The explanation of the advantages of leaflets such as clarity, accessibility, and ease of distribution is particularly strong. Future studies are recommended to use larger and more diverse samples and adopt randomized controlled designs to validate the findings and strengthen conclusions about the role of leaflet media in improving maternal health knowledge.

C. *THE DIFFERENCE IN EFFECTIVENESS OF HEALTH EDUCATION BETWEEN AUDIOVISUAL MEDIA AND LEAFLETS ON MOTHERS' KNOWLEDGE*

The non-parametric statistical analysis using the Mann-Whitney test resulted in an Asymp. Sig value of 0.000, which is below the significance level of α (0.05). Therefore, the alternative hypothesis (H_1) is accepted, indicating a significant difference in the effectiveness of health education between audiovisual media and leaflets in enhancing mothers' knowledge about diphtheria in toddlers within the working area of Mojo Health Center. The average rank score for the audiovisual group was 118.39, whereas the leaflet group had an average score of 79.83, showing that the audiovisual media was more effective than the leaflet.

The increase in mothers' knowledge following health education using audiovisual media was more significant than that observed in the group receiving education through leaflets. This was evident from the higher average knowledge scores in the audiovisual group. One of the main reasons is that audiovisual media combines both visual and auditory elements, making it easier for mothers to understand the material—particularly the transmission process and symptoms of diphtheria. The visualization provided by audiovisual media helps mothers to clearly imagine how diphtheria can affect toddlers' bodies, something that may be harder to comprehend through text-only information presented in leaflets [23].

This finding aligns with a study conducted by Septianingsih and Pangestu, which found that health education for mothers of toddlers using video media was more effective than using leaflets. Videos were shown to capture attention better, illustrate realistic and relevant situations, and provide a deeper impression of the material. Audiovisual media accelerates the learning process by increasing comprehension and changing passive and static attitudes into more active and dynamic ones. In contrast, leaflets are limited to visual media only, where the reader's attention is divided between the visuals and written information, without the interactive or experiential component that audiovisual media can offer [17].

The findings are also supported by research from Kurniasari et al. (2023), which showed that both audiovisual and leaflet media increased participant knowledge, with p-

values of <0.001 and 0.001 , respectively. However, the increase in knowledge in the group that received audiovisual education was 4%, while the leaflet group showed a 2% increase. This indicates that audiovisual media is more effective in improving knowledge, likely due to its more interactive and engaging format, which helps participants better grasp the material. While leaflets are practical and informative, they do not provide the same depth of experience as audiovisual media in the learning process. Therefore, it can be concluded that audiovisual media has a greater impact on knowledge enhancement and supports the goals of health education more effectively [24].

This research is based on Edgar Dale's Cone of Experience theory, which posits that the effectiveness of learning experiences depends on their level of abstraction. The higher up the cone, the more abstract the medium becomes. In this context, audiovisual media—which engages multiple senses—is considered more effective in delivering information compared to one-sense media like leaflets [25]. Audiovisual media allows the audience, in this case mothers of toddlers, not only to see but also to hear the material, which enhances comprehension and retention. In contrast, although leaflets are effective as practical information sources, they rely solely on visual input, limiting the depth of learning. Even if mothers read the leaflet, they do not gain the same immersive experience as when engaging with audiovisual content that stimulates more senses.

The researcher assumes that audiovisual media is more effective, although both types of media—leaflets and audiovisual—play important and influential roles in health education. The combination of both media in health education delivery could optimize learning outcomes, as each has complementary strengths. Audiovisual media, with its integrated visual and auditory components, captures attention and enhances comprehension, while leaflets serve as concise, portable sources of information that can be revisited as needed. Additionally, the practicality of leaflets meets the demands of modern information access, making it easier for the public to obtain and absorb necessary health knowledge. By integrating both media types, health education is expected to be more comprehensive and effective in increasing community knowledge. In this study, a representative sample of 198 mothers of toddlers was selected to reflect the overall population. Those who received the intervention are expected to share the knowledge they have gained, thereby extending the impact of the health education to a broader community.

These underlying factors could affect the extent to which participants absorbed and retained the information presented through both leaflet and audiovisual media. Acknowledging these factors allows for a more accurate and nuanced understanding of the intervention's impact. In addition, the lack of random assignment and a true control group limits the ability to establish a causal relationship between the educational media and the observed knowledge improvement. Potential bias due to self-reporting and variations in individual motivation to learn may also

influence the outcomes. Nonetheless, the discussion effectively interprets the results, compares them to previous studies, and offers valuable insight into the effectiveness of audiovisual media in health education. The explanation of the advantages of audiovisual media particularly in enhancing understanding and engagement is especially well-articulated. Integrating both audiovisual and print media appears to be a promising strategy for maximizing the reach and impact of health education initiatives.

V. CONCLUSION

This study explored the impact of health education on mothers' knowledge about diphtheria in toddlers in the working area of Puskesmas Mojo, Surabaya. The findings showed that mothers who received health education through audiovisual media experienced a significant improvement in knowledge, with most reaching a good level of understanding after the intervention. Meanwhile, mothers who received education through leaflet media showed moderate improvement, with the majority reaching only a sufficient level of knowledge. These findings suggest that audiovisual media should be prioritized in health education efforts for mothers, especially in areas with a high risk of diphtheria. Audiovisual media's ability to attract attention, deliver information clearly, and enhance retention makes it a more impactful tool compared to printed materials.

Future research is encouraged to apply broader approaches, involve larger and more diverse sample sizes, and explore the integration of multiple educational media to maximize learning outcomes. It is also recommended that Puskesmas provide regular, structured health education programs, particularly in underserved areas, to ensure equitable access to information and strengthen community capacity in disease prevention.

VI. REFERENCES

- [1] Rumaisih, R., Rohmatin, H., & Widayati, A. (2024). Pengetahuan ibu balita terhadap pemberian imunisasi difteri lengkap di Desa Gili Ketapang Probolinggo. *Jurnal Ilmiah Kebidanan (Scientific Journal of Midwifery)*, 10(1), 1–8. <https://doi.org/10.33023/jikeb.v10i1.1546>.
- [2] Salsabila, A. S. N., Handayani, D., & Qudrotin. (2024). Distribusi kasus difteri berdasarkan orang, tempat, dan waktu. *Journal of Social Science Research*, 4, 9150–916.
- [3] Wardani RA, Herlina H, Idayanti T, Virgia V, Yuliani A. Hubungan pengetahuan dengan sikap ibu tentang imunisasi difteri pada anak balita di Desa Jatiwates Kecamatan Tembelang Kabupaten Jombang. *Nurse and Health: Jurnal Keperawatan*. 2018;7(1):31–41.
- [4] Sutyono, Triyono A. Pengaruh pendidikan kesehatan dengan metode konseling terhadap pengetahuan tentang difteri pada orang tua di Desa Jatilor Kecamatan Godong Grobogan. [Tesis]. Universitas Negeri Semarang;
- [5] Dinkes Jawa Timur. (2022). *Profil kesehatan Provinsi Jawa Timur tahun 2022*. Surabaya: Dinkes Jawa Timur.
- [6] Dinkes Surabaya. (2022). *Profil Dinas Kesehatan Kota Surabaya 2022*. Surabaya: Dinas Kesehatan.
- [7] Saputra, M. A. S. (2018). Difteri dalam lingkup asuhan keperawatan. *Jurnal Kesehatan*, Januari (2017), 1–17. <https://doi.org/10.17605/O.SF.IO/3A2.NV>
- [8] Basri, S. (2022). Epidemiologi penyakit menular. Jakarta: Tahta Media.
- [9] Pracoyo, N. E. (2020). Faktor penyebab terjadinya kejadian luar biasa (KLB) difteri pada anak di Indonesia. *Jurnal Ekologi Kesehatan*, 19(3), 184–195. <https://doi.org/10.22435/jek.v19i3.4018>
- [10] Azki, F. F., & Rokhaidah, R. (2019). Pendidikan kesehatan dengan metode brainstorming dan media audiovisual berpengaruh terhadap pengetahuan ibu tentang pencegahan difteri. *Jurnal Keperawatan Widya Gantari Indonesia*, 3(2), 1. <https://doi.org/10.52020/jkwgi.v3i2.1027>
- [11] Aditya RS, Qur'aniati N, Krisnana I. Pengaruh pendidikan kesehatan metode ceramah media film pendek terhadap pengetahuan, sikap, dan praktik ibu tentang deteksi dini kasus difteri anak. *Pendidikan Muhammadiyah Nursing Journal [Internet]*. 2014;32. Available from: <https://e-journal.unair.ac.id/PMNJ/article/view/11788/6755>
- [12] Trisutrisno, I., Hasnidar, Lusiana, S. A., Simanjuntak, R. R., Hadi, S., Sianturi, E., Tasnim, & Hasanah, L. N. (2020). Pendidikan dan promosi kesehatan. *Pendidikan dan Promosi Kesehatan*, February. <https://doi.org/10.52574/syahkualauine.rsitpress.224>.
- [13] Bolon, C. M. T. (2021). *Pendidikan dan promosi kesehatan* (S. Siregar, Ed.). Padang: UIM Press. <https://storage-imelda.s3.amazonaws.com/1.amaz0naws.com/repositori/t6NjyZcb6r8v1Q1V7J6VN-eud0ESiq.Ws36sUrLHS4.pdf>
- [14] Rimadeni, Y., Warnidar, E., Riani, E. O., & Ikwan, M. (2024). Pendidikan kesehatan kesiapsiagaan ibu dalam menghadapi kejadian luar biasa difteri melalui media leaflet di Desa Lam Blang Trieng Kecamatan Darul Imarah Aceh Besar. *Jurnal Kesehatan*, 0651.
- [15] Kemenkes RI. (2017). *Pedoman pencegahan dan pengendalian difteri*. Jakarta: Kementerian Kesehatan Republik Indonesia. <https://sehatnegeriku.kemkes.go.id/wp-content/uploads/2018/01/buku-01/buku-pedoman-pencegahan-dan-pengendalian-difteri.pdf>
- [16] Wea, K. B., Kristiawati, & Laily, H. (2018). Pendidikan kesehatan dengan media audiovisual meningkatkan perilaku ibu dalam penanganan infeksi saluran pernafasan akut pada balita di Kelurahan Lebijaga Kabupaten Ngada. *Critical, Medical and Surgical Nursing*.
- [17] Septianingsih, N., & Pangestu, J. F. (2020). Perbedaan pengetahuan ibu balita sebelum dan sesudah diberikan penyuluhan tentang stunting melalui media video dan leaflet di wilayah kerja Puskesmas Saigon Kecamatan Pontianak Timur. *Jurnal Kesehatan*, 6(1), 1–10.
- [18] Prawesti, L. N. I., Putro, A. N. S., Pratiwi, M., Mahmudi, M. A., & Papua, U. Y. (2024). Media pembelajaran. *Akeisha*. Jakarta: Akeisha.
- [19] Sujono A. Mengembangkan Penggunaan Media Pembelajaran Audio Visual Dalam Meningkatkan Motivasi Belajar Siswa. *Ta'dib J Pendidik Islam dan Isu-Isu Sos*. 2022;20(1):25–42.
- [20] Choirunisa, A., & Rindu. (2021). Perbedaan promosi kesehatan menggunakan video dengan leaflet terhadap pengetahuan ibu hamil tentang stunting pada anak. *Jurnal Kesehatan*, 1(2), 57–64.
- [21] Alya, K. Q., & Apriani, A. (2023). Efektivitas pendidikan kesehatan dengan media leaflet tumbuh kembang balita terhadap pengetahuan ibu balita di Desa Ngijo. *Jurnal Kesehatan*, 3(1), 45–53. <http://eprints.ukh.ac.id/id/eprint/5265>
- [22] Pratiwi, G. D., Vita Lucya, & Paramitha. (2022). Efektivitas penggunaan media leaflet dalam peningkatan pengetahuan dan sikap terhadap pencegahan tuberkulosis. *Jurnal Ilmiah Keperawatan (Scientific Journal of Nursing)*, 8(3), 8–13. <https://doi.org/10.33023/jikep.v8i3.1153>
- [23] Putri, A. T., Rezal, F., & Akifah. (2017). Efektivitas media audiovisual dan leaflet terhadap peningkatan pengetahuan, sikap, dan tindakan tentang pencegahan penyakit gastritis pada santriwati di Pondok Pesantren Hidayatullah Putri dan Ummushshabri Kota Kendari tahun 2017. *Anisha*, 2(6), 1–11.
- [24] Kurniasari, E., Wardani, D. S., Putri, R., & Jannah, M. (2023). Efektivitas edukasi menggunakan media audiovisual dan e-leaflet terhadap peningkatan pengetahuan kader posyandu dalam pencegahan stunting di masa pandemi COVID-19. *Jurnal Kesehatan Masyarakat*, 14(1), 13–20.
- [25] Ikhyia D, Ratnawati, Anshory J, Mardiana N. Edukasi stunting melalui audiovisual dan meningkatkan pengetahuan dan sikap ibu hamil melalui audiovisual dan leaflet (Stunting education through audiovisuals increases the knowledge and attitudes of pregnant women through audiovisuals and leaflets). *J Ris Gizi [Internet]*. 2023;11(2):2023. Available from: <https://ejournal.poltekkes-smg.ac.id/ojs/index.php/jrg/article/view/10382>