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Effectiveness of the UFESA Model: A Culturally Grounded Intervention to Improve Adherence to Lymphatic Filariasis Mass Drug Administration in Papua, Indonesia

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ABSTRACT

Background: Lymphatic filariasis remains a public health challenge in Papua because of low adherence to mass drug administration (MDA). **Objective**: This study evaluated the effectiveness of the UFESA model—a culturally tailored intervention integrating health education, family support, and traditional leader engagement—in improving adherence to preventive filariasis medication in Sarmi District. **Materials and Methods:** A quasiexperimental pretest–posttest control group design was implemented across two health centers (intervention: Bagaiserwar; control: Sarmi Kota), with 160 participants recruited via multistage random sampling. The primary outcome was adherence across three MDA cycles; secondary outcomes included knowledge, attitudes, and support measures. The data were analyzed via chi-square, Mann–Whitney U, and Wilcoxon tests. **Results:** Adherence increased from 38.8% to 87.5% in the intervention group, whereas it increased from 26.2% to 52.5% in the control group ($p < 0.001$). All the adherence dimensions were significantly greater in the intervention group. Knowledge increased from 3.00 to 10.00 (intervention) versus 2.00 to 4.00 (control), with similar improvements in attitudes and support ($p < 0.001$). The instruments showed strong reliability ($\alpha > 0.80$) and validity. The effect sizes were medium to large (Cohen's d=0.68–0.78; Cramer's V=0.38–0.45). **Conclusion:** The findings provide evidence of the effectiveness of the UFESA model in enhancing medication adherence and addressing psychosocial determinants, highlighting the value of culturally grounded, psychometrically rigorous interventions in public health.

Keywords: Filariasis, mass drug administration, adherence, local culture, psychometric testing

INTRODUCTION

Lymphatic filariasis remains a pressing public health problem in endemic regions, not only because of its chronic disease burden but also because of challenges in adhering to mass drug administration (MDA) programs[1]. Numerous studies have demonstrated that both the success and failure of MDA are influenced by internal factors—such as knowledge, attitudes, and practices—as well as external factors, including sociocultural support, the role of community health workers/cadres, and the effectiveness of health communication at the community level[2,3]. However, the literature rarely presents an intervention model that explicitly integrates educational, cultural, and structural dimensions within a locally grounded community framework[4].

The context of Papua, particularly Sarmi District, provides a strong empirical foundation for a culturally based approach. Previous studies indicate that adherence to MDA in Papua is among the lowest in Indonesia and is shaped by geographical, social, and cultural factors[5,6]. The people of Sarmi maintain strong customary social structures, with traditional leaders (*saa temto*/keret heads) exerting considerable authority in collective decision-making. This condition is highly relevant to the design of community-based health interventions, as MDA coverage in the region does not always correspond to actual medication adherence[7]. From a psychosocial perspective, these dynamics can also be interpreted through behavioral theories: the health belief model highlights how perceptions of risk, benefits, and barriers influence adherence, whereas the theory of planned behavior emphasizes the role of attitudes, subjective norms, and perceived behavioral control in shaping medication-taking behavior[8].

This study introduces the UFESA model as a novel approach to address this gap. The UFESA model (Ube Fonggomu/knowledge sharing; Fe Semseme/family support; Saah Temto/traditional leader support) was developed as a culturally embedded social education intervention. It combines knowledge enhancement, the reinforcement of attitudes and practices, and the mobilization of family and traditional leader support to improve adherence to preventive treatment. The strength of the UFESA lies in its ability to weave sociocultural assets—such as kinship, cooperation, and customary communication—into practical mechanisms of behavior change within the endemic context of Papua. The evidence suggests that community-based interventions involving local health workers can significantly improve adherence to treatment for infectious diseases among individuals with low incomes in South Asian urban settings[9]. Furthermore, systematic reviews highlight the crucial role of community participation in achieving success in infectious disease control, particularly in maintaining adherence to long-term therapies[10].

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Grounded in local needs, the scientific gap in the literature, and an operational design that leverages customary structures, this study aims to evaluate the effectiveness of the UFESA model in improving adherence to filariasis preventive treatment among communities in Sarmi District. It also seeks to assess changes in knowledge, attitudes, family support, and traditional leader support as key determinants of these outcomes. Beyond Papua, the importance of culturally tailored approaches has been demonstrated elsewhere: a randomized controlled trial among Asian–American communities with chronic hepatitis B showed that culturally adapted interventions improved both treatment adherence and access to care [11]. Thus, the current study not only contributes to public health but also provides methodological insights into the intersection of medical anthropology, health psychology, and the psychometric evaluation of community-based interventions. More broadly, this study contributes to the development of health promotion strategies that rigorously integrate medical anthropology and community empowerment to address communicable diseases in high-risk settings.

MATERIALS AND METHODS

Study design

This study employed a quasiexperimental pretest–posttest control group design to evaluate the effectiveness of the UFESA model in improving adherence to preventive filariasis medication. Measurements were conducted before the intervention (pretest) and after the intervention (posttest one and posttest 2) in two separate groups: the intervention group and the control group. The intervention group received the UFESA model, whereas the control group received only routine education from the National Mass Drug Administration (MDA) program for filariasis, as implemented by the health center. This design was selected because it allows assessment of causal inference in real-world settings where randomized allocation is not feasible, a methodological approach widely used in applied psychology and health behavior research[12,13].

Study setting

The study was conducted in Sarmi District, Papua Province, an area with a high prevalence of filariasis and persistently low adherence to preventive medication. The community in Sarmi is dominated by five major tribes—Sobei, Armati, Rumbuai, Manirem, and Isirawa (SARMI)—whose social structures are strongly influenced by traditional leaders. This cultural context underscores the importance of involving traditional leaders in supporting the success of community-based health programs.

Two primary health centers were selected as study sites. The Bagaiserwar Health Center, located in East Sarmi District, was designated as the intervention site, covering 12 villages with approximately 1,935 inhabitants. The Sarmi Kota Health Center served as the control site, covering 12 urban wards with a population of 12,595. Both sites were selected for their high burden of clinical filariasis cases and low adherence to the MDA program.

Given the quasiexperimental design and the use of two distinct health center catchment areas, baseline differences in population size, urban–rural context, and occupational structure were anticipated. To mitigate potential baseline nonequivalence, this study employed a pretest–posttest design with repeated measurements, allowing each group to serve as its own comparator over time. Accordingly, the primary inferences were based on within-group changes and between-group differences in change trajectories rather than on cross-sectional comparisons at baseline.

The study was conducted from September 2024 to April 2025. In the initial phase, respondents were recruited, and baseline adherence data were collected from health center records. In October 2024, baseline measurements (pretests) were conducted to assess knowledge, attitudes, family support, and traditional leader support, followed by the implementation of the UFESA model and the first posttest measurement after the intervention and MDA cycle. From October 2024 to April 2025, participants in the intervention group received continuous support through the KEPFIMA module. The final evaluation (posttest 2) was conducted in April 2025 to assess adherence and supporting variables.

Participants

The inclusion criteria for this study were community members aged 20–70 years who were registered as recipients of filariasis medication under the MDA program and were willing to participate by signing an informed consent form. The exclusion criteria included being ill or receiving treatment for conditions other than filariasis, being pregnant, and being under 20 years of age. The respondents were recruited via a multistage random sampling method. In the first stage, clusters, represented by villages within the health center's catchment areas, were selected; in the second stage, individuals were chosen according to the established inclusion and exclusion criteria. Recruitment was facilitated by health center staff and community health workers, with data collection conducted within the catchment areas of the Bagaiserwar Health Center (intervention) and the Sarmi Kota Health Center (control).

Intervention

The intervention consisted of training traditional leaders (*saa temto* or *kepala keret*), who served as facilitators of the community's participation in the filariasis MDA program. The training materials included (1) an overview of filariasis—its signs and symptoms, causes, transmission, MDA activities, adverse events following medication, and preventive measures; (2) practical aspects of implementing MDA, such as group health education, completing medication cards, completing reporting forms, and preparing activity plans; and (3) leadership responsibilities, including defining work areas, determining distribution sites and schedules, conducting population censuses, and leading community health education related to MDA.

Each training participant received a package consisting of the KEPFIMA module (community adherence to filariasis medication), a filariasis education flipchart, medication cards, reporting forms, stationery, and a training schedule. The training was conducted by the health center staff two days before the MDA campaign. A pretest was administered prior to the training, followed by two posttests—one immediately after the material was delivered and another at the end of the training—to ensure comprehension. The participants who did not master the content were provided with additional explanations until they could accurately describe the material.

Following the training, kepala keret received formal assignments from the health center head as the person in charge of their respective clans. They subsequently conducted community outreach via the KEPFIMA module and flipcharts, employing culturally appropriate communication. The outreach emphasized the dangers of filariasis, the benefits of prevention, and the importance of adhering to medication. Thus, traditional leaders acted as community mobilizers to strengthen adherence to the MDA program.

Sample size

Sample size determination was conducted via multistage random sampling as an extension of simple cluster sampling. In the first stage, clusters in the form of villages were selected, followed by individual selection within the chosen clusters according to the inclusion criteria. The sample size was calculated via the Lemeshow formula, with a 95%

confidence level, a population proportion of 0.5, and a 10% margin of error. The calculation yielded a minimum requirement of 80 respondents. With a 1:1 allocation between the intervention and control groups, the final sample comprised 80 respondents in each group, for a total of 160 participants. The sample distribution was proportionally adjusted to the population examined, resulting in 45 respondents from the Bagaiserwar Health Center area and 35 respondents from the Sarmi Kota Health Center area for each group.

Outcomes

The primary outcome of this study was short-term adherence to preventive filariasis medication across three MDA cycles (April 2024, October 2024, and April 2025). Adherence was measured via a dichotomous questionnaire (yes/no) that included indicators such as timely consumption, correct dosage, compliance with health worker instructions, and treatment completion. The secondary outcomes included knowledge, attitudes, family support, and support from traditional leaders. Knowledge was assessed via 12 yes/no items on the basis of the national filariasis elimination guidelines, and responses were categorized as good when at least 75% were correct. Attitudes were measured via 13 Likert-scale statements (1–4), with positive attitudes defined as scores equal to or above the median. Family support was assessed via 11 yes/no items, and traditional leader support was assessed via 10 yes/no items; both were categorized as supportive when their scores were equal to or above the median. To strengthen methodological rigor, the psychometric properties of the scales were assessed: reliability was calculated via Cronbach's alpha ($\alpha \geq 0.70$ considered acceptable), and construct validity was examined via exploratory factor analysis (EFA), following best practice recommendations in health and social research[14,15]. Exploratory factor analysis was used to examine the underlying structure of the measurement instruments, which were newly developed and culturally adapted for the Papuan context. At this stage of instrument development, EFA was appropriate for identifying latent constructs and assessing initial construct validity in a setting where the dimensional structure had not yet been empirically established.

Statistical analysis

The unit of analysis was individual respondents who participated in the MDA program, either in the intervention or control groups. Data analysis was conducted via SPSS version 25. Categorical variables, including adherence to preventive filariasis medication, were analyzed via chi-square tests. Numerical variables, including knowledge, attitudes, family support, and traditional leader support scores, were analyzed via the Mann–Whitney U test for between-group comparisons and the Wilcoxon signed-rank test for within-group (pre–post) comparisons. All analyses aimed to assess changes before and after the intervention and to compare outcomes between the intervention and control groups. Statistical significance was set at $p < 0.05$.

In addition, psychometric analyses were performed for the instruments: internal consistency was assessed via Cronbach's alpha ($\alpha \geq 0.70$ considered acceptable), and construct validity was examined via exploratory factor analysis (EFA). Effect sizes (Cohen's d for continuous outcomes and Cramér's V for categorical outcomes) were reported alongside p values to provide a more comprehensive interpretation of the intervention's impact.

Ethical considerations

This study was approved by the Health Research Ethics Committee (HREC) of the Faculty of Public Health, Cenderawasih University, under approval number 001/KEPK-FKM UC/2024. Additionally, official permits for site access and data collection were obtained from the Faculty of Public Health, Cenderawasih University, and the Sarmi Health Center, Sarmi District, under the letter number 445/842/PKM-SRM/2024. Written informed consent was obtained from all participants prior to their involvement in the study.

RESULTS

Baseline characteristics of the respondents

Table 1 presents the baseline characteristics of the respondents in the intervention and control groups. Most respondents in both groups were male (52.5% and 56.2%, respectively). The majority were aged 40 years or older (58.8% in the intervention group and 66.2% in the control group). The education level was predominantly senior high school graduates (42.5% and 35.0%), while farming was the main occupation, with a greater proportion in the control group (61.2%) than in the intervention group (38.8%).

Adherence to preventive filariasis medications

Table 2 shows adherence to preventive filariasis medication across the three measurement points. Preventive drug consumption increased significantly in the intervention group from 38.8% at pretest to **87.5%** at posttest 2, whereas it increased from 26.2% to **52.5%** in the control group ($p<0.001$). Other aspects of adherence—including taking medication at night, following instructions, taking medication on the designated day, and voluntary adherence—were consistently greater in the intervention group than in the control group at both posttest one and posttest 2 (all $p<0.001$).

Changes in psychosocial determinants

Table 3 shows significant improvements in knowledge, attitudes, family support, and traditional leader support among participants in the intervention group compared with those in the control group. The median knowledge score increased from 3.00 (IQR 2.00) at baseline to 10.00 (IQR 3.00) at posttest 2 in the intervention group, whereas it increased from 2.00 (IQR 3.00) to 4.00 (IQR 4.00) in the control group ($p<0.001$). The attitude scores rose from 29.00 (IQR 8.00) to 38.00 (IQR 5.00) in the intervention group but increased from 25.00 (IQR 10.00) to 29.00 (IQR 8.00) in the control group ($p<0.001$). Family support improved from 14.00 (IQR 3.00) to 20.00 (IQR 2.00) in the intervention group, whereas it changed only marginally in the control group, from 12.00 (IQR 3.00) to 13.00 (IQR 3.00) ($p<0.001$). Similarly, traditional leader support increased from 13.00 (IQR 2.00) to 19.00 (IQR 2.00) in the intervention group, with minimal change in the control group, from 11.00 (IQR 2.00) to 12.00 (IQR 2.00) ($p<0.001$).

Psychometric properties of the measurement instruments

To ensure that the instruments used in this study were reliable and valid for the Papuan context, internal consistency and construct validity were assessed. All scales demonstrated high reliability, with Cronbach's alpha values exceeding 0.80. Construct validity was supported by exploratory factor analysis, with adequate sampling adequacy (KMO > 0.70), significant Bartlett's tests ($p < 0.001$), and satisfactory factor loadings (> 0.50), as summarized in Table 4. These findings indicate that the measurement instruments were both psychometrically sound and culturally appropriate for use in this study.

Effect sizes are reported for both categorical and continuous outcomes at posttest 2. For categorical outcomes (adherence indicators), effect sizes were measured via Cramér's V after chi-square tests. For continuous psychosocial determinants (knowledge, attitudes, family support, and traditional leader support), effect sizes were measured via Cohen's d after Wilcoxon signed-rank tests. Interpretation of effect sizes is based on conventional thresholds (Cramer's V ≥ 0.40 = large; Cohen's d ≥ 0.80 = large). All outcomes demonstrated large effect sizes,

Table 1. Baseline characteristics of the respondents in the intervention and control groups

Characteristics	Intervention (n = 80)	Control (n = 80)
Sex		
Male	42 (52.5)	45 (56.2)
Female	38 (47.5)	35 (43.8)
Age group (years)		
≥ 40	47 (58.8)	53 (66.2)
< 40	33 (41.2)	27 (33.8)
Education		
No schooling/Incomplete primary school	5 (6.2)	12 (15.0)
Primary school	7 (8.8)	18 (22.5)
Junior high school	23 (28.8)	21 (26.2)
Senior high school	34 (42.5)	28 (35.0)
Higher education	11 (13.8)	1 (1.2)
Occupation		
Student	8 (10.0)	3 (3.8)
Civil servant/Police/Military	7 (8.8)	3 (3.8)
Private employee	5 (6.2)	3 (3.8)
Housewife	23 (28.8)	20 (25.0)
Entrepreneur	0 (0.0)	2 (2.5)
Farmer	31 (38.8)	49 (61.2)
Fisherman	6 (7.5)	0 (0.0)

The data are presented as n (%). Baseline comparisons were not performed in accordance with the quasiexperimental reporting guidelines (TREND).

Table 2. Adherence to preventive filariasis medication in the intervention and control groups

Adherence aspect	Time	Intervention, n (%)	Control, n (%)	p value*
	Pretest	**31 (38.8)**	**21 (26.2)**	**0.091**
Preventive drug consumption	Posttest 1	68 (85.0)	35 (43.8)	<0.001
	Posttest 2	70 (87.5)	42 (52.5)	<0.001
Taking medication at night	Posttest 1	58 (85.3)	12 (34.3)	<0.001
	Posttest 2	68 (97.1)	18 (42.9)	<0.001
Taking medication as instructed	Posttest 1	65 (95.6)	15 (42.9)	<0.001
	Posttest 2	70 (100.0)	25 (59.5)	<0.001
Taking medication on the designated day	Posttest 1	66 (97.1)	20 (57.1)	<0.001
	Posttest 2	70 (100.0)	28 (66.7)	<0.001
Taking medication voluntarily	Posttest 1	55 (80.9)	10 (28.6)	<0.001
	Posttest 2	62 (88.6)	15 (35.7)	<0.001

The data are presented as n (%). The chi-square test was used for analysis. $p < 0.05$ was considered statistically significant. Abbreviations: Posttest 1 = evaluation after the first MDA cycle; Posttest 2 = evaluation after the second MDA cycle; MDA = mass drug administration.

Table 3. Knowledge, attitudes, family support, and traditional leader support scores in the intervention and control groups (median [IQR])

Variable	Assessment	Intervention Median (IQR)	Gain	Control Median (IQR)	Gain	Gain Difference	p value
	Pretest	3.00 (2.00)	–	2.00 (3.00)	–	–	0.032
Knowledge	Posttest 1	8.00 (4.00)	5.00	3.00 (4.00)	1.00	4.00	<0.001
	Posttest 2	10.00 (3.00)	7.00	4.00 (4.00)	2.00	5.00	<0.001
	Pretest	29.00 (8.00)	–	25.00 (10.00)	–	–	0.015
Attitudes	Posttest 1	35.00 (6.00)	6.00	27.00 (9.00)	2.00	4.00	<0.001
	Posttest 2	38.00 (5.00)	9.00	29.00 (8.00)	4.00	5.00	<0.001
	Pretest	14.00 (3.00)	–	12.00 (3.00)	–	–	<0.001
Family support	Posttest 1	18.00 (2.00)	4.00	13.00 (3.00)	1.00	3.00	<0.001
	Posttest 2	20.00 (2.00)	6.00	13.00 (3.00)	1.00	5.00	<0.001
	Pretest	13.00 (2.00)	–	11.00 (2.00)	–	–	<0.001
Traditional leader support	Posttest 1	17.00 (2.00)	4.00	12.00 (2.00)	1.00	3.00	<0.001
	Posttest 2	19.00 (2.00)	6.00	12.00 (2.00)	1.00	5.00	<0.001

Data are presented as the median (IQR). Between-group comparisons were performed via the Mann–Whitney U test, and within-group (pre–post) comparisons were performed via the Wilcoxon signed-rank test. $p < 0.05$ was considered statistically significant. IQR = interquartile range.

Table 4. Reliability and validity of the measurement instruments

Variable	Items (n)	Cronbach's α	KMO	Bartlett's test (p)	Factor loading range
Knowledge	12	0.81	0.76	<0.001	0.52–0.78
Attitudes	13	0.88	0.82	<0.001	0.55–0.81
Family support	11	0.84	0.79	<0.001	0.53–0.77
Traditional leader support	10	0.86	0.81	<0.001	0.54–0.80

Cronbach's α indicates internal consistency reliability, and KMO represents sampling adequacy. Bartlett's test of sphericity was used to assess the suitability of the data for factor analysis. Factor loadings represent the range of standardized coefficients obtained from exploratory factor analysis

Table 5. Effect sizes for primary and secondary outcomes

Outcome	Time point	Test statistic	Effect size	Interpretation*
Adherence (overall consumption)	Posttest 2	$\chi^2 = 24.15$	Cramer's V = 0.39	Medium to Large
Taking medication at night	Posttest 2	$\chi^2 = 32.18$	Cramer's V = 0.45	Large
Taking medication as instructed	Posttest 2	$\chi^2 = 28.40$	Cramer's V = 0.42	Large
Taking medication on a designated day	Posttest 2	$\chi^2 = 22.54$	Cramer's V = 0.38	Medium
Voluntary medication adherence	Posttest 2	$\chi^2 = 30.25$	Cramer's V = 0.44	Large
Knowledge score	Pre–Posttest 2	Z = −6.85	Cohen's d = 0.72	Medium to Large
Attitude score	Pre–Posttest 2	Z = −6.20	Cohen's d = 0.68	Medium
Family support score	Pre–Posttest 2	Z = −6.95	Cohen's d = 0.75	Medium to Large
Traditional leader support score	Pre–Posttest 2	Z = −7.10	Cohen's d = 0.78	Medium to Large

indicating substantial practical impacts of the UFESA model beyond statistical significance.

Table 5 summarizes the effect sizes for the primary and secondary outcomes. The UFESA intervention was associated with **medium to large effects** across all adherence indicators, with Cramér's V values ranging from 0.38 to 0.45 at posttest 2, indicating meaningful associations between group assignment and adherence outcomes. Similarly, knowledge, attitudes, family support, and traditional leader support scores yielded **medium to large Cohen's d values (0.68–0.78)**, indicating **clinically meaningful improvements** in the intervention group compared with those in the control group. These effect size estimates complement the statistical significance tests and were associated with practically relevant behavioral and psychosocial changes related to adherence.

DISCUSSION

The main findings of this study provide evidence that is consistent with the effectiveness of the UFESA model in improving adherence to preventive filariasis medication within endemic communities in Sarmi District. In the intervention group, adherence increased markedly from baseline to 87.5% at the final assessment (posttest 2), whereas in the control group, adherence increased to 52.5%. All aspects of adherence behavior—taking medication at night, following instructions, consuming the medication on the designated day, and engaging in voluntary adherence—were consistently greater in the intervention group than in the control group. These consistent findings align with those of Njomo, Kibe, Kimani, Okoyo, Omondi and Sultani[16] in Kenya, who reported that improved community participation in MDA after participatory interventions was designed to address local barriers. The behavioral improvements observed in this study were accompanied by significant enhancements in proximal determinants: knowledge, attitudes, family support, and traditional leader support. The median scores for all four variables increased substantially in the intervention group compared with those in the control group at posttest 1 and continued to improve at posttest 2. This pattern reflects earlier documentation by Silumbwe, Halwindi and Zulu[17], who reported that community engagement strategies in Zambia directly shaped participation in MDA, emphasizing the role of local leaders as behavioral enablers.

In addition to the main findings, this study also evaluated the **psychometric properties of the measurement instruments**. Reliability testing confirmed that all scales had strong internal consistency (Cronbach's α > 0.80), and exploratory factor analysis indicated satisfactory construct validity, with factor loadings exceeding 0.50. These results provide assurance that the instruments used to assess knowledge, attitudes, family support, and traditional leader support were both culturally appropriate and statistically robust. Similar findings have been emphasized in behavioral health research, where culturally validated tools are essential for ensuring accurate measurement in diverse populations[18].

From both theoretical and practical perspectives, the mechanism of the UFESA can be understood as the reinforcement of interconnected educational, social, and cultural pathways. A systematic review by Silumbwe, Zulu, Halwindi, Jacobs, Zgambo, Dambe, Chola, Chongwe and Michelo[19] highlighted that the success of MDA in Sub-Saharan Africa was determined by integrating cultural factors and community support into the intervention design. In this study, the intervention began with intensive training for traditional leaders (saa temto/kepala keret) to ensure mastery of the material (through a pretest, two posttests, and remedial explanations for those needing reinforcement), thereby preparing them to act as facilitators of healthy behavior within their communities. Following the training, leaders conducted culturally grounded outreach via the KEPFIMA module and flipcharts, emphasizing the dangers of filariasis, the benefits of prevention, and the importance of adherence. This pathway leverages family support and community norms as reinforcing factors for adherence[20]. Thus, the UFESA not only enhanced individual knowledge but also reshaped the surrounding social context—consistent with quantitative findings that improvements in family and leader support were closely aligned with increased adherence.

From an implementation perspective, the UFESA model can be institutionalized within existing MDA structures. Rather than creating parallel delivery systems, the intervention builds on roles that are already embedded in routine MDA operations, including traditional leaders, community health workers, and primary health center staff. The training content, educational materials, and reporting tools used in the UFESA align with standard MDA activities, suggesting that the model could be incorporated into routine pre-MDA preparation, community mobilization, and follow-up processes. Formalizing the involvement of traditional leaders through existing health center coordination mechanisms may further support sustainability and accountability without requiring major structural changes to the current MDA program[21].

In terms of resource requirements, the UFESA intervention was designed to be relatively modest and operationally feasible. Training activities were conducted over a short duration and relied primarily on existing primary health center personnel and locally recognized traditional leaders, without the need for additional full-time staff. The implementation was synchronized with routine MDA cycles, which minimized disruption to existing workflows. These characteristics suggest that the UFESA model is feasible for scaling up to other districts in Papua and to comparable low- and middle-income country settings where health system resources are constrained. The reliance on community-based leadership and short, focused training sessions aligns well with implementation realities in resource-limited settings and supports adaptability across diverse sociocultural contexts[22,23]. Although a formal economic evaluation was beyond the scope of this study, the UFESA model is likely to entail relatively low incremental costs. By leveraging existing traditional leaders and primary health center personnel rather than hiring additional staff, the intervention minimizes additional financial burden while maintaining community engagement and program legitimacy[24].

Within the local context of Papua, the involvement of traditional structures was both logical and strategic. Similarly, Kisoka, Tersbøl, Meyrowitsch, Simonsen and Mushi[25] reported in Tanzania that MDA acceptance and adherence are strongly influenced by community perceptions of the legitimacy of drug distribution and the involvement of local leaders. The study sites—two health centers with the highest burden of clinical filariasis, Bagaiserwar (intervention) and Sarmi Kota (control)—were situated in communities where traditional leaders have a profound influence on social life. Repeated measurements (pretest, posttest one after the intervention and MDA cycle, and posttest two at the final evaluation) allowed for the tracking of behavioral changes and their determinants across the October 2024–April 2025 cycles. Positioning traditional leaders as bridges between the health center's MDA program and households strengthened information flow, social legitimacy, and informal supervision—empirically reflected in the consistently higher "gain" scores for knowledge and attitudes in the intervention group than in the control group.

In addition, effect size analyses indicated medium-to-large, practically meaningful associations between the UFESA intervention and adherence outcomes. The intervention was associated with improved adherence (Cramer's V = 0.38–0.45) and clinically relevant improvements in psychosocial determinants (Cohen's d = 0.68–0.78). These effect sizes suggest that the UFESA model was associated not only with statistically significant differences but also with practically relevant behavioral and social changes within the community. These findings are consistent with methodological recommendations that interventions should report both the significance and magnitude of effects to support cumulative science[26-28]

Compared with previous studies, which have predominantly emphasized factors such as knowledge, attitudes, perceptions of side effects, family support, and the role of community health workers or local leaders, most studies have examined these factors separately without developing an integrated intervention model grounded in local culture. Wynd, Melrose, Durrheim, Carron and Gyapong[29] highlighted that the sociocultural impact of filariasis is often overlooked, despite its critical influence on adherence to MDA programs. The UFESA model addresses this gap by integrating Ube Fonggomu (knowledge sharing), Fe Semseme (family support), and Saah Temto (traditional leader support) into a single community-based operational package, thereby introducing a novel, state-of-the-art approach in the Indonesian endemic context, particularly in Sarmi, Papua. This "new" position is vital because sustainable behavioral change in MDA depends not only on information transfer but also on restructuring local norms and social networks.

Taken together, integrating psychometric rigor and effect-size reporting enhances the credibility of the UFESA as a culturally grounded intervention. From a programmatic perspective, this approach offers three key lessons. First, coproducing interventions alongside traditional structures enhances acceptance and extends the reach of MDA to the household level, as evidenced by increased support from families and leaders. Similarly, adapting interventions to local contexts in Ghana improved the quality of MDA implementation and ensured sustained adherence[30]. Second, strengthening the capacity of traditional leaders prior to drug distribution cycles—through training packages (KEPFIMA module, flipcharts, medication cards) and repeated assessments—ensures message quality and consistency in field practices. Third, synchronizing interventions with MDA cycles maximizes the impact on target behaviors (taking medication on the correct day and in the correct manner), as reflected in higher, more stable postintervention adherence outcomes observed through the final evaluation.

In the future, model replication and expansion should be considered. Cross-country studies have shown that MDA adherence increases when religious and social leaders are involved, as demonstrated by King, Zielinski-Gutierrez, Pa'au and Lammie[31] in American Samoa. First, trials in additional health centers and across diverse customary communities are necessary to assess the generalizability of the effects. Second, integrating the UFESA with simple digital monitoring (e.g., cadre/leader reporting via standardized forms) could strengthen the provision of rapid feedback to health centers, aligned with the reporting forms and medication cards already used within the intervention package. Third, comparative cost-effectiveness studies could help policymakers decide whether to scale up interventions in other endemic areas. At the national level, the findings of this study have important implications for Indonesia's filariasis elimination program. Persistent gaps between MDA coverage and actual medication adherence remain a key challenge in several endemic provinces. The UFESA model demonstrates how culturally grounded community engagement—particularly through the structured involvement of family and traditional leaders—can complement existing national MDA strategies by strengthening adherence without requiring major structural changes.

Nonetheless, this study has several limitations. The quasiexperimental design with nonequivalent control groups may introduce selection bias and confounding by unmeasured factors. However, the pre–post design with repeated measurements and between-group comparisons provides strong indications regarding the causal direction of the intervention effect. Silumbwe, Zulu, Halwindi, Jacobs, Zgambo, Dambe, Chola, Chongwe and Michelo[19] also emphasized that without designs accounting for local variations, the success of MDA may diminish despite high initial coverage. Additionally, behavioral and support constructs were measured via questionnaires, which introduced the risk of self-reported bias. The use of nonparametric tests and reporting of medians (with interquartile ranges) represented an appropriate methodological compromise for the data scale; however, future studies should consider triangulation, such as medication card audits or verification via health center information systems.

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CONCLUSION

A culturally grounded intervention through the UFESA model—integrating health education, family support, and traditional leader involvement—was associated with substantial improvements in community adherence to preventive filariasis medication. The findings demonstrated significant improvements not only in adherence but also in knowledge, attitudes, and sociocultural support from families and traditional leaders in the intervention group compared with the control group. Psychometric testing confirmed that the instruments used were reliable and valid, strengthening the robustness of these findings, whereas medium to large effect sizes indicated that the UFESA model was associated with not only statistically significant but also practically meaningful differences. These results underscore the importance of leveraging local wisdom to strengthen the success of mass drug administration programs for filariasis prevention while contributing to broader strategies for filariasis elimination in Indonesia, particularly by strengthening adherence within routine mass drug administration programs in endemic regions. More broadly, the study highlights the value of embedding psychometric rigor and culturally tailored psychosocial approaches in applied public health interventions.

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