



Research Article

The Relationship Between Knowledge and History of Dengue Hemorrhagic Fever and Community Participation as Foster Parents of the Wolbachia-Aedes Program in Tembalang Subdistrict, Semarang City

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ABSTRACT

The Wolbachia–Aedes technology was implemented in 2023 as part of the dengue control programme in Semarang City, with Tembalang Subdistrict designated as the pilot project area. In 2024, Tembalang recorded the highest incidence of dengue cases in the city. This study aimed to examine the relationship between knowledge and history of dengue hemorrhagic fever and community participation as foster parents (orang tua asuh / OTA) of the Wolbachia-Aedes program in Tembalang subdistrict, Semarang City. This study employed was a cross-sectional approach involving of all heads of families (Kepala Keluarga / KK) in Tembalang Subdistrict, Semarang City. A simple random sampling technique was used to select a sample of 110 families. The subject of this study consisted of individuals aged 17 years and older who resided in Tembalang Subdistrict. Data were collected using a questionnaire and analyzed using chi-squared statistical test. The findings revealed that a relationship between the family history of dengue (p -value = 0.003) as well as the respondent's or family history of hospitalization due to dengue (p -value = 0.001) and community participation as foster parents. However, no relationship was found between the level of knowledge (p -value = 0.966) as well as the respondent's history of dengue (p -value = 0.582) and community participation as foster parents.

Keywords: knowledge, disease history, foster parents, dengue)

INTRODUCTION

Dengue haemorrhagic fever (DHF) remains one of the major public health problems in Indonesia, with cases showing an annual upward trend. Semarang City, as a dengue-endemic area, continues to face significant challenges in controlling the spread of the disease. Tembalang Subdistrict is among the areas in Semarang that have consistently reported a high incidence of dengue cases. In 2024, Tembalang recorded an incidence rate (IR) of 24.03 per 100,000 population (Dinas Kesehatan Kota Semarang, 2023).



In line with the Decree of the Minister of Health No. 1341 of 2022, the Indonesian Ministry of Health launched a pilot project for dengue control through the implementation of the Wolbachia–*Aedes* technology. This programme represents the latest innovation in dengue prevention and control efforts (Biro Komunikasi dan Pelayanan Publik Kementerian Kesehatan RI, 2023; Kementerian Kesehatan Republik Indonesia, n.d.; Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023). Using Wolbachia bacteria to prevent the virus from spreading in the mosquito's body and reduce virus transmission (Nordin et al., 2022; Utarini et al., 2021). This technology been implemented in five cities, including Semarang City, which is one of the endemic areas of dengue infection in Central Java. Dengue cases in Semarang City nearly tripled between 2022 and 2023, while the mortality rate in 2023 for times higher than in 2021 (Biro Komunikasi dan Pelayanan Publik Kementerian Kesehatan RI, 2023; Pemerintah Kota Semarang, 2023). As a result, Semarang City was selected as the first location in Central Java to implement the Wolbachia–*Aedes* innovation.

The Wolbachia–*Aedes* technology in Indonesia relies on community involvement, particularly through the participation of cadres and residents in its implementation (Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023). Community participation is a crucial factor in the success of this program, especially through the role of foster parents (*orang tua asuh* /OTA). Foster parents in the context of the Wolbachia mosquito program are individuals or families who are willing to accommodate and care for containers containing *Aedes aegypti* eggs that have been inoculated with Wolbachia bacteria in their homes (Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023). Their role is essential in ensuring that the eggs hatch and develop into adult mosquitoes carrying Wolbachia, which then interact with local mosquito populations to reduce the spread of diseases such as DHF (Dinas Kesehatan Kota Semarang, 2024; Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023; Santosa, 2024). In addition, foster parents are responsible for ensuring that mosquito breeding occurs in a controlled manner (Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023; Santosa, 2024). However, the level of community participation in this programme remains inconsistent, influenced by various factors, including the level of knowledge, history of DHF, and history of hospitalisation due to dengue.

This variability in participation is important to examine, as a family history of illness can increase risk awareness regarding the dangers of dengue. Previous research has shown that individuals with direct or indirect experience of dengue are more likely to recognise the importance of preventive measures (Anasari & Pantiawati, 2021; Dewi & Azam, 2018). Nevertheless, few studies have explored the relationship between knowledge, history of hospitalisation due to dengue, and community participation in innovative interventions such as the Wolbachia–*Aedes* programme. Therefore, this study aimed to determine the influence of knowledge level and history of illness on community participation as foster parents in the Wolbachia–*Aedes* programme in Tembalang Subdistrict.

MATERIAL AND METHODS

This study used a cross-sectional analytical design to examine the relationship between the level of knowledge and history of dengue fever and community participation as foster parents in the Wolbachia–*Aedes* program. This study was conducted in Tembalang Subdistrict, Semarang City from July to September 2024. The research subjects were selected using a random sampling technique from all heads of families residing in eight villages in Tembalang Subdistrict.

The sample size was determined using the Slovin's formula with a significance level of (α) of 5%, resulting a total of 110 participating families. The subject inclusion criteria's were the head of the family or a family member 17 years or older, residing in Tembalang Subdistrict for at least six months, possessing adequate communication skills, and willing to be a research participant by signing the informed consent form.

Data were collected through interviews by enumerators using research questionnaires. The questionnaire consisted of questions related to the characteristics of the respondents (name, age, sex, education level, employment status and income), level of knowledge, history of dengue fever, family history of dengue fever, history of hospitalization due to dengue fever and community participation a foster parent of the Wolbachia-Aedes program. Foster parents in the context of the Wolbachia mosquito program are individuals or families within the community who agree to host and maintain containers holding *Aedes aegypti* eggs inoculated with Wolbachia bacteria in their homes (Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023). The knowledge questionnaire consists of six questions related to Wolbachia technology and its implementation.

Descriptive analysis was conducted to analyze the frequency distribution of respondents' characteristics, level of knowledge, personal history of dengue fever, family history of dengue fever, history of hospitalization due to dengue fever, and participation a foster parent. The relationship between these variables was analyzed using the chi-squared test with a significance level (α) of 0.05. The statistical test was carried out using Stata version 15.1 SE (Yatra et al., 2015). This study received ethical approvals from the Health Research Ethics Committee, Faculty of Public Health, Universitas Diponegoro with letter number 244/EA/KEPK-FKM/2024.

RESULTS AND DISCUSSION

The majority of respondents were in the middle-aged group (45–59 years) (62.73%), female (95.45%), and had attained higher education, ranging from senior high school to university level (80.00%). Most respondents were unemployed (82.73%) and reported having no income (83.64%).

Regarding participation as foster parents in the Wolbachia programme in Semarang City, 77.27% of respondents reported not participating. With respect to dengue fever history, 6.36% had been diagnosed with the disease themselves, while 16.36% reported having a family member who had been diagnosed. Among those with a history of dengue fever, 15.35% stated that they or a family member had been hospitalised due to the illness.

Table 1. Frequency distribution of the characteristics of respondents

Variable	n	%
Age		
Teenager (18-25 years old)	4	3.64
Adult (26-45 years old)	37	33.64
Middle age (45-59 years old)	69	62.73
Sex		
Male	5	4.55
Female	105	95.45
Education Level		
Primary (elementary school to junior high school)	22	20.00
Higher (senior high school to university)	88	80.00
Employment Status		
Employed	19	17.27
Unemployed	91	82.73
Family Income/month		
No income	92	83.64
≤ the regional minimum wage	14	12.73
≥ the regional minimum wage	4	3.64
Participation as Foster Parents		
Yes	25	22.73

No	85	77.27
Personal History of Dengue Fever		
Yes	7	6.36
No	103	93.64
Family History of Dengue Fever		
Yes	18	16.36
No	92	83.64
Pernosal/Family History of hospitalization due to Dengue		
Yes	17	15.45
No	93	84.55
Level of Knowledge		
Good	36	32.73
Poor	74	67.27

Table 2 presents the frequency distribution of the study variables. In terms of knowledge, most respondents (67.27%) were unaware that Wolbachia is not found in other living organisms, including insects. Furthermore, 82.73% incorrectly believed that Wolbachia is a genetically engineered product developed by the government.

Table 2. Frequency distribution of the respondents' level of knowledge regarding the implementation of Wolbachia

Variable	True		False	
	n	%	n	%
Wolbachia is a dangerous type of virus	31	28.18	79	71.82
The Wolbachia-Aedes innovation is applied to inhibit the dengue virus in the body of <i>Aedes aegypti</i> mosquitoes	93	84.55	17	15.45
The implementation of the Wolbachia-Aedes innovation aims to control malaria and elephantiasis	26	23.64	84	76.36
Wolbachia is not found in other living things including insects	74	67.27	36	32.73
Wolbachia is a genetically engineered product developed by the government	91	82.73	19	17.27
The Wolbachia-Aedes innovation has been tested in Yogyakarta for five to six years with effective results	82	74.55	28	25.45

The results of this study showed a relationship between family history of dengue fever and participation as foster parents (p -value = 0.003), as well as personal or family history of hospitalization and participation as foster parents (p -value = 0.001). However, no relationship was found between personal history of dengue fever (p -value=0.582) and level of knowledge (p -value=0.966) with participation as foster parents, as seen as in Table 3.

The implementation of the Wolbachia technology in Semarang City began in 2023 across 12 villages in Tembalang Subdistrict. The implementation of this program involves collaboration among various parties such as the village government, heads of neighborhood (*rukun tetangga*/RT) and community units (*rukun warga*/RW), community cadres, educational institutions and residents in Tembalang Subdistrict. The results of this study showed a relationship between the family history of dengue fever and the level of community participation as Wolbachia foster parents. This may be attributed to the higher awareness among families who have experienced dengue cases, leading to an increased perception of the risks of dengue fever. Individuals who have experienced an illness are more likely to develop a deeper understanding of the dangers of the disease, which to participate in disease prevention efforts.(Tuba et al., 2023) The results of this study are consistent with a study in Bandung City, which also found a relationship between the family experience with dengue fever

and the participation in the Mosquito Nest Eradication (*Pemberantasan Sarang Nyamuk/PSN*) (Tuba et al., 2023). In addition, this study found a relationship between the history of hospitalization and participation as Wolbachia foster parents. Experiencing of hospitalization due to dengue fever, especially when it affects an individual or an immediate family member, can be an emotional moment for the family, potentially causing trauma and psychological stress (Anasari & Pantiawati, 2021; Dewi & Azam, 2018; Kusuma et al., 1984). Such experiences can increase the motivation of families to be more actively engaged in disease prevention and control programs.

Table 3. Relationship between dependent and independent variables

Variable	Participation as Foster Parents				p-value	OR (95% CI)
	n	Yes %	n	No %		
Personal history of dengue fever						
Yes	1	14.29	6	85.71	0.582	0.5846 (0.0115-4.9006)
No	24	23.30	79	76.70		
Family history of dengue fever						
Yes	9	50.0	9	50.0	0.003	4.75 (1.4021-5.7672)
No	16	17.39	76	82.61		
Personal/Family History of hospitalization due to Dengue						
Yes	9	52.94	8	47.06	0.001	5.4140 (1.5578- 8.616)
No	16	17.20	77	88.80		
Level of knowledge						
Good	16	22.86	54	77.14	0.966	1.0206 (0.3711-2.9508)
Poor	9	22.50	31	77.50		

A family history of dengue fever and even hospitalization can also encourage individuals to become agents of change in their communities. Those who have suffered from dengue are more likely to share their experiences and encourage others to participate in disease prevention programs to help others avoid similar conditions. This can foster greater community participation in disease prevention programs promoted by the health office and/or local health centers (Dewi & Azam, 2018; Harapan et al., 2016; Trauth et al., 2000; Trisnaniyanti et al., 2010; Tuba et al., 2023). Furthermore, having a family members affected by dengue tends to increase the family knowledge regarding the severity of the disease and increase the perception of self-vulnerability, thereby strengthening the willingness to participate in dengue prevention and control efforts (Harapan et al., 2016; Trauth et al., 2000). Conversely, families without prior experience of illness or hospitalization due to dengue tend to be more indifferent to dengue prevention efforts. Personal or familial experience with dengue not only raise awareness and but also facilitate learning within families, enabling them to better anticipate the severity of the disease and encouraging them to play a more active role in dengue prevention efforts (Dewi & Azam, 2018; Tuba et al., 2023).

This study found no relationship between public knowledge and community participation as foster parents. Most respondents still lacked an understanding of the bioecology of Wolbachia bacteria and were unfamiliar with the process of its implementation with mosquitoes. An individual level of knowledge can be influenced by various factors, including access to disease prevention information from various sources such as family, the surrounding community, health workers, and media (Dewi & Azam, 2018). However, experience is one of the factors that shapes knowledge and behavior. Hands-on health-related experience can strengthen the existing knowledge and encourage practical application in daily life (Notoatmodjo, 2011; Rachmawati, 2012).

The implementation of Wolbachia technology in Semarang City follows a community-based strategy encouraging the community to play an active role in preventive measures against dengue

(Dinas Kesehatan Kota Semarang, 2024; Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023; Santosa, 2024). Community involvement aims to foster a shared understanding in the community so as to minimize resistance to the implementation of Wolbachia technology in Semarang City. In addition, the community plays a crucial role in implementing the program particularly in maintaining the bucket storage system for the spread of Wolbachia-Aedes distribution. The role of the community as foster parents in the Wolbachia-Aedes technology program is vital in the success of this program, the effectiveness of this program depends on the active community participation in caring for and ensuring the hatching of mosquitoes with Wolbachia (Petunjuk Teknis Penyelenggaraan Pilot Project Penanggulangan Dengue Dengan Metode Wolbachia, 2023; Santosa, 2024). To enhance the effectiveness of the Wolbachia-Aedes program, efforts should be made to public knowledge and awareness, thereby increasing participation and willingness to become foster parents.

The implementation of the Wolbachia-Aedes innovation is a relatively new, especially in Semarang City. Therefore, this study has limitations due to its cross-sectional design which restricted the ability to data on individuals participating as foster parents in Tembalang Subdistrict. Consequently, further research, should consider employing a broader sample and incorporating more in-depth variables.

CONCLUSION AND SUGGESTION

This study found a relationship between the family history of dengue fever (p-value = 0.003) and the personal or family history of hospitalization due to dengue (p-value = 0.001) and community participation as foster parents. Additionally, this study found no relationship between the level of knowledge (p-value = 0.966) and the personal history of dengue fever (p-value = 0.582) and community participation as foster parents. Therefore, efforts should be made by the health office and relevant health centers to increase public knowledge regarding the Wolbachia-Aedes program, ultimately increasing the awareness and public participation in the dengue control programs in Semarang City.

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CONFLICT OF INTEREST

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

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