DOI: 10.35990/mk.v9n2.p127-136

Medika Kartika : Jurnal Kedokteran dan Kesehatan

RESEARCH ARTICLE

THE EFFECT OF THE WINGKOSMART EDUCATIONAL PLATFORM ON COMMUNITY KNOWLEDGE OF THE WOLBACHIA PROGRAM

(PENGARUH PENGGUNAAN PLATFORM EDUKASI WINGKOSMART TERHADAP TINGKAT PENGETAHUAN MASYARAKAT TENTANG PROGRAM WOLBACHIA)

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ABSTRACT

Dengue hemorrhagic fever (DHF) remained a major public health issue in Semarang City, with 404 reported cases and 16 fatalities in 2023. To address this issue, the Wolbachia-based vector control program, *WINGKO (Wolbachia Ing Kota Semarang)*, was introduced in 2023. However, public understanding of the program remained limited. This study aimed to evaluate the effectiveness of *WINGKOSmart*, a digital education platform, in improving community knowledge of the Wolbachia program. A quasi-experimental one-group pretest-posttest design was conducted from June to August 2025 in Muktiharjo Kidul Village, involving 30 purposively selected participants aged 18 to 59 years who were capable of using the internet. Data were collected using a validated 20-item questionnaire and analyzed using the Wilcoxon test. The results showed significant improvement in respondents' knowledge after the intervention ($p < 0.05$). The proportion of respondents in the "good" knowledge category increased across all subgroups, with younger respondents (87.5%), females (92%), high school graduates (91.3%), and unemployed participants (90%) demonstrating the greatest improvements, while the "poor" knowledge category was eliminated. The study concluded that *WINGKOSmart* effectively improved community knowledge of the Wolbachia program and has strong potential as a digital-based health promotion strategy to support dengue control efforts in Semarang City.

Keywords: dengue hemorrhagic fever, health education platform, Wolbachia

ABSTRAK

Demam Berdarah Dengue (DBD) masih menjadi masalah kesehatan masyarakat yang signifikan di Kota Semarang, dengan 404 kasus dilaporkan dan 16 kematian pada tahun 2023. Untuk mengatasi hal tersebut, program pengendalian vektor berbasis Wolbachia, WINGKO (*Wolbachia Ing Kota Semarang*) *diperkenalkan pada tahun 2023. Namun, pemahaman masyarakat terhadap program ini masih beragam. Penelitian ini bertujuan untuk mengevaluasi efektivitas* WINGKOSmart, *sebuah platform edukasi digital dalam meningkatkan pengetahuan masyarakat mengenai program Wolbachia. Desain penelitian kuasi-eksperimental dengan rancangan satu kelompok pre-test dan post-test dilakukan pada bulan Juni hingga Agustus 2025 di Kelurahan Muktiharjo Kidul. Penelitian ini melibatkan 30 partisipan yang dipilih*

secara purposif dengan usia 18–59 tahun dan mampu menggunakan internet. Data dikumpulkan melalui kuesioner tervalidasi berjumlah 20 pertanyaan dan dianalisis menggunakan uji Wilcoxon. Hasil penelitian menunjukkan adanya peningkatan signifikan pada pengetahuan responden setelah intervensi (p < 0,05). Kategori pengetahuan "baik" meningkat pada seluruh subkelompok, dengan responden usia muda (87,5%), perempuan (92%), lulusan SMA (91,3%), dan peserta yang tidak bekerja (90%) menunjukkan peningkatan paling menonjol, sementara responden dengan kategori "kurang" tidak ada. Penelitian ini menyimpulkan bahwa WINGKOSmart *efektif dalam meningkatkan pengetahuan masyarakat mengenai Wolbachia dan memiliki potensi kuat sebagai strategi promosi kesehatan berbasis digital untuk mendukung upaya pengendalian DBD di Kota Semarang.*

Kata kunci: demam berdarah dengue, platfrom edukasi kesehatan, wolbachia

INTRODUCTION

Dengue hemorrhagic fever (DHF) is a communicable disease caused by the dengue virus and transmitted by *Aedes* spp. mosquitoes.[1] According to data from the Semarang City Health Office, there were 404 reported DHF cases with 16 fatalities in 2023.[2] Despite various vector control efforts, the high number of cases indicates the need for innovative mosquito control strategies. One such innovation is the use of Wolbachia technology, in which the bacterium inhibits dengue virus replication within mosquitoes.[3] Semarang City was selected as one of the pilot project implementation sites in Indonesia, under the *WINGKO* (*Wolbachia Ing Kota*) Semarang program, which was initiated in September 2023.[4] Since the program was only fully implemented city-wide in 2024, public understanding of the program remained limited.[5]

Previous studies revealed that the level of knowledge among high school students in Semarang regarding dengue prevention using Wolbachia technology was relatively low, with a mean post-test score of 50.6 (95% CI: 4.6–5.6).[6] A study conducted among community women's groups (*PKK*) in Semarang also reported that, prior to socialization activities, 29.7% of respondents had poor knowledge and 54% had moderate knowledge of Wolbachia.[7] These concerns were largely driven by misinformation and a lack of comprehensive socialization, which contributed to doubts about the safety and effectiveness of the technology.[8] In contrast, the Wolbachia Program in Yogyakarta has been proven to reduce DHF cases by up to 77%.[9] This success was strongly supported by active community participation and a high level of public understanding of the program, demonstrating that effective public communication plays a crucial role in successful implementation.[10]

With the advancement of digital technology, the use of internet-based platforms has become an effective solution

for disseminating health information to the public.[11] Therefore, the development of **WINGKOSmart** (*Wolbachia Ing Kota Semarang-Smart*), a digital education platform available at www.wingkosmart.com, represents a strategic effort to enhance community understanding of the Wolbachia program in Semarang. Digital education platforms offer flexibility by enabling users to access materials anytime and anywhere, thereby increasing opportunities for independent learning. The use of the WINGKOSmart in this study was intended to assess community knowledge levels before and after the intervention, providing evidence of improvements in awareness and understanding of the importance of the Wolbachia Program in dengue control in Semarang City.

MATERIALS AND METHODS

This study employed a quasi-experimental design with a one-group pretest–posttest approach to compare participants' level of knowledge before (pretest) and after (posttest) using the WINGKOSmart educational platform. The study was conducted from June to August 2025 in Muktiharjo Kidul Village, Semarang City. The data collected consisted of both primary and secondary data. Primary data were obtained through observations, interviews, and questionnaire responses, while secondary data were obtained from a review of relevant literature and the distribution map of Wolbachia implementation areas in Semarang City.

The research instrument consisted of a 20-item questionnaire that was tested for validity and reliability prior to data collection. In addition, the researchers developed the WINGKOSmart educational platform, available at www.wingkosmart.com, which served as the educational intervention in this study. The study sample was selected using purposive sampling and consisted of 30 participants. Participants were recruited directly from households in Muktiharjo Kidul Village, where the researchers conducted door-to-door screening to identify eligible individuals based on the inclusion criteria. The inclusion criteria were individuals who possessed a Semarang City identification card, had resided in the city for at least three years, were aged 18 to 59 years, and were capable of using the internet. The exclusion criteria were individuals who did not meet the inclusion criteria or declined to participate in the study.

Data were analyzed using the Wilcoxon test to examine differences in community knowledge before and after the intervention. Differences were considered statistically significant at a p-value of < 0.05. All statistical analyses were

performed using SPSS version 16.0. This study received ethical approval from the Ethics Committee of Universitas Ngudi Waluyo (Approval No. 315/KEP/EC/UNW/2025).

RESULTS AND DISCUSSION

Table 1 presents the characteristics of the respondents, showing that the majority were aged 18 to 30 years (53.3%), female (83.3%), high school graduates (76.7%), and unemployed (66.7%). These characteristics may have contributed to the success of the intervention, as younger age groups tend to be more adaptive to digital technology.[12] This finding is consistent with previous research, which reported that younger individuals adapt more quickly and prefer digital-based health education compared with older age groups.[13] Similar results were also reported by Mancone et al. (2024), who found that younger age groups preferred digital platforms and social media for health education because they were considered more practical and easily accessible.[14]

Furthermore, most respondents were women and non-working individuals, such as housewives, who generally have more time to participate in educational activities. This characteristic may have enhanced the effectiveness of the intervention, as housewives play an important role as agents of change within the family, particularly in promoting family health.[15] This finding is consistent with a 2024 study demonstrating that housewives play a strategic role in disseminating health information within both the family and the community.[16] In addition, Syarwani et al. (2022) emphasized that women, especially housewives, tend to have higher participation rates in health education programs due to their flexible schedules and motivation to improve family health.[17]

Table 1 Characteristic of the respondents

Characteristic	n	%
Age		
18-30 years	16	53,3%
31-55 years	14	46,7%
Gender		
Male	5	16,7%
Female	25	83,3%
Education		
High school graduate	23	76,7%
University graduate	7	23,3%
Occupation		
Unemployed	20	66,7%
Employed	10	33,3%

*(n=30)

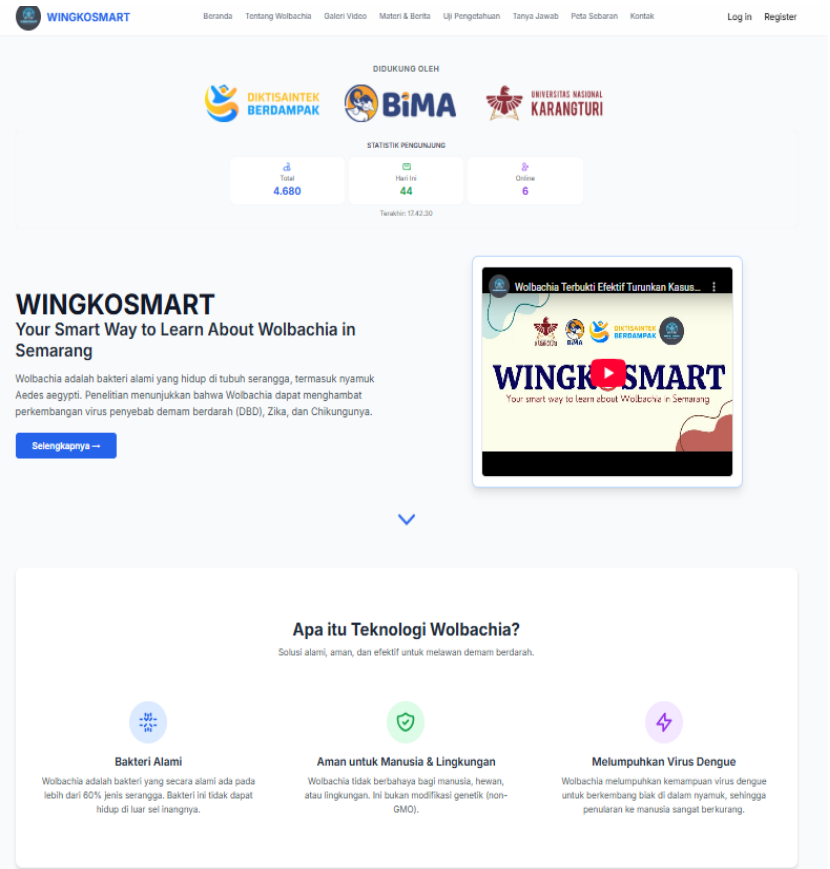

Figure 1 WINGKOSmart educational platform (www.wingkosmart.com).

In addition to respondents' characteristics, this study also collected data on respondents' preferred sources of health information (**Table 2**). The findings indicated that digital or online media (e.g., websites, social media, and e-learning) were the most preferred source (43.3%), followed by electronic media (e.g., television, radio, and educational films) (33.3%), whereas face-to-face media (6.7%) and printed media (3.3%) were less preferred. Previous studies have found that the younger generation in Indonesia tends to prefer digital platforms due to their accessibility and the speed at which information can be obtained.[18] Moreover, Sultan (2024) highlighted that digital media has revolutionized the paradigm of health communication in Indonesia, replacing much of the role of traditional media through wider use, interactivity, and greater accessibility to the public.[19]

Table 2 Respondents' preferred sources of information about the WINGKO program

Preferred Sources of Information	Distribution	
	n	%
Printed media (e.g., brochures, books, billboards,)	1	3%
Electronic media (e.g., TV, radio, educational films	4	13%
Face-to-face media (e.g., counseling, seminars, discussions)	2	7%
Digital/online media (e.g., websites, social media, e-learning)	13	43%
Electronic media (e.g., TV, radio, educational films)	10	33%

Figure 2 shows an increase in respondents' knowledge levels after the intervention using the WINGKOSmart digital education platform. The most notable improvement was observed in the "good" knowledge category, which increased in both mean scores and the proportion of respondents. Conversely, the "fair" knowledge category declined as respondents shifted to the "good" category. The most evident change was the elimination of the "poor" knowledge category, accompanied by a shift from "fair" to "good." Furthermore, the posttest results demonstrated a significant improvement in knowledge across all groups (**Table 3**). Among respondents aged 18 to 30 years, the proportion in the "good" category increased to 87.5%, while among those aged 31 to 59 years, it reached 93.9%, with no respondents remaining in the "poor" category. By gender, female respondents showed greater improvement (92%) than male respondents (80%). In terms of education, respondents with a high school background (91.3%) and those with higher education (85.7%) both demonstrated increased knowledge. Similarly, both employed and unemployed groups achieved 90% in the "good" category.

Table 3 Distribution of respondents by posttest knowledge level

Respondent Characteristics		Posttest Knowledge Level			
		Good		Fair	
		N	%	N	%
Age	18-30 years	14	87,5	2	12,5
	31-59 years	13	93,9	1	7,1
Gender	Male	4	80	1	20
	Female	23	92	2	8
Education	High school graduate	21	91,3	2	8,7
	University graduate	6	85,7	1	14,3
Occupation	Unemployed	18	90	2	10
	Employed	9	90	1	10

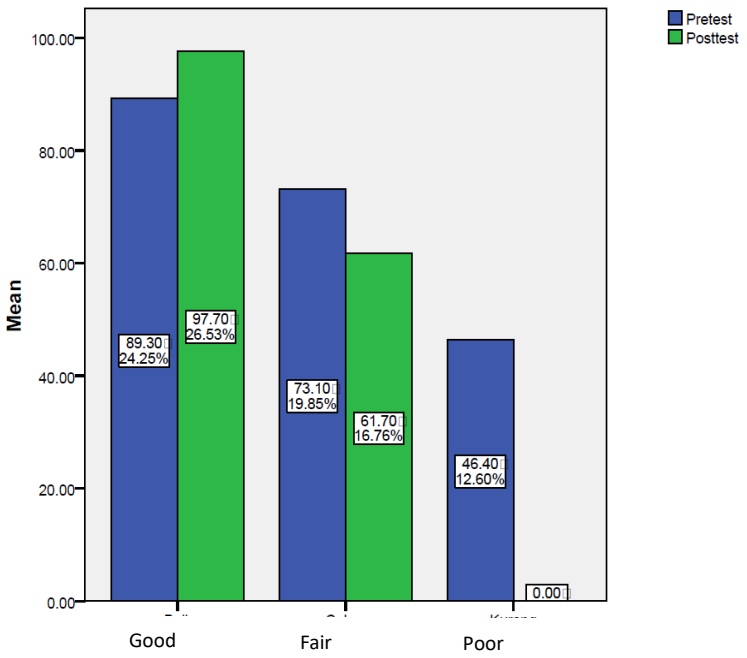

Figure 2 Comparison of knowledge levels between pretest and posttest.

These findings are consistent with those of Dong et al. (2021), who reported that digital health education interventions can significantly improve health literacy among both younger and adult populations.[20] In addition, the findings of this study support those of Aldhafeeri et al. (2022), who reported that women and individuals with secondary education can benefit from digital education, provided that the content is delivered in a simple and interactive manner.[21] The use of digital platforms enables faster, more accessible, and more interactive dissemination of information.[22] Therefore, WINGKOSmart as an education platform has been proven effective in improving community knowledge across age, gender, education, and employment groups, making it a feasible recommendation as a primary strategy for technology-based health promotion, particularly for the WINGKO Program in Semarang City.

While the WINGKOSmart platform proved effective, this study has several limitations. First, the sample size was relatively small (n=30) and limited to one sub-district, which may affect the generalizability of the findings to the broader Semarang population. Second, the quasi-experimental design without a control group limited the ability to attribute changes in knowledge solely to the intervention. Third, the assessment focused only on short-term knowledge improvement, without evaluating long-term retention or

behavioral changes in dengue prevention practices.

Future studies should consider involving larger and more diverse samples across different regions, employing randomized controlled designs, and integrating follow-up assessments to evaluate the sustainability of knowledge gains. Additionally, combining digital platforms with offline socialization activities may further enhance program reach, reduce misinformation, and build stronger community trust in Wolbachia technology.

CONCLUSION

This study demonstrated that the WINGKOSmart digital education platform was effective in significantly improving community knowledge about the Wolbachia Program for dengue control in Semarang City. Respondents across different age groups, genders, educational levels, and employment statuses demonstrated substantial improvement in knowledge following the intervention. These findings highlight the potential of digital platforms as accessible, flexible, and interactive tools for health education, particularly in enhancing public understanding and acceptance of innovative disease control strategies such as Wolbachia technology. Strengthening community knowledge is crucial for fostering participation and ensuring the long-term success of the WINGKO Program in Semarang City.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in this scientific article.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to the Ministry of Higher Education, Science, and Technology (Kemdiktisaintek) for providing financial support through the 2025 Penelitian Dosen Pemula (PDP) Grant, which made this research possible.

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