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Assessment of Knowledge and Premises Inspection Performance of Field Mosquito Control Assistants in the Kalutara, Sri Lanka

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Abstract

Introduction: Dengue fever remains a major public health challenge in Sri Lanka. Field Assistants in Mosquito Control (FAMCs) play a key role in dengue prevention through household inspections, source reduction activities, and community education. Their effectiveness depends on both knowledge and field performance.

Objective: To assess the knowledge and premises inspection performance of FAMCs in the Kalutara Regional Director of Health Services area, Sri Lanka, and to determine the association between knowledge and inspection performance.

Methods: A descriptive cross-sectional study was conducted among all 94 FAMCs attached to Medical Officer of Health areas in Kalutara district. Data were collected using a pretested interviewer-administered questionnaire and a direct observation checklist. Knowledge on dengue prevention and vector control was assessed, while field performance was evaluated through observation of routine premises inspections. Descriptive statistics and Chi-square tests were used for analysis, with statistical significance set at $p<0.05$.

Results: Participants demonstrated good knowledge regarding dengue prevention. Most correctly identified the female *Aedes* mosquito as the vector (94.7%), and all recognized clean-water breeding and disposable containers as major breeding sites (100%). However, inspection performance was suboptimal. Although 75.5% inspected more than 50 households daily, only 13.8% performed satisfactory inspections of all potential breeding sites. Basic health advice was provided by 68.0% of participants. No significant association was observed between knowledge and inspection performance (all $p>0.05$).

Conclusion: The workforce of FAMC possesses high foundational knowledge; however, the knowledge does not impact on their performance. Field oriented training and regular supervision is suggested.

Keywords: Dengue, Vector control, Field assistants, Premises inspection, Sri Lanka

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1.Introduction

1.1: Background

Dengue is a vector-borne viral disease transmitted by Aedes aegypti and Aedes albopictus mosquito species (WHO, 2012). This neglected tropical disease (NTD) was ranked as one of the top ten threats to Global Health in 2019 (WHO, 2020).

There are nearly 128 dengue-endemic countries across the globe. More than half of the global dengue disease burden is from South East Asia. Sri Lanka is among the 30 most highly endemic countries in the world (WHO, 2020). The first serologically confirmed Dengue case was recorded in Sri Lanka in 1962 (Sirisena & Noordeen, 2014). The majority of the annual dengue cases were reported from the Western province with seasonal outbreaks (Cader et al., 2019).

Following the massive dengue outbreak in 2017, additional human resources were recruited through a policy decision with special cabinet approval. They were recruited under the National Dengue Control Unit of the Ministry of Health to carry out mosquito control activities. These "Field Assistants Mosquito Control (FAMCs) also called Saukya Karya Sahayaka (SKS) were dispatched island-wide based on the dengue disease burden of each district (Cader et al., 2019; Epidemiology Unit. Ministry of Health, 2018). They inspect house to house and give instructions to household as required without taking legal interventions.

Inspection of premises while instructing to remove breeding sites and follow-up is included in the job role of FMCAs. In addition to the routine premise inspections at high-risk areas and surroundings of reported patients, they are expected to assist in special mosquito control campaigns and outbreak control (National Dengue Control Unit, 2021).

Field Mosquito Control Assistants have several key duties, including inspecting premises to identify and eliminate mosquito breeding sites, assisting technical officers during outbreaks, and performing fogging activities under supervision. Assisting entomological surveys, and raising public awareness to empower the community about mosquito control measures also comes under their duties. They should maintain accurate records of daily activities and participate in training programs to update their knowledge and skills. In addition to the routine premise inspections at high-risk areas and surroundings of reported patients, they are expected to assist in special mosquito control campaigns (National Dengue Control Unit, 2021).

1.2: Justification

With the epidemiological transition, non-communicable disease prevention, and control activities are being focused on globally. The sustainability of already implemented programs must be ensured based on the need and efficacy. However, there exists a gap in local evidence which may hinder the prioritization process.

Being situated in the tropical monsoon and equatorial zone the dengue epidemic is still a major public health problem in Sri Lanka. Integrated Vector management (IVM) is the most effective mode of prevention and control of dengue outbreaks (WHO, 2004). The responsibility of integrated vector management mainly lies with the local health authority as well as the residents of the area. A dedicated team of trained workforce for field activities such as FMACs is essential for capacity building at the divisional level. The field activities of FAMCs need to be updated on current trends via continuous on-the-job training. This aspect is less monitored at the local level.

The current study aims to describe the effectiveness of premises inspection by FAMCs in Regional Director of Health Service (RDHS) area, Kalutara It will assist the health care personnel at the district level as well as the national level in prioritization of health care needs and costs. The end user, the community will gain the ultimate benefit of proper use of limited resources.

1.3: Objective:

Objective is to assess the knowledge and premises inspection performance of Mosquito Control Field Assistants in Kalutara RDHS area in relevant to prevention of dengue infection

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2. Methods

A descriptive cross-sectional study was conducted across all 13 Medical Officer of Health (MOH) areas in the Kalutara RDHS region, including all 94 Field Assistants for Malaria Control (FAMCs) in the district. FAMCs with at least six months of service were included in the study, while those not in active service during the data collection period were excluded. Data were collected using a pre-tested structured questionnaire and an observational checklist; the questionnaire captured socio-demographic characteristics, service-related factors, and knowledge on dengue prevention. Trained medical officers carried out data collection, and observations were conducted during routine field inspections to assess actual performance. Data analysis was performed using SPSS version 20, with knowledge scores calculated out of 10, and associations assessed using chi-square tests, considering a p-value of less than 0.05 as statistically significant. Ethical clearance was obtained from the National Institute of Health Sciences, Kalutara. Written informed consent was obtained from all participants.

3. Results

3.1: Socio-demographic characteristics

A total of 94 consented to participate for the study (response rate of100%). The study sample consisted of 58 (61.7%) males and 36 (38.3%) females. Majority of the respondents (47.8%; n= 45) were in the age category 30-40 years of age. Among all respondents, 91.5% (86) were Sinhalese. Majority of the respondents (62.7%; n=59) were educated up to Ordinary level. Results of socio-demographic characteristics of the study sample are summarized in Table 1.

Table 1: Socio-demographic characteristics of the sample

Gender	Frequency	Percentage
Male	58	61.70
Female	36	38.30
Age		
20-30	6	6.39
30-40	45	47.87
40-50	39	41.50
50-60	4	4.26
Race		
Sinhala	86	91.50
Tamil	7	7.45
Moor	1	1.05
Religion		
Sinhala	86	91.50
Hindu	7	7.45

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Muslim	1	1.05
Education level		
Grade 5	24	25.53
O/L	59	62.77
A/L	11	11.70

3.2: Service-related factors

Majority of the respondents (84.04%; n= 79) more than 10 years of service. Among all respondents, 77.66% (73) were casual workers. Results of service-related factors of the study sample are summarized in Table 2.

Table 2: Service-related factors

Service Duration	Frequency	Percentage
2-5 years	8	8.51
5-10 years	7	7.45
More than 10 years	79	84.04
Service type		
Casual	73	77.66
Permanent	21	22.34

3.3: Knowledge on dengue prevention

Table 3 presents the frequency and percentages on knowledge assessed. Majority of the respondents (94.68%; n= 89) knew that dengue is transmitted by female Aedes mosquito. All respondents knew that Aedes mosquito breeds in clean water, discarded containers are the commonest breeding site and fever is the commonest symptom. Among all respondents, 78.72% (74) were correct on length of the life cycle, 92.55% (87) were correct on biting time and 91.48% (86) correct on flying length. Though 96.81% (91) new that fogging is the method to kill adult mosquitoes only 23.4% (22) knew that Gokilaht is used for indoor fogging.

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Table 3: Knowledge on dengue prevention

Knowledge area		Frequency	Percentage
Spread of Dengue Fever	By female Aedes mosquito	89	94.68
	By male Aedes mosquito	4	3.19
	By female Anopheles mosquito	1	2.18
Type of water dengue mosquito breed	Clean water	94	100
Commonest breeding place of Dengue	Disposable container	94	100
Length of the life cycle of Dengue	7	74	78.72
	14	19	20.21
	30	1	1.07
The time Dengue mosquitoes commonly bite	**Early morning and late evening**	**87**	**92.55**
	Midnight	6	6.38
	Noon	1	1.06
Flying length of dengue mosquitoes	50m	5	5.32
	200m	86	91.48
	1 Km	3	3.20

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Method of killing adult mosquito	Fogging	91	96.81
	Breeding fish	3	3.19
Chemical used in indoor fogging	Malathion	54	57.45
	Gokilaht	22	23.40
	Abate	13	13.83
	Aquatain	5	5.32
Common symptom of Dengue	Fever	94	100

3.4: Process of premises inspection

Among all respondents, 53.19% (50) departed the MOH area on time. Majority (75.53%, n= 71) inspected at least 50 houses per day. All were in standard T-shirt given by the Dengue Control Unit. Among all respondents, 86.17% (81) failed inspect all possible sites; therefore, inspection level was not satisfactory. Basic health advices were given by 64 (68%) respondents. Results are shown in table 4.

Table 4: Process of premises inspection

Process		Frequency	Percentage
Time departed from MOH office	On time (before 9am)	50	53.19
	Late (after 9am)	44	46.81
Standard T-shirt worn	Yes	94	100
No. of household covered	<25	0	0
	25-50	23	24.47
	>50	71	75.53
Self-introduction	Done	46	48.93
	Not done	48	51.07
Communication level	Friendly	49	52.13
	Not friendly		47.87
Active inspection all	Satisfactory	13	13.83

possible places			
	Not satisfactory	81	86.17
Basic advices	Given	64	68
	Not given	30	32

3.5: Association between the knowledge and satisfactory level of premises inspection

Association between inspection satisfactory level and knowledge factors was analyzed. Inspection of all possible places considered as “satisfactory”. None of the knowledge factors were significantly associated with inspection level ($p>0.05$). Table 5 shows the association between inspection satisfactory level and knowledge factors with Chi-square value, degree of freedom and p value.

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Table 5: Association between inspection satisfactory level and knowledge factors

Variable	Category	Inspection satisfactory (%)	Inspection not satisfactory (%)	χ^2	df	p-value
Dengue Fever spread	By female Aedes mosquito	64 (67.9)	30 (32.1)	4.115	2	0.128
	By male Aedes mosquito	73 (77.5)	21 (22.5)			
	By female Anopheles mosquito	65 (68.8)	29 (31.3)			
What type of water dengue mosquito breed	Cleaned water	70 (74.3)	24 (25.7)	1.477	1	0.224
	Polluted water	75 (80)	19 (20)			
What is the commonest breeding place of Dengue	Disposable container	71 (75.2)	23 (24.8)	1.313	1	0.252
	Permanent places	94 (100)	0 (0.0)			
What is a method of killing adult mosquito	Fogging	68 (72.2)	26 (27.8)	0.745	1	0.388
	Breeding fish	72 (76.2)	22 (23.8)			
What time Dengue mosquitoes commonly bite	Early morning and late evening	80 (84.9%)	14 (15.1%)	2.855	2	0.096
	Midnight	70 (74.5%)	24 (25.5%)			
	Noon	71 (75.6%)	23 (24.4%)			
What is the common symptom of Dengue	Fever	70 (74.3)	24 (25.7)	3.063	1	0.080
	Cough	75 (80)	19 (20)			
What is the length of the life cycle of Dengue	7 days	69 (73.8)	25 (26.3)	1.389	2	0.499
	14 days	73 (77.7)	21 (22.3)			
	30 days	68 (72.0)	26 (28.0)			
What is the flying length of dengue mosquitoes	50m	71 (75.1)	23 (24.9)	0.154	2	0.926
	200m	72 (76.2)	22 (23.8)			
	1 Km	60 (63.5)	34 (36.5)			
What is the chemical used in indoor fogging	Malathion	60 (63.6)	34 (36.4)	0.976	3	0.323
	Gokilaht	58 (61.9)	36 (38.1)			
	Abate	58 (62)	36 (38)			
	Aquatain	50 (53.5)	44 (46.5)			

4. Discussion

4.1: Knowledge on Dengue prevention

Knowledge enhances the Mosquito Control Field Assistant's (FAMC) ability to communicate risk effectively and influence behavioral change among householders, institutions, and local authorities. Given that dengue prevention largely depends on community participation, inspecting FAMC must translate technical knowledge into clear, culturally appropriate messages that motivate compliance. Inadequate knowledge may lead to misinformation, reduced public trust, and poor adherence to recommendations. Additionally, informed Field Assistants are better equipped to advise on corrective actions.

Field assistants demonstrated a strong understanding of the primary vector: 94.68% correctly identified the female Aedes mosquito as responsible for Dengue transmission. This is encouraging, as the female mosquito is the only sex that bites humans to obtain blood for egg development. However, there were small but concerning misconceptions: 3.19% thought male Aedes mosquitoes transmit Dengue, and 2.18% believed female Anopheles mosquitoes are involved. These misunderstandings, although affecting a minority, could impact the effectiveness of control activities if field assistants misidentify vectors in practice. Continuous refresher training may be needed to eliminate these gaps.

All (100%) field assistants correctly identified that Dengue mosquitoes breed in clean water, and recognized disposable containers as the most common breeding sites. This indicates a solid understanding of the practical aspects of vector control, which is critical for targeting source reduction measures. Such uniform knowledge is a positive finding and suggests training programs emphasizing environmental management and source reduction have been effective.

Understanding the life cycle is crucial for timing interventions such as larvicide and source elimination. About 78.72% correctly indicated a 7-day life cycle, while 20.21% thought it was 14 days, and 1.07% believed it was 30 days. While the majority are accurate, nearly one-fifth overestimate the development time. This could lead to mistimed interventions—either premature or delayed—which may reduce the impact of control measures. More practical, hands-on training with life cycle demonstrations could help bridge this gap.

Overall, the field assistants display strong knowledge in practical areas of vector control (breeding habitats and water preference), which is essential for community-level interventions. Field Assistants in the study were knowledgeable than the link workers in Indian setup in 2011 (Arpit et al., 2022). Good knowledge among Field Assistants may be due to regular trainings, meetings and discussions with higher officers like Public Health Inspectors and Medical Officers of Health. However, the minor misconceptions in vector identification and life cycle duration highlight the need for continuous education. Misunderstandings in these areas, even if limited, could affect strategic decision-making, monitoring, and evaluation of Dengue control efforts.

4.2: Process of premises Inspection

A critical analysis of the observed performance of Field Assistants reveals important strengths alongside significant gaps that may undermine the effectiveness of dengue prevention activities. Although all officers adhered to the requirement of wearing the standard T-shirt (100%), indicating strong compliance with visible institutional identity and uniform policy, this does not necessarily translate into quality field performance. Similarly, a relatively high proportion of officers (75.53%) covered more than 50 households, suggesting that quantitative targets are being achieved. However, this emphasis on coverage may be occurring at the expense of the quality and depth of inspections.

Timeliness is a concern, with 46.81% of officers departing late from the MOH office, potentially reducing effective field hours and limiting opportunities for thorough inspections. More critically, only 48.93% of officers engaged in self-introduction, and nearly half demonstrated unfriendly communication. These findings point to deficiencies in interpersonal skills, which are essential for community engagement, trust-building, and promoting behavior change. The absence of proper introduction and poor communication may reduce household cooperation and weaken the impact of health education efforts.

The most striking gap is observed in the technical quality of inspections. A vast majority (86.17%) of officers failed to carry out active and comprehensive inspections of all possible breeding sites, indicating a predominantly superficial approach. This raises serious concerns about the effectiveness of vector control, as undetected breeding sites can sustain dengue transmission despite high inspection coverage. Furthermore, while 68% of officers provided basic advice, nearly one-third failed to deliver even minimal health education, highlighting inconsistency in fulfilling their dual role as inspectors and educators.

Overall, the findings suggest a performance pattern that is heavily skewed toward meeting procedural and numerical targets rather than achieving meaningful public health outcomes. The combination of inadequate inspection practices, weak communication, and inconsistent health education reflects gaps in training, supervision, and performance monitoring. These results underscore the need for a shift from quantity-driven approaches to quality-oriented performance evaluation, alongside strengthening capacity-building initiatives, supportive supervision, and accountability mechanisms to enhance the overall effectiveness of dengue prevention efforts.

4.3: Association between the knowledge and satisfactory level of premises inspection

A critical analysis of the association between knowledge variables and the level of inspection performance reveals an important and somewhat paradoxical finding: none of the knowledge components show a statistically significant association with satisfactory inspection performance (all p-values > 0.05). This suggests that possessing correct knowledge on dengue-related aspects does not necessarily translate into improved field practices among inspection officers.

Although certain trends indicate that Field Assistants with correct knowledge tend to demonstrate relatively higher proportions of satisfactory inspections—for example, those correctly identifying biting time (84.9%), breeding places (75.2%), or clean water as breeding sites (74.3%)—these differences are not statistically significant. This lack of significance may be attributed to several factors, including limited sample variability, measurement constraints in assessing "satisfactory inspection," or the presence of confounding variables such as experience, supervision, or workload. Interestingly, in some instances, even incorrect knowledge categories (e.g., polluted water as breeding sites or cough as a symptom) show comparable or higher percentages of satisfactory inspection, further weakening the presumed direct relationship between knowledge and performance.

These findings highlight a critical gap between cognitive knowledge and practical application, reinforcing the argument that knowledge alone is an insufficient determinant of effective field performance. Inspection quality appears to be more strongly influenced by other factors such as motivation, attitudes, field supervision, time constraints, and organizational culture. For instance, the previously observed deficiencies in active inspection practices and communication skills suggest that behavioral and systemic issues may override the influence of theoretical knowledge.

Moreover, the absence of significant associations raises questions about the adequacy of current training approaches, which may focus more on information dissemination rather than skill development, problem-solving, and field-based competencies. It also points to the need for more robust performance assessment frameworks that capture practical skills rather than relying solely on knowledge-based indicators.

4.4: Limitations

This study has several limitations inherent to its cross-sectional descriptive design. First, it captures knowledge and practices of dengue field assistants at a single point in time, which prevents assessment of changes over time or causal relationships between training and actual field performance. Second, the reliance on self-reported responses may introduce social desirability bias, as participants might overstate their knowledge or adherence to recommended practices. Third, the study may not fully account for regional or seasonal variations in dengue exposure, vector prevalence, or operational challenges that could influence field assistants' experiences and practices. Additionally, the sample size, though sufficient for descriptive purposes, may limit generalizability to all dengue control personnel in other districts or settings. Finally, observational verification of reported practices was not conducted, which restricts the ability to confirm that knowledge translates into effective action in the field. These limitations should be considered when interpreting the findings and designing future studies.

5. Conclusion and recommendation

This study revealed that a majority of Field Assistants in Kalutara have satisfactory level of knowledge on vector dynamics and the disease. The data suggests that field assistants are well-informed about practical aspects of Dengue control. However, the analysis indicates that while knowledge is a necessary foundation, it is not a sufficient driver of satisfactory inspection performance. Knowledge does not show a significant relationship with the performance. Effective dengue control requires a more comprehensive approach that integrates knowledge with practical skills, supportive supervision, accountability mechanisms, and behavioral change strategies among inspection officers.

Regular close supervision is the strongest recommendation to made. Public Health Inspector as the immediate supervising officer may not have adequate time for a quality supervision due to his other commitments. Supervisions should be done according to a plan with a roster of supervising officers: Public Health Inspectors, Supervising Public Health Inspectors and Medical Officers of Health.

Implementing standardized training focusing field based practical demonstrations is recommended over the traditional lecture hall-based power point presentations. It is suggested to do the training in the field.

Formal mentorship programs and performance-based appraisal mechanisms need to be established to improve the job satisfaction which in turn improve attitudes and work performance.

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