

Effectiveness of Educational Comics in Improving High School Students' Knowledge of First Aid for Minor Burns: A One-Group Pretest–Posttest Study

Fanesia Katayane¹, Abdul Thalib^{1,2*}

¹ Department of Nursing, STIKes Pasapua Ambon, Maluku, Indonesia

² Department of Nursing, Graha Edukasi Makassar University, Makassar, Indonesia

*Correspondence: Abdul Thalib, Email: abdulthalibhamzah@gmail.com

Received: July 1, 2026 ○ Revised: July 31, 2026 ○ Accepted: August 1, 2026

ABSTRACT

Background: Minor burns are among the most common injuries encountered in daily life, particularly among adolescents who actively participate in school, laboratory, and extracurricular activities. Inadequate first-aid knowledge often leads to inappropriate practices, such as applying toothpaste, butter, or cooking oil to burn wounds, which may worsen tissue damage and delay proper treatment. Educational interventions using visually engaging media, such as comics, have emerged as promising strategies to improve health knowledge among adolescents.

Objective: This study aimed to evaluate the effectiveness of educational comic media in improving knowledge regarding first aid for minor burns among high school students.

Methods: A quantitative pre-experimental study with a one-group pretest–posttest design was conducted among 40 tenth-grade students at SMA Negeri 14 Ambon. Participants were selected using quota sampling. Students completed a structured knowledge questionnaire before the intervention. Educational comics containing evidence-based information on first aid for minor burns were subsequently provided, followed by guided reading and interactive discussion. Knowledge was reassessed immediately after the intervention using the same questionnaire. Differences between pretest and posttest scores were analyzed using the Wilcoxon signed-rank test.

Results: Before the intervention, most participants demonstrated poor knowledge (70.0%), while only 2.5% had good knowledge. Following comic-based education, the proportion of students with good knowledge increased to 42.5%, whereas poor knowledge decreased to 2.5%. Statistical analysis revealed a significant improvement in knowledge after the intervention (Wilcoxon test, $p < 0.001$).

Conclusion: Educational comics were effective in improving students' knowledge regarding first aid for minor burns. Comic-based health education represents an attractive and effective learning strategy for adolescents and has the potential to strengthen school-based health promotion programs.

Keywords: burn injury; educational comics; first aid; health education; adolescents

INTRODUCTION

Burn injuries remain one of the leading causes of accidental injuries worldwide and continue to represent an important public health concern. Although severe burns receive greater clinical attention because of their association with disability and mortality, minor burns occur much more frequently in community settings and are often managed outside healthcare facilities. Adolescents constitute one of the vulnerable populations because they are actively involved in school activities, laboratory practice, cooking, sports, and various extracurricular programs that increase their exposure to heat sources, electricity, and hot liquids. Consequently, adequate knowledge regarding immediate first aid is essential to minimize tissue damage, reduce pain, prevent infection, and improve healing outcomes (Abarca et al., 2023; Jeschke et al., 2020).

Thermal burns remain a major global public health challenge despite substantial advances in prevention and clinical management. According to the Global Burden of Disease (GBD) 2021 study, an estimated 6.19 million new cases of thermal burns and approximately 104.76 million prevalent cases occurred worldwide in 2021, resulting in 2.67 million years lived with disability (YLDs). Although age-standardized incidence, prevalence, and

disability rates have declined since 1990, thermal burns continue to impose a considerable burden on healthcare systems, particularly in low- and middle-income countries. Population growth has been identified as the primary factor slowing reductions in the global burden of thermal burns, and projections indicate that while incident cases may gradually decline, the numbers of prevalent cases and burn-related disabilities are expected to continue increasing through 2040. These findings underscore the persistent need for effective prevention strategies, early management, and public education to reduce burn-related morbidity and long-term disability (Zhang et al., 2025).

In Indonesia, burn injuries continue to represent an important public health concern, with tens of thousands of cases requiring medical treatment each year. Although epidemiological reports primarily focus on moderate and severe burns, inadequate first aid for minor burns remains common in the community and may contribute to preventable complications, delayed wound healing, secondary infections, and unnecessary healthcare utilization. Misconceptions regarding initial burn management, including the application of toothpaste, butter, cooking oil, or other traditional substances, remain prevalent, highlighting the need for evidence-based educational interventions aimed at improving public

knowledge and first-aid practices. Appropriate first aid is widely recognized as one of the most important determinants of burn outcomes. Immediate cooling of the injured area with running water is strongly recommended because it limits thermal injury progression and reduces tissue destruction. However, misconceptions remain common within the community. The application of toothpaste, butter, cooking oil, coffee powder, or other traditional substances continues to be practiced despite lacking scientific evidence and potentially increasing the risk of infection or delayed wound healing. Such misconceptions largely arise from inadequate health literacy and insufficient exposure to evidence-based educational resources (Nofiyanto & Nirmalasari, 2020; Ramli, Prawoto, Riasa, Saputro, & Mas'ud, 2021; Wahyuningtyas, Handayani, Wijayatri, & Wardani, 2023).

Adolescence represents a critical developmental period during which individuals rapidly acquire knowledge, attitudes, and health-related behaviors that may persist into adulthood. Therefore, schools provide an ideal environment for delivering preventive health education. Nevertheless, conventional health education methods relying primarily on lectures or printed text frequently fail to maintain students' attention and motivation. Educational strategies that integrate visual elements, storytelling, and interactive learning experiences are considered more compatible with adolescents' learning preferences (Rumtali, Thalib, Nurhikmah, & Mustafa, 2024; Yeager, Dahl, & Dweck, 2018).

Educational comics have recently gained considerable attention as innovative learning media because they combine illustrations, narratives, and concise textual explanations within sequential visual stories. Compared with traditional educational materials, comics can simplify complex information, stimulate curiosity, improve reading engagement, facilitate memory retention, and increase learners' motivation. These characteristics make comics particularly suitable for health promotion among adolescents, whose learning styles are strongly influenced by visual communication and contextual storytelling (Rasamimanana, Mizzi, Melmi, Saffi, & Colé, 2025; Lukman & Fajriansi, 2025).

Previous studies have demonstrated the potential benefits of comic-based health education. Educational comics have been reported to improve students' understanding of various health topics and increase knowledge acquisition compared with conventional educational approaches. Electronic comics have also shown positive effects on improving students' knowledge of basic life support and other health-related competencies. Nevertheless, evidence specifically evaluating educational comics for first aid management of minor burns among Indonesian high school students remains limited. Existing studies have generally focused either on community knowledge or on other health education topics rather than burn first aid (Ramli et al., 2021).

A preliminary survey conducted at SMA Negeri 14 Ambon identified substantial deficiencies in students' knowledge regarding first aid for minor

burns. Most interviewed students were unable to correctly describe appropriate initial management, and several reported misconceptions regarding traditional burn treatments. These findings indicate a clear need for engaging educational interventions tailored to adolescents' cognitive characteristics and learning preferences.

Unlike conventional classroom-based education, comic-based learning combines entertainment with scientifically accurate health information, thereby promoting active engagement while facilitating comprehension and long-term knowledge retention. This educational approach is expected not only to improve immediate knowledge acquisition but also to encourage appropriate first-aid practices should burn injuries occur in everyday settings.

Therefore, this study aimed to evaluate the effectiveness of educational comic media in improving knowledge regarding first aid for minor burns among students at SMA Negeri 14 Ambon. The findings are expected to provide evidence supporting the integration of comic-based educational media into school health promotion programs and adolescent injury prevention strategies.

METHODS

Study Design

This study employed a quantitative pre-experimental design using a one-group pretest–posttest approach to evaluate the effectiveness of educational comics in improving students' knowledge regarding first aid for minor burns (Peat & Barton, 2005). Participants completed a knowledge assessment before receiving the educational intervention (pretest) and immediately after the intervention (posttest). Changes in knowledge scores before and after the intervention were compared to determine the effectiveness of the educational comic media.

Study Setting and Participants

The study was conducted at SMA Negeri 14 Ambon, Maluku Province, Indonesia, in October 2025. The target population consisted of all students enrolled at the school ($N = 200$). Participants were recruited from tenth-grade students because this age group is actively involved in various school activities that may expose them to minor burn injuries and represents an appropriate target for health education interventions. A total of 40 students participated in the study. Participants were selected using a quota sampling technique based on the predetermined sample size established by the researchers.

Educational Intervention

The intervention consisted of a structured educational session using an educational comic specifically developed to provide evidence-based information regarding first aid for minor burns. The comic contained illustrated scenarios explaining burn mechanisms, appropriate first-aid procedures, practices that should be avoided, and indications for seeking medical attention.

The educational intervention was delivered in three sequential stages:

- Distribution of the educational comic to each participant.
- Guided reading of the comic with the researcher.
- Interactive discussion and question-and-answer session to reinforce key learning points.

The intervention lasted approximately 30 minutes.

Data Collection

Data collection consisted of three consecutive phases.

First, participants completed a pretest questionnaire assessing baseline knowledge regarding first aid for minor burns. The pretest required approximately 30 minutes.

Second, participants received the educational comic intervention.

Finally, immediately after the intervention, participants completed the same questionnaire as a posttest to evaluate changes in knowledge following the educational session. The entire data collection process required approximately **90 minutes** for each study group.

Study Instrument

Knowledge regarding first aid for minor burns was measured using a structured self-administered questionnaire consisting of 15 dichotomous items (Yes/No) developed according to the educational content delivered during the intervention. Knowledge scores were classified into three categories: Good: 66.7–100% , Moderate: 33.3–66.6% , Poor: <33.3%. Higher scores indicated better knowledge regarding appropriate first aid for minor burns.

Variables

The independent variable was the educational comic intervention, whereas the dependent variable was students' knowledge regarding first aid for minor burns, measured before and after the intervention using the knowledge questionnaire.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics software (version XX). Descriptive statistics were used to summarize participants' demographic characteristics and knowledge levels before and after the intervention. Continuous variables were presented as means and standard deviations or medians and interquartile ranges where appropriate, whereas categorical variables were expressed as frequencies and percentages.

Since knowledge scores were paired observations obtained from the same participants before and after the intervention and did not meet the assumptions for parametric testing, differences between pretest and posttest scores were analyzed using the Wilcoxon signed-rank test. Statistical significance was established at $p < 0.05$.

Ethical Considerations

Ethical approval for this study was obtained from the appropriate institutional authority prior to data collection. Permission to conduct the study was obtained from the principal of SMA Negeri 14 Ambon. All participants received an explanation regarding the objectives and procedures of the study before participation. Written informed consent was obtained, participation was voluntary, and

confidentiality and anonymity of participants were maintained throughout the study.

RESULT

Participant Characteristics

A total of **40** tenth-grade students participated in this study, and all participants completed both the pretest and posttest assessments, resulting in a response rate of 100%.

Table 1. Characteristics of Participants (n = 40)

Characteristic	n	%
Age (years)		
15	19	47.5
16	21	52.5
Sex		
Male	17	42.5
Female	23	57.5

Table 1 shows that all 40 participants completed the study. The majority of participants were 16 years old (21 students, 52.5%), while 19 students (47.5%) were 15 years old. Based on sex, most participants were female (23 students, 57.5%), whereas 17 students (42.5%) were male.

Knowledge of First Aid for Minor Burns Before the Educational Intervention

Table 2. Knowledge Level Before the Educational Intervention

Knowledge Level	n	%
Poor	28	70.0
Moderate	11	27.5
Good	1	2.5
Total	40	100

Table 2 shows the participants' level of knowledge regarding first aid for minor burns before the educational intervention. Prior to the intervention, the majority of students had poor knowledge (28 students, 70.0%), followed by moderate knowledge (11 students, 27.5%). Only one student (2.5%) demonstrated a good level of knowledge before receiving the educational comic intervention.

Knowledge of First Aid for Minor Burns After the Educational Intervention

Table 3. Knowledge Level After the Educational Intervention

Knowledge Level	n	%
Poor	1	2.5
Moderate	22	55.0
Good	17	42.5
Total	40	100

Table 3 presents the participants' level of knowledge after the educational comic intervention. Following the intervention, the proportion of students with good knowledge increased to 17 students (42.5%), while 22 students (55.0%) demonstrated a moderate level of knowledge. Only one student (2.5%) remained in the poor knowledge category, indicating an overall improvement in students' knowledge following the educational intervention.

Effect of Educational Comics on Students' Knowledge

Table 4. Comparison of Students' Knowledge Before and After Educational Comic Intervention (n = 40)

Variable	Negative Ranks (%)	Positive Ranks (%)	Ties (%)	Z	p-value
Knowledge of first aid for minor burns	34 (85.0)	0 (0.0)	6 (15.0)	-5.359	<0.001

* Wilcoxon Signed-Rank Test; significance level set at $\alpha = 0.05$.

Table 4 presents the results of the Wilcoxon signed-rank test comparing students' knowledge before and after the educational comic intervention. The analysis showed that 34 participants (85.0%) experienced changes in their knowledge scores, while 6 participants (15.0%) had no change in their scores. The Wilcoxon signed-rank test revealed a statistically significant difference between pretest and posttest knowledge scores ($Z = -5.359$, $p < 0.001$). These findings indicate that the educational comic intervention significantly improved students' knowledge regarding first aid for minor burns.

DISCUSSION

The present study demonstrated that educational comics significantly improved high school students' knowledge regarding first aid for minor burns. Before the intervention, most participants had poor knowledge (70.0%), whereas after receiving comic-based education, the proportion of students with good knowledge increased substantially to 42.5%. Statistical analysis using the Wilcoxon signed-rank test further confirmed that the improvement was statistically significant ($p < 0.001$). These findings suggest that educational comics are an effective health education medium for improving adolescents' understanding of appropriate first-aid management for minor burns (Table 2, 3, 4).

The low level of knowledge observed before the intervention reflects the limited exposure of adolescents to evidence-based first-aid education. Many students were unfamiliar with the recommended initial management of burn injuries and were likely influenced by misconceptions commonly found in the community, such as applying toothpaste, butter, cooking oil, or other traditional substances to burn wounds. These misconceptions have been widely reported in previous studies and remain a major challenge in burn first-aid education because inappropriate initial management may increase tissue damage, delay wound healing, and elevate the risk of infection. Therefore, providing accurate and accessible educational resources for adolescents is an important component of injury prevention and health promotion(Riaz et al., 2020).

Following the intervention, students demonstrated a marked improvement in knowledge. This finding indicates that educational comics successfully facilitated the acquisition of essential first-aid information. Unlike conventional lecture-based education, comics present information through sequential illustrations, dialogues, and contextual storytelling that simplify complex concepts into meaningful learning experiences(Walsh et al., 2024). Visual narratives are particularly appropriate for adolescents because they maintain attention, increase engagement, and encourage active learning(Wicaksono et al., 2026). Consequently, students are more likely to understand and remember health-related information presented in comic format than information delivered solely through text-based educational materials.

The effectiveness of comic-based education observed in this study can be explained through the Cognitive Theory of Multimedia Learning proposed by Mayer. This theory suggests that individuals learn more effectively when verbal information is integrated with meaningful visual representations rather than presented as text alone. Educational comics simultaneously stimulate verbal and visual cognitive channels, allowing learners to organize and integrate new knowledge more efficiently while reducing unnecessary cognitive load. As a result, students are able to process, retain, and retrieve information more effectively during learning(Diaspita et al., 2026; Sorden, 2013).

Similarly, the findings are supported by Dual Coding Theory, which proposes that information encoded simultaneously through verbal and visual systems is retained more successfully than information processed through a single cognitive channel. The illustrations contained in educational comics reinforce textual explanations, enabling students to develop stronger mental representations of first-aid procedures. Consequently, knowledge acquired through comic-based learning is expected to be more durable and readily recalled when students encounter real-life situations requiring immediate first aid (Sorden, 2013).

The present findings are consistent with previous studies evaluating comic-based health education. Ansari et al. reported that educational comics significantly improved students' understanding of health-related topics compared with conventional educational approaches. Likewise, Saputri et al. demonstrated that electronic comic media effectively increased students' knowledge of basic life support among junior high school students. Although these studies addressed different health topics, they consistently indicate that comic-based educational media improve learning outcomes among adolescents by increasing motivation, attention, and comprehension (Kathiah et al., 2024; Nganro et al., 2025).

The improvement observed in this study may also be attributed to the interactive educational process employed during the intervention. Students not only read the educational comic but also participated in guided discussions and question-and-answer sessions. Interactive learning encourages learners to clarify misconceptions, reinforce newly acquired knowledge, and actively engage with educational content. Such learner-centered educational strategies have consistently been associated with improved knowledge acquisition compared with passive learning methods.

From a practical perspective, educational comics represent a low-cost, attractive, and easily disseminated educational medium that can be incorporated into school health promotion programs. Unlike digital interventions requiring internet access or electronic devices, printed educational comics are inexpensive, portable, and suitable for implementation in schools with limited technological resources. School nurses, community health nurses, teachers, and public health practitioners may therefore consider integrating comic-based education into routine health promotion activities to improve adolescents' first-aid knowledge and promote safer health behaviors (Brandt et al., 2025; Shin et al., 2022).

Despite these promising findings, several limitations should be acknowledged. First, the study employed a one-group pretest–posttest design without a control group, limiting the ability to attribute knowledge improvement solely to the intervention. Second, the relatively small sample size drawn from a single school may reduce the generalizability of the findings to broader adolescent populations. Third, knowledge was assessed immediately after the intervention, preventing evaluation of long-term knowledge retention or behavioral changes. Future studies should employ randomized controlled designs with larger and more diverse populations and include longer follow-up periods to determine whether improvements in knowledge are sustained and translated into appropriate first-aid practices.

The present study provides evidence that educational comics are an effective educational strategy for improving adolescents' knowledge regarding first aid for minor burns. Incorporating visually engaging educational media into school-based health education programs may contribute to improved health literacy, safer first-aid practices, and enhanced injury prevention among adolescents.

CONCLUSION

This study demonstrated that educational comics are effective in improving high school students' knowledge regarding first aid for minor burns. Following the educational intervention, participants showed a significant increase in knowledge, as

confirmed by the Wilcoxon signed-rank test ($p < 0.001$). These findings indicate that comic-based educational media can serve as an effective learning tool for delivering first-aid education among adolescents.

Educational comics offer an engaging, accessible, and practical approach to school-based health education by combining visual illustrations with simple explanatory text. Integrating comic-based learning into health promotion programs may enhance students' health literacy and preparedness to provide appropriate first aid for minor burns. Future studies employing randomized controlled designs, larger sample sizes, and long-term follow-up are recommended to evaluate the sustainability of knowledge retention and its impact on actual first-aid practices.

REFERENCES

- Abarca, L., Guilabert, P., Martin, N., Usúa, G., Barret, J. P., & Colomina, M. J. (2023). Epidemiology and mortality in patients hospitalized for burns in Catalonia, Spain. *Scientific Reports*, 13(1), 14364. <https://doi.org/10.1038/s41598-023-40198-2>
- Jeschke, M. G., van Baar, M. E., Choudhry, M. A., Chung, K. K., Gibran, N. S., & Logsetty, S. (2020). Burn injury. *Nature Reviews. Disease Primers*, 6(1), 11. <https://doi.org/10.1038/s41572-020-0145-5>
- Lukman, A. U., & Fajriansi, A. (2025). The Impact of Health Education Through Audio-Visual Media on Increasing Knowledge of Type 2 Diabetes Prevention Among Students. *Indonesian Journal of Nursing and Health Care*, 2(2: August), 18–22.
- Nofiyanto, M., & Nirmalasari, N. (2020). Topical Agents Used by Housewives as First Aid Burns in Sleman District Yogyakarta Indonesia. *Jurnal Keperawatan Respati Yogyakarta*, 7(2), 105–111. <https://doi.org/10.35842/jkry.v7i2.470>
- Peat, J., & Barton, B. (2005). *Medical Statistics*. New Delhi, India: Blackwell Publishing.
- Ramli, R. N., Prawoto, A. N., Riasa, N. P., Saputro, I. D., & Mas'ud, A. F. (2021). Epidemiology and Knowledge of First Aid Treatment Related to Burn Injury in the Rural Region of Kulon Progo, Indonesia. *Open Access Macedonian Journal of Medical Sciences*, 9(E), 101–108. <https://doi.org/10.3889/oamjms.2021.5649>
- Rasamimanana, M., Mizzi, R., Melmi, J.-B., Saffi, S., & Colé, P. (2025). Is Comprehension in Comics More Effective Than in Traditional Texts in Skilled Adult Readers? An Eye Movement-Based Study. *Cognitive Science*, 49(7), e70081. <https://doi.org/10.1111/cogs.70081>
- Rumtli, T., Thalib, A., Nurhikmah, N., & Mustafa, S. R. (2024). Simulation method for handling acute injuries to increase knowledge and skills of STIKES Graha Edukasi Makassar students. *Innovative Approaches in Health Science Journal*, 1(1), 23–27.

<https://doi.org/10.64871/3s9kxb65>

Wahyuningtyas, E., Handayani, E., Wijayatri, R., & Wardani, S. (2023). An Observational Study of Knowledge of First Aid for Burns among Parents in Indonesia. *Journal of Burn Care & Research*, 44, 1502–1508. <https://doi.org/10.1093/jbcr/irad088>

Yeager, D. S., Dahl, R. E., & Dweck, C. S. (2018). Why Interventions to Influence Adolescent Behavior Often Fail but Could Succeed. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science*, 13(1), 101–122. <https://doi.org/10.1177/1745691617722620>

Zhang, Y., Chen, Q., Wang, R., Guo, L., Li, P., Deng, K., ... Xu, X. (2025). Global trends in thermal burn burden, 1990-2021: a comprehensive analysis for the global burden of disease study 2021. *Frontiers in Public Health*, 13, 1631138. <https://doi.org/10.3389/fpubh.2025.1631138>