Development and Implementation of WhatsApp-based Health Literacy Media for Pregnant Women (Rakes Bumil): A Community Empowerment Approach using ADDIE and AIDA Models

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ARTICLE INFO

ABSTRACT

Background: Pregnant women in urban areas are used to accessing digital information, but not all of it is easy to understand, especially for those with low health literacy. A survey in Bogor District showed that 27.5% of pregnant women have problematic literacy. WhatsApp, as a commonly used platform, has the potential to be an interactive educational media. Using the ADDIE stages and the AIDA strategy, the media was designed to deliver clear and engaging messages.

Aims: This study aims to develop and implement WhatsApp-based Rakes Bumil educational media with ADDIE stages and AIDA strategies to deliver accurate and interesting health information, to encourage an increase in the health literacy of pregnant women, especially in the aspects of knowledge, search, assessment, and decision making related to pregnancy health information.

Methods: This study uses a quantitative approach with participatory action research design for content validation and development, implementation of Rakes Bumil educational media following the ADDIE model and AIDA strategy.

Result: The media was developed through ADDIE stages, in Rakes Bumil there are ChatBot media, flyers, animated videos, and interactive quizzes. The feasibility test results show that the media is well received by pregnant women, with >90% of pregnant women stating that the media is feasible to use to support pregnancy literacy. The 14-day implementation showed an increase in engagement and understanding of health information. These findings form the initial basis for further research that will quantitatively evaluate the effectiveness of the media.

1. Introduction

According to the Ministry of Higher Education, learning media development is the process of designing, developing, and editing various types of media and tools used in the learning process to improve understanding in individuals. Pregnant women in urban areas are accustomed to quick access to digital technology and value the information and support obtained through various online sources (Lupton, 2016). However, pregnant women need accurate health information to maintain their pregnancy and prepare for childbirth, so it is important to understand these needs in planning educational programs (Javanmardi M *et al.,* 2020). The use of the internet is the primary choice due to its ease of access and ability to connect with other individuals who have similar experiences (Javanmardi *et al.,* 2018).

Therefore, an intervention is needed that maximizes access to healthcare providers and bold and digital resources, while ensuring that materials are easy to understand, convenient, and patient-focused, to facilitate informed decision-making (Vamos *et al.,* 2019). The health literacy level of pregnant women has a decisive influence on the use of the internet as a source of health information, which is positively associated with higher frequency of use, repetition to formal sources, and discussion of information accessed with health professionals. Conversely, lower health literacy levels were associated with greater difficulty in evaluating and understanding the information accessed, which required support from a health professional. The health literacy level of pregnant women should be considered for personalized recommendations of valid and reliable online information (Neves Dutra & Bertolo Ferreira, 2023).

With increased health literacy, pregnant women are more prepared to share their personal and health information (Rahdar *et al.,* 2023). However, most pregnant women have limited health literacy. Based on a preliminary survey conducted among 40 pregnant women in the study area, it was found that 27.5% had problematic literacy, 25.0% had sufficient literacy, and 47.5% had good health literacy. Given that one of the basic requirements for utilizing health information is adequate media literacy, the promotion of media literacy to pregnant women is very important (Akbarinejad *et al.,* 2017). Health literacy requires certain cognitive qualities and depends on the quality of information provided. Obtaining and accessing health information depends on understanding, time, trust and understanding of the information (Sorensen *et al.,* 2012).

Health information can be expressed in the media. AIDA theory is a theory that is often used in marketing and promotion to influence a person's behavior to convey messages to get attention, become interested and take action (Kotler & Keller, 2007). Previous research mentioned the use of ADDIE stages in research can help develop media to improve literacy skills (Lestari, 2023). Education uses the ADDIE stages (analysis, design, development, implementation, evaluation) to address the problem of lack of health literacy (Liberman *et al.,* 2016). The approach method used in the form of media development with the ADDIE (Analysis Design Develop Implementation and Evaluation) development method can be effective in delivering learning materials (Ranuharja *et al.,* 2021). Media development with the ADDIE (Analysis Design Develop Implementation and Evaluation) development method can be effective in delivering learning materials. This research produces learning innovations using Edugame as a medium for delivering information while inviting play (Ranuharja *et al.,* 2021).

Previous research also states that the AIDA strategy is effective in delivering good message quality in the application, making it easier for people to understand the message (Romadhoni & Surianto, 2022). Another study also mentioned that health-related messages on social networks have a positive impact on audience attention, interest, desire and action, influencing individual behavior and encouraging positive health behavior (Danaei & Sanei, 2019). The model can be one of the efforts to utilize technology to improve health literacy. Online searches for health-related information on the internet are increasing rapidly, driven by affordable access and the proliferation of mobile phones,

including smartphones. Online health information helps them make health-related decisions (Alhuwail & Abdulsalam, 2019).

However, research related to media development with the AIDA strategy through WhatsApp is still minimal, so an innovative and easily accessible digital approach is needed to improve the health literacy of pregnant women. Media development and implementation are made to be able to improve the health literacy of pregnant women through the effective utilization of WhatsApp social media. By applying the AIDA concept and WhatsApp features such as ChatBot, it is expected that health information about pregnancy can be disseminated in an interesting, easy-to-understand, and interactive manner. This media not only aims to provide accurate information, but also encourage positive behavior change through better health education.

Previous research has highlighted the importance of health literacy and the use of digital media in health education (Liberman *et al.*, 2016; Sorensen *et al.,* 2012). Maternal health literacy instruments need to be developed, which are important for strengthening maternal health education in primary care and improving skills in helping perinatal mothers use health information effectively (Chen *et al.*, 2022). Health Media Literacy and eHealth Literacy are essential in empowering individuals to actively engage in their health (Levin-Zamir & Bertschi, 2018). This study aims to develop educational media WhatsApp Rakes Bumil and implement it as an interactive learning media through the ADDIE approach and AIDA strategy. This media is designed in the form of WhatsApp developed through ADDIE and AIDA stages to convey health information in an attractive, easy-to-understand, and interactive manner. This approach is expected to expand access and improve the quality of information received by pregnant women. The indicators observed in this study include the quality of message delivery and the level of user interaction with WhatsApp Rakes Bumil as an educational media.

2. Methods

Evidence-based community empowerment in this study used a quantitative approach for content validation and implementation evaluation (Ernawati & Sukardiyono, 2017; Glowalla & Hasebrook, 1995; Leithwood & Montgomery, 1980; Slocumb & Cole, 1991). Data were collected from a specific population and sample with standardized research instruments, then statistically analyzed. The research took place from January to June 2024, spanning the preparation stage to the reporting of results. The design of this research study is participatory action research

Data sources were involved at each stage in the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model and the AIDA (Attention, Interest, Desire, Action) communication strategy. At the analysis stage, an initial survey of 40 pregnant women in Bogor District was conducted to identify the level of health literacy and assess the educational media. This number is in accordance with Singarimbun & Effendi's recommendation which states that a minimum of 30 respondents are required for questionnaire trials so that the data distribution approaches a normal curve (Nurdiansyah & Jayanto, 2021).

The media design and development stage refers to the ADDIE model developed by Dick and Carey (Sugihartini & Yudiana, 2018). For information content, the AIDA strategy was used (Kotler & Keller, 2007) and the material was prepared based on the MHELIP pregnancy literacy questionnaire (Taheri et al., 2020). In the implementation stage, the selection of respondents was carried out by purposive sampling with the following criteria: (a) pregnant women registered in the working area of the Ciangsana Health Center, Bogor Regency; (b) having a communication tool such as a cellphone with WhatsApp access; and (c) willing to participate in the entire series of activities. These criteria were chosen because they were in accordance with the objectives of the implementation of WhatsApp Rakes Bumil media to 25 respondents.

The indicators observed included the quality of message delivery and the level of interaction with WhatsApp Bot as a health literacy education medium. The research instruments were tested for

validity and reliability before use. The results of the validity test on 14 question items on 40 respondents showed the calculated r value ranging from 0.762 to 0.933, with r table = 0.312, so all items were declared valid. Reliability test using Cronbach's Alpha shows a value > 0.6, which means the instrument is reliable. The media assessment instrument uses indicators of Attractiveness, Material, and Language, which are evaluated through verification sheets by pregnant women using a Likert scale (Ernawati & Sukardiyono, 2017). Scores were given in the range of 1-5 for each item. The product design assessment was also calculated using the average assessment formula as described by (Arikunto., 2009 in the journal Ernawati, 2017).

$$\bar{x} = \frac{\sum x}{n}$$

Description:
$\bar{x}$: average score
n : number of raters
$\sum x$: total score of each

Then for the percentage formula the results can be calculated with the following formula:

$$Result = \frac{total\ score\ obtained}{maximum\ score} \times 100\ \%$$

Table 1. Media Feasibility Category

No	Score in percent (%)	Feasibility Category
1.	< 21 %	Highly Inappropriate
2.	21 – 40 %	Inappropriate
3.	41 – 60 %	Fairly Appropriate
4.	61 – 80 %	Appropriate
5.	81 – 100 %	Highly Appropriate

3. Results and Dicussion

In an effort to improve health literacy in pregnant women, community empowerment activities are needed that focus on the development and implementation of digital media. This activity involved 40 pregnant women to conduct a WhatsApp Rakes Bumil assessment to assess the effectiveness of the WhatsApp Rakes Bumil media and 25 pregnant women participated in the implementation through WhatsApp Rakes Bumil based on the AIDA model to assess the effectiveness in attracting attention to improve health literacy. In the early stages, shortcomings were found in the existing media platforms, especially the absence of a ChatBot that could support improving health literacy. Seeing this need, it is necessary to design and implement WhatsApp-based media. Various types of media are provided in WhatsApp Rakes Bumil. So that this media can provide relevant health information and support pregnant women in improving pregnancy literacy better. The stages in developing Media include:

3.1. *Analyze*

In this study, researchers also conducted an interview with a midwife to discuss the implementation of pregnant women's classes at the Puskesmas. The midwife explained that one of the main programs for pregnant women at the Puskesmas is the pregnant women's class, which is a forum for education about various things about pregnancy. In these classes, information is provided directly by health workers.

> *"One of them is the pregnant women class. In the class, education is given about pregnancy," explained the midwife.*

"Usually, we use the flip sheet media," she added.

In its implementation, the midwife said that the pregnant women's class still faces a number of challenges, especially with regard to attendance. Many pregnant women do not attend due to long distances, the absence of a companion to escort them, weather factors, busy work, and lack of interest and concern for the class.

> *"We haven't reached this target yet, because pregnant women are lazy to come because of the long distance to the locations where there is no one to take them, because of the weather, lack of concern about attending pregnant women's classes, busy work and lack of enthusiasm,"* she said.

When asked about methods to ensure that participants understand the material, the midwife revealed that currently there is only a question and answer session at the end of the class. There is no formal measurement such as a pre-test or post-test to assess the extent of pregnant women's understanding of the material that has been delivered.

> "*There is only a question and answer session after class. There is no formal pre-test or post-test to measure participants' understanding,"* she explained further.

In addition, interactive activities such as games or breakout sessions that involve active interaction of participants are also not optimal. Usually, the class is less than 1 hour long, followed by a question and answer session and pregnant gymnastics as part of the closing session.
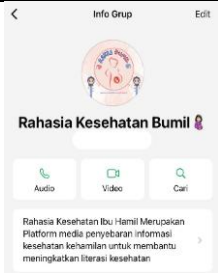
> *"There is no breakout session, our pregnant women class seems to be less than 1 hour. Usually education first and then pregnant exercises, maybe that's the breakout session,"* explained the midwife..

The results of the interview explained that the class for pregnant women had not reached the target due to obstacles such as low work enthusiasm, long distances, and weather. To overcome these obstacles, it is recommended to use online media such as WhatsApp Bot. In a preliminary survey in Bogor Regency with 40 pregnant women, the results of pregnant women's health literacy varied, namely 27.5% were problematic, 25% were sufficient, and 47.5% were very good. Therefore, pregnancy health content is needed by referring to official information to ensure the accuracy of the information.

3.2. *Design*

The following is the design in the WhatsApp media of Pregnant Women's Health Secrets that has been made by researchers. Content information created by researchers based on MHELIP. This design was created by researchers using Canva, Capcut and WhatsApp Auto applications to create ChatBot Rakes Bumil, the information on the media consists of 4 literacy components. This design is made as attractive as possible because pregnant women appreciate digital media information that is immediate, detailed, entertaining, customizable, practical, professional, convincing, and unbiased (Lupton, 2016). Meanwhile, effective interventions to improve health literacy are still rare (Nawabi *et al.*, 2021).

Table 2. Information on Content Distribution Based on MHELIP

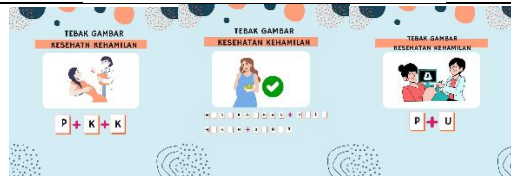| Media	Design
WhatsApp Group - *Pregnancy Health Information Knowledge* - *Pregnancy Health Information Search* - *Pregnancy Health Information Appraisal* - *Pregnancy health information retrieval or behavior*	

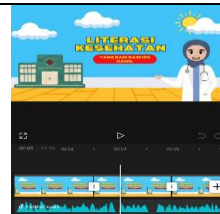|	
Flyer 　- *Pregnancy Health Information Knowledge*	
Picture Guess Quiz 　- *Pregnancy Health Information Knowledge* 　- *Pregnancy health information retrieval or behavior*	
ChatBot 　- *Pregnancy Health Information Knowledge* 　- *Pregnancy Health Information Search* 　- *Pregnancy Health Information Appraisal*	
Maternal Health Literacy Video	

3.3. *Development*

Rakes Bumil educational media was developed through WhatsApp Bot and WhatsApp Group as a means of delivering health information for pregnant women. The bot functions to provide automatic information about pregnancy, such as risk signs, nutrition, and puskesmas service schedules, based on MHELIP health literacy principles. WhatsApp groups are used to spread access to the bot, build interaction, and hold quiz sessions and educational games. The combination of the two was designed to make the information easily accessible, engaging, and increase active participation of pregnant women. The following steps were taken by the researchers:

　a. Flow of Use of WhatsApp Rakes Bumil Information System
　　1. First Step: Establish a confidential WhatsApp Group for pregnant women and health workers. This group is used to discuss pregnancy topics and disseminate health information through regular interactions, quizzes, and WhatsApp bot guides.
　　2. Step Two: Access the Bot, Respondents can access the bot by typing "Hello" in the chat room to get pregnancy health information.
　　3. Step Three: Provision of Options, The bot provides information options in the form of numbers that users can select to get relevant data.
　　4. Step Four: Bot Response, The bot provides an automated response based on the number options selected by the user.
　　5. Step Five: Advanced Interaction, The user can select new numbers to get additional information, and the bot will provide the appropriate response.

　b. Flow of Making Rakes Bumil WhatsApp Media
　　a. Creation of WhatsApp Group: Create a WhatsApp Group for interaction between researchers, respondents, and health workers, as well as to disseminate information and conduct question and answer sessions.

b. WhatsApp Bot Creation::
c. Using Spreadsheet Features:
   1. Creating Code: Compile code in a spreadsheet for relevant information.
   2. Providing Code: Connecting the codes with the information in the bot.
   3. Synchronization: Synchronize the spreadsheet with the bot application for automatic updates.
d. User Features: Open an account on the bot designer app, synchronize spreadsheets, and connect the WhatsApp app
e. Reply Test: Testing, Checking the functionality of text commands in the bot.

3.4. *Implementation*

The AIDA model for delivering health-related messages and has a significant positive impact on individual behavior (Danaei & Sanei, 2019). The AIDA theory is a message that must gain attention, attract interest and take action (Kotler & Keller, 2007). The implementation of this intervention was designed using the AIDA model (Attention, Interest, Desire, and Action). This implementation to improve health literacy through social media WhatsApp researchers designed so that all pregnant women can access it. By utilizing the available features and messages that are carefully arranged by researchers to attract attention, easy to understand and encourage pregnant women to actively use it. From reading to replying to messages, the intervention was organized in such a way as to trigger pregnant women's interest and involvement in learning health literacy. Therefore, the messages are not only easily accessible, but also impactful in improving literacy (Polk, 2018). The AIDA model helps in developing communication in various media that is dynamic, memorable, and persuasive. The use of the AIDA model in educational settings can increase understanding and enthusiasm.
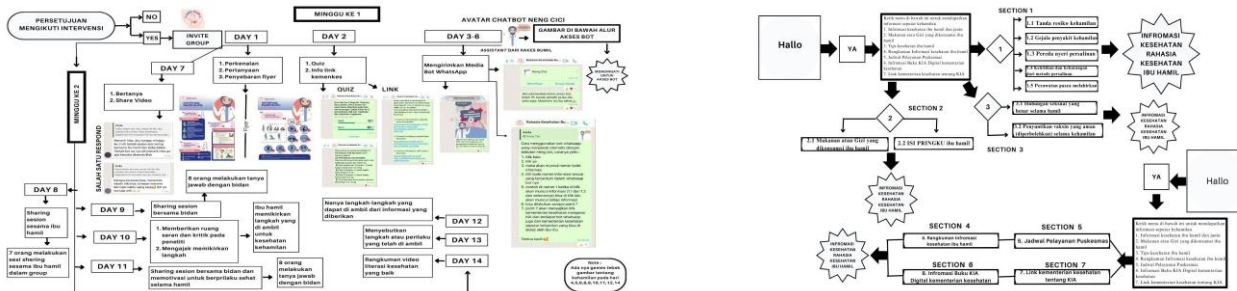

Figure 1 Implementation Plan Process based on AIDA

The figure above explains the flow of Implementation based on the AIDA Model. The steps to deliver the message are as follows:

Figure 2 Flowchart

1. *Attention*

At the attention stage (Attention), researchers utilize the principles of effective communication to attract the attention of pregnant women to actively follow the health information disseminated through the WhatsApp group. The group name "Pregnant Women's Health Secrets" and the description "Media platform for disseminating information to improve health literacy" were deliberately designed to arouse curiosity and give an exclusive impression. Through the AIDA approach of Attention, Interest, Desire, and Action, the message was systematically organized to achieve the goal of increasing pregnant women's engagement.

On the first day, the message opened with a friendly welcome and introduced the researcher's identity. Researchers invite pregnant women to participate in improving health literacy related to pregnancy. Starting with an interactive Q&A using emoticons to provide enthusiastic votes, as well as short questions about understanding pregnancy health which ends with (door prizes) for the fastest respondents. This creates a sense of attachment and enthusiasm among pregnant women members, so that they feel appreciated. At the end of the message, researchers add an encouraging rhyme, accompanied by an announcement about the information brochure that will be distributed. At this stage, the attention of group members is obtained through personal greetings and friendly interactions.

On the second day, researchers increased the interest of pregnant women with more specific and relevant messages. Through a simple quiz on ideal weight during pregnancy and important information related to pregnancy check-ups and sources from the Ministry of Health, researchers strengthened group members' interest in pregnancy health topics. The inclusion of links to official sources to build trust in the information provided. This stage also introduces BOT media as a source of further information, thereby fostering a higher interest in exploring relevant health information. On the third to sixth days, researchers remained at the Attention stage by maintaining the attention of pregnant women through the interactive and informative WhatsApp BOT service. The messages began with a warm greeting such as, "Hi, pregnant women! How are you today? Come on, check out our pregnancy health tips on WhatsApp!" which invites mothers to type 'HELLO' as the initial access. After that, the BOT provides an automatic response that greets pregnant women again and offers a variety of information menu options that can be selected according to needs.

The ChatBot menu includes pregnancy health such as pregnancy risk signs, nutrition, health tips, to Puskesmas service schedules and access to official information sources from the Ministry of Health. By maintaining friendly and accessible interactions, researchers ensure that pregnant women's attention remains focused on relevant and interesting health content. Researchers remind pregnant women to access all information points, thereby strengthening their understanding of the material. This approach optimizes the Attention stage through consistent communication and actively supports the improvement of health literacy.

2. **Interest**

At the Interest stage, researchers focus on building a deeper interest in pregnant women in the information presented. Once initial attention has been gained, the focus now shifts to maintaining engagement by offering additional sources of in-depth information. In the WhatsApp group, researchers provided direct access for pregnant women to ask questions and discuss, both with fellow members and with midwives from participating puskesmas. In addition, pregnant women could also use the "Health Secrets" BOT shared by researchers in the group. This BOT serves as an additional means for pregnant women to explore relevant health information more flexibly.

On the seventh day, the researcher began to explore further interest by inviting pregnant women to provide feedback on the topic of pregnancy care that had been delivered previously. By inviting pregnant women to respond with enthusiasm emoticons, the researcher created a two-way interaction and provided an opportunity for pregnant women to express their interest.

Responding to this enthusiasm, researchers then provided links to health education videos as additional information. The recommended videos include important topics such as "How to Calculate Fetal Movement" which can be accessed through this link, as well as "Factors Affecting Fetal Health" using a vedeo link from YouTube. Through this approach, pregnant women are encouraged to explore information visually, adding to their understanding in an engaging and interactive way.

3.   Desire

In the second week, the Desire stage was continued to encourage a stronger desire in pregnant women so that they were not only interested, but also had a strong will to undergo health care during pregnancy. The researchers began by thanking the pregnant women who had been active and enthusiastic, and emphasized the importance of health care for the well-being of the mother and fetus. On the first to fourth days of the second week, conversations in the WhatsApp group invited pregnant women to start thinking about concrete steps in maintaining their health. Greetings such as "Hi beautiful mothers in the pregnant women's WhatsApp group! How are you?" opened the door to warm discussions, encouraging them to share positive and inspiring pregnancy experiences, such as how to deal with nausea, back pain, and ultrasounds.

In addition to exchanging stories between pregnant women, the opportunity to discuss with the health center midwife was also provided, increasing the appeal for pregnant women to be more actively involved. The researchers directed pregnant women to think about long-term health. The most active and enthusiastic pregnant women also had the opportunity to receive gifts, which made them feel appreciated and involved in the process. This approach is expected to foster the desire of pregnant women to continue to use ChatBot, so that it becomes an important part of obtaining information that supports their well-being during pregnancy.

4.   Action

In this Action stage, the researcher aims to encourage pregnant women to take concrete actions regarding pregnancy care. Participants are encouraged to actively share their experiences of pregnancy care in the group, creating an interactive and supportive discussion space. On the fifth to seventh day of the last week, researchers began to encourage more specific actions. The messages reminded pregnant women that good prenatal care can reduce the risk of complications and support a healthy growing baby. During this discussion, participants were asked to give their opinions about the information presented and how it could be applied in their daily health care steps. In the Action stage, researchers encouraged pregnant women to mention concrete steps in maintaining a healthy pregnancy. The following are some responses quoted from participants.

"The most important step is a healthy lifestyle to take good pregnancy care. Like the information that you have told me, one of them is maintaining emotional stability, postpartum care such as eating a variety of foods, getting enough rest, etc. and avoiding harmful activities." (Participant 1)

"The steps I took from the information from Ms. Wulan that I applied, namely, exercise such as yoga is good for controlling emotions and stress, applying healthy food, and getting enough sleep, and eating fruits and vegetables is what I did." (Participant 2)

"In maintaining health during pregnancy, care is needed with a good lifestyle. Maintaining health, diet, drinking enough vitamins and mineral water and paying attention to every nutrient eaten, adequate rest is also very necessary. Especially to avoid stress and excessive emotions. And exercise to balance the body's health." (Participant 3)

"There are many steps, like the information from Ms. Wulan during this week. The point is to maintain a better and healthier lifestyle and consult a midwife if something feels uncomfortable." (Participant 4)

Researchers also shared relevant videos to improve health literacy, which included topics on the importance of family support in maternal health and valid health information. Through the dynamic and diverse WhatsApp Group, pregnant women can access additional materials from trusted sources, such as educational videos from health channels, informative brochures, and links to valid sources from the Ministry of Health and scientific journals. In addition, this group is also supported by the presence of midwives who are ready to provide answers to questions about pregnancy. The presence of WhatsApp Group services equipped with interactive materials and professional assistance is expected to help pregnant women improve their health literacy, making it easier for them to maintain their own and fetal health easily and practically.

3.5.   *Evaluation*

On the media feasibility category Table 1. Media Feasibility Category. Based on the results of the feasibility test conducted, it was found that each aspect contained in the WhatsApp Rakes Bumil media received a "Highly Appropriate" category assessment. This finding indicates that the research objectives to understand and determine the level of understanding of respondents on the intervention material have been achieved. This analysis also provides an overview for researchers regarding the success of the intervention instrument to be provided, and confirms that the instrument has a high level of understanding and interest (average score results ≥ 90%). Thus, it can be ensured that the intervention material is well received and interested by the respondents.

Tabel 3. Rakes Bumil Media Feasibility Results (User Experience)

No	Aspects assessed	Average score	Results
Attractiveness			
1.	WhatsApp title is very interesting	3,875	92.81%
2.	Ease of joining	3,95	94.60%
3.	Interaction in the group has an effect on increasing literacy	4,1	98,20%
4.	Quiz can make the process of understanding the material less boring	4.025	96,40%
5.	Variations in the provision of information material motivate	4,1	98,20%
Material			
6.	The material presented in varied content through (Video, webset, Flyer and WA Bot) is easy to understand	4,05	97,00%
7.	The material in the media is related to the health of pregnant	4,125	98,80%

| No	Aspects assessed	Average score	Results
	women		
8	The presentation of concepts in this media encourages sharing	4,125	98,80%
9	The whatsapp media intervention is very interesting	4,175	100,00%
10	The concept and content of the material encourage me to pay more attention to health during pregnancy	4,15	99,40%
11	The topic of discussion on whatsapp chatbot and group media can increase understanding of health in pregnant women	4,175	100,00%
	Language		
12	The politeness of the language conveyed	4	95,80%
13	The language used is simple and very easy	4,075	97,60%
14	The letters used in chatbot and group interactions are simple and easy to read	4,025	96,40%

In improving the results of media feasibility, researchers have made various changes based on suggestions during the media test assessment, namely the initial WhatsApp Chatbot name Rakes Bumil was changed to have an avatar, namely Neng Cici Rakes Bumil to make it more personal and interactive, making it easier to join the group, researchers did not send a group link but made invitations directly one by one. The addition of a picture guessing quiz was also done to provide variety and attract pregnant women. Not only that, researchers also made flyers and short animated videos related to health literacy to increase the attractiveness and effectiveness of disseminating varied content and involving midwives in this intervention, and in the chatbot content there are links to health ministries about pregnancy health that are connected to ChatBot Rakes Bumil, ChatBot with automatic answer captions replaced with Neng Cici Rakes Bumil To make the interaction warmer and not seem rigid, we changed the ChatBot name to 'Neng Cici Rakes Bumil.' This name is expected to create a more familiar atmosphere so that pregnant women feel more comfortable when communicating and accessing information about health during pregnancy.
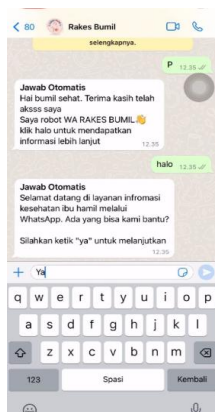
Before   **After**
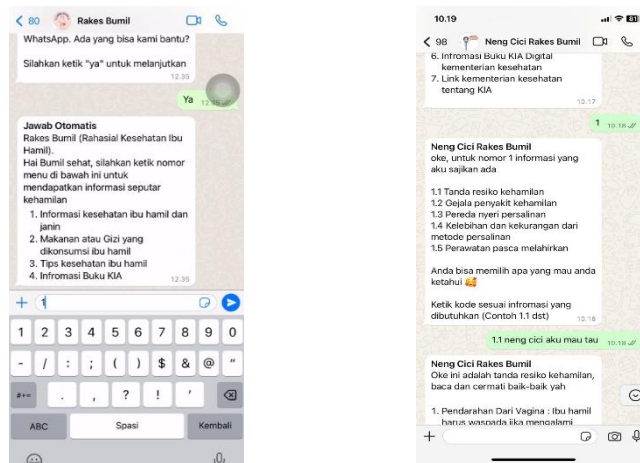
Figure 3 Before and After ChatBot Revision

(Feine *et al.*, 2020) explains three key principles in the development of an effective chatbot system: Live Editing, Contextualized Response, and Visualization of Interaction Results. The principle of live editing allows experts to instantly change a chatbot's response and see the results instantly, giving them more control over the interaction. Contextualized response means that the chatbot can respond more naturally as it pays attention to previous conversations, making the conversation feel more fluid. Finally, visualization of interaction results gives users an idea of their contributions (such as the number of improvements made), which encourages a sense of satisfaction and enthusiasm to continue participating. These three principles make the chatbot development process more interactive and enjoyable for non-technical users.

3.6.   Media Development and Implementation

In this study, researchers developed a WhatsApp Rakes Bumil media as a health literacy intervention tool for pregnant women. Furthermore, researchers designed content that would be distributed to pregnant women through chatbots, flyers, quizzes and animated videos. The content design carried out by researchers is based on 4 health literacy components, namely first, knowledge of pregnancy health information which presents basic information about pregnancy health before the intervention is carried out. The proportion of content for knowledge is found in groups, flyers, quizzes, ChatBot, Videos. While information search, information assessment and decision making are not all in the content. So that the knowledge component gets more information from various sources compared to the information search component, assessing information, but the decision-making content is included in the knowledge section so that the decision-making component receives a lot of information to increase knowledge which will encourage their awareness to take healthier actions or decision making.

Further researchers can add information content to the literacy media that is developed. This is very useful especially in terms of searching and assessing information. By adding more relevant and useful content, as well as providing clearer directions in assessing the truth and quality of information through literacy media, it can be more effective in helping pregnant women to be more critical and intelligent in understanding information. The media development process also involved samples of pregnant women for the development of WhatsApp Rakes Bumil media and obtained a very feasible category with a value of >90%.

Furthermore, there is an implementation stage about the material provided in various ways including videos and quizzes so that pregnant women can more easily get information with a variety of media, there are also sharing sessions that form networks between pregnant women as many as 7 people and researchers answer directly at that time and there is a sharing session for 2 days with

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midwives as many as 16 pregnant women asking questions this is because the message conveyed is interesting so that it raises interest in health literacy in pregnant women.

This implementation involved the use of smartphone applications for two weeks to disseminate health information by maximizing WhatsApp social media as the main platform. The approach included the use of ChatBot, videos, Ministry of Health links, flyers and quizzes as content on the Rakes Bumil WhatsApp platform and health consultations conducted through WhatsApp groups involving health workers such as midwives at puskesmas. The development and implementation received positive responses from pregnant women, as evidenced by active participation in the Rakes Bumil WhatsApp Application. Pregnant women also showed interest in accessing the chatbot to get various information they needed. The enthusiasm shown by pregnant women showed that the Rakes Bumil media design was able to trigger Attention, Interest, Desire, and Action according to the AIDA theory and pregnant women stayed for two weeks following the community service activities.

Research Fasimi et al. (2020) Interventions provided through WhatsApp media conducted for 14 days can increase understanding in pregnant women so that WhatsApp media can be utilized as one of the media in providing health education. Previous research by Montenegro et al. (2022) said that over a seven-day period, research shows that chatbots have proven to be a tool in providing education to pregnant women with support from doctors. The chatbot was able to deliver information in a language that was easy to understand and comprehensive, while also meeting the desired performance expectations. These results confirm that chatbots are a viable and useful tool for pregnant women as well as healthcare providers.

Another study Arifah et al. (2023) also mentioned that daily educational messages delivered via WhatsApp can increase the knowledge of pregnant women. Research Elsharkawy et al. (2022) said the Health Information Package Program by routinely using the WhatsApp platform is an effective educational intervention for pregnant women to improve knowledge, skills, and compliance. Research on the use of digital media for maternal health literacy in Indonesia has increased since COVID-19. According to research Mulyani et al., (2023) said a significant increase in knowledge and healthy lifestyle behavior of pregnant women after an AR media-based health education intervention. Therefore, AR media-based health education can be used as an alternative approach in increasing the knowledge and healthy lifestyle behavior of pregnant women during the COVID-19 pandemic. According to research Kusyanti et al., (2022) Electronic information and telecommunications technology can be used to support remote clinical health care, a growing trend that offers better patient access and more engaged patients with better outcomes. For midwives who provide direct health services to patients (pregnant women) in rural and urban areas and locations, ranging from clinics and hospitals to emergency/urgent care sites, nurse/midwife practices, and nursing homes, among others, the use of mHealth can help improve the provision of health services to underserved pregnant women. This is also supported by research Damayanti et al., (2022) which says there are pregnant women who use the internet to find health information and the majority of pregnant women have made decisions regarding emergency assistance independently and according to research Utari & Astuti Zebua, (2020) the experience of using digital pregnancy applications is quite varied, but the existence of the application is considered capable of changing the behavior of people who are initially apathetic to their health conditions to be more aware of the importance of health information. Ningrum et al. (2024) research summarizes the efforts to improve the health literacy of pregnant women that are important and can be associated with the implementation of WhatsApp Rakes for Pregnant Women are Empowerment of Pregnant Women, Support from the Broader Health System, Development of Culturally Relevant Learning Materials and a multidisciplinary approach.

The application of the AIDA theory (Attention, Interest, Desire, and Action) in delivering messages in the WhatsApp Rakes Bumil group for two weeks was able to create a continuous sense of curiosity in pregnant women every day. By using this approach, the messages delivered can increase knowledge,

expand the reach of information, improve the ability to assess the information received, and assist in better decision making. Thus, during the two-week period, each message delivered was designed in stages to attract attention, arouse interest, arouse the desire to seek further information, and encourage action or active participation from pregnant women in WhatsApp Rakes Bumil. Research (Rangga, 2022) states that through the application of messages with the AIDA concept in the information system, the effectiveness of promotion can be increased by attracting attention, maintaining interest, creating desire, and encouraging action. This is expected to help increase positive behavior towards the information to be achieved. Research (Omole et al., 2018) states that message-based interventions have a positive impact on pregnancy and mothers welcome their use during pregnancy.

4. Conclusions

This study aims to develop and implement WhatsApp-based Rakes Bumil digital education media to improve the health literacy of pregnant women. An initial survey of 40 pregnant women in Bogor Regency showed that 27.5% had problematic literacy. The media was developed through ADDIE and AIDA approaches in the form of chatbots, flyers, videos, and interactive quizzes. The feasibility test results showed that the media was feasible and well received, and the 14-day implementation increased participants' engagement and understanding. The main contribution of this research is to provide accessible and relevant educational media. However, limitations include the chatbot design that has not been as interactive as AI and the results of this study cannot be generalized. These results form the basis for further quantitative evaluation.

5. Acknowledgment

6. Authors Note

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism

7. References

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