

The Effectiveness of Health Education Using Comic Media on Knowledge and Attitudes Toward Menarche Among Female Students in Grades Iv–V At SDN 2 Kayuambon, West Bandung Regency, 2026

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ABSTRAK

Background: Menarche is an important reproductive milestone that may be accompanied by fear, embarrassment, anxiety, and confusion when girls have insufficient prior information. Preliminary findings at SDN 2 Kayuambon indicated that many girls had not received specific education about menarche and several still lacked basic knowledge and felt afraid or embarrassed about menstruation (Dewi, 2023; Nadila et al., 2024).

Purpose: This study aimed to determine the effectiveness of health education using comic media on knowledge and attitudes toward menarche among female students in grades IV–V at SDN 2 Kayuambon, West Bandung Regency, in 2026 (Notoatmodjo, 2018).

Materials and methods: A quasi-experimental study using a pretest–posttest control group design was conducted among 48 female students who had not experienced menarche. Twenty-four students received health education using comic media and 24 received health education using leaflet media. Data were collected using knowledge and attitude questionnaires before and after the intervention. The Wilcoxon Signed Rank Test was used for paired comparisons with $\alpha=0.05$; the study protocol also specified Mann–Whitney testing for comparisons between independent groups (Nursalam, 2020; Sugiyono, 2020).

Results: In the comic group, knowledge changed from 19 students (79.2%) in the poor category and 5 (20.8%) in the sufficient category before intervention to 18 (75.0%) in the good category and 6 (25.0%) in the sufficient category after intervention. The Wilcoxon test showed $p<0.001$. Attitudes changed from 18 students (75.0%) with negative attitudes and 6 (25.0%) with positive attitudes before intervention to 15 (62.5%) with positive attitudes and 9 (37.5%) with negative attitudes after intervention; the tabulated Wilcoxon result was $p=0.020$. In the leaflet group, knowledge changed to 16 (66.7%) poor, 5 (20.8%) sufficient, and 3 (12.5%) good, with $p=0.100$, while attitudes changed to 15 (62.5%) negative and 9 (37.5%) positive, with $p=0.527$ (Primary data, 2026).

Conclusions: Health education using comic media was associated with significant improvements in knowledge and attitudes toward menarche in the intervention group. The comic approach may therefore be considered an appropriate educational medium for elementary-school girls, particularly because visual and story-based materials can make health information more concrete and engaging for children (Daryanto, 2016; Sari et al., 2025)..

Keywords: comic media; health education; knowledge; attitude; menarche

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INTRODUCTION

Menarche is the first menstruation experienced by girls and represents an important milestone in female growth and development. This period is not only associated with biological changes but also requires psychological and social adaptation. For school-aged girls who have not yet experienced menstruation, adequate information about menarche is important to help them understand the changes that will occur in their bodies. Lack of information before menarche may cause girls to perceive menstruation as something unfamiliar and frightening. Therefore, reproductive health education should be provided before the occurrence of menarche so that girls can develop an appropriate understanding and prepare themselves physically and psychologically. Education regarding reproductive health at school age is particularly important because children are approaching the stage of puberty and require information that is appropriate to their level of development (Dewi,

2023; Fatmawati et al., 2023).

The need for information about menstruation remains an important issue among school-aged girls. The thesis literature review reports that one in four children may not have adequate information about menstruation before experiencing it, while limited access to information is one factor associated with inadequate menstrual knowledge. In Indonesia and other Southeast Asian countries, knowledge related to sexuality and reproductive health has also been reported to remain relatively low. Insufficient information may cause girls to enter menarche without adequate understanding of menstrual changes, menstrual hygiene, and appropriate responses to menstruation. Consequently, reproductive health education is needed as an effort to provide accurate and understandable information before girls experience their first menstruation (Nadila et al., 2024).

Menarche can become a difficult experience for girls who have not received appropriate information beforehand. Girls who lack knowledge about menstruation may experience confusion, fear, anxiety, embarrassment, and discomfort when facing their first menstruation. Readiness to experience menarche involves not only understanding the biological process but also the ability to adapt psychologically and socially to changes in the body. Knowledge is one of the factors that may influence this readiness because adequate knowledge enables girls to understand menstruation as a normal physiological process rather than as something that should be feared or avoided. Therefore, providing information before menarche is expected to support girls in developing a more positive perception and better readiness toward menstruation (Dewi, 2023; Dwi et al., 2025).

In addition to knowledge, attitude is an important component in preparing girls for menarche. Attitude reflects an individual's tendency to respond to an object or situation and can change through interaction with information, experience, beliefs, feelings, and the surrounding environment. In the context of menarche, a positive attitude is reflected in the ability to accept menstruation as a normal part of female development, whereas a negative attitude may be characterized by fear, embarrassment, rejection, or discomfort. Girls who have a positive attitude toward menstruation are expected to be better prepared to accept physical changes and respond appropriately when menarche occurs. Thus, reproductive health education needs to address not only cognitive aspects, such as knowledge, but also affective aspects, particularly attitudes toward menstruation (Dwi et al., 2025; Notoatmodjo, 2018).

The selection of educational media is an important consideration in delivering reproductive health information to elementary school students. Children at this developmental stage may have difficulty understanding information when it is presented only through abstract explanations or conventional verbal methods. Visual learning media can make information more concrete, attract attention, and facilitate understanding and retention. Comic media is one form of visual educational media that combines illustrations, simple text, characters, and storylines to present information in a more engaging manner. The combination of visual and written information may help children understand health messages more easily while increasing their interest in reading and participating in the learning process. Therefore, comic media can be considered an appropriate educational approach for delivering information about menstruation and puberty to school-aged girls (Daryanto, 2016; Sari et al., 2025).

Previous studies have also provided support for the use of comic-based health education in improving knowledge and attitudes related to menstruation. Research cited in the thesis indicates that comic-based education can increase students' understanding of reproductive health because information is presented through attractive illustrations and a storyline that is easier for children to follow. A study using Menstrupedia comic-based health education also reported improvements in knowledge and more positive attitudes toward menstruation after the intervention. These findings indicate that comics may serve not merely as a medium for delivering information but also as a learning medium that can encourage children's attention, facilitate comprehension, and support the development of positive perceptions toward menstruation (Sari et al., 2025; Shrestha et al., 2025).

The need for appropriate education was also identified at SDN 2 Kayuambon, West Bandung Regency. Preliminary data indicated that there were 48 female students in grades IV–V who had not yet experienced menarche and met the inclusion criteria for the study. Furthermore, a preliminary study conducted on January 12, 2026, involving 10 female students who had not experienced

menarche found that 8 students (80%) did not yet have adequate knowledge about menarche. In addition, 7 students (70%) did not know the signs indicating the occurrence of first menstruation, while 6 students (60%) reported feelings of fear and embarrassment when facing menstruation. These findings demonstrate that a proportion of female students still require appropriate information and preparation before experiencing menarche. The preliminary findings therefore provide a specific basis for implementing reproductive health education using an educational medium that is attractive and appropriate for elementary school students (Dewi, 2023; Nadila et al., 2024).

Based on the existing problem and the preliminary findings at SDN 2 Kayuambon, an educational strategy that can improve knowledge while supporting the formation of positive attitudes toward menarche is needed. Comic media was selected because it combines visual illustrations and simple narratives that are considered suitable for the characteristics of elementary school students. Although previous studies have demonstrated the potential of comic-based education in improving reproductive health knowledge and attitudes, its effectiveness in the specific context of female students in grades IV–V at SDN 2 Kayuambon had not been established. Therefore, this study was conducted to determine the effectiveness of health education using comic media on knowledge and attitudes toward menarche among female students in grades IV–V at SDN 2 Kayuambon, West Bandung Regency, in 2026 (Sari et al., 2025; Shrestha et al., 2025).

METHOD

This study used a quantitative quasi-experimental approach with a pretest–posttest control group design. Both groups were assessed before and after health education. The intervention group received education about menarche through comic media, whereas the control group received education through leaflet media. This design was selected to assess changes in knowledge and attitudes following education and to provide a comparison group (Nursalam, 2020).

The study was conducted at SDN 2 Kayuambon, West Bandung Regency, on 13 and 18 May 2026. The population consisted of 54 female students distributed across grades IV A (9), IV B (11), V A (19), and V B (15). A sample of 48 students was obtained using the sample-size calculation described in the thesis, with proportional allocation across the class clusters; the final sample consisted of 24 students in the comic group and 24 in the leaflet group (Sugiyono, 2020).

Inclusion criteria were active female students in grades IV–V, aged 10–11 years, who had not experienced menarche, were able to read and understand the questionnaire and educational material, were willing to participate, and attended the pretest and posttest. Exclusion criteria included absence during the study, incomplete questionnaires, withdrawal from participation, or having already experienced menstruation (Nursalam, 2020).

Primary data were collected directly from respondents using knowledge and attitude questionnaires. The knowledge questionnaire assessed understanding of the definition of menarche, age of occurrence, signs preceding menarche, and menstrual hygiene. Knowledge was categorized as good (76–100%), sufficient (56–75%), and poor ($\leq 55\%$). The attitude questionnaire assessed readiness, feelings toward pubertal bodily changes, acceptance of menarche, and menstrual hygiene attitudes using a Likert scale; attitudes were categorized as positive when the score was at or above the mean and negative when below the mean (Nurhidayah, 2019; Notoatmodjo, 2018).

Data were analyzed using univariate and bivariate analysis. The Wilcoxon Signed Rank Test was used to compare paired pretest and posttest scores within each group because the data did not meet the assumptions for parametric analysis. The research methodology also specified the Mann–Whitney test for comparisons between the independent intervention and control groups. Statistical significance was set at $\alpha=0.05$, with $p\leq 0.05$ interpreted as statistically significant (Nursalam, 2020).

Ethical principles applied in the study included informed consent, anonymity, confidentiality, justice, and non-maleficence. Respondents were informed about the study and participated voluntarily; their identities were protected through coding and their information was used only for research purposes (Nursalam, 2020).

FINDING AND DISCUSSION

Findings

Before the intervention, the comic group consisted of 24 students: 19 (79.2%) had poor knowledge, 5 (20.8%) had sufficient knowledge, and none had good knowledge. After comic-based education, 18 students (75.0%) had good knowledge, 6 (25.0%) had sufficient knowledge, and none remained in the poor category. For attitudes, 18 students (75.0%) initially had negative attitudes and 6 (25.0%) had positive attitudes; after intervention, 15 (62.5%) had positive attitudes and 9 (37.5%) remained negative (Primary data, 2026).

Table 1. Distribution of knowledge and attitudes in the comic intervention group (n=24)

Variable	Category	Pretest n (%)	Posttest n (%)
Knowledge	Poor	19 (79,2)	0 (0,0)
Knowledge	Sufficient	5 (20,8)	6 (25,0)
Knowledge	Good	0 (0,0)	18 (75,0)
Attitude	Negatif	18 (75,0)	9 (37,5)
Attitude	Positif	6 (25,0)	15 (62,5)

Based on Table 1, the knowledge and attitudes of students in the comic intervention group (n = 24) significantly improved after receiving comic-based education. Before the intervention, the majority of students had a knowledge level of 19 (79.2%) in the poor category, followed by 5 (20.8%) in the fair category, and no students in the good category (0.0%). After receiving the comic-based educational intervention, there was a significant increase in knowledge, with the majority of students having good knowledge (18) (75.0%), 6 (25.0%) in the moderate category, and no students in the poor category (0.0%). Meanwhile, regarding attitudes, before the intervention, the majority of students had negative attitudes (18) (75.0%), and only 6 (25.0%) had positive attitudes. After the intervention, the proportion of students' attitudes returned to being dominated by positive attitudes (15) (62.5%), while the number of students with negative attitudes decreased to 9 (37.5%). Overall, these results show that comic-based educational media is effective in increasing knowledge and changing students' attitudes in a more positive direction.

Table 2. Distribution of knowledge and attitudes in the leaflet control group (n=24)

Variable	Category	Pretest n (%)	Posttest n (%)
Knowledge	Poor	20 (83,3)	16 (66,7)
Knowledge	Sufficient	4 (16,7)	5 (20,8)
Knowledge	Good	0 (0,0)	3 (12,5)
Attitude	Negatif	17 (70,8)	15 (62,5)
Attitude	Positif	7 (29,2)	9 (37,5)

Based on Table 2, the level of knowledge and attitudes of students in the control group who received education using leaflets (n = 24) showed several changes. Regarding knowledge before the intervention (pretest), the majority of students were in the poor category (20 students (83.3%)), followed by 4 students in the adequate category (16.7%), and no students in the good category (0.0%). After the intervention (posttest), the proportion of students with poor knowledge decreased to 16 students (66.7%), students with adequate knowledge increased to 5 students (20.8%), and students with good knowledge increased to 3 students (12.5%). Meanwhile, regarding attitude before the intervention, the majority of students had negative attitudes (17 students (70.8%)), and 7 students (29.2%) had positive attitudes. After the intervention, the number of students with negative attitudes

decreased to 15 students (62.5%), while the number of students with positive attitudes increased to 9 students (37.5%). Overall, the use of leaflet media can provide a slight increase in students' knowledge and attitudes, although the percentage of students in the category of less knowledge and negative attitudes is still relatively dominant.

Table 3. Wilcoxon test results for pretest–posttest changes

Outcome	Wilcoxon p-value	Interpretation
Knowledge	<0.001	Significant change
Attitude	0.020	Significant change
Knowledge	0.100	Not significant
Attitude	0.527	Not significant

The Wilcoxon analysis showed a statistically significant change in knowledge in the comic group ($p < 0.001$). Cross-tabulation showed that 14 of 19 students with poor knowledge improved to good knowledge and 5 improved to sufficient knowledge. Among the 5 students who initially had sufficient knowledge, 4 improved to good knowledge and 1 remained sufficient. For attitudes, the tabulated Wilcoxon result was $p = 0.020$, indicating a statistically significant pretest–posttest difference; 12 of 18 students with negative attitudes changed to positive, while 3 of 6 students with positive attitudes remained positive (Primary data, 2026).

Discussion

Distribution of knowledge and attitudes in the comic intervention group

The findings showed that before health education using comic media, most respondents had a low level of knowledge (19 respondents; 79.2%), while 5 respondents (20.8%) had a moderate level, and none had a good level of knowledge. This condition indicates limited understanding of menarche, which may be influenced by the respondents' age as they approached puberty and limited access to information from family and school. According to Varney, Kriebs, and Gegor (2015), menarche is the first menstruation and a sign of reproductive maturity, generally occurring at the age of 10–16 years; therefore, providing information before menarche is important to prevent fear, confusion, and anxiety. Wiknjosastro (2018) stated that reproductive health knowledge is influenced by age, education, experience, social environment, and sources of information, while Notoatmodjo (2018) explained that knowledge is formed through sensory perception and is influenced by education, experience, environment, and access to information. Bobak, Lowdermilk, Jensen, and Perry (2017) emphasized that preparation for menarche is important because inadequate knowledge may cause anxiety, fear, embarrassment, and inappropriate menstrual hygiene practices. These findings are consistent with Sari and Rahmawati (2022) and Putri, Lestari, and Handayani (2021), who found low levels of knowledge among female elementary school students before health education due to limited information, but differ from Nurhayati and Kurniawati (2020), who found that most respondents had good knowledge because they had previously received education through School Health Unit (UKS) activities, health workers, and parents. After the intervention, knowledge increased to 18 respondents (75.0%) in the good category and 6 (25.0%) in the moderate category, with no respondents remaining in the low category. According to Notoatmodjo (2018), information received through visual and auditory senses can facilitate comprehension and retention; Daryanto (2016) stated that visual media can increase interest, clarify learning materials, and improve retention; while Piaget's theory explains that children aged 9–11 years are generally in the concrete operational stage and therefore understand information more easily through pictures, examples, and concrete illustrations. These findings are consistent with Sari and Rahmawati (2022), who demonstrated that comics significantly improved reproductive health knowledge, and Putri et al. (2021), who found increased understanding of puberty, menarche, and menstrual hygiene, but differ from Yuliana and Fitriani (2020), who found that the increase in knowledge was not significant due to the short duration of education, low participant involvement, and the use of lectures without attractive visual media. The improvement in the present

study was presumably related to the attractive, simple, concrete, and age-appropriate presentation of the comic, supported by the respondents' attention, enthusiasm, and active participation.

Regarding attitudes, before the intervention, most respondents had negative attitudes toward menarche (18 respondents; 75.0%), while only 6 (25.0%) had positive attitudes, indicating inadequate readiness to face their first menstruation, which may be characterized by fear, anxiety, embarrassment, and confusion. According to Notoatmodjo (2018), attitude is an individual's tendency to respond to an object, consisting of cognitive, affective, and conative components, and is influenced by knowledge, experience, environment, and information. Varney, Kriebs, and Geger (2015) explained that although menarche is a normal physiological process, limited information about bodily changes may cause anxiety and influence attitudes, while Bobak et al. (2017) stated that education before puberty supports emotional readiness, improves acceptance of physical changes, and reduces fear and embarrassment. These findings are consistent with Lestari and Wulandari (2022), who found that most female elementary school students had negative attitudes before health education due to limited information, and Sari, Handayani, and Putri (2021), who associated low positive attitudes with limited reproductive health communication within families and schools. However, these findings differ from Rahmawati and Fitriani (2020), who found that most respondents had positive attitudes because they had previously received information through UKS activities, health workers, and parents. After the intervention, the proportion of respondents with positive attitudes increased to 15 (62.5%), although 9 respondents (37.5%) remained negative. Notoatmodjo (2018) stated that attitude changes may be associated with increased knowledge, while Daryanto (2016) explained that concrete and attractive visual media can improve attention, comprehension, and memory. Bobak et al. (2017) further noted that appropriate information can increase confidence, reduce fear, and help children accept menarche as a normal physiological process.

The change in attitudes is consistent with Lestari and Wulandari (2022), who demonstrated that health education using comics improved positive attitudes and readiness to face menarche, as well as Putri, Handayani, and Sari (2021), who found significant changes in attitudes following the use of image-based educational media, characterized by greater openness to puberty information, better readiness, and more positive perceptions of physical changes. However, the present findings differ from Rahmawati and Fitriani (2020), who found that changes in attitudes were not significant because attitudes are also influenced by individual experiences, family, social environment, culture, the time required to change beliefs, respondent characteristics, educational methods, and media. Based on the researcher's analysis, the improvement in knowledge and attitudes following the intervention was presumably due to the ability of comic media to present information about menarche in an attractive, communicative, simple, concrete, and developmentally appropriate manner through illustrations, colors, simple language, and storylines that facilitated understanding and acceptance of menarche as a normal physiological process. Active respondent involvement during the education, such as paying attention, participating in discussions, and asking questions, also supported the acceptance of the information. Therefore, comic media can serve as an appropriate alternative for health education to improve knowledge, promote positive attitudes, and enhance the readiness of elementary school girls to face menarche.

Distribution of knowledge and attitudes in the leaflet control group

Based on the research findings, before receiving health education using leaflets, most respondents had a low level of knowledge, namely 20 respondents (83.3%), while 4 respondents (16.7%) had moderate knowledge and none had good knowledge. This condition indicates that the students did not optimally understand menarche, including its definition, age of occurrence, signs and symptoms, physical and psychological changes, and personal hygiene. According to Notoatmodjo (2018), knowledge is formed through the process of sensing, particularly through sight and hearing, and is influenced by age, education, experience, environment, and availability of information. Varney, Kriebs, and Geger (2015) stated that menarche is the first menstruation and a sign of the beginning of reproductive function; therefore, information before puberty is needed to prevent confusion, fear, and misconceptions. Wiknjosastro (2018) explained that reproductive health information can be obtained from families, schools, health workers, and mass media, but menstruation is still considered a sensitive topic, which may limit communication. These findings are consistent with Lestari and

Wulandari (2022), who found low knowledge among elementary school students before health education due to limited information from families and schools, and Putri, Handayani, and Sari (2021), who found that students' understanding of the basic concept of menarche was not optimal. In contrast, Rahmawati and Fitriani (2020) found that most respondents had good knowledge before the intervention, possibly due to respondent characteristics, parental education, routine reproductive health programs, diverse digital information sources, and parental support. After health education using leaflets, the proportion with low knowledge decreased to 16 respondents (66.7%), moderate knowledge increased to 5 (20.8%), and good knowledge appeared in 3 respondents (12.5%), indicating an improvement although it was not optimal. According to Notoatmodjo (2018), leaflets can help develop understanding through the sensing process, while Daryanto (2016) explained that leaflets present concise information through text and images, although their effectiveness is influenced by reading interest, comprehension ability, and motivation. These findings are consistent with Lestari and Wulandari (2022) and Putri, Handayani, and Sari (2021), who reported that leaflets can improve knowledge although the improvement is not always optimal, but differ from Rahmawati and Fitriani (2020), who found that leaflets increased most respondents' knowledge to the good category. These differences may be influenced by reading ability, quality of content and leaflet design, delivery methods, assistance, respondent characteristics, and the research environment.

Regarding attitudes, before health education using leaflets, 17 respondents (70.8%) had negative attitudes and 7 respondents (29.2%) had positive attitudes. This indicates that readiness to face menarche was not optimal, possibly due to limited information about physical and psychological changes. Notoatmodjo (2018) stated that attitudes are formed through knowledge, experience, and information; therefore, limited knowledge may result in less supportive attitudes. Varney, Kriebs, and Geger (2015) explained that menarche is a normal physiological process, but inadequate understanding may cause fear, anxiety, and confusion, making education before puberty important for children's mental and emotional readiness. These findings are consistent with Lestari and Wulandari (2022), who found that negative attitudes were dominant before health education due to limited parent-child communication, but differ from Rahmawati and Fitriani (2020), who found that most respondents already had positive attitudes, possibly because of previous health education at school, family support, experience, and information about puberty. After health education using leaflets, positive attitudes increased to 9 respondents (37.5%), while 15 respondents (62.5%) remained negative, indicating a change although it was not optimal. According to Notoatmodjo (2018), attitude changes do not occur instantly because they are influenced by knowledge, experience, beliefs, social environment, and family support. Bobak, Lowdermilk, Jensen, and Perry (2017) also explained that readiness to face menarche includes emotional readiness, which needs to be developed through continuous health education. These findings are consistent with Putri, Handayani, and Sari (2021), who reported that leaflets can improve positive attitudes although the change may be limited because attitude formation requires time, but differ from Lestari and Wulandari (2022), who found that positive attitudes were more dominant after using more interactive visual media. These differences indicate that attractive media involving active participation can improve attention, understanding, and engagement in learning.

Overall, health education using leaflets in the control group showed an improvement in knowledge and a change toward more positive attitudes, although the results were not optimal. In terms of knowledge, the proportion with low knowledge decreased from 83.3% to 66.7%, with the emergence of a good knowledge category at 12.5%; meanwhile, positive attitudes increased from 29.2% to 37.5%, although negative attitudes remained dominant at 62.5%. These findings indicate that leaflets can serve as an educational medium but may not be sufficient to provide optimal understanding and attitude changes among elementary school students. Based on the researcher's analysis, these limitations may be related to the fact that leaflets rely more heavily on independent reading and comprehension, whereas elementary school students may require media that are more attractive, interactive, concrete, and appropriate to their developmental stage. Furthermore, attitude changes are influenced not only by knowledge but also by experience, beliefs, environment, family, and the time required for change. Therefore, health education about menarche should be provided continuously with support from families, schools, and health workers, while using media appropriate to

children's characteristics to improve knowledge and promote positive attitudes and better readiness to face their first menstruation.

The Wilcoxon test results

The results showed that health education using comic media was effective in improving students' knowledge and attitudes toward menarche. The Wilcoxon Signed Rank Test showed a significant difference in knowledge before and after the intervention ($p < 0.001$), with 14 of 19 respondents who initially had poor knowledge improving to good and 5 to sufficient, while 4 of 5 respondents with sufficient knowledge improved to good and 1 remained sufficient. Attitudes also improved significantly ($p < 0.020$); of 18 respondents with negative attitudes at pretest, 12 changed to positive, while 3 of 6 respondents who initially had positive attitudes remained positive. Overall, positive attitudes increased from 6 to 15 respondents. According to Notoatmodjo (2018), health education is a learning process that improves an individual's ability to receive and understand health information, while attitudes are influenced by knowledge, experience, beliefs, values, and the environment. Daryanto (2016) states that visual media can increase attention, interest, understanding, and retention. This is consistent with Piaget's theory that children aged 9–11 years are generally in the concrete operational stage and understand information more easily through pictures, examples, and concrete situations. Comics combine illustrations, colors, text, dialogue, and storylines that are appropriate to children's characteristics, while Bobak, Lowdermilk, Jensen, and Perry (2017) explain that information provided before menarche can support psychological and emotional readiness, confidence, and positive acceptance of menstruation.

In contrast, health education using leaflet media did not produce statistically significant changes in either knowledge or attitude. The Wilcoxon test showed $p = 0.100$ for knowledge and $p = 0.527$ for attitude. In the knowledge cross-tabulation, of 20 respondents with poor knowledge at pretest, 13 remained poor, 4 improved to sufficient, and 3 to good; among 4 respondents with sufficient knowledge, 3 decreased to poor and 1 remained sufficient. For attitudes, of 17 respondents with negative attitudes, 6 changed to positive and 11 remained negative, while among 7 respondents who initially had positive attitudes, 3 remained positive and 4 changed to negative. Overall, positive attitudes increased only from 7 to 9 respondents. Notoatmodjo (2018) explains that the effectiveness of health education is influenced by the method, media, target characteristics, ability to receive information, and learning environment, while attitude formation generally requires more time because it involves affective aspects. Daryanto (2016) notes that leaflets are practical, easy to store, and can be reread, but their effectiveness depends on reading interest, comprehension, motivation, and attention. For elementary school children, text-dominated media may be less attractive than visual and story-based media, consistent with Piaget's theory. Environmental factors, including personal experience, family support, social environment, culture, peers, and previous information, may also influence attitudes; Bobak et al. (2017) emphasize that psychological readiness for menarche develops gradually and is strengthened through communication and support from parents and teachers.

The findings are consistent with Lestari and Wulandari (2022) and Putri, Handayani, and Sari (2021), who reported that comic-based health education can significantly improve reproductive-health knowledge, positive attitudes, and readiness because simple language, illustrations, and stories make information easier to understand and remember. Their findings also indicate that leaflets may provide only limited improvements and are generally less optimal than more interactive media, particularly for affective outcomes. However, the present findings differ from Rahmawati and Fitriani (2020), who found that comic and leaflet-based education could produce significant improvements in some outcomes. These differences may be related to the quality and suitability of the material, media presentation, educational techniques, intervention duration and intensity, respondent characteristics, reading ability, parental or teacher support, and previous experience with reproductive-health information. Based on the researcher's analysis, individual differences in attention, concentration, interest, comprehension, prior knowledge, experience, emotional readiness, beliefs, and social environment may explain variations in responses; however, these factors were not specifically measured, so the most dominant factor cannot be determined. Overall, the significant results in the comic group ($p < 0.001$ for knowledge and $p < 0.020$ for attitude), compared with the non-significant results in the leaflet group ($p = 0.100$ and $p = 0.527$), indicate that comic-based health education has

greater potential to improve knowledge and foster positive attitudes toward menarche among grade IV–V students at SDN 2 Kayuambon, West Bandung Regency.

CONCLUSIONS

Health education using comic media produced significant pretest–posttest changes in knowledge and attitudes toward menarche among female students in grades IV–V at SDN 2 Kayuambon. Knowledge improved from predominantly poor before intervention to predominantly good after intervention, while positive attitudes increased from 25.0% to 62.5%. The corresponding Wilcoxon results were $p < 0.001$ for knowledge and $p = 0.020$ for attitudes (Primary data, 2026). The findings indicate that comic media can be considered a promising medium for reproductive-health education before menarche because it combines visual and narrative elements that are appropriate for school-age learners. Schools and health workers may consider incorporating attractive, age-appropriate media into continuing reproductive-health education, while future research should include a direct between-group statistical comparison and larger samples to strengthen evidence of comparative effectiveness (Daryanto, 2016; Notoatmodjo, 2018).

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