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Development of Promotional Media for Prevention of DM in Children in Indonesia: A Systematic Review

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ABSTRACT

Introduction: Diabetes Mellitus (DM) is one of the non-communicable diseases that has increased significantly in children due to unhealthy lifestyle changes. The prevalence of DM in children has increased drastically, which is influenced by lifestyle factors such as unbalanced diet and lack of physical activity. Therefore, an effective educational strategy is needed to increase children's awareness of DM prevention. Interactive and innovative health promotion media is one approach that can be used to provide a better understanding of DM prevention in children.
Objective: This study aims to identify various methods of developing promotional media in preventing DM in children and evaluate their effectiveness in improving children's knowledge and attitudes towards DM prevention.
Method: The method used in writing this article is a literature review study with a systematic review method. The articles reviewed were obtained through searches on *Google Scholar, Pubmed, Proquest, and ScienceDirect* in the period 2015-2025 with the search keywords being Diabetes Mellitus, Childhood DM, Promotional Media, Prevention of DM Using PRISMA, from 9.748 articles obtained, 10 journal articles were selected to be reviewed.
Results: The review results show that digital-based promotional media, such as animated videos and YouTube Shorts , are more effective in increasing knowledge and attitude change compared to conventional print media such as leaflets and posters. Pop-up books and e-booklets have also been shown to increase children's understanding with an attractive visual approach. The increase in children's understanding scores after educational interventions through interactive promotional media ranged from 24.03% to 60.34% , depending on the type of media used.
Conclusion: The use of innovative and interactive health promotion media, such as animated videos, pop-up books, e-booklets, and YouTube Shorts , has high effectiveness in increasing children's awareness and understanding of DM prevention. Therefore, the development of technology-based educational media needs to be continuously improved to strengthen preventive strategies in preventing DM in children.

Keywords: Childhood DM, Diabetes Mellitus, DM Prevention, Promotional Media

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INTRODUCTION

Diabetes Mellitus (DM) is one of the non-communicable diseases that has increased significantly throughout the world, including in Indonesia. Data from the International Diabetes Federation (IDF) shows that the number of DM sufferers continues to increase every year, even the prevalence of DM in children has increased drastically up to 70 times in recent years. This disease is caused by metabolic disorders due to inadequate insulin production or insulin resistance, which leads to high blood sugar levels. The main factors contributing to the increase in DM cases in children are unhealthy lifestyles, such as lack of physical activity and a diet high in sugar and fat. Therefore, early prevention is very important to suppress the growth rate of DM cases and reduce the risk of complications in the future.

Health education is a key strategy in preventing DM, especially for children who are in the growth and development stage. Children tend to be more receptive to information through interesting and interactive media compared to conventional educational approaches. Innovative health promotion media, such as animated videos, YouTube Shorts, pop-up books, and e-booklets , have been shown to be effective in increasing children's awareness and understanding of the importance of a healthy lifestyle. In addition, approaches that combine visual and narrative elements have been shown to be more effective in attracting children's attention compared to conventional print media such as posters or leaflets.

Several studies have shown that the use of technology-based promotional media can improve children's understanding and change attitudes towards DM prevention. For example, a study that developed animated videos and pop-up books found an increase in children's understanding of healthy living behaviors by 60.34% , while the use of e-booklets showed an increase in understanding of up to 24.03% . Development models such as ADDIE and 4D (Define, Design, Develop, Disseminate) are often used to ensure the effectiveness of the designed educational media. Therefore, the use of technology and attractive visual media needs to be developed more to support DM prevention programs in children.

Based on the urgency of this problem, this study aims to further explore the development of various health promotion media that can increase children's awareness of DM prevention. By identifying the most effective media, it is hoped that health education strategies can be more optimal in building early awareness of the importance of maintaining a healthy diet and doing physical activity regularly. In addition, the results of this study can also be recommendations for health practitioners and educators in designing more effective technology-based health promotion strategies.

MATERIALS AND METHODS

This study is a systematic review *using* the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-analyses*) method. This method is carried out systematically by following the correct research stages or protocols. The *systematic review procedure* consists of several steps, namely: 1) compile background *and purpose* ; 2) *research question:* 3) *searching for the literature;* 4) *selection criteria;* 5) *practical screen;* 6) *quality checklists and procedures;* 6) *data extraction strategy;* 7) *data synthesis strategy* (Ningsih, Adi & Saraswati, 2019).

Literature search was obtained from *Google Scholar, Pubmed, Proquest, and ScienceDirect.* Keywords used were Diabetes Mellitus, Children, Promotional Media, Prevention. In addition to keywords,

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the article search was based on articles written between 2015-2025 and obtained 9,748 journal articles. The final result, as many as 10 articles met the inclusion criteria for analyzed. The selected journal articles are based on several inclusion criteria. The inclusion criteria in this study include the following: 1) The research article was published in 2015-2025; 2) The type of research design is cross sectional and experimental; 3) The research study discusses the diabetes mellitus risk prevention program 4) Using the test statistically.

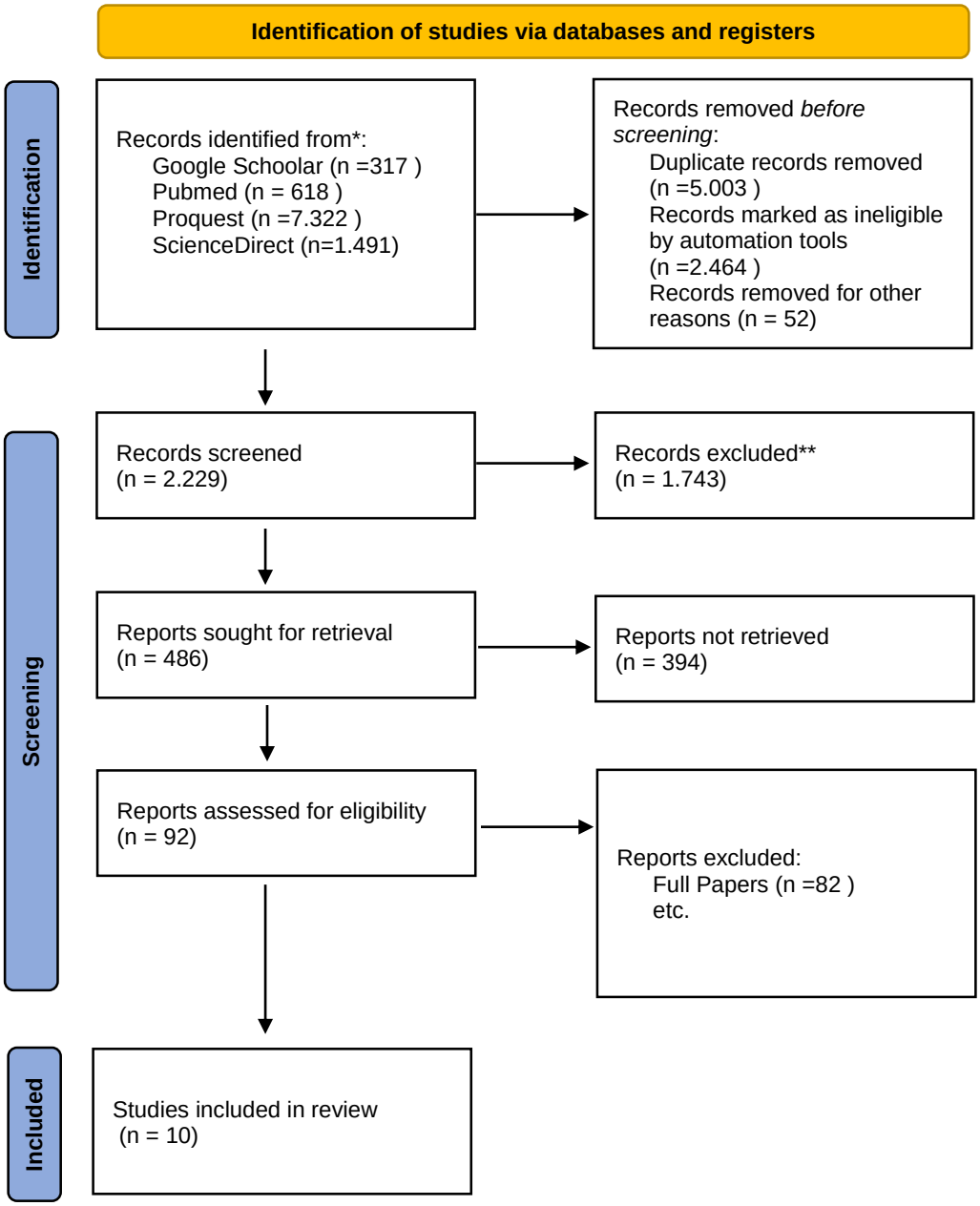

Figure 1. PRISMA diagram

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RESULTS

Based on the search results of articles taken from several databases, 9,748 articles were found. The articles were then filtered by language and title, leaving 2,229 articles. After that, we assessed the articles based on Table 1, leaving 486 articles and sorted them again for duplicate publications (the same article found in different databases), resulting in 92 articles. The last step was to ensure that the 486 articles had full text and met the inclusion and exclusion criteria. Finally, this study obtained 10 articles for the systematic review study. This process can be seen in Figure 1. Flowchart.

Results review literature on article with range time rise year 2015-2025, use Language Indonesia And Language English And overall study found 10 Article based on Topic systematic discussion review.

Table 1. Literature Review

No	Researchers & Years	Article Title	Types of Promotional Media	Research methods	Research result
1	Barto Mansyah & Fetty Rahmawati (2021)	*The Effectiveness of Audio-Visual Health Education Media on Diet on the Level of Knowledge and Attitude of Adolescents in the Prevention of Type 2 Diabetes Mellitus*	Audio-visual (Educational Video)	Quasi-experimental (pretest-posttest with control group)	Significant increase in knowledge (16.27%) and attitude (13.37%) in the intervention group compared to the control group.
2	Ardila et al. (2024)	*Health Promotion Prevention and Control of Diabetes Mellitus in Adolescents*	Leaflets & PowerPoints	Socialization with pretest-posttest	Increase in student knowledge from 59% (pre-test) to 86% (post-test) after education.
3	The Last Airbender (2024)	*Development of Pop-Up Book CERDIK Media for Preventing Type 2 Diabetes Mellitus in Grade 6*	Pop Up Book	Research & Development (ADDIE)	The CERDIK Pop-Up Book was assessed as very appropriate by material experts (95.3%) and media experts (100%), and increased children's understanding by 60.34% .
4	The Last Supper (2024)	*Development of Media YouTube Short Video Prevention of Diabetes Mellitus*	Short videos (YouTube Shorts)	Research & Development (4D: Define, Design,	YouTube Shorts media is considered very worthy and attracts audience attention

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No	Researchers & Years	Article Title	Types of Promotional Media	Research methods	Research result
				Develop, Disseminate)	because of its short and informative format.
5	The Last Supper (2024)	*Development of Animated Video Media as Prevention of Type 2 Diabetes Mellitus in Class XI Adolescents*	Animation Video	Research & Development (4D)	Animated video media is very suitable for use , with an assessment of 93.75% from material experts and 100% from media experts , and increasing student understanding by up to 96% .
6	Azmii & Ruhmawati (2024)	*The Effect of Animated Video Education on CERDIK Knowledge to Prevent Diabetes Mellitus in Adolescents*	Animation Video	Mixed-method (sequential exploratory)	The increase in student knowledge scores was 80 points , with a significance value of $p < 0.05$.
7	The Last Supper (2024)	*Development of an E-Booklet on Healthy Eating Patterns for the Prevention of Type 2 Diabetes Mellitus in Adolescents*	E-Booklet	Research & Development (ADDIE)	E-booklet media increased student understanding by 24.03% , with an assessment of 88% by material experts and 87% by media experts .
8	Nurhidayanti et al. (2023)	*E-Booklet Media Can Influence Knowledge and Attitudes for Type 2 DM Prevention in Adolescents*	E-Booklet	True Experimental (randomized pretest-posttest control group)	Increased knowledge by 25.49% and attitude by 0.24 times , with $p < 0.05$ compared to the control group.
9	Rahmawati et al. (2024)	*Diabetes Mellitus Prevention Education for Children Through Pocket Book Media at Rosela Integrated Health Post*	Pocket book	Counseling with pretest-posttest	Increasing public awareness of preventing DM in children, with 50% of participants feeling very satisfied .
10	Alifah et al. (2024)	*Intervention to Improve Knowledge, Attitudes, and Behavior of Diabetes Mellitus Prevention in Elementary School Students*	Videos & Posters	Quasi-experimental (pretest-posttest control group)	Videos and posters are effective in increasing knowledge , but less significant in changing attitudes and behavior .

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DISCUSSIONS

Audio-Visual (Educational Video)

The use of audio-visual media , such as educational videos , in health promotion has become one of the effective strategies to improve children's understanding of Diabetes Mellitus (DM) prevention . This media is able to convey information more interestingly through a combination of images, animations, sound, and text , making it easier for children to understand compared to printed media such as leaflets or posters . Research shows that educational videos about healthy eating patterns can significantly improve children's knowledge and attitudes towards DM , as found in the study of Barto Mansyah & Fetty Rahmawati (2021) , where there was an increase in understanding of up to 16.27% and a change in attitude of 13.37% after intervention using educational videos.

In addition, research by Raden Roro Fadilah Salsabila & Febri Sri Lestari (2024) revealed that educational-based animated videos designed with a 4D approach (Define, Design, Develop, Disseminate) were considered very suitable for use as educational media by experts (93.75% by material experts and 100% by media experts). This animated video is more attractive to children because it presents interactive visuals and characters that can increase their appeal and understanding of health information. This is also supported by research by Alfiyyah Nurul Azmii & Tati Ruhmawati (2024) , which shows that the use of educational videos based on the CERDIK concept can increase students' knowledge scores by 80 points , with a significance value of $p < 0.05$, indicating its effectiveness in delivering health messages.

Although proven effective in increasing knowledge , additional strategies are still needed to ensure that the information delivered through educational videos actually has an impact on changing children's attitudes and behavior . Rafidha Nur Alifah et al. (2024) found that although educational videos can improve students' understanding, changes in attitudes and behavior did not occur significantly . Therefore, a more interactive and sustainable approach is needed , such as reinforcement with group discussions, direct practice activities, and the involvement of parents and health workers , so that educational messages delivered through videos can really be applied in children's daily lives.

Leaflets & PowerPoints

Leaflets and PowerPoint are conventional health promotion media that are still widely used in education on preventing Diabetes Mellitus (DM) in children . Leaflets have the advantage of providing short, concise, and easy-to-carry information , while PowerPoint is more effective when used in interactive presentations during health education. Research conducted by Mita Ardila et al. (2024) highlighted the effectiveness of using leaflets and PowerPoint in socializing DM prevention to school students. The results showed that after being given education using these two media, students' knowledge increased from 59% (pre-test) to 86% (post-test) , indicating a significant increase in understanding.

However, although leaflets and PowerPoints have proven effective in conveying information, their limitations lie in the lack of interactivity and audience engagement , especially in children who are more interested in visual and digital media . Compared to animated videos or pop-up books , leaflets tend to be passive , so they are only effective if they are read and understood well by the target audience. Likewise, PowerPoints used in face-to-face socialization will be more effective if combined with two-way

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communication methods, such as discussions or question and answer sessions , to ensure that the information conveyed is truly understood by the children.

To improve the effectiveness of leaflets and PowerPoint , innovation is needed in their design and delivery. The use of attractive illustrations, simple language, and interactive visual elements can help attract children's attention and increase the absorption of information. In addition, the integration of QR codes in leaflets that lead to educational videos or other interactive materials can be a good strategy to increase student engagement. Thus, although leaflets and PowerPoint are still the choice in health promotion, there needs to be a combination with other more interactive media so that educational messages about DM prevention can be conveyed more effectively and sustainably.

Pop Up Book

Pop-Up Book is an innovative and interactive educational media in delivering health information, including prevention of Diabetes Mellitus (DM) in children . This media is designed with three-dimensional elements that can move , making it more attractive to children compared to conventional print media such as leaflets or posters . Research conducted by Riani Fitriani & Ridwan Setiawan (2024) shows that the use of Pop-Up Book CERDIK in health education has succeeded in increasing children's understanding of the prevention of type 2 DM. The results of this study indicate that the media received a very decent assessment (95.3%) from material experts and 100% from media experts , and increased children's understanding by 60.34% .

The advantage of Pop-Up Book lies in its ability to present information visually and interactively , which is very suitable for elementary school children. Through embossed images, attractive illustrations, and interactive designs , children can more easily understand important concepts such as healthy eating patterns, physical activity, and healthy living habits to prevent DM . In addition, research shows that visual-based learning media and direct experience are more effective in improving children's memory and understanding than verbal or plain text counseling methods.

Although Pop-Up Books have many advantages, there are several challenges in their implementation, such as relatively high production costs compared to regular print media, as well as limitations in mass distribution . Therefore, a strategy is needed so that this media can be accessed more widely, such as developing an interactive digital version or e-Pop-Up Book that can be accessed via electronic devices. The combination of Pop-Up Books with other digital media, such as educational videos or interactive applications , can also increase the effectiveness of delivering health messages and ensure that children remain interested in learning about DM prevention .

Short Videos *(YouTube Shorts)*

YouTube Shorts is one of the increasingly popular digital-based health promotion media , especially in delivering health information quickly and attractively. This media has the advantage of reaching a wide audience , especially children and adolescents who tend to be more active in consuming short video content. Research conducted by Muhammad Hizbi Abdullah & Febri Sri Lestari (2024) highlighted the effectiveness of YouTube Shorts as an educational media for preventing Diabetes Mellitus

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(DM) , using the 4D development model (Define, Design, Develop, Disseminate) . The results of the study showed that YouTube Shorts was considered very feasible by media experts and had great potential in increasing children's awareness and understanding of DM prevention.

One of the main factors that makes YouTube Shorts effective as an educational medium is its short, concise, and easily accessible format , which can increase children's attention compared to conventional educational media. Videos packaged in the form of attractive visuals, simple animations, and interactive narratives can help convey information in a more fun and less boring way . In addition, this study found that audiences are more interested in videos that use animated elements compared to text presentations or static images. The "entertain to educate" approach is also applied in content creation to make health messages easier for children to understand and apply.

However, although YouTube Shorts has great potential as a health promotion medium, there are several challenges that need to be considered, such as the limited duration that requires the delivery of information to be done concisely without losing its educational essence. In addition, the effectiveness of this media also depends heavily on the quality of the content and message delivery techniques , so a special strategy is needed in making videos that are relevant, interesting, and easy for children to remember . The combination of YouTube Shorts with other media, such as Pop-Up Books or e-Booklets , can be a solution to strengthen the impact of education and improve children's understanding of DM prevention more comprehensively.

Animation Video

Animated videos are one of the increasingly popular educational media in health promotion, including for the prevention of Diabetes Mellitus (DM) in children . This media has the advantage of conveying information in an interesting, interactive, and easy-to-understand way , especially for children who are more interested in visual elements than text or lectures. Research by Raden Roro Fadilah Salsabila & Febri Sri Lestari (2024) found that the use of educational-based animated videos increased students' understanding of DM prevention by up to 96% , with a feasibility test result of 93.75% by material experts and 100% by media experts , indicating that animated videos are very effective in conveying health messages to children.

The main advantage of animated videos is their ability to combine visual elements, animated characters, and narratives that make learning more interesting. Children find it easier to understand concepts such as healthy eating, physical activity, and other healthy habits through illustrations and stories compared to traditional counseling methods. Research by Alfiyyah Nurul Azmii & Tati Ruhmawati (2024) also showed that animated videos based on the CERDIK concept significantly improved students' understanding of DM prevention, with an increase in knowledge scores of 80 points and a significance value of $p < 0.05$, indicating its effectiveness as an educational medium.

Although animated videos have proven to be effective, challenges in their use include relatively high production costs and the need for adequate digital access . In addition, the effectiveness of animated videos in changing long-term behavior still needs further research, because increased understanding is not necessarily immediately followed by changes in attitudes and healthy living habits. Therefore, to maximize

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the impact of education, animated videos can be combined with other methods , such as group discussions, interactive applications, or digital story books , to increase effectiveness in preventing DM in children .

E-Booklet

E-Booklet is one of the innovations in educational media that combines the advantages of printed books with digital technology , making it more flexible and easily accessible to children and parents. In the context of preventing Diabetes Mellitus (DM) in children , e-booklets have an important role in conveying health information in a more interesting and interactive way than conventional leaflets. Research conducted by Fatimah Azzahra Zakiyatun Nufus & Ridwan Setiawan (2024) showed that the use of e-booklets on healthy eating patterns succeeded in increasing students' understanding by 24.03% , with the results of a feasibility test of 88% from material experts and 87% from media experts , indicating that e-booklets are a very suitable educational media to use .

The main advantage of e-booklets compared to regular print media is their ability to display images, illustrations, and hyperlinks that can connect directly to other sources of information , such as educational videos or interactive infographics. In addition, e-booklets are more environmentally friendly, easy to share, and can be updated quickly according to the latest health information developments . A study conducted by Nova Nurhidayanti et al. (2023) also showed that nutrition education through e-booklets can increase children's knowledge by 25.49% and attitudes by 0.24 times compared to the control group , with a p value <0.05 , which confirms its effectiveness in health promotion.

Although e-booklets have many advantages, the main challenge in their use is the dependence on technology access and digital literacy . Not all children or parents have devices that support reading e-booklets, especially in areas with limited internet access. In addition, children who are less accustomed to reading on digital screens may lose interest more quickly , so e-booklets need to be combined with other media such as animated videos or interactive applications to be more effective in delivering health education messages. Therefore, a blended learning approach , which combines e-booklets with direct counseling methods , can be the best solution in increasing children's understanding and awareness of DM prevention .

Pocket book

Pocket books are one of the printed educational media designed to convey health information in a concise, easy-to-carry, and practical format . In the context of preventing Diabetes Mellitus (DM) in children , pocket books can be an effective tool to provide brief and direct information about healthy lifestyles, DM risk factors, and how to prevent it . Research conducted by Dewi Rahmawati et al. (2024) showed that the use of pocket books in health education at Posyandu Rosela succeeded in increasing public awareness of preventing DM in children. Evaluation of participant satisfaction showed that 50% of respondents were very satisfied with this media because it was considered useful in increasing their knowledge and understanding .

One of the advantages of pocket books is their simple but information-dense design , making them easy to understand for both children and parents. These books usually contain pictures, illustrations, and short texts that explain important concepts about preventing DM , such as healthy eating patterns, the

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importance of physical activity, and how to avoid excessive sugar consumption . Because of their small and practical size, pocket books are also easier to distribute and do not require internet access , making them suitable for use in a variety of environments, including schools and communities.

Although pocket books have advantages in ease of use and accessibility, their limitations lie in the lack of interactive elements compared to digital media such as animated videos or e-booklets . Children who are more accustomed to visual and audio-based media may be less interested in reading pocket books for a long period of time. Therefore, to be more effective, pocket books can be combined with digital media such as QR codes that lead to educational videos, or supplemented with interactive educational sessions by health workers and teachers . Thus, pocket books can still be an effective medium in supporting efforts to prevent DM in children , especially when used together with other educational methods.

Videos and Posters

Videos and posters are a combination of effective health promotion media in increasing children's knowledge and awareness of preventing Diabetes Mellitus (DM) . Videos have the advantage of conveying information visually and interactively , while posters function as supporting media that can provide visual reminders of the health messages that have been conveyed. Research conducted by Rafidha Nur Alifah et al. (2024) showed that the use of video and poster media in DM prevention education for elementary school students resulted in a significant increase in student knowledge , although it did not have a significant impact on changes in attitudes and behavior .

The main advantage of video as an educational medium is its ability to convey complex information in a more interesting way , especially for children who are more responsive to animation, narration, and moving visuals . Videos made with an educational but entertaining approach can help children more easily understand the concept of a healthy diet, the importance of physical activity, and how to prevent DM early on . Meanwhile, posters function as reinforcement tools that can be posted in schools or public places , so that children can recall the information they have learned from previous educational videos.

Although the combination of videos and posters has been shown to be effective in increasing knowledge , this study suggests that changing attitudes and behaviors requires a more sustainable approach . Children may understand the information provided, but may not immediately apply it in their daily lives. Therefore, additional strategies are needed such as mentoring by health workers or teachers, practice-based activities, and parental involvement in implementing a healthy lifestyle at home . By integrating videos, posters, and other interactive learning methods , efforts to prevent DM in children can be more effective and sustainable.

CONCLUSIONS

systematic review study show that the development of health promotion media has an important role in increasing children's knowledge and awareness of preventing Diabetes Mellitus (DM) **.** Various promotional media that have been developed, such as animated videos, YouTube Shorts, pop-up books, e-booklets, pocket books, as well as posters and leaflets **,** have proven effective in increasing children's

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understanding of the importance of healthy diet and physical activity as preventive measures against DM. A study using animated video media and YouTube Shorts showed high effectiveness in attracting children's attention and increasing their understanding by up to 96 **%** , while e-booklets and pop-up books succeeded in increasing children's understanding by 24.03% to 60.34% **.** Further research can develop a combination of print and digital media , such as interactive e-booklet which is also available in print version **,** as well as pop-up book equipped with QR code leading to educational video or interactive animation **.**

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