

A Final Research Report submitted to ERB/NHRC Nepal

**ASSESSMENT OF PERFORMANCE IN ACTIVE MALARIA
CASE SURVEILLANCE OF FEMALE COMMUNITY HEALTH
VOLUNTEERS IN THE HIGH ENDEMIC AREAS OF NEPAL**

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SATYA NARAYAN YADAV

ABSTRACT

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ABSTRACT

Malaria is a recognized public health concern in Nepal. This is noted by a significant prevalence of illness and mortality in high-endemic regions. The Nepal government has made efforts to malaria control techniques and strategies under the national malaria elimination by 2030 AD. One most notable approach is the engagement of community health volunteers within the models of the community health strategy. Previous research around the globe has also shown that CHVs perform significantly in active malaria surveillance. Moreover, the Previous literature well emphasizes the importance of psychosocial factors such as autonomy, competence, and relatedness in influencing the performance of CHVs in malaria surveillance. However, there is a gap in understanding how these factors specifically impact FCHVs in Nepal, particularly in the context of active malaria case detection and response. Therefore, this study aimed to assess the performance level of FCHVs and determine the association between factors affecting the performance in active malaria case surveillance in high-endemic regions of Nepal.

A cross-sectional survey was conducted from 1 June to 30 August among FCHVs in eight high-risk malaria districts of three provinces of Nepal. A total of 1204 participants were employed as study participants. Data was collected through face-to-face interviews using a structured questionnaire. For data analysis, using SPSS 26.0 and AMOS 29.0 for descriptive statistics, chi-square, correlation, and multiple linear regression were used to predict the performance of FCHVs. followed by confirmatory factor analysis (CFA) to validate the measurement model and structural equation modeling (SEM) to examine the relationships between work motivation, leadership, self-efficacy, social support, and performance.

The result found that 635 (52.7%) of FCHVs had a high level of performance in active malaria case surveillance. The Chi-square tests showed that the factors associated with the performance of FCHVs ($p < 0.05$) include age (45-60 years), major occupation other than FCHVs as trading/business, and work experience as malaria work (> 5 years). Regarding autonomy as work motivation, both extrinsic (control motivation) and intrinsic (autonomy motivation), Leadership styles, including transformative, political, and teambuilding leadership, competencies such as self-efficacy, and relatedness as social support factors, such as family and

health personnel support were significantly associated with higher performance levels. Moreover, Spearman's product correlation matrix provides a positive significant relationship between performance and autonomy motivation, political, team building leadership, self-efficacy, family, and community support. Additionally, the result of the multiple linear regression model ($r^2=0.301$), revealed that the independent variable in malaria surveillance causes a 30.10% change in the dependent variable performance in malaria surveillance in FCHVs. Overall, ANOVA results show that autonomy motivation, self-efficacy, political leadership skills, and health personnel support had a significant relationship with performance. Furthermore, the significant standardized coefficient beta results of autonomy motivation, political leadership, self-efficacy, health personnel support, and control supervision (0.510, 0.085, 0.114, -0.105, and 0.005 respectively), which means that a change in autonomy motivation, political leadership, self-efficacy, health personnel support, and control supervision by one unit will bring about a change in FCHVs performance by 0.510, 0.085, 0.114, -0.105, and 0.005 respectively.

The five-factors model (Motivation, Leadership, Self-efficacy, social support, and Performance) yielded a good fit for the data: CMIN/DF = 4.956, GFI = .887, CFI = .915, TLI = .907, RMR = .052, and RMSEA = .057. All the indices revealed that the measurement model was acceptable, particularly when items with low factor loading values (<0.50) were excluded from the CFA to decrease measurement errors. Moreover, SEM analysis results reveal that autonomy motivation significantly influenced leadership, which, in turn, along with self-efficacy, affected performance behaviors. Moreover, the support from the community, supervisor, and self-efficacy moderated the effects on performance.

This study concluded that imposing autonomy motivation and enhancing leadership skills can effectively promote engagement and sustained performance in active malaria case surveillance among FCHVs. These insights could be useful policy strategies for stakeholders aiming to enhance performance in new disease surveillance activities.

IMPLICATIONS OF THE THESIS RESULTS

The study's findings have significant implications for human resources management (HRM) guidelines in the community model, particularly in the recruitment, placement, and evaluation of Community Health Volunteers. Firstly, the emphasis on autonomy motivation suggests that selecting individuals who exhibit intrinsic motivation, and a sense of responsibility is crucial during the recruitment process. HRM guidelines should prioritize candidates who demonstrate self-driven attitudes and a willingness to take initiative, as these traits align with the autonomy required for effective malaria surveillance. Additionally, recruitment strategies

could include assessments to identify candidates with strong problem-solving skills and a proactive mindset in specified roles.

For placement, the study highlights the importance of aligning FCHVs' roles with their competencies and motivations. HRM guidelines should ensure that FCHVs are placed in environments where they can exercise autonomy and leverage their skills effectively. This could involve assigning FCHVs to areas where they have local knowledge and community connections, enhancing their ability to perform tasks like active case detection and response. Furthermore, placing FCHVs under supportive leadership, such as transformative and team-building leaders, can foster a conducive work environment that enhances their performance.

In terms of evaluation, the study underscores the need to assess FCHVs' performance based on factors like self-efficacy, leadership support, and social support systems. HRM guidelines should incorporate regular evaluations that measure not only quantitative outcomes (e.g., number of malaria cases detected) but also qualitative aspects such as motivation levels, leadership engagement, and community support. Evaluations should also consider the impact of extrinsic factors like supervision and control, as these were found to influence performance. Providing constructive feedback and recognizing FCHVs' efforts can further enhance their motivation and job satisfaction.

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LIST OF ABBREVIATIONS

ACD	Active case detection
API	Annual Parasitic Index
CHV	Community Health Volunteers
EDCD	Epidemiology and Disease Control Division
FCHVs	Female Community Health Volunteers
GoN	Government of Nepal
LLIN	Long-lasting infected nets
LMICs	Low and Middle-Income Countries
MCD	Malaria Case Detection
MoHP	Ministry of Health and Population
NDHS	National Demography and Health Survey
NMES	National Malaria Elimination Strategy
PHC	Primary Health Care
PHCC	Primary Health Care Center
RDT	Rapid diagnostic test
SDGs	Sustainable Development Goals
SDT	Self Determination Theory
TICA	Thailand International Cooperation Agency
UNDP	United Nation Development Program
UHC	Universal Health Coverage
WHO	World Health Organization
CFA	Confirmatory Factors Analysis
CFI	Comparative Fit Index
CVI	Content Validity index
EFA	Exploratory Factors Analysis
PCA	Principle Component Analysis

CHAPTER I

INTRODUCTION

1.1 Background and Significance of the Problem

Malaria is an infectious blood disease caused by a protozoan of the genus *Plasmodium* and transmitted by the bite of an *Anopheles* mosquito. Human malaria is caused by five species of *Plasmodium*, of which *Plasmodium falciparum* causes the malignant form and *Plasmodium vivax* is the most common cause of human malaria in the world. *Plasmodium oval* and *malariae* with a low degree of transmission spread cause a milder form of the disease. *Plasmodium knowlesi* is a zoonotic species that has been reported in Southeast Asia in recent years (1, 2).

Even though widespread control and elimination measures were implemented through international and national malaria control programs, malaria continues to be the most important parasitic disease worldwide. Malaria fever is still a major global public health problem with over 3.3 billion people at risk annually (3). The Global Malaria Eradication Program initiated in 1969 failed as hundreds of millions of people were infected with malaria, tens of millions of individuals died (mostly in sub-Saharan Africa and Asia regions), hundreds of thousands of pregnant women died during delivery due to malaria-related complications, and millions of children were born with low birth weight, causing early death or disability (4). However, the first two decades of the current century in the new millennium represent a golden era in the history of malaria control (4).

Global and regional situation

According to the recent annual global malaria report published by the World Health Organization (WHO), there were an estimated 249 million malaria cases in 85 malaria-endemic countries, an increase of 5 million cases from the year 2021 (5). Moreover, they were higher than the 218 million estimated malaria cases for the baseline year 2015 reported at the Global Technical Strategy (GTS) for malaria 2016–2030 (6). Although, between 2000 and 2014, the trend in case numbers fluctuated, there was an overall decrease from 243 million to 230 million across the 108 countries that were

malaria endemic in 2000. This is reflected in the increase in the global malaria case incidence (cases per 1000 population at risk) from 57.2 in 2019 to 59.4 in 2020 -2021. Thus, global malaria incidence increased by 2.2 % between 2021 and 2019. Most of the increase in case numbers over the past 3 years occurred in countries in the WHO African and Asian Region (7).

Most malaria infections in the world are caused by *P. falciparum* which is also more virulent and causes most of the malaria-related mortality worldwide. However, the increasing prevalence of *P. vivax* infections, particularly in the Indian sub-continent, poses unique diagnostic and therapeutic challenges (8). Infection with *P. vivax* also results in the persistence of the parasite as dormant liver-stage hypnozoites which can cause recurrent episodes of malaria. As a result, *P. vivax* often causes imported malaria cases predominantly among adult men in settings outside of sub-Saharan Africa. *P. falciparum* malaria accounted for nearly 99% of cases in Africa and 94% of all malaria cases and deaths globally in 2019 (5).

Malaria situation and strategies in Nepal

Nepal is considered to be a high transmission zone with more than 1 case per 1000 population because of its remarkable geographical plain with topographic variations including plain, hilly, and mountain areas, ranging from 59 m from the sea level to 8,848 m to its highest altitude (9). According to the Malaria Indicators Survey in 2018, the disease represented 75% of the total patients received in health facilities (all age groups) and 10% of the consultations for children under the age of five (10). This proportion has increased in the country from 10% to 17% from 2019 to 2021 as revealed by the demographic and health survey (DHS) performed in high endemic areas during 2019–2021 with a high burden of malaria with 51 out of 77 malaria-endemic districts, and more than two-thirds of its population at risk of malaria infection (11).

The trends of the malaria epidemiological situations for the last three years show a slightly decreasing trend, but from last fiscal year the trend is increasing as confirmed malaria cases Increased from 377 in fiscal year 2077/78 to 491 in fiscal year 2078/79. The proportion of *P. falciparum* infections has increased and accounted for more than 23% of all cases in the current year (11).

In Nepal, about 84% (23 million) of the people were at risk of malaria in 2021 with 4% at high risk. One million people live in areas with a reported incidence of more than one case per 1,000 population per year (12, 13). The major endemic districts in the southern plain of Nepal, which shares a porous border with India are in the tropical zone and provide a favorable wet and moist climate for the breeding of mosquitoes. Nearly more than 80% of cases of malaria in Nepal are caused by *Plasmodium vivax* (9, 14). In Nepal, up to the end of 2018, risk area stratification has been carried out in a total of 1254 wards of the municipalities, the smallest local administrative unit. About 13.02 million population (47.9%) live in malaria-endemic areas; out of which about 1 million (3.62%), 2.66 million (9.8%), and 9.38 million (34.52%) population residing in high-risk, moderate-risk, and low-risk malaria areas respectively (12, 15).

Nepal's National Malaria Elimination Strategy (NMES) 2015-2026, which outlines a vision for reaching zero indigenous cases by 2025, was approved by the government of Nepal in 2016. In line with the global strategies, the National Malaria Elimination Strategy, Nepal is also committed to eliminate malaria by 2030 by ensuring equitable and universal access to effective malaria preventive and curative services (15). Although the government provides diagnosis and treatment for malaria-free of cost in government health facilities (16). However, the scale of preventive interventions appears to have been limited in Nepal (12). In recent years, malaria control activities have been carried out in 65 districts at risk out of 75 administrative districts. In 2010, these 65 districts were further categorized for malaria control program interventions. Based on the annual parasite incidence (API), there were 13 high-risk districts ($API \geq 1$), 18 moderate-risk districts ($API = 0.5-1$), 34 low-risk districts ($API = 0-0.5$), and ten no-risk districts ($API = 0$) (17).

The core focus of these plans is to identify rapid infections and to use timely and active surveillance and response to prevent them from spreading. The NMES introduced the 1-3-7 strategy as a robust surveillance and response approach for elimination that would prioritize timely, evidence-based action. The strategy requires notification of each malaria case within 1 day of diagnosis, investigation, and classification of each case within 3 days, and a focus investigation and response within 7 days to deploy needed interventions (15). Furthermore, the National Malaria Elimination Strategy has

set specific policies in the National Malaria Elimination Plan 2016 -2030 (11), including achieving equity in access to services irrespective of gender, race, and ethnicity, especially for the most vulnerable and hard-to-reach populations. As part of this, the government has implemented extensive malaria case surveillance systems at the village level by supporting the female community health volunteers' workforce (18).

CHVs in Malaria surveillance

Surveillance plays a pivotal role in shaping strategies, interventions, and resource allocation in effective malaria control and elimination strategies. Surveillance is a foundation for comprehensive tracking, monitoring, and analysis of malaria cases to enable public health authorities to understand the spatial and temporal patterns of transmission. This knowledge is indispensable for the timely implementation of targeted interventions, such as vector control measures, distribution of bed nets, and administration of antimalarial drugs(19). Active case surveillance stands out as a proactive and targeted detection method within the surveillance landscape. In contrast to passive surveillance, reliant on symptomatic individuals seeking healthcare, active case surveillance entails systematic efforts to actively seek and identify malaria cases within communities. This approach is essential for capturing asymptomatic and subclinical cases, often missed by traditional surveillance methods. The timely identification of both symptomatic and asymptomatic cases is instrumental in preventing the spread of the disease, reducing transmission, and facilitating prompt and targeted responses (20).

Community health volunteers (CHVs) play a pivotal and multifaceted role at the forefront of active case surveillance (21). Embedded within local communities, CHVs serve as crucial intermediaries, bridging the gap between formal healthcare systems and often hard-to-reach populations. Trained to actively seek, identify, and report malaria cases, CHVs contribute to enhanced surveillance coverage, particularly in areas where access to healthcare infrastructure is limited. Their deep-rooted knowledge of local contexts, cultural sensitivity, and established community relationships uniquely position CHVs to navigate the intricacies of community dynamics. Beyond their instrumental role in case detection, CHVs facilitate transformative community engagement, fostering trust and cooperation. This engagement not only ensures the inclusivity of surveillance

efforts but also promotes community ownership and adherence to preventive measures(21).

In Nepal, the Ministry of Health and Population of Nepal introduced the Female Community Health Volunteer (FCHV) in 2015 at the community level to provide universal access to malaria prevention and care services among rural and hard-to-reach populations (22). They constitute grassroots-level workers in the public health system. In Nepal, community-based malaria diagnosis and treatment services are primarily delivered by a network of around 50,000 FCHVs under the National Malaria Control and various local and international nongovernmental organizations. They are involved in the early diagnosis of malaria (using the rapid diagnostic test, RDT) and prompt treatment (using artemisinin combination therapy (ACT)/chloroquine and primaquine) which is the cornerstone of malaria control. They are also involved in promoting awareness about the prevention and management of malaria, distribution of insecticidal-treated bed nets, and referral of complicated cases (23).

These roles of FCHVs are related to the concept of performance. Performance has long been the focus of research on the prevention and control of infectious diseases, provision of basic health services at individual and community groups (24). Since the importance of CHV performance was pointed out in the Alma Ata Declaration, it has also become a core concept in health-promotion activities at PHC (25). The concept of performance involves multiple factors, including individual and social environment (26). As individual factors consist of individual ability, work motivation, leadership skills including socioeconomic status, and socio-environmental support including support from others (27).

Self-determination theory (SDT), a psychological framework that explores human motivation and behavior also suggests that individuals have inherent psychological needs for autonomy, competence, and relatedness, which influence their performance and participation in activities. Autonomy refers to the need for self-determination as work motivation and leadership, competence refers to the need to feel capable as self-efficacy, and relatedness refers to the need for social connections and support. Fulfilling these needs promotes self-motivation, overall well-being, and growth (28). Moreover, when considering the role of FCHVs in providing active malaria surveillance services in malaria case surveillance activities including education

and awareness, early detection and referral, and treatment of simple malaria cases as appropriate their knowledge and skills and use of a collaborative and multidisciplinary approach in active malaria case surveillance activities to the community people to encourage, support, and follow up on the cases continuously and effectively (29).

However, there are several factors related to CHVs in the provision of malaria surveillance services. A review of the literature revealed that individual ability, work motivation, and leadership and social support factors could influence health volunteers in the provision of malaria services (24, 30-37). Self-efficacy is associated with individual belief in his or her ability to carry out the actions required to achieve specified performance (38, 39). CHVs with high self-efficacy are more likely to persist in the face of challenges and setbacks encountered during malaria surveillance activities. Motivation as an individual's degree of willingness to exert and maintain effort toward a role is related to performance. The performance of CHVs depends on their job satisfaction derived from certain intrinsic and extrinsic motivators (40). In addition, CHVs with good leadership are expected to motivate and encourage the community to be independently healthy (41). Moreover, Social support as interactions with members of social networks that support behavior through emotions and appraisal of values, resources, and information was related to the performance of volunteers in the community (42).

Although Nepal is moving towards implementing elimination strategies, a review literature also illustrated that high rates of importation along its southern border present a major challenge to continued progress. As the number of total cases declined by 92% between 2002 (12,750 cases) and 2016 (1009 cases), the proportion of cases classified as imported increased from approximately 20 to 50% (14). Most imported cases during this period reported a history of travel to malaria-endemic areas of India. Close to two million Nepalese are estimated to work in India as seasonal or long-term labours, and a large proportion of external labour migration, particularly seasonal migration, is believed to originate in malaria-endemic areas such as far- and mid-western Nepal (17). This population movement across Nepal's southern border, which citizens of both nations may cross freely, is thought to contribute to the persistence of local malaria foci in border areas (17, 20). The fact that imported cases have not declined at the same rate as indigenous cases suggests that additional control measures such as

active malaria case surveillance may be needed to effectively prevent, detect, and resolve infections among mobile and migrant populations in endemic areas.

In 2015-2019, MOHP prepared a guideline for FCHVs and conducted training to develop the capacity of FCHVs to prevent and control malaria in high-endemic areas with a high prevalence of the disease according to the national strategic plan. However, the country could not achieve the target reduction of cases in endemic areas. Furthermore, in the past, there has never been a national study on the performance of FCHVs in active malaria case surveillance. In addition, there are no baseline studies evaluating the performance of FCHVs in high-endemic areas.

Therefore, this study was to determine the baseline information on the performance in active malaria case surveillance and its associated factors. This could identify a performance gap that could be useful in the development of plan-appropriate control programs and strategies for FCHVs programs to enhance their performance in active malaria case surveillance in high-endemic areas of Nepal. The results of this study could be useful as a suggestion for enhancing performance in active malaria case surveillance of female community health volunteers in the high-endemic areas of Nepal.

1.2 Research Questions

- 1.2.1 What level of performance of female community health volunteers in active malaria case surveillance in the high-endemic areas of Nepal?
- 1.2.2 Are socio-economic factors of FCHVs such as age, occupation, education, income, work experience, numbers of refresher training, perceived work motivation, leadership, self-efficacy, and social support related to the performance in active malaria case surveillance ?

1.3 Research Objectives

1.3.1 General Objective

To assess the performance and analyze the causal relationship model of factors determining the performance of female community health volunteers in active malaria case surveillance in the high-endemic areas of Nepal.

1.3.2 Specific Objectives

- 1) To assess the performance of female community health volunteers in active malaria case surveillance in the high-endemic areas of Nepal.
- 2) To identify the socio-economic status, perceived work motivation, leadership, self-efficacy, and social support in active malaria case surveillance of female community health volunteers in the high-endemic areas of Nepal.
- 3) To analyze the causal relationship model of factors determining the performance in active malaria case surveillance of female community health volunteers in the high-endemic areas of Nepal.

1.4 Research Hypotheses

H1. Autonomy motivation positively impacts the FCHV to perform active malaria case surveillance activities.

H2. Autonomy leadership skills positively impact the FCHV to perform active malaria case surveillance activities.

H3. Perceived self-efficacy positively impacts the FCHV to perform active malaria case surveillance activities.

H4. Perceived social support positively impacts the FCHV to perform active malaria case surveillance activities.

H5. Perceived supportive supervision positively impacts the FCHV's active surveillance of malaria cases.

1.5 Variables of the Study

1.5.1 Dependent variables

In this study, the dependent variables were seven role performances as diagnosis, treatment, refer, transferring knowledge, IEC distribution, home visit, and, recording and reporting the malaria cases in active malaria case surveillance by female community health volunteers in high endemic areas of Nepal.

1.5.2 Independent variables

In this study, variables such as age, education, occupation, family income, years of work experience, and numbers of malaria refresher training in the past, and perceived work motivation, leadership, self-efficacy, as individual factors, and social/environmental factors as social support from family, community people, and health personnel in active malaria case surveillance among female community health volunteers were also considered as independent variables of this study.

1.6 Conceptual Framework of the Study

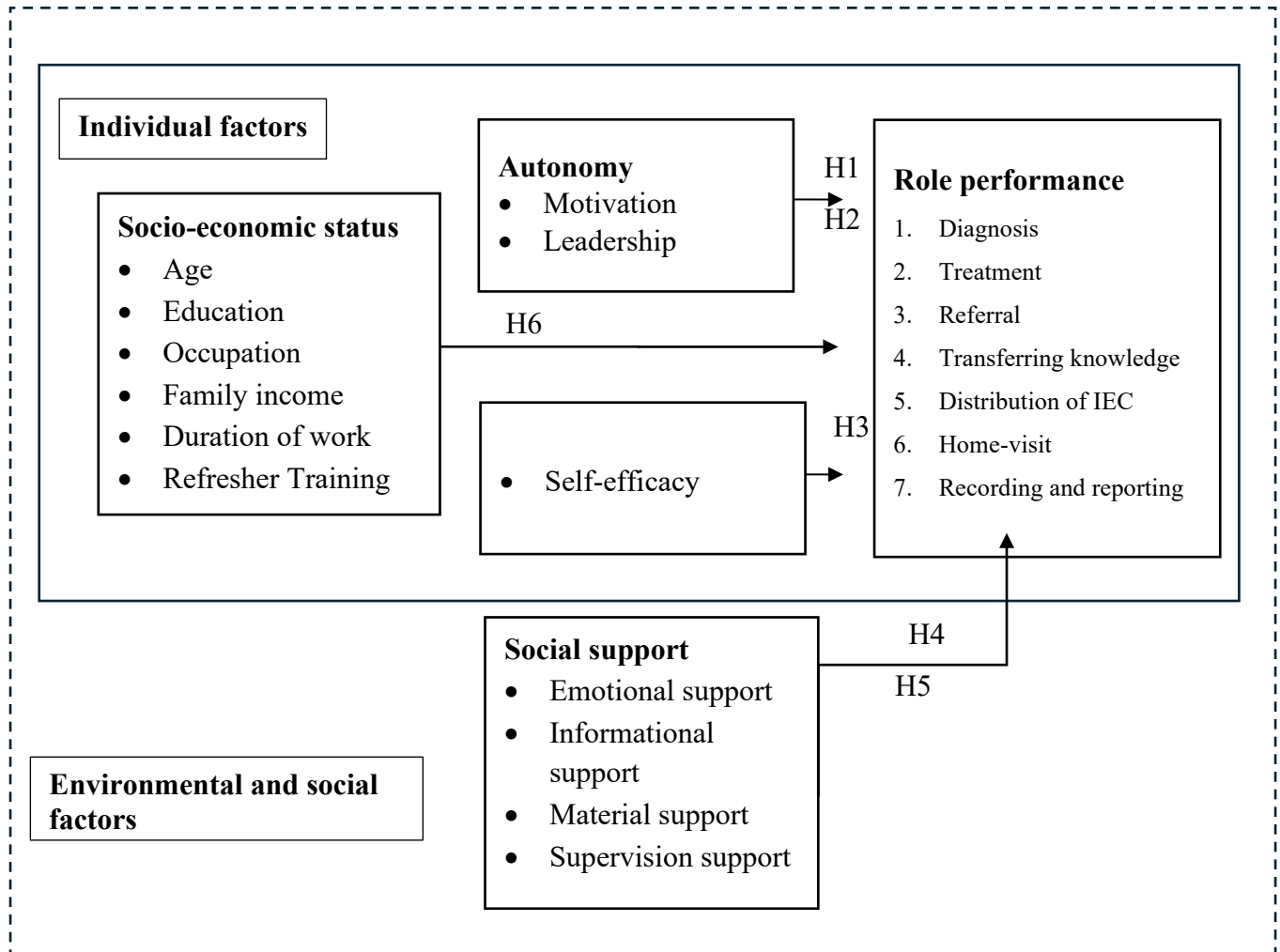


Figure 1.6 Conceptual Framework of the Study

1.7 Operational Definition of the Study Variables

1.7.1 Dependent variable

Performance of Female Community Health Volunteers (FCHVs)

For this study, performance refers to the roles of FCHVs defined in the operational guidelines of the Department of Health Service, MOHP (2015), in terms of their key performance indicators (process and outcome) performed during the last year in malaria elimination programs in high-endemic areas (23). The performance of FCHVs was measured based on their seven dimensions of role malaria case surveillance in high-endemic areas including: 1) diagnosis of cases, 2) treatment of cases, 3) referring to the cases, 4) transferring knowledge, 5) distribution of IEC materials, 6) Observation (home visit) usage of LLIN, and 7) recording and reporting the cases.

1.7.2 Independent variable

1. Socio-economic status of FCHVs

Age: It was referred to as the complete age of FCHVs in years at the time of data collection.

Education: It was obtained as the highest level of education completed by individual respondents at the time of data collection.

Occupation: It was referred to as the major work or job that female community health volunteers are doing to earn money apart from volunteer.

Family income: Family income refers to the total income per month of family members of FCHVs at home as perceived by the participants who cooperated in the survey. The income of the family was recorded as monthly income on average.

Duration of working as an FCHV: It refers to working as a registered FCHV. The total duration of working years as a health volunteer in the community was recorded as years of working period.

Number of malaria training in the past: It refers to the number of malaria-related refresher training in the past.

2. Autonomy in active malaria case surveillance

It referred to the two aspects of psychological behaviors of perceived express opinion at their task including work motivation, and the leadership role of FCHVs in active malaria case surveillance.

2.1 Motivation for Active Malaria Case Surveillance

It referred to the aspect of behaviors, such as the degree of willingness as personal choices (autonomous) and external effort choices (controlled) to exert and maintain an effort towards active malaria case surveillance.

For this study, five components of work motivation was adapted to assess work motivation in active malaria case surveillance among FCHVs.

The five components of work motivation are defined as:

- 1) intrinsic motivation - refers to when helping gives joy
 - 2) integrated regulation - refers to when being a volunteer is central to one's identity
 - 3) identified regulation- refers to when volunteering is considered to support an important personal cause
- and two components of controlled motivation: which refers to doing work to receive a reward or to avoid punishment or feelings of guilt:
- 4) introjected regulation - refers to a low form of internalization when behaviors are performed to avoid guilt and shame or to obtain ego enhancements and feelings of worth
 - 5) external regulation -refers to no internalized behaviors as they are mainly driven by external rewards or to avoid punishment.

2.2 Leadership in Active Malaria Case Surveillance

It referred to the four leadership skills of female community health volunteers including transformational competence, political competence, trans-organizational competence, and team-building competence in active malaria case surveillance.

3. Self-efficacy in active malaria case surveillance

Refers to FCHV's perception about her ability in use of RDT, refer, treatment guidelines, transfer knowledge, prevent infection, and report cases in active malaria case surveillance in high-endemic areas of Nepal.

4. Social support in active malaria case surveillance

Social support refers to the network of assistance, empathy, encouragement, or resources that individuals receive from their relationships, community, or social circles. (43).

In this study, this information is obtained through perceived social support as emotional, information, materials and supportive supervision support from their family, community, and health providers respectively.

1) Emotional support refers to the experience of receiving empathy, care, and love from family members.

2) Information support refers to experience of receiving advice, suggestions, and malaria related information from community people.

3) Materials support: referring to the experience of receiving tangible aids and services from health providers.

4) Supportive and controlling supervision support refers to the experience of receiving positive and negative feedback information useful to make decisions on malaria diagnosis, treatment, and referral from health providers.

1.8 Usefulness of the Study

1. The study determined the baseline information on the performance of FCHVs working in active malaria case surveillance in Nepal.
2. The study determined the related factors to the performance such as socio-economic status, self-efficacy, work motivation, leadership, and social support of female community health volunteers in active malaria case surveillance in the high-endemic areas of Nepal. This could be useful to identify performance constraints that would be useful in the development of capacity development programs to enhance role performance.
3. The results of this study could be useful for policymakers and planners to update regarding the current performance of FCHVs in active malaria case detection, early diagnosis, and control. Therefore, it will help the policymakers to formulate effective strategies for the improvement of performance.

CHAPTER II

LITERATURE REVIEW

This study aims to assess the performance in active malaria case surveillance of female community health volunteers in high-endemic areas of Nepal. The researcher has reviewed and studied a variety of literature to support this study in the scope of relevant concepts in performance and research. Moreover, the research design and instruments applied by previous researchers are also examined to support the design of further factor analysis steps. The review results are presented in the following clarification:

- 2.1 Global, regional, and country situation of malaria diseases
- 2.2 Nepalese Health System and Shortage of Health Workforce
- 2.3 Female Community Health Volunteers in Nepal
- 2.4 Concepts, determinants, and measurement of performance
- 2.5 Theoretical background and hypothesis
- 2.6 Review of related studies
- 2.7 Summary and Knowledge Gap

2.1 Global, Regional, and Country Situation of Malaria Diseases

Malaria is a severe mosquito-borne infectious disease caused by an obligate intracellular protozoan parasite of the genus *Plasmodium*. It is an endemic vector-borne parasitic disease in tropical and subtropical regions worldwide. There are five *Plasmodium* species causing malaria in humans, *P. falciparum*, *P. vivax*, *P. malaria*, *P. ovale*, and *P. knowlesi*. *P. falciparum* and *P. vivax* account for more than 95% of malaria cases worldwide. *P. falciparum* is fatal in its characteristics and responsible for most of malaria's overall deaths (12). Despite being preventable and curable and important efforts to control the disease, malaria continues to have a devastating impact on people's health and livelihoods worldwide.

The life cycle of the parasites is a complex process occurring in both vertebrate hosts and a mosquito vector. Besides, it undergoes both sexual and asexual reproduction mechanisms. This makes the development of drugs and vaccines challenging (44). Although artemisinin and its derivatives are potent treatments for malaria and are being widely used in combination therapies worldwide, resistance is emerging in some parts of the world. This calls for the need to discover new anti-malarial agents possessing high therapeutic value with minimal toxicity, and lower cost. However, the impact of long-lasting impregnated nets (LLINs) has been compromised in recent years by several factors: the emergence of resistance to the insecticide in the mosquito populations, the diversity and changes in the behavior of *Anopheles* since some of the species are (or have become) esophagus/exophilic and early biters (45).

2.1.1 Global Situation of Malaria

Even though widespread control and elimination measures were implemented through international and national malaria control programs, malaria continues to be the most important parasitic disease worldwide. The Global Malaria Eradication Program initiated in 1969 failed as hundreds of millions of people were infected with malaria, tens of millions of individuals died (mostly in sub-Saharan Africa), hundreds of thousands of pregnant women died during delivery due to malaria-related complications, and millions of children were born with low birth weight, causing early death or disability (4). However, the first two decades of the current century in the new millennium represent a golden era in the history of malaria control (4).

According to the recent annual global malaria report published by the World Health Organization (WHO), there were an estimated 249 million malaria cases in 85 malaria-endemic countries, an increase of 5 million cases from the year 2021 (5). Moreover, they were higher than the 218 million estimated malaria cases for the baseline year 2015 reported at the Global Technical Strategy (GTS) for malaria 2016–2030 (6). Although, in between 2000 and 2014, the trend in case numbers fluctuated, there was an overall decrease from 243 million to 230 million across the 108 countries that were malaria endemic in 2000. This is reflected in the increase in the global malaria case incidence (cases per 1000 population at risk) from 57.2 in 2019 to 59.4 in 2020 -2021.

Thus, global malaria incidence increased by 2.2 % between 2021 and 2019. Most of the increase in case numbers over the past 3 years occurred in countries in the WHO African and Asian Region (7).

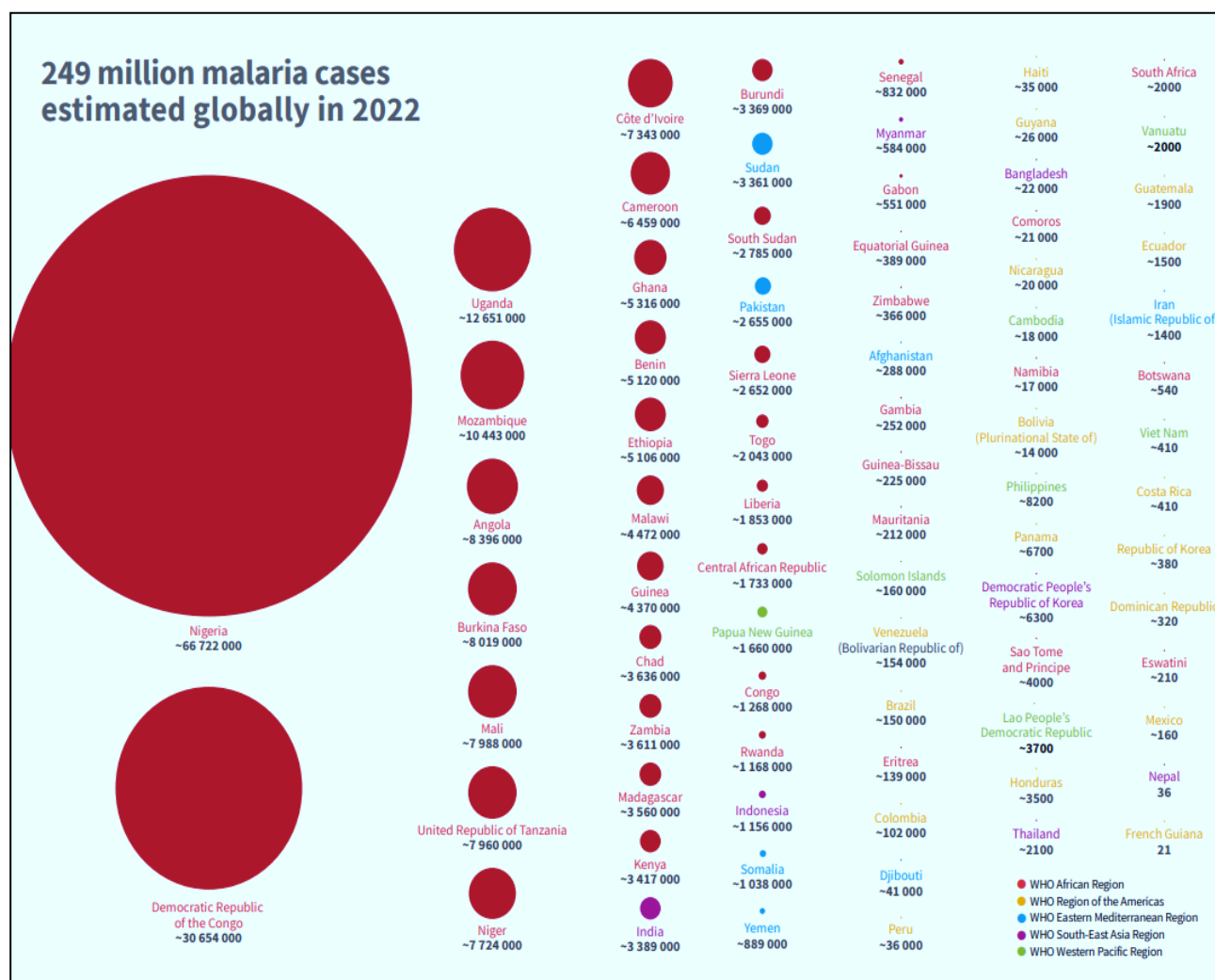


Figure 2.1.1 Estimated numbers of malaria cases country-wise in 2023

(Source: WHO, Global malaria report, 2023)

The main countries contributing to the increase in cases between 2021 and 2022 were Pakistan (+2.1 million), Ethiopia (+1.3 million), Nigeria (+1.3 million), Uganda (+597 000) and Papua New Guinea (+423 000). Among these countries, the increase in Nigeria was attributable to population growth as incidence remained unchanged. In the other four countries and compared with 2021, incidence increased in 2022 fivefold in Pakistan (2.2 to 11.5 cases per 1000 population at risk), by 32% in Ethiopia (46.3 to 60.9 cases per 1000 population at risk), by 32% in Papua New Guinea (124.3 to 163.7 cases per 1000 population at risk) and by 2% in Uganda (262.9 to 267.8 cases per 1000 population at risk) (5).

Global estimated malaria cases and deaths, 2000–2022 ^a Source: WHO estimates.							
Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% <i>P. vivax</i>	Point	Lower bound	Upper bound
2000	243 000	227 000	263 000	8.3%	864 000	835 000	905 000
2001	248 000	230 000	271 000	8.3%	873 000	841 000	918 000
2002	245 000	227 000	267 000	7.7%	841 000	811 000	885 000
2003	249 000	232 000	271 000	8.0%	813 000	783 000	856 000
2004	250 000	232 000	277 000	7.9%	808 000	774 000	866 000
2005	249 000	232 000	273 000	8.0%	770 000	738 000	819 000
2006	244 000	226 000	268 000	6.9%	776 000	745 000	826 000
2007	240 000	223 000	262 000	6.6%	754 000	723 000	796 000
2008	239 000	223 000	259 000	6.4%	716 000	686 000	757 000
2009	245 000	227 000	267 000	6.4%	726 000	692 000	775 000
2010	247 000	229 000	272 000	6.6%	703 000	668 000	755 000
2011	241 000	225 000	263 000	7.0%	665 000	633 000	707 000
2012	237 000	221 000	257 000	7.0%	619 000	590 000	660 000
2013	232 000	215 000	251 000	6.0%	591 000	560 000	633 000
2014	230 000	209 000	253 000	5.5%	588 000	551 000	643 000
2015	231 000	211 000	254 000	4.9%	586 000	548 000	645 000
2016	232 000	214 000	253 000	4.6%	582 000	546 000	645 000
2017	237 000	219 000	258 000	3.7%	580 000	545 000	644 000
2018	232 000	215 000	253 000	3.0%	581 000	545 000	656 000
2019	233 000	213 000	255 000	2.7%	576 000	537 000	660 000
2020	244 000	221 000	271 000	1.9%	631 000	587 000	747 000
2021	244 000	220 000	272 000	2.1%	610 000	568 000	726 000
2022	249 000	225 000	278 000	2.8%	608 000	566 000	738 000

Figure 2.1.1 Global estimated malaria cases and deaths, WHO (2023)
(Source: WHO estimates, Global malaria report, 2023)

Malaria in humans is caused by five *Plasmodium* species, namely *P. falciparum*, *P. vivax*, *P. ovale*, *P. malariae*, and *P. knowlesi*. Most malaria infections in world are caused by *P. falciparum* which is also more virulent and causes most of the malaria-related mortality worldwide. However, increasing prevalence of *P. vivax* infections, particularly in the Indian sub-continent, poses unique diagnostic and therapeutic challenges (8). Infection with *P. vivax* also results in persistence of the parasite as dormant liver-stage hypnozoites which can cause recurrent episodes of malaria. As a result, *P. vivax* often causes imported malaria cases predominantly among adult men in settings outside sub-Saharan Africa. *P. falciparum* malaria accounted for nearly 99% of cases in Africa and 94% of all malaria cases and deaths globally in 2019 (5).

Globally, malaria caused 409,000 deaths in 2019 with 95% of deaths occurring in 31 countries and 51% of all malaria deaths occurring in only six countries (Nigeria, 23%; Democratic Republic of Congo, 11%; Tanzania, 5%; Mozambique, 4%; Niger, 4% and Burkina Faso, 4%) [4]. About 67% of all malaria deaths occurred in children aged five years or less. Malaria-related deaths have declined steadily during the period 2000–2019, from 736,000 in 2000 to 409,000 in 2019. The malaria mortality rate (i.e., deaths per 100,000 population at risk) has also declined from ~25/100,000 population in 2000 to 12/100,000 in 2015 but only to 10/100,000 in 2019 indicating decreasing rate of decline in later years (5). The largest reduction in malaria mortality rate (74%) occurred in WHO South-East Asia Region, from ~35,000 in 2000 to 9,000 in 2019 while in absolute numbers, the largest reduction occurred in the WHO African Region, from 680,000 in 2000 to 384,000 in 2019 (5).

Imported malaria cases into non-endemic regions and malaria-free countries are being increasingly recognized as a new public health challenge for industrialized and other malaria-non-endemic countries. Changes in the ecosystem and climate due to global warming have also increased the risk of vector-borne diseases such as malaria (46). The ever-increasing travel for business and/or leisure and migratory movements for employment or due to geopolitical conflicts have changed the epidemiological characteristics of imported malaria in many malaria-free and non-endemic countries (47).

Two other major areas of concern were also apparent from the latest global malaria report. Deletions in the *P. falciparum* histidine-rich protein (pfhrp)2 and pfhrp3 genes have been confirmed in 11 (China, Equatorial Guinea, Ethiopia, Ghana, Myanmar, Nigeria, Sudan, Uganda, United Kingdom (imported cases), Tanzania, and Zambia) countries. This makes the parasites detectable by rapid diagnostic tests based on detection of HRP2(8). Furthermore, mutations in PfKelch13 have been identified which confer partial resistance to artemisinin, first-line treatment for *P. falciparum* infections. Resistance to other drugs (antifolates, naphthoquinones, antibiotics like clindamycin and doxycycline and 4-aminoquinolines) has also emerged in malarial parasites and few novel targets have recently been identified for the development of new antimalarial drugs (48).

2.1.2 Regional situation of Malaria disease (according to WHO region)

In 2022, the WHO African Region accounted for about 93.6% of cases and 95.4% of deaths globally; 78.1% of all deaths in this region were among children aged under 5 years in 2022, compared with 90.7% in 2000. Between 2019 and 2020, estimated malaria cases increased from 218 million to 230 million, and deaths from 552,000 to 604,000 in this region. Between 2020 and 2022, there was almost no change in the estimated number of cases in the region, while deaths decreased to 580,000. However, between 2019 and 2022, there were substantial increases in estimated case numbers in Nigeria (5.3 million), Ethiopia (2.4 million), Madagascar (1.5 million), Uganda (1.3 million), the United Republic of Tanzania (1.3 million), Mali (1.1 million) and Mozambique (1 million). Over the same period, Rwanda saw a decrease of more than 3.8 million cases (5, 7).

Estimated malaria cases and deaths in the WHO African Region, 2000–2022 ^a <i>Source: WHO estimates.</i>							
Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% <i>P. vivax</i>	Point	Lower bound	Upper bound
2000	209 000	194 000	227 000	2.9%	808 000	785 000	839 000
2001	214 000	196 000	235 000	2.6%	819 000	791 000	856 000
2002	213 000	195 000	233 000	2.3%	790 000	764 000	825 000
2003	216 000	199 000	236 000	2.3%	761 000	736 000	798 000
2004	216 000	198 000	242 000	1.8%	754 000	726 000	807 000
2005	213 000	196 000	235 000	1.2%	715 000	690 000	757 000
2006	213 000	196 000	235 000	1.3%	726 000	699 000	767 000
2007	211 000	194 000	232 000	1.3%	707 000	681 000	744 000
2008	210 000	195 000	229 000	1.2%	669 000	646 000	702 000
2009	215 000	198 000	236 000	1.4%	677 000	649 000	719 000
2010	216 000	199 000	238 000	1.6%	652 000	623 000	700 000
2011	214 000	198 000	234 000	2.3%	621 000	595 000	659 000
2012	213 000	197 000	231 000	2.8%	580 000	554 000	617 000
2013	212 000	196 000	230 000	2.7%	558 000	530 000	599 000
2014	210 000	190 000	233 000	2.9%	553 000	520 000	606 000
2015	211 000	192 000	233 000	2.2%	551 000	517 000	608 000
2016	211 000	193 000	231 000	1.4%	545 000	512 000	601 000
2017	219 000	201 000	240 000	1.0%	548 000	515 000	611 000
2018	216 000	198 000	237 000	0.2%	555 000	520 000	630 000
2019	218 000	198 000	240 000	0.3%	552 000	513 000	636 000
2020	230 000	207 000	257 000	0.3%	604 000	561 000	721 000
2021	230 000	207 000	259 000	0.3%	584 000	542 000	700 000
2022	233 000	209 000	261 000	0.5%	580 000	538 000	710 000

The WHO South-East Asia Region had nine malaria-endemic countries in 2022, accounting for 5.2 million cases and contributing to 2% of the burden of malaria cases globally. In 2022, India accounted for about 65.7% of all malaria cases in the region. Almost 46% of all cases in the region were due to *P. vivax*. Between 2000 and 2022, malaria cases decreased by 77%, from 22.8 million in 2000 to 5.2 million in 2022, and incidence decreased by 83%, from 17.6 to 3.0 per 1000 population at risk. Sri Lanka was certified malaria-free in 2016. In 2022, Timor-Leste reported zero indigenous cases for the second consecutive year, and Bhutan reported zero indigenous cases for the first time. Despite an overall decrease of 11.9% in estimated cases

between 2021 and 2022, increases in cases and incidence were seen in Bangladesh, Indonesia, Myanmar, and Thailand (7). (Source: WHO estimates).

Estimated malaria cases and deaths in the WHO South-East Asia Region, 2000–2022 ^a Source: WHO estimates.							
Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% <i>P. vivax</i>	Point	Lower bound	Upper bound
2000	22 800	18 400	28 800	47.6%	35 000	20 000	54 000
2001	23 100	18 800	28 800	50.4%	34 000	20 000	52 000
2002	21 900	17 600	27 700	49.8%	33 000	19 000	51 000
2003	23 100	18 600	28 900	52.2%	33 000	19 000	51 000
2004	25 300	20 200	32 500	51.9%	37 000	20 000	57 000
2005	27 200	21 000	35 900	53.7%	38 000	21 000	61 000
2006	22 500	17 500	30 300	51.4%	33 000	18 000	53 000
2007	22 100	17 000	30 000	49.5%	33 000	18 000	53 000
2008	23 300	17 700	32 300	47.4%	35 000	19 000	58 000
2009	23 700	17 700	33 000	45.2%	37 000	20 000	61 000
2010	23 900	18 700	32 400	44.7%	38 000	21 000	60 000
2011	20 600	16 000	27 600	45.9%	32 000	18 000	51 000
2012	17 700	14 000	23 500	47.7%	27 000	16 000	42 000
2013	13 200	10 400	17 200	46.1%	20 000	11 000	32 000
2014	12 800	10 000	17 000	35.0%	23 000	12 000	37 000
2015	13 300	10 400	17 900	34.3%	24 000	12 000	40 000
2016	13 700	10 200	19 300	34.9%	25 000	12 000	42 000
2017	10 300	7 700	14 100	37.3%	18 000	9 000	30 000
2018	7 500	5 500	10 300	50.5%	11 000	6 000	18 000
2019	6 400	4 600	8 800	51.3%	9 000	5 000	15 000
2020	5 800	4 000	7 900	36.3%	10 000	5 000	17 000
2021	5 900	4 100	8 300	39.5%	10 000	5 000	17 000
2022	5 200	4 300	7 400	45.7%	8 000	5 000	13 000

Estimated malaria deaths decreased by 77.1%, from about 35 000 in 2000 to 8000 in 2022. Between 2000 and 2022, the malaria mortality rate decreased by 82.7%, from 2.7 to 0.5 per 100 000 population at risk. India and Indonesia accounted for about 94% of all malaria deaths in this region in 2022. Between 2020 and 2022, all countries in the region in which malaria deaths occurred reported an increase in the malaria mortality rate, except for India. The mortality rate in Myanmar experienced a near sixfold increase, from 0.17 to 0.99 per 100 000 population at risk (5).

The estimated malaria cases in the WHO Eastern Mediterranean Region decreased by 38.0% between 2000 and 2015, from 6.9 million to 4.3 million, before increasing by 92% between 2015 and 2022 to reach 8.3 million cases. Between 2021 and 2022, there was an increase of 34%; this was mainly due to a large increase of 2.1 million malaria cases in Pakistan owing to a malaria outbreak following the catastrophic flooding that affected more than 30 million people. Significant increases were also seen in Afghanistan and Sudan, with an additional 94,000 and 35,000 cases, respectively (7).

Between 2000 and 2022, in the WHO Region of the Americas, malaria cases and incidence declined by 64.0% (from 1.5 million to 0.55 million) and 72.5% (from 13.1 to 3.6 cases per 1000 population at risk), respectively. Since 2015, the WHO European Region has been free of malaria. The last country to report an indigenous malaria case was Tajikistan in 2014. Throughout the period 2000–2022, no malaria deaths were reported in the WHO European Region (5).

The highest number of malaria cases and deaths occur in sub-Saharan African and south/southeast Asian countries. However, imported cases of malaria also occur in the Middle East Region and other developed countries which are either considered malaria-free or have eradicated malaria through concerted efforts and have been declared malaria-free recently. Many Middle East Region countries, have large expatriate populations originating from malaria-endemic countries of south/southeast Asia, such as India, Pakistan, Afghanistan, Bangladesh, and the Philippines and Africa, such as Nigeria, Sudan, and Ethiopia. Imported malaria cases into non-endemic regions and malaria-free countries are being increasingly recognized as a new public health challenge. Imported malaria cases from South Asia where *P. vivax* infections are also common, often result in persistence of the parasite as dormant liver-stage hypnozoites which can cause recurrent episodes of malaria in non-endemic settings. Imported *P. vivax* infections can thus result in outbreaks of infection if mosquito vector breeding is facilitated and maintained by artificial water reservoirs such as construction sites as was demonstrated in the outbreak reported from Oman in 2014 which had been malaria-free since 2010.

2.1.3 Situation of Malaria disease in Nepal

Nepal is considered to be a high transmission zone with more than 1 case per 1000 population because of its remarkable geographical plain with topographic variations including plain, hilly, and mountain areas, ranging from 59 m from the sea level to 8,848 m to its highest altitude (9). According to the Malaria Indicators Survey in 2018, the disease represented 75% of the total patients received in health facilities (all age groups) and 10% of the consultations for children under the age of five (10). This proportion has increased in the country from 10% to 17% from 2019 to 2021 as revealed by the demographic and health survey (DHS) performed in high endemic areas during 2019–2021 with a high burden of malaria with 51 out of 77 malaria-endemic districts, and more than two-thirds of its population at risk of malaria infection (11).

The major endemic districts in the southern plain of Nepal, which shares a porous border with India are in the tropical zone and provide a favorable wet and moist climate for the breeding of mosquitoes. Nearly more than 80% of cases of malaria in Nepal are caused by *Plasmodium vivax* (9, 14). In Nepal, up to the end of 2018, risk area stratification has been carried out in a total of 1254 wards of the municipalities, the smallest local administrative unit. About 13.02 million population (47.9%) live in malaria-endemic areas; out of which about 1 million (3.62%), 2.66 million (9.8%), and 9.38 million (34.52%) population residing in high-risk, moderate-risk, and low-risk malaria areas respectively (12, 15).

In Nepal, about 84% (23 million) of the people were at risk of malaria in 2021 with 4% at high risk. One million people live in areas with a reported incidence of more than one case per 1,000 population per year (12, 13). However, the scale of preventive interventions appears to have been limited in Nepal (12). In recent years, malaria control activities have been carried out in 65 districts at risk out of 75 administrative districts. In 2010, these 65 districts were further categorized for malaria control program interventions. Based on the annual parasite incidence (API), there were 13 high-risk districts ($\text{API} \geq 1$), 18 moderate-risk districts ($\text{API} = 0.5-1$), 34 low-risk districts ($\text{API} = 0-0.5$) and ten no-risk districts ($\text{API} = 0$) (17).

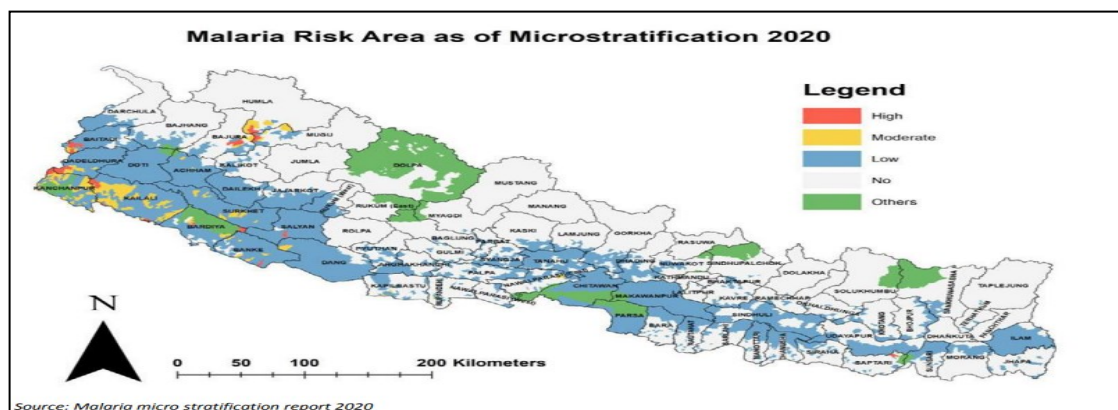


Figure 2.1.3 Malaria Microstratification Report 2020

Source: MOHP, EDCD, Nepal

Bases on microstratification in 2020, It was found that, higher number of malaria cases are found in rural and Terai region of Nepal. Based on the annual parasite incidence (API), high-risk districts ($API \geq 1$). Hence, this study will focus only the high endemic districts namely, Bake, Humla, Kalikot, Achham, Baitadi, Bajura, Dadeldhura, and Kanchanpur. These districts are selected based on high risk of malaria cases (49, 50).

Malaria transmission occurs year-round in Nepal, peaking in July during the seasonal monsoon. Risk groups include ethnic minorities, the poor, young individuals, mobile populations, and people living near the Indian border. Although the government provides diagnosis and treatment for malaria free of cost in government health facilities, in reality the lack of medicines and human resources in these facility, high travel costs, and socio-cultural factors discourage the poor and vulnerable individuals from seeking and utilizing care (16).

The proportion of *P. falciparum* is gradually increasing, as current interventions are more effective at controlling *P. falciparum*.

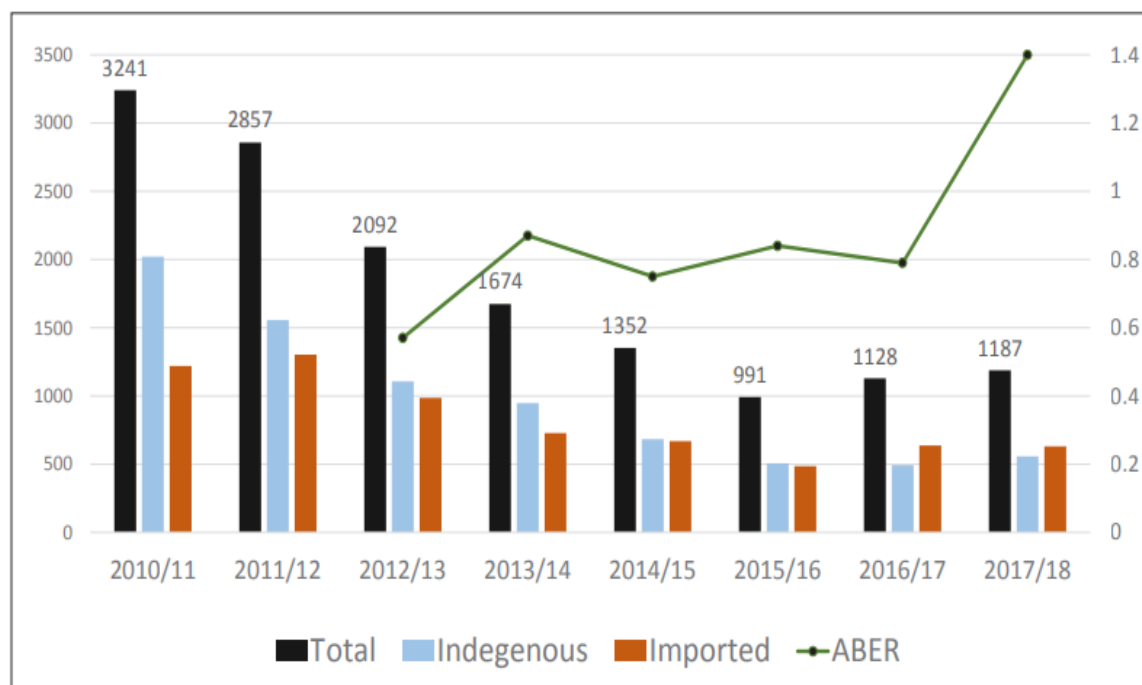


Figure 2.1.3.1 Trend of Malaria Epidemiological Information in Nepal 2073/74 and 2074/75 show a slightly increasing trend (51). Malaria epidemiological information (FY 2074/75–2076/77).

Source: Annual Malaria Parasitic Index, EDCD

At all endemic districts, there is a significant variation in malaria risk by regions, areas, and villages and they are largely dependent upon the local context. Thus, it is unlikely that a one-size-fits-all strategy will be appropriate for all endemic settings within a country. This situation echoes Nepal's current malaria epidemiology, where the risk of contracting malaria is highly variable from district to district and even between areas within the district (14).

Overall malaria trend in Nepal for the last 5 years indicates a decline in both clinical and confirmed malaria cases. The country has exceeded the Millennium Development Goals in 2010 (set for 2015) to reduce malaria morbidity and mortality and is in a unique position to move towards elimination (15). With the significant reduction in malaria burden, the Nepal malaria program has set up the vision of a malaria-free Nepal by 2025 and the country is currently in the pre-elimination phase (9).

2.1.3.1 National Malaria Strategic Plan (2014–2025) In Nepal

National Malaria Strategic Plan (NMSP 2014-2025) was updated since it was developed in 2013 with aim of “Malaria Elimination in Nepal by 2025” by ensuring proportional and equitable access to quality assured diagnosis and treatment in health facilities as per federal structure and implement effective preventive measures to achieve malaria elimination (15). The updated NMSP (2014-2025) will attain the elimination goals through the implementation of following five strategies such as Strengthen surveillance and information system on malaria for effective decision making, Ensure effective coverage of vector control interventions in malaria risk areas to reduce transmission, Ensure universal access to quality assured diagnosis and effective treatment for malaria, Ensure government committed leadership and engage community for malaria elimination and Strengthen technical and managerial capacities towards malaria elimination (15).

Malaria program is currently supported by WHO, PMI/USAID, SCI (current PR of TGF grant). The technical working group (TWG) guides the program on the technical issues and policies impacting malaria elimination. The national program envisages a malaria elimination steering committee and malaria elimination task force to guide the country and track the progress towards malaria elimination (51). Furthermore, According to the Global Technical Strategy in Malaria 2016-2030 framework, the new anti-malarial treatment policy, community-based Malaria Control program has been introduced and implemented in some high-risk malaria endemic district near border with India since 2019 and expanded in total 29 districts, 2700 volunteers were trained in 2021 for case detection using RDTs in hard-to-reach endemic areas (52).

In fiscal year 2078/79, the National Malaria Program achieved more than 90 % reduction in indigenous malaria cases compared to last three fiscal year whereas more than 90% (66) in 2077/78 Case and Foci investigation are getting momentum. Around 99% (486/491) cases went through the case-based investigation which was around 93% in 2077/78. This year (2078/79) annual Blood Examination Rate (ABER) and annual parasite incidence are increased (2.89%) and 0.05 compared to previous fiscal years and positivity rate is decreasing (0.17%) trend respectively. In 2078/79, altogether 38 suspected foci were investigated. Out of that only 24 foci were active where local

transmission was ongoing. In this year, a total of 48 foci were residual non-active, and 87 foci were cleared (11).

The trends of the malaria epidemiological situations for the last three years show a slightly decreasing trend, but from last fiscal year the trend is increasing as confirmed malaria cases increased from 377 in 2077/78 to 491 in 2078/79. The proportion of *P. falciparum* infections has increased and accounted for more than 23% of all cases in the current year. After a decade, the program has diagnosed found *p. ovale* malaria cases among returnees of peace keeping mission among them one case was died due to malaria in high-risk district named Kanchanpur (14).

Even, Nepal has made impressive gains against malaria through integrated vector control, diagnosis, and treatment measures. However, pockets of high transmission persist along the India border, along with risks of imported cases and asymptomatic reservoirs. Further political commitment, cross-border coordination, and addressing surveillance and access challenges will be key to achieving Nepal's target of zero indigenous cases by 2026. Elimination will require targeting interventions to mobile high-risk groups and persisting hotspots.

Active malaria case surveillance program

According to the Global Technical Strategy in Malaria 2016-2030 framework, the new anti-malarial treatment policy, community-based Malaria Control program as active malaria case surveillance has been introduced and implemented in some high-risk malaria endemic district near border with India since 2019 and expanded in total 29 districts, 2700 volunteers were trained in 2021 for case detection using RDTs in hard-to-reach endemic areas (52).

Active malaria case surveillance is defined as a systematic process undertaken by health authorities to actively seek and detect malaria cases within a specific area or population. This involves proactive strategies like field visits, community screenings, health facility data collection, and diagnostic tests to promptly identify cases, track their spread, and gather epidemiological data. This surveillance is crucial for monitoring malaria prevalence, incidence, and transmission patterns, and facilitating timely interventions towards controlling and eliminating the disease (19). An active malaria surveillance strategy is essential for effective malaria control in areas where

the disease is endemic (19). Active surveillance helps to identify potential malaria risk factors. By analyzing the data, public health experts can identify any environmental factors that may contribute to the persistence of malaria. The effectiveness of active surveillance depends on how well the system is implemented and monitored. If the system is not effectively monitored and maintained, it may fail to detect an increase in malaria cases or potential risk factors (19). In Nepal, Female Community Health Volunteers (FCHVs) conduct active surveillance of malaria cases by routinely conducting home visits to identify and report suspected malaria cases (15). This approach ensures that malaria cases are detected early, and appropriate treatment can be provided immediately. Active malaria surveillance requires the collection of reliable and accurate data to track disease trends, inform public health policy and provide health care providers with an informed basis for decisions on malaria treatment and case management in the community.

In Nepal, various concepts and strategies are employed for active malaria case prevention and control performance (11, 17). Some of these concepts and approaches include:

Early Case Detection and Prompt Treatment: Ensuring timely detection of malaria cases through active surveillance, including community-based health workers and volunteers. Once cases are identified, prompt and appropriate treatment with effective antimalarial drugs is essential to prevent severe illness and further transmission.

Vector Control: Implementing measures to control mosquito vectors, primarily *Anopheles* mosquitoes, which transmit the malaria parasite. This includes distribution and promotion of insecticide-treated bed nets (ITNs), indoor residual spraying (IRS) of insecticides, and environmental management to reduce mosquito breeding sites.

Health Education and Behavioral Change Communication (BCC): Conducting awareness campaigns and health education programs to inform communities about malaria prevention measures. This includes promoting the use of bed nets, proper diagnosis, and treatment-seeking behavior, and educating on environmental sanitation practices to reduce mosquito breeding.

Capacity Building and Training: Providing training to healthcare workers, community health volunteers, and relevant stakeholders on malaria diagnosis,

treatment, surveillance, and control strategies. This ensures that they are equipped with the necessary knowledge and skills to actively participate in malaria prevention and control efforts.

Integrated Malaria Management: Integrating malaria control activities with other health services and interventions, such as maternal and child health programs, to maximize resources and reach a broader population.

Surveillance and Monitoring: Establishing robust surveillance systems to track malaria cases, identify high-risk areas, and monitor the effectiveness of control measures. Continuous monitoring and evaluation help in adapting strategies based on changing epidemiological patterns.

Cross-Border Collaboration: Given Nepal's geographical location and proximity to malaria-endemic countries, cross-border collaboration, and coordination with neighboring countries for malaria control are crucial to prevent the importation of malaria cases and ensure a comprehensive approach to control efforts.

Policy Development and Resource Mobilization: Developing and implementing policies that support malaria prevention and control programs, as well as mobilizing resources and partnerships at national and international levels to sustain efforts towards malaria elimination.

Population Services International/Nepal (PSI/Nepal) began operations in early 2002 and has been partnering with the Government of Nepal, the private sector, and local and international organizations in areas of nationally defined health priorities to create health solutions that are built to last. In Nepal, PSI project is being a part of National Malaria Control Program since 2011. This project implemented community-based case management of malaria program and promotes the usage of recommended Artemisinin combination therapy (ACT) and rapid diagnostic tests (RDTs). It also trained and mobilized female community health volunteers for outreach village in malaria endemic township for early diagnosis and treatment (51, 53).

2.2 Primary Health Care and Shortage of Health workers, Importance of CHVs and History of Primary Health Care in Nepal

From the Alma-Ata declaration of 1978, to the recent Astana Declaration, Nepal has continuously strived to reform PHC (25). These declarations and their commitment have engendered a shift in focus and transformed the way PHC worked in the past. Specifically, the shift from vertical governance to horizontal and community-based health program implementation bears a plethora of benefits including its contribution in community engagement in programs and health research (54). Although the success through this declaration was not uniform around the globe, many countries including Nepal were able to achieve modest coverage in childhood immunization and access to water and sanitation particularly among the urban population (55). Inevitably, globalization of health and its indicators have triggered health system to achieve such goals including strengthening of primary health care system. These efforts were reflected in the Millennium Development Goals (MDGs) which incited a major focus on reducing disease burden and promoting good health particularly focusing on mothers and children (56). The SDGs, which were adopted in 2016, were another historic milestone in reinforcing full focus back to health indicators which were not covered before in MDG era.

Transition of health system from unitary to federal system

Nepal promulgated a new constitution in 2015 and transformed to a federal republic with seven provinces (57). The seven provinces are sub-divided into 753 local governments comprising 6 metropolitan cities, 11 sub-metropolis, 276 urban municipal councils and 460 rural municipalities (58). The health system in Nepal has also been restructured to align with the new federal structure.

Although the federal system paved a new pathway to opportunities to building better health systems, it can suffer from pre-existing and new challenges such as inheriting structural inequities in health services (health infrastructure, geographical and economic barriers) (59). For instance, poor availability (inequitable distribution) of tertiary health institutions may continue to be major constraints for health services. In addition, people in remote regions within Nepal may further suffer from geographical

barriers to attending the health centers, including economic constraints in attending the health services (60).

Primary health care system at crossroads

Nepal has undergone a radical transformation from a unitary administrative system to the three tiers of decentralized governments: a federal government, seven provincial governments, and 753 local government since the adoption of a new constitution in 2015 (58). In addition, the health care structure is also devolved into three tiers (federal, provincial, and local health systems) with more autonomy to the local governments.

At the local or community level health facilities (municipality or ward level), urban health clinics, health posts, and primary health care centers are the primary contacts for health services (58). Female community health volunteers (FCHVs), supported by outreach clinics, urban health clinics, and health promoters are frontline health cadres at the community level (22, 61). Districts hospitals are secondary care referral health centers at the district level. The Hospitals under the provincial and federal governments are at the tertiary care referral centers (62). Private health care facilities, which are mostly expensive and unaffordable available throughout the country mainly as polyclinics, pharmacies, nursing homes, and hospitals (62).

An increase Shortage of Health Workers in community health

Furthermore, Nepal has encountered a shortage of health workers. The latest HRH report shows the requirement of health workers for community health. According to Human resources for health in Nepal estimates that about 243000 community health workers will be necessary by 2030 to achieve UHC/SDG by 2030. Then additional about 1 million doctors/nurse and physician will be required by 2030 for primary health care services at community (63).

In addition, Nepal faces considerable challenges in HRH management, which is characterized by top-down decision-making (64), despite the fact that amendments to policy have emphasized the empowerment of local government to regulate and monitor local development agencies (65) . Furthermore, the implementation of the Human

Resource Information System (HuRIS), which was established to facilitate HR planning and management at all levels, is used primarily for administration rather than proactive management. A barrier to the effective implementation of the decentralized system is the lack of coordination between local actors. The system is highly dependent on the working relationship between different actors at the local level. This is illustrated by the conflict caused due to the elected bodies at the rural municipality. It was observed that one of the new rural municipality chairpersons, who assumed this position on an elected basis, has been raised to a more senior position above the in-charge of the local health institutions. This has caused conflict, particularly from the perspective of the in-charge, who was not satisfied with the new level of responsibilities taken on by the rural municipality members. These phenomena at the local level could influence the basic health services at community level.

Therefore, in this situation, to tackle these issues, community-based health volunteers, as they available 24 hours at ward level, named female community health volunteers (FCHVs) have been an option to lead to success of improving the control of local endemic diseases including malaria for provision of essential health services at community level by primary health care/outreach clinic (PHC/ORC).

Table 2.2 A details profile of community health workers in Nepal and FCHVs in Nepal

Types of community health workers/cadres	Gender	Numbers	Sector located in	Place of location	Payment	Types of services provides	Areas of health covered
Female community health volunteers (FCHVs)	All Women	51,423	Completely in the public sector	Community	Volunteers (incentive) \$ 15/month	Preventive, promotive, curative	Health education FP/MCH counselling Treatment minor disorder

Auxiliary Nurse Midwife, (ANM)	All Women	21000	Completely in the public sector	Facility	Salaried staff paid by government S	Preventive, promotive, curative	PHC MCH/FP ANC/INC/PNC Child health Health education
Auxiliary Health Worker (AHW)	Majority Men, few Women	53344	Completely in the public sector	Facility	Salaried staff paid by government S	Preventive, promotive, curative	Basic treatment at HP/PHC IMCI management

2.3 Female Community Health Volunteer Program in Nepal

Background Of FCHVs

The government of Nepal under the Ministry of health and population (MOHP) initiated the Female Community Health Volunteers (FCHVs) program as an integral part of community health Centre in the fiscal year 1988-1989 (66, 67).

FCHVs are the local women above 25 years of age who receive a basic 18 days training in various primary health care topics and they are selected by members of Mothers' Group for Health (MG-H) with the help of local health facility staff and then are left in the community with the responsibility of providing maternal and child health and family planning services to their respective communities (67).

Performance of Female community health volunteers

The core roles and responsibilities of Female Community Health Volunteers (FCHVs). The basic role of FCHVs are based on FCHV's work guideline/handbooks recommended by the Government of Nepal under the Ministry of Health and Population (MoHP) (53, 66).

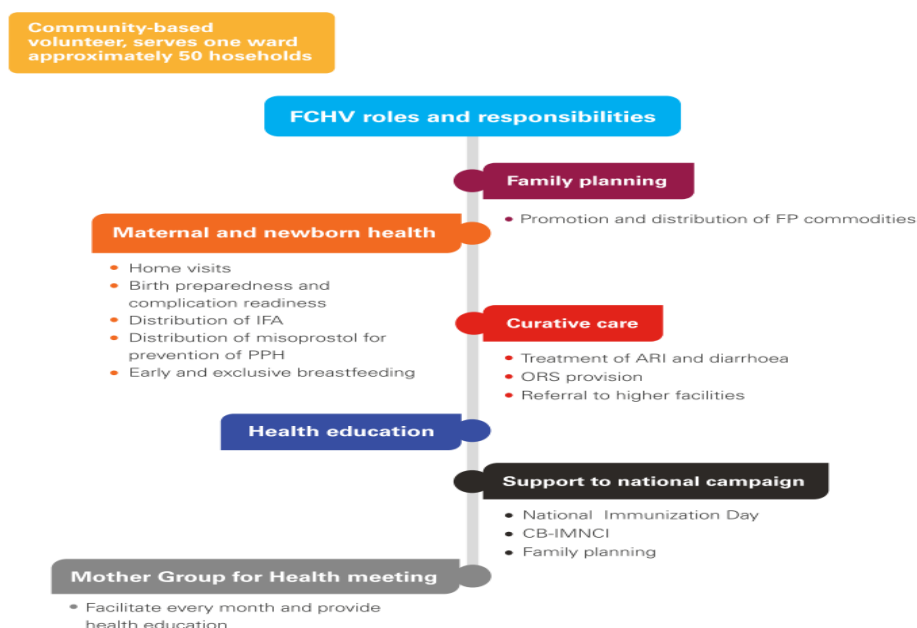


Figure 2.3 Role and responsibilities of FCHVs

The main focus of the FCHV program has remained improving the health of local communities by promoting public health that includes imparting knowledge and skills for empowering women, increasing awareness on health-related issues and involving local institutions in promoting health outcomes (67, 68). As of 2020, the number of FCHVs have reached to 51,423 of which 49,481 FCHVs are actively serving in the community as a source of information with government health services and a source of direct services in number of important areas of primary healthcare services (51).

Primary Health Care (PHC) and Female Community Health Volunteers (FCHVs) play integral roles in Nepal's healthcare system, particularly in extending healthcare services to rural and remote communities.

Here are the concepts associated with PHC and the role of FCHVs in Nepal (69):

Primary Health Care (PHC):

- **Comprehensive Healthcare:** PHC in Nepal focuses on providing essential healthcare services that are accessible, affordable, and culturally appropriate to the entire population.
- **Preventive and Promotive Services:** Emphasis on preventive healthcare measures, health education, and promoting healthy behaviors within communities to prevent diseases.
- **Basic Healthcare Services:** Delivery of basic healthcare services including maternal and child health, family planning, immunization, nutrition, management of common illnesses, and health education.
- **Equitable Access:** Ensuring equitable access to healthcare services for all, especially marginalized and underserved populations in remote areas.
- **Community Participation:** Involving communities in decision-making processes, empowering them to take ownership of their health, and promoting community-based healthcare.
- **Community Health Advocates:** FCHVs are local women selected and trained to act as a bridge between communities and the formal healthcare system.
- **Health Promotion and Education:** They conduct health promotion activities, educate communities on various health issues, and disseminate information about preventive health practices.
- **Basic Health Services:** FCHVs provide basic health services including maternal and child health, family planning, nutrition counseling, immunization, and treatment of common illnesses at the community level.

- **Monitoring and Referral:** They monitor the health status of families in their assigned areas, identify health problems, and refer individuals to health facilities for further evaluation or treatment when needed.
- **Cultural Sensitivity and Trust:** FCHVs, being part of the community themselves, possess cultural sensitivity and earn the trust of community members, making them effective in delivering health messages and services.

The overall goal of the FCHV program is to contribute to reducing fertility and under 5 mortality and MMR with an emphasis on family planning and MCH through community participation in public health activities. These goals are expected to be achieved through provision of knowledge and skills for women's empowerment , increasing awareness of health issues and involvement of women in local health activities (22).

Types and Selection criteria and training opportunities

There are two types of FCHVs: ward-based (hill and mountain regions) and population-based (the Terai). In the former, there is at least one volunteer per ward, while in the latter the allocation is in proportion to the number of residents. In general, there is expected to be one FCHV for every 250, 350 and 1000 population in the mountain, hill and Terai regions respectively (70).

According to the FCHV strategy, volunteers are selected in each village by the mothers' group executive committee, which meets every month to discuss health issues. Upon selection, FCHVs receive 18 days basic training on selected PHC topics, MCH care and family planning. The training is divided into two separate sessions of nine days each (22). Then, each FCHV receives a uniform, education and communication materials, a nameplate displaying her volunteer service, and a kit box with necessary drugs and supplies for conducting outreach services (71). Such training and supplies are provided from government health facilities.

Social support and incentive support for FCHVs

Financial support for FCHV program is mainly provided by international organizations such as USAID, UNICEF and UNFPA, though the program is operated and owned by MoHP Nepal (53). About 75% of the national health budget focuses on MCH especially in marginalized populations (72). Recently the MoHP and the USAID launched the “Health for Life” project worth \$18 million to strengthen the government’s ability to provide quality and equitable MCH and family planning services in Nepal (68).

Regarding the FCHVs Incentives/Compensation they receive a monthly stipend of \$10USD and a travel allowance of NRs.3000(\$25) is provided to each FCHV as transportation cost every year from the Ministry of Health. Further, as a facility for FCHVs A total of Rs.10, 000/- is provided to each FCHV as dress allowance every year. Since 2017/2018 the government has allocated budget of Rs. 20,000/- to each FCHVs as an appreciation for their contribution during the farewell to FCHVs over 60 years of age as recommended by health mothers’ groups. Government of Nepal bears the 50 % of premium of health insurance for individual FCHVs and also, they are one of the target groups to receive service through Social Service Unit of health facilities (51).

In addition, as the acknowledgement of FCHVs, there is a national ceremony annually which is called “FCHV Day” on 5th December to celebrate and recognize “The best FCHVs of the Year”.

The responsibilities of FCHVs in Nepal

The potential of Female community health volunteers

The role of FCHVs towards health of communities (73), the study found evidence that FCHV programs, when compared to usual care such as increase children's immunization uptake, increase the number of mothers who start breastfeeding and who breastfeed their child at all, reduce neonatal mortality, and improve pulmonary tuberculosis cure rates, but have little to no effect on other outcomes.

Regarding the impact of FCHVs on lowering maternal morbidity and death (73), however, a study demonstrates that community--based care packages, administered by a variety of community based personnel, can lower maternal morbidity, newborn mortality, stillbirths, and perinatal death (74, 75).

From a systems perspective, the position and function of FCHVs offer more benefits than just carrying out health-related (and occasionally shifted) tasks. By providing services close to the community, they help poor populations avoid the opportunity costs associated with traveling long distances to a health facility. CHVs frequently provide services to the neighborhood they live in. Due to the fact that CHVs are familiar with and responsive to the current socio-cultural norms, this embedding may present opportunities to increase access of marginalized communities to health services (74). They serve as a bridge between communities and health and social services; they have also been referred to as cultural brokers or mediators (76). They can give communities the strength to assert their rights. They also have a better knowledge of the wider context of people's lives from having the chance to interact with clients at the household and community level (77). This knowledge can be useful for the creation of prevention programs and the optimization of treatment regimens, which are led by public health and medical experts who frequently overlook this knowledge due to their facility-based work.

FCHV Involvement in Basic health services Provision

For the provision of Community Health Services (CHs), CHVs are involved in three key areas: (a) mothers' group interventions, (b) home visits, and (c) therapeutic services (d) recording and reporting, and (e) mobilization of FCHV by NGOs.

1. Mothers' group meetings

The main role of CHVs in a developing country is to promote the health of pregnant women and mothers through awareness and educational activities (74, 78). One usual approach is sharing health messages through regularly held meetings where mothers and women in their local communities participate and discuss MCH issues. While such participation is often difficult to achieve because of the need for substantial time investment (79), evidence shows the positive effects of community participation in maternal health. For example, a meta- analysis of seven trials (119,428 births) showed that participation in women's groups was associated with a 37% decline in

maternal mortality (Odds Ratio 0.63, 95% CI 0.32-0.94), with high heterogeneity ($I^2=58.8\%$, $p=0.024$). However, none of the empirical studies were sufficiently powered to accurately assess maternal mortality (80).

In one example in India, a participatory intervention using women's groups involved local CHWs providing health information. This intervention involved the participation of all interested members including men, relatives of the pregnant women and health workers; all the members shared their problems and the participants offered support to each other (81). The same study concluded that the acceptability of services of CHWs, the active targeting of marginalized women in the communities, and the active recruitment of newly pregnant women into the mothers' groups helped to increase safe delivery practices.

Similarly, in the rural communities of Nepal, mothers' groups involving CHWs were helpful in reducing MMR. A paid literate female facilitator was trained to facilitate the group where local FCHVs were also present. The facilitator led the women's group through ten monthly meetings using a participatory learning method where health messages on preventing illness in mothers and infants were shared. In the control group, training of traditional birth attendants was held, and the findings were compared with the intervention group. The findings showed a significant improvement in maternal health as MMR dropped from 341 to 69 per 100,000 in the intervention group. Though the reduction in MMR was not statistically significant (82), it indicated that CHWs were able to encourage women to participate in the groups and discuss maternal health topics (83).

Maternal health improvement in Nepal has been credited to FCHVs facilitating mothers' groups to raise awareness among community members (18). Such groups were first started by the Nepal Safer Motherhood project in 1997 and are currently functioning in about 76% of rural communities (53). Their presence in the remote villages may be the reason for the improved health status of Nepalese women even while the country faced a decade long conflict (68). For example, women attending mothers' groups were more likely to use health services (82, 83). In recognition of the importance of mothers' groups led by FCHVs, the Department for International Development (DFID) is planning to continue to fund the maternal health activities including the women's group intervention in Nepal.

However, mothers' groups in Nepal have faced some challenges. For example, there were cases where mothers' groups became inactive after the initial group formation (53). A study reported that mothers' groups were less engaged in identifying and solving maternal health problems in the groups as the groups spent their time dealing with other issues such as collecting money from group members. The group members saved money to support each other in case of financial need, and sometimes these financial matters took priority over the discussion of health matters (61). However, this study did not provide information on how many groups were included, or how many participants were involved. Moreover, when mothers' groups were not functioning effectively, it was difficult to establish conclusively whether any health message was shared amongst community members.

2. Home visits

A systematic review reported that home visits along with community mobilization and training of CHVs have the best chances of improving community level maternal health outcomes. Maternal health outcomes such as antenatal care, tetanus immunization coverage, referral and initiation of early breast-feeding were improved while the rate of antenatal hospital admission was reduced through interventions led by CHVs (75). In Bangladesh, door to door visits by CHVs using birth registers were effective in identifying pregnant women and assessing them from pregnancy to postnatal period (84). Similarly, in Pakistan health service at the doorstep was important for the success of CHVs' services, especially in the mountainous region where CHWs were able to raise the proportion of pregnant women who delivered with a skilled birth attendant to 51% compared to the national average of 39% (85). In Nepal, FCHVs generally do not visit houses but when they do so, they are trained to undertake specific activities. For example, they visit houses to provide misoprostol tablets to pregnant women in order to prevent hemorrhage after childbirth (67).

With respect to service users, some mothers were concerned about confidentiality during home visits by CHVs, and others reported that CHW services were not relevant, especially if they provided only health promotional services (78). Therefore, many CHVs are also involved in the provision of some basic therapeutic services as presented below.

3. Therapeutic services

CHVs providing medicines to members of their communities are often well recognized in their communities and are more likely to be approached by their community members (78). Conversely, if CHVs do not provide medicine then they are not valued by their community members and their preventive work could be undermined. Such as, in Sri Lanka, where the role of CHVs is restricted to health education, they could not produce any effective results, which led to decline in the number of volunteers (86). In contrast, communities in India responded to CHWs more positively when they provided curative services (87). Similarly in Nepal, the role of volunteers was more highly valued after their involvement in medicine distribution campaigns such as those for malaria or polio (88).

4. Recording and reporting by FCHVs

Besides involvement in all the activities mentioned above, FCHVs have an increasing role in recording and reporting community health activities. They keep records of their activities in a pictorial ward register which they submit every month to the health center (53). This activity is important, as the reports received from them are passed to the SHPs or HPs, then to the PHC centers, the district and finally the data is fed into a national report.

5. Prevention and Control of endemic disease, Malaria

The Female Community Health Volunteer (FCHV) program was introduced in Nepal in 1988 with the primary aim of delivering family planning and maternal child health education in rural communities. Women with limited formal education were provided basic training to promote health and provide select services (78).

In the 1990s, the role of FCHVs expanded to deliver community-based integrated management of childhood illness. They were trained to diagnose and treat simple illnesses like pneumonia and diarrhea. Their role in infectious disease control, including malaria, also emerged during this period (18).

As National Malaria elimination program, FCHVs mobilized a wide range of malaria prevention and control activities. Their routine work includes household visits to test for febrile illness, distribute long-lasting insecticidal nets, make referrals for

confirmation testing and treatment, and conduct community awareness programs. During malaria outbreaks, they undertake more active surveillance by testing all fever cases and household contacts of confirmed cases. FCHVs also follow up patients to ensure adherence to malaria treatment and record-keeping for the national surveillance system (16).

With the advent of artemisinin-based combination therapy (ACT) for malaria in the early 2000s, FCHVs were increasingly involved in community-based malaria diagnosis and treatment. They were trained to use rapid diagnostic tests and ACT medicines for uncomplicated cases. Their work became critical in early malaria case detection and prompt treatment in remote areas (89).

Over the last decade, FCHVs have become progressively more important in active malaria surveillance in Nepal. With the distribution of long-lasting insecticidal nets and declining burden, their role shifted from clinical care to active case detection, reporting and follow-up. They now conduct household visits to test for fever, track cases and treatment adherence, and maintain village-level records to support Nepal's elimination goal (17).

The specific role of FCHVs in active malaria case surveillance by using RDTs

According to the guidelines of the Department of Health Service Support, MOHP (NMCP, 2009, 2019) determines the roles and responsibilities of FCHVs as malaria volunteers in endemic regions for the prevention and control of malaria disease as follows:

- 1) Diagnosis of cases: Diagnosis of cases refers to volunteer-tested malaria-suspected cases by rapid diagnostic tests (RDTs).
- 2) Treatment of cases: Treatment of cases refers to volunteers giving first dose treatment to RDT (+) patients according to NMT guidelines.
- 3) Refer to the cases: it refers to the volunteer timely refer to the negative RDT and severe malaria cases to the nearest health Centre with no time delay.
- 4) Transferring knowledge refers to volunteers giving health education about how to prevent and control malaria to community people.

5) Distribution of materials refers to the volunteers distributing the IEC materials like posters, pamphlet and long-lasting insecticide treated nets (LLIN) in high endemic region that supported by related organization accordingly to community.

6) Observation usage of LLIN: it refers to volunteers visiting door to door to observe the proper usage of LLIN by villagers.

7) Recording and reporting refers to volunteers records correctly patient factors and list of drugs and submit report timely and properly to respective office.

Performance Monitoring and Evaluation Mechanism

Regular monitoring and evaluation mechanisms are established to assess the performance of FCHVs in malaria case surveillance. This includes tracking key performance indicators, conducting periodic reviews of surveillance data, and providing feedback to FCHVs to support continuous improvement (51).

However, several studies (37, 66, 72, 90), have identified significant role performance gaps such as knowledge and skills gaps in prevention, diagnosis, treatment, and reporting, supervision, and coordination issues, work motivation and social support in conducting high-quality malaria surveillance in Nepal among female community health volunteers (FCHVs).

2.4 Concepts, Determination, and Measurement of the Performance

2.4.1 Concept of the Performance

The meaning and concepts of performance are defined as follows:

The World Health Report 2006 by the World Health Organization (WHO) (91) defined the “performance of community health workers in terms of availability, responsive, fair, and efficient which related to the individual role to achieve the best health outcomes in the available resources and circumstances”.

Human performance in job task defined the performance as “Role performance is defined as the total expected value to the organization of the discrete behavioral episodes that an individual carries out over a standard period (92).

In addition, the existing study revealed that the term job performance covers many important dimensions of employee behavior, attitudes, and traits, which improve the productivity of organizations (41). In this regard, Byars and Rue (2006) argued that performance is the degree of an employee’s task accomplishment according to the nature of the job. Therefore, improving the contextual and task performance of employees is becoming an increasing concern for practitioners and academicians (Madsen et al., 2005). Thus, job performance is estimated to show the contribution of individuals to the job, especially when employees are working in a multicultural setting.

Performance is defined as the execution of an action or process of carrying out or accomplishing an action, task, or function. Which is a combination of the knowledge and capacity of the individual (26). This emphasizes that knowledge is not sufficient to accomplish tasks properly because competency is associated with the ability to perform task adherence to standard thus the evidence-based study revealed that even though knowledge is high competency (skills) low is associated with low performance (93).

Performance is about doing the job and the results achieved from the job. Performance is about what to do and how to do it. Performance is determined by the objectives to be achieved and to do so requires the motive. But performance requires the support of facilities, competencies, opportunities, standards, and feedback. Moreover, argues that performance is defined as a record of the outcomes generated from a particular activity, over a period (94).

In summary, Performance is derived from the words Job Performance or Actual Performance (actual performance or achievement achieved by someone).

Performance (work performance) is the work of quality and quantity achieved by an employee in performing their duties according to the responsibilities given to him. Factors that affect the achievement of performance is a factor of ability (ability) and motivation factor (motivation) (94).

2.4.2 Determination of Performance

The performance of individual community health volunteers is affected by a complex set of factors. The sources of performance can be individual to the health workers, or they can be attributed to factors in their work and social environment (37, 90).

In the theory of performance, a model of causal patterns of relations between the individual performance and its determination is presented by Campbell, McHenry and Wise (1990), and Campbell et. al (1993). In the model of Campbell et al. (1993), it is supposed that the performance components as a function of three determinants: competences as knowledge, and skills, and motivation with support as social or organization (27, 95).

In summary, individual work performance is not only depending on individual attributes (competencies such as knowledge and skills) but also a combination of work efforts (belief or intention as self-efficacy, motivation, and leadership skills) and social/organization support (working environment as social support) (96). Thus, the performance equation is the combination of personal attributes, work efforts, and support (27, 95). Which are the key functions of competence as self-efficacy, motivation, leadership, and the opportunity to participate or contribute (97).

Performance = Competencies (self-efficacy, leadership), work motivation + socio-environmental support as family, community, and health providers' support.

Thus, based on the above concept the performance factors in this study are broadly classified into individual and social/environmental factors. Individuals influencing performance at individuals are motivation, leadership, self-efficacy, including socio-economic factors of individuals as age, education level, and family income, and the factors influencing performance socio-environmental are perceived social support as emotional, informational, materials, and supervision from family, community, and health providers.

The concept and its measurement of individual and environmental factors are described below:

Concept and measurement of motivation

Motivation refers to the drive or energy that propels individuals to achieve their goals, excel in their tasks, and maintain persistence in the face of challenges. In the context of work or professional performance, motivation influences the effort, intensity, and direction of behavior toward achieving desired outcomes. This is an essential psychological process and factor for promoting performance. Also, it results in the interaction of the individual and the environment (98).

Autonomous motivation refers to behavior that is performed because of personal choice and because the subject finds pleasure in it. Moreover, autonomous motivation can further be subdivided into three components that differ in terms of how internalized the behavioral motives are. From highly to less internalized, one distinguishes intrinsic motivation (e.g., when helping gives joy), integrated regulation (e.g., when being a volunteer is central to one's identity), and identified regulation (e.g., when volunteering is considered to support an important personal cause) (99).

In contrast to autonomous motivation stands controlled motivation, which refers to doing something to receive a reward or to avoid punishment or feelings of guilt. Controlled motivation can be subdivided into two components that differ in terms of how internalized behavioral motives are. Introjected regulation refers to a low form of internalization when behaviors are performed to avoid guilt and shame or to obtain ego enhancements and feelings of worth (e.g., engaging in volunteering to escape the feeling of guilt caused by being more fortunate than others), whereas external regulation refers to no internalized behaviors as they are mainly driven by external rewards or to avoid punishment.

There is a relationship between motivation and job satisfaction, which is the principle of any organization's existence. Job satisfaction is one part of the motivational process. While motivation is principally concerned with the goal directed behavior, and

the job satisfaction related to the fulfillment, which acquire through different rewards and job-related activities (100).

Several factors influence the desire of individuals to work. According to Hierarchy of Needs by Abraham Maslow, is one of the most widely identified theories of motivation. In his theory Maslow identified five basic needs of individuals' i.e. physiological (pay, food, clothing etc.), security (physical and social security), affiliation (love, affection etc.), self-esteem (recognition, autonomy, independence etc.) and self-actualization (realizing one's full potential and abilities). Herzberg's Two Factor Theory is heavily based on motivation. They carry out several experiments to find those factors that motivate the employees. They found those factors that satisfy and dissatisfy the workers. All those factors that cause workers to be dissatisfied were called hygiene and those factors that satisfy the workers were called motivators. The hygiene factors do not motivate the workers and include the company's policies, salary, administration, working conditions and relationship with supervisors etc. Motivators were the factors that stimulate workers to work harder, and it includes achievement, recognition, work itself and challenging tasks (101).

Motivation at work scale- Revised (MAWS-R)

Motivation at work scale revised (MAWS-R) for Motivation for volunteering work was measured using the MAWS-R by Van den Broeck et. al. 2010 (102). In this scale, participants are to rate the reasons for engaging in volunteer work according to the different forms of autonomous (3 components), and controlled motivation (2 components), on a scale from 1 (not at all because of this reason) to 5 (exactly because of this reason).

Concept and measurement of leadership

Leadership in health service is defined as the individual ability to influence other people to reach personal, group, or organization goals (103). CHVs are community members who are willing to manage and actuate the community voluntarily. CHVs with good leadership are expected to motivate and encourage the community to be independently healthy. The previous study found that CHVs in Village have got a good role in leadership, CHVs who have good leadership with a democratic leadership style, which is frequently performed by the CHV is associated with outcomes of community people (41).

Leadership skills in CHVs

Leadership skills among Community Health Volunteers (CHVs) encompass various competencies essential for effective community health promotion and disease prevention (41, 104-106).

Transformational competence refers to the ability to inspire and motivate others toward a common vision of health improvement, empowering community members to take ownership of their well-being.

Political competence involves navigating the complex socio-political landscape to advocate for resources and policies conducive to public health initiatives, thereby ensuring sustained support for community health programs.

Trans-organizational competence entails forging partnerships and collaborations with diverse stakeholders, including governmental agencies, NGOs, and community-based organizations, to maximize resources and leverage collective efforts for better health outcomes.

Team-building competence is crucial for fostering cohesion and collaboration among CHVs and other stakeholders, promoting mutual respect, trust, and effective communication within the team (105).

These leadership skills enable CHVs to mobilize community resources, engage stakeholders, and facilitate collective action toward addressing health disparities and promoting community resilience, ultimately contributing to improved public health outcomes.

Measurement scale

Four (4) components of leadership skills include transformational competence, political competence, trans-organizational competence, and team-building competence, 3 items in each components, totally 12 items leadership questionnaire are common scale to measure leadership skill in CHVs (104).

For this study, a 12-item leadership skills questionnaire using a 5-point Likert scale based on four leadership scales will be used to assess perceived leadership among in active malaria case surveillance among FCHVs (106). (41, 104).

Concept and Measurement of Self-efficacy

Self-efficacy refers to a person's belief in his or her ability to carry out the actions required to achieve specified performance goals (38, 39). Self-efficacy is a measure of one's belief in one's ability to influence one's own motivation, behavior, and social environment (38). These cognitive self-evaluations have an impact on all aspects of human life, including the goals for which people strive, the amount of energy invested in achieving those goals, and the likelihood of achieving specific levels of behavioral performance (39).

Self-efficacy theory, developed by psychologist Albert Bandura, revolves around the belief in one's ability to accomplish specific tasks and goals (107). It emphasizes that people's actions, motivation, and perseverance are strongly influenced by their confidence in their own capabilities. The theory consists of several key components: mastery experiences, vicarious experiences, social persuasion, and physiological and emotional states. Mastery experiences involve past successes and failures, which shape self-beliefs. Vicarious experiences occur through observing others like oneself succeeding, bolstering one's confidence. Social persuasion involves encouragement and feedback from others, influencing self-efficacy belief (107). Lastly, physiological and emotional states, such as stress or anxiety, can impact one's perceived capabilities. Overall, self-efficacy theory highlights the importance of fostering confidence in one's abilities to enhance motivation and performance in various domains of life.

Numerous studies on behavior change show that self-efficacy theory predicts behavior modification and maintenance (108-111). Self-efficacy theory was first used to explain behavior in subjects with various types of phobias in a laboratory environment (e.g., snakes). The research's scope has widened significantly, and it now includes chosen areas of health behavior (e.g., cigarette smoking, weight control, exercise and cardiac rehabilitation, functional status, and work resumption). The studies consistently show that an individual's self-efficacy perception is linked to many types of health behavior modification.

Regarding perceived self-efficacy and job performance of CHVs, in active malaria case detection and self-efficacy is significant and multifaceted (37, 42, 94). In the context of CHVs, higher levels of self-efficacy are associated with more effective job performance in malaria case detection for several reasons. Firstly, CHVs with high self-efficacy are more likely to persist in the face of challenges and setbacks encountered during malaria surveillance activities, leading to improved performance over time. Secondly, individuals with strong self-efficacy are more inclined to set ambitious goals and exert greater effort to accomplish them, resulting in increased diligence and thoroughness in case detection efforts (112). Additionally, CHVs with high self-efficacy are better equipped to cope with stressors and uncertainties inherent in their roles, which can positively impact their job performance (112). Moreover, self-efficacy influences the level of motivation and initiative CHVs demonstrate in their duties, leading to more proactive and engaged involvement in malaria case detection activities. Overall, a strong positive correlation exists between the self-efficacy of CHVs and their job performance in active malaria case detection, highlighting the importance of fostering self-belief and confidence among these frontline healthcare workers to enhance malaria control efforts (112, 113).

Perceived self-efficacy scale

The Generalized Self-Efficacy Scale (GSES) is a widely used psychometric instrument designed to measure individuals' beliefs in their ability to cope with a variety of stressful situations in life. Developed by Ralf Schwarzer and Matthias Jerusalem, it consists of 10 items that assess one's perceived self-efficacy across different domains (114).

These domains include decision-making, problem-solving, goal setting, and overcoming obstacles. The scale captures individuals' confidence in their capacity to handle challenges effectively and achieve desired outcomes. Variables measured by the GSES include personal mastery, resilience, and adaptability.

Responses are typically rated on a Likert scale ranging from "not at all true" to "exactly true," with higher scores indicating greater perceived self-efficacy. For this study, GSES will be utilized to measure perceived self-efficacy in active malaria case surveillance.

Concept and Measurement of Social Support

Social support is an individual's perception that he or she is loved and valued by people in his or her social network (115). Social support as beliefs and/or perceptions that indicate an individual is part of an interpersonal relationship that includes parents and peers (116). However, social support talks about the person needs for support with close others and provide it when others experience distress (117). In addition, social support might provide a person with a forum to share and deal with a wide range of issues.

Thus, the concept of social support has been defined in various ways. Some studies on social support conceptualized it as the existence of interpersonal relationships (structural support) and the functions served by such interpersonal relationships (functional support). On the other hand, social support is defined as an individual's perceptions of specific or general support (emotional, informational, appraisal, instrumental) from people in their society.

Social support is a theory based on social-psychological (118). The studies found that most of the a person's decisions are usually based on the individual and there will be an indication of the presence purposeful interactions between individuals, that show an interest in helping one another, whether it is helping with knowledge, emotions, information, material objects, to create a bond. Social support is essential to individual behavior especially the behavior physical and mentally health promotion disease prevention and acting according to the advice of Medical and public health personnel (119).

Sources of social support

The source of social support refers to members belonging to a social network that provides social support to an individual as a social network (120). Social support sources can also State the size and social network as unofficial sources of support (Informal sources) such as friends, relatives, spouses, neighbors, and acquaintances and official sources of support (Formal sources) such as health or professional workers and self-help groups (118).

Type of social support

House (1981) states that social support is an interpersonal interaction consisting of love, concern, trust, financial assistance, material labor, and information sharing, as well as providing feedback and information for learning and self-assessment.

Social support can be divided into many forms that focus on interpersonal exchanges and are divided into 4 areas as follows (43).

Emotional (Emotional support) is an expression of appreciation, appreciation, love, trust, concern, and listening.

Appraisal in terms of valuation support is information about self-learning or self-assessment information to certify social comparison feedback.

Information (Information support) to gain knowledge Suggestions, suggestions Guidance which can be implemented and used to adjust the environment.

Instrumental support to get help directly to the needs of people for materials, things, money, and labor. Social support is a response to psychological needs.

Appraisal support: provides valuable information for self-evaluation, such as constructive feedback, affirmation, and social comparison.

From these concepts, the researcher will develop the questionnaire on role performance support of female community health volunteers with the important variables (emotional, informational, instrumental, and supervision support) as cooperation from family members, cooperation from the community, and health providers.

The scale of social support

The Multidimensional Scale of Perceived Social Support (MSPSS) developed by Zimet et. al (121) in 1988, is a widely used psychometric tool developed to assess individuals perceived social support across various domains.

This consists of 12 items, the scale measures perceived support from three sources: family, friends, and significant others. Participants rate their agreement with statements reflecting the availability of support, such as "I can talk about my problems with my family" or "I have friends with whom I can share my joys and sorrows." The MSPSS captures the perceived adequacy and satisfaction with social support networks, which are crucial for buffering against stress and promoting mental well-being.

High scores on the MSPSS indicate strong perceived social support, while low scores may indicate a lack of perceived support (121).

2.5 Theoretical Background and Hypotheses

Self-Determination Theory (SDT), proposed by Deci and Ryan in 1985, provides a comprehensive framework for understanding human motivation and its role in behavior (122). SDT emphasizes the psychological processes underlying an individual's actions. However, SDT focuses on the fulfillment of three innate psychological needs—autonomy, competence, and relatedness—as key determinants of motivation and performance (123). In the context of Community Health Volunteers (CHVs), SDT offers valuable insights into how these factors influence their performance in healthcare delivery and disease surveillance activities.

According to SDT, the performance of CHVs is directly influenced by their motivation to fulfill their roles (28). This motivation is shaped by intrinsic and extrinsic factors that satisfy the core psychological needs. When these needs are met, CHVs are more likely to be engaged, effective, and resilient in their work. The three components of SDT and their influence on CHV performance are detailed below.

2.5.1 Autonomy

Autonomy refers to the sense of control and self-direction in one's actions. For CHVs, autonomy is linked to their intrinsic motivation to make meaningful contributions to community health and their perception of having the freedom to make decisions in their work (123). Effective leadership plays a critical role in fostering autonomy by providing CHVs with clear goals, supportive supervision, and opportunities for self-directed problem-solving. When CHVs perceive that their roles align with their personal values and that they have the independence to perform tasks in their own way, their engagement and performance are enhanced.

2.5.2 Competence

Competence, or the belief in one's ability to successfully perform a task, is a significant determinant of CHV performance (38). Training and capacity-building initiatives equip CHVs with the skills and knowledge required for tasks such as identifying disease cases, collecting data, and educating community members. Regular feedback and recognition further reinforce their sense of competence, boosting their confidence and willingness to take on complex challenges. High self-efficacy enables CHVs to remain motivated and effective even in resource-constrained or high-pressure environments (39).

2.5.3 Relatedness

Relatedness refers to the sense of connection and belonging to others (122). For CHVs, strong relationships with community members, health personnel, and family provide the emotional and practical support needed to sustain their efforts. Social support fosters trust and collaboration, making it easier for CHVs to engage with the community and carry out their responsibilities. Encouragement from family members and colleagues, as well as positive reinforcement from community leaders and health supervisors, enhances their sense of purpose and commitment (42).

This study employs the Self-Determination Theory (SDT) to investigate the factors contributing to performance in active malaria case surveillance behaviors of female community health volunteers (CHVs) in endemic areas (123). SDT is a motivation-based framework that explains human behavior through the satisfaction of three core psychological needs: autonomy, competence, and relatedness (28). These needs drive intrinsic motivation and influence the engagement and effectiveness of individuals in specific tasks or roles. In this context, active malaria case surveillance refers to the behaviors exhibited by female CHVs, including identifying malaria cases, referring cases, knowledge transfer, home visits, reporting health data, and educating the community about prevention and treatment.(122).

SDT is used in this study to explore the psychological and social factors that enhance or hinder the performance of CHVs in malaria surveillance. While SDT has been widely applied in health, education, and organizational psychology, limited studies have investigated its application in the domain of community-based disease surveillance (34, 37). This study aims to address this gap by examining how autonomy, competence, and relatedness impact the motivation and performance of female CHVs in malaria-endemic areas. The proposed framework highlights relationships between these SDT components and surveillance behaviors (123).

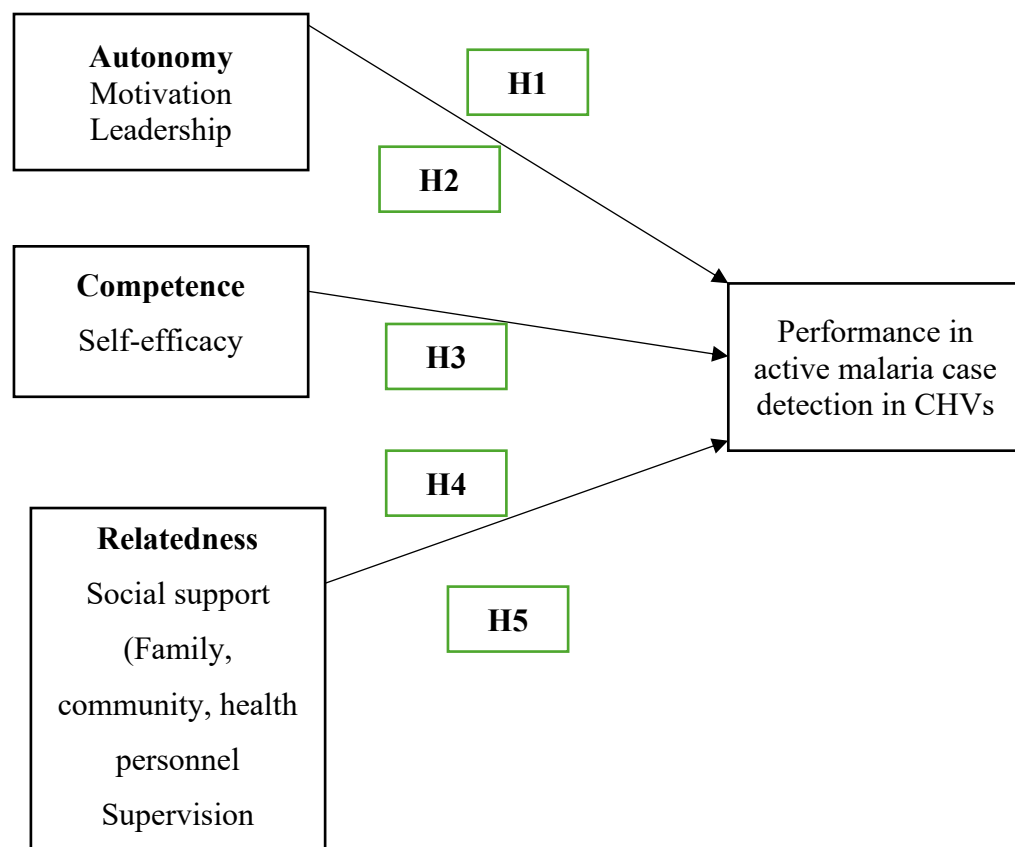


Figure 2.5 Theoretical framework and hypotheses

Autonomy Motivation

Motivation refers to the psychological drive that determines an individual's engagement in a specific behavior (123). According to SDT, intrinsic motivation (performing tasks because they are inherently satisfying) and extrinsic motivation (performing tasks to achieve external rewards or avoid punishment) play a crucial role in influencing CHV performance in malaria surveillance. Female CHVs with high intrinsic motivation may feel personal fulfillment and purpose in their roles, such as protecting their communities from malaria outbreaks. Studies indicate that when CHVs perceive their work as meaningful, they are more likely to sustain high levels of commitment and performance. Moreover, extrinsic motivators, such as financial incentives or public recognition, can enhance engagement by addressing immediate needs.

For this study, five components of work motivation will be adapted to assess work motivation in active malaria case surveillance among FCHVs.

The five components of work motivation are defined as:

- 1) intrinsic motivation - refers to when helping gives joy
- 2) integrated regulation - refers to when being a volunteer is central to one's identity
- 3) identified regulation- refers to when volunteering is considered to support an important personal cause
- and two components of controlled motivation: which refers to doing work to receive a reward or to avoid punishment or feelings of guilt:
- 4) introjected regulation - refers to a low form of internalization when behaviors are performed to avoid guilt and shame or to obtain ego enhancements and feelings of worth
- 5) external regulation -refers to no internalized behaviors as they are mainly driven by external rewards or to avoid punishment.

Hypothesis 1: Motivation positively influences the CHVs to perform active malaria case surveillance behaviors.

Autonomy Leadership

Leadership, particularly autonomy-supportive leadership, refers to supervisors' ability to empower CHVs by providing clear guidance, feedback, and opportunities for self-directed decision-making (28). According to SDT, autonomy-supportive leadership fosters a sense of independence and control, which enhances intrinsic motivation. When leaders create an environment where female CHVs feel trusted and capable of making decisions, it increases their intention to engage in surveillance behaviors (105). Research shows that CHVs who perceive their supervisors as supportive are more likely to adopt innovative approaches and sustain their performance (41).

For this study, it refers to the four leadership skills of female community health volunteers including transformational competence, political competence, trans-organizational competence, and team-building competence in active malaria case surveillance.

Hypothesis 2: Autonomy-supportive leadership positively impacts the CHVs to perform active malaria case surveillance behaviors.

Self-efficacy (competences)

Self-efficacy refers to the confidence an individual has in their ability to successfully perform a task (122). In the context of malaria surveillance, competence is enhanced through training, capacity-building, and skill development initiatives for CHVs. CHVs with high self-efficacy are more likely to believe in their ability to identify, report, and manage malaria cases effectively (42). Feedback from supervisors and recognition of their work further reinforces their competence. Research shows that self-efficacy directly impacts behavioral intention and the actual performance of health-related tasks (38).

For this study, SE refers to FCHV's perception of her ability in active malaria case surveillance in diagnosis, treatment, refer, knowledge transfer, IEC distribution, home visits, and recording and reporting the cases.

Hypothesis 3: Self-efficacy positively impacts the CHVs to perform active malaria case surveillance behaviors.

Social support (Relatedness)

Social support, as a key aspect of relatedness in SDT, refers to the encouragement and resources provided by family, community members, and health personnel. CHVs working in malaria-endemic areas often rely on their social networks to sustain their motivation and resilience (42). Supportive communities and health systems foster trust, reduce stress, and create collaborative environments, making CHVs more effective in their roles. Research indicates that CHVs with strong social connections are more likely to perform well in surveillance activities, as they feel valued and supported (37, 42).

In this study, this information is obtained through perceived social support as emotional, information, materials and supportive supervision support from their family, community, and health providers respectively.

1) Emotional support refers to the experience of receiving empathy, care, and love from family members.

2) Information support refers to experience of receiving advice, suggestions, and malaria related information from community people.

3) Materials support: referring to the experience of receiving tangible aids and services from health providers.

4) Supportive and controlling supervision support refers to the experience of receiving positive and negative respectively feedback information useful to make decisions on malaria diagnosis, treatment, referral from health providers.

Hypothesis 4: Social support positively influences the CHVs to perform active malaria case surveillance behaviors.

Hypothesis 5: Supervision positively influences the CHVs to perform active malaria case surveillance behaviors.

2.5.4 Conceptual Model for the Relationship of SDT to the Performance

Self-determination theory (SDT) is a psychological framework that explores human motivation and behavior. It suggests that people are driven by three innate psychological needs: autonomy, competence, and relatedness. According to SDT, individuals are most motivated when they feel a sense of autonomy (the ability to make choices and control their actions), competence (the feeling of effectiveness in their actions), and relatedness (a sense of connection and belongingness with others) (124).

In the context of community health volunteers (CHVs) and malaria case detection, SDT can shed light on how to enhance their performance and motivation. Research applying SDT to CHVs has found that when volunteers perceive their work as meaningful and aligned with their values, they are more likely to be motivated and engaged (125). For example, in malaria case detection, CHVs who feel autonomous in their decision-making process, competent in their ability to recognize malaria symptoms, and connected to the community they serve are likely to perform better. They may demonstrate higher levels of initiative in conducting health education sessions, actively seek out potential cases, and adhere more closely to reporting protocols.

Furthermore, providing CHVs with opportunities for skill development, supportive supervision, and feedback can enhance their sense of competence and autonomy, thereby improving their performance in detecting malaria cases. Building strong relationships and networks within the community can also foster a sense of relatedness, encouraging CHVs to continue their efforts despite challenges.

In summary, applying the principles of SDT to CHVs involved in malaria case detection can help improve their performance by addressing their innate psychological needs for autonomy, competence, and relatedness, thereby increasing their motivation and effectiveness in combating malaria.

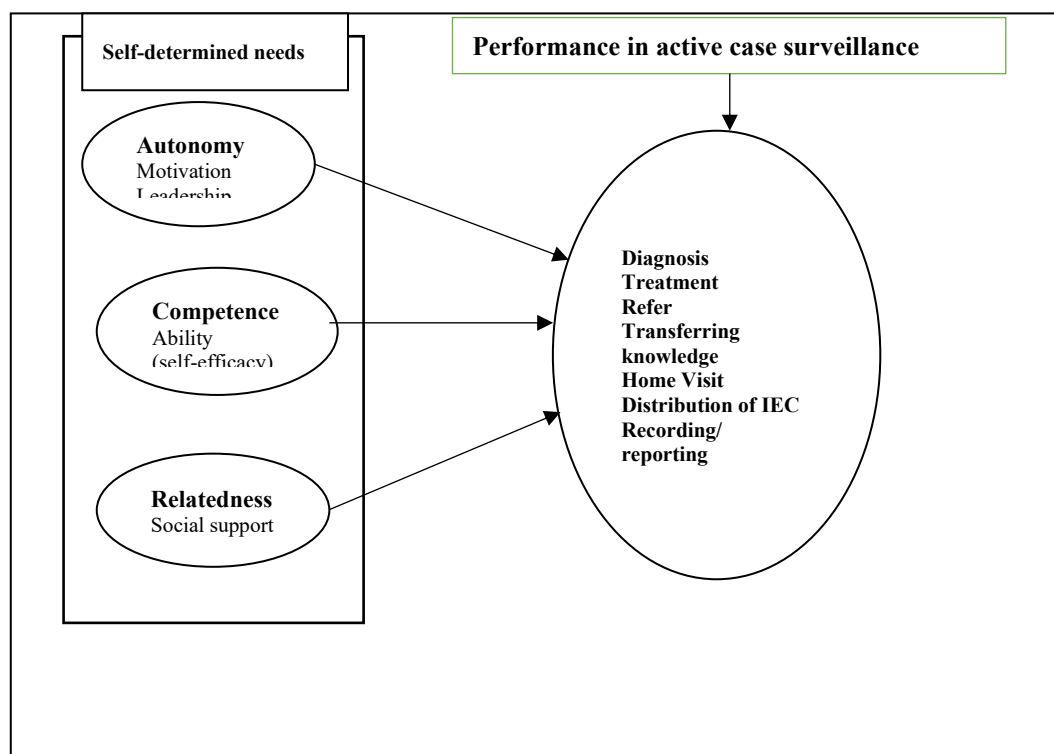


Figure 2.5.1 Conceptual model

SDT is a meta-theory of human motivation that includes five mini theories and several motivation-related concepts. Among them three components of the theory: social context (organizational context), needs satisfaction, and motivation are the key concepts in an impact on the satisfaction of needs, and this, in turn, influences autonomous (or self-determined) motivation (28, 124).

SDT states that all individuals have innate tendencies to grow and develop toward their full potential. To do so, SDT argues that the three basic psycho-logical needs should be satisfied, that is, the need for autonomy, competence, and relatedness (99). People have their autonomy need satisfied when they experience ownership of their behavior and act with a sense of volition, their competence need can be satisfied when they are able to successfully achieve desired outcomes, meet performance standards and manage different challenges, and their relatedness need gets satisfied when they feel connected with others and feel cared for by them (126).

To experience needs satisfaction, the theory further states that support and “nutriments” from the social context are necessary. In this respect, SDT differentiates between two types of contexts. An autonomy-supportive context refers to an environment in which persons with authority (such as managers, coordinators, or supervisors) take the perspectives of others into account, offer relevant information and opportunities to choose, encourage initiative, provide optimal challenges and positive feedback, and facilitate a secure environment for social interactions. In contrast, a controlling supportive context refers to an environment in which people experience pressure to think, feel, or behave in specified ways. In an organizational setting, autonomy support does not refer to job characteristics but to the interpersonal climate created between a supervisor or coordinator and the work team members (106, 124).

SDT assumes that social contexts facilitate two major types of motivation through satisfaction of the three basic needs. In this respect, a central distinction is made between autonomous and controlled motivation. Autonomous motivation refers to behavior that is performed because of personal choice and because the subject finds pleasure in it. Moreover, autonomous motivation can further be subdivided into three components that differ in terms of how internalized behavioral motives are. From highly to less internalized, one distinguishes intrinsic motivation (e.g., when helping gives joy), integrated regulation (e.g., when being a volunteer is central to one’s identity), and identified regulation (e.g., when volunteering is considered to support an important personal cause) (99).

In contrast to autonomous motivation stands controlled motivation, which refers to doing something to receive a reward or to avoid punishment or feelings of guilt. Controlled motivation can be subdivided into two components that differ in terms of how internalized behavioral motives are. Introjected regulation refers to a low form of internalization when behaviors are performed to avoid guilt and shame or to obtain ego enhancements and feelings of worth (e.g., engaging in volunteering to escape the feeling of guilt caused by being more fortunate than others), whereas external regulation refers to no internalized behaviors as they are mainly driven by external rewards or to avoid punishment.

The organizations prioritize volunteer retention, often by fostering positive intentions among volunteers (28). Behavior intentions are thought to be an important predictor of actual behavior. Previous research has identified various factors influencing retention, such as workplace enjoyment and effective training. Notably, support from social connections and the opportunity for autonomy and expression significantly impact retention, aligning with SDT's autonomy, competence, and relatedness.

Furthermore, autonomy-supportive leadership, in turn, is considered as one of the most important antecedents of individuals' psychological need satisfaction. Autonomy-supportive leadership and psychological need satisfaction both fuel the process of internalization. The study conducted in the paid-work context and found that, in general, an autonomy supportive interpersonal environment enhanced autonomous motivation, and, in turn, positive job outcomes (98). Therefore, the quality of the interaction with significant others, such as an autonomy-supportive work climate between supervisors or volunteer coordinators and volunteers, is supposed to affect the degree to which a volunteer feels autonomous, competent and related and thus autonomously motivated (106). Thus, SDT maintains that volunteer satisfaction has roots in autonomy-supportive leadership that positively influences psychological need satisfaction.

Previous studies often use Self-Determination Theory (SDT) to explore the relationship between employees' intrinsic and extrinsic motivations at work. They find that intrinsic motivations drive individuals to engage in activities because they find them interesting and satisfying, while extrinsic motivations rely on external goals to entice certain behaviors. Employers often seek to motivate employees to enhance performance, using methods like extrinsic motivations to internalize organizational behaviors. However, some argue that relying too heavily on external contingencies like incentives can diminish intrinsic motivations. Despite potential coercion from employers, employees may also be driven by personal interests, leading to enjoyment in their tasks.

2.6 Review of Relevant Related Studies

There are many previous studies conducted on the performance of CHVs in various health activities and some independent variables are found to be related to the performance of CHVs. The results of previous studies are described as the following sub-topics:

Factors shaping the performance of community health volunteers in malaria prevention interventions.

This section outlines the factors that shape the performance of CHVs in programs aimed at managing malaria. The factors have been grouped into three major headings: CHVs characteristics as SES, social support factors as family, community, and health providers/systems factors. Table 2.6 gives details of different factors influencing performance of CHV in malaria interventions.

1) Community health volunteer characteristics

Socio-economic factors

Socio-economic factors such as age, gender and education status, and work experience as CHV of CHVs affected their performance as per studies conducted in Nepal, Ghana Kenya, and Uganda (30, 34, 127, 128). Being a female CHV was associated with performance as some female community members who were found home during CHV visits felt freer to be served by a fellow female CHV (34). Being married also showed to have an influence on performance due to availability of supporters within the household of the CHVs to enable him or her perform her malaria-related duties (34, 127). Attainment of secondary-level education positively influenced performance as CHVs would easily read and write monthly reports (128). Longer work experience also positively influenced performance as it provided an opportunity to receive effective training, supervision, and incentives and to build a confidential relationship with community members (127). Table 2.5.1 details of different factors influencing performance of CHV in malaria interventions.

2) CHVs self-efficacy, motivation, and leadership

A review of the literature revealed that individual ability, work motivation, and leadership and social support factors could influence health volunteers in provision of malaria services (24, 30-37). Self-efficacy is associated with individual belief in his or her ability to carry out the actions required to achieve specified performance (38, 39). CHVs with high self-efficacy are more likely to persist in the face of challenges and setbacks encountered during malaria surveillance activities. Motivation as an individual's degree of willingness to exert and maintain effort towards role is related with performance. The performance of CHVs depends on their job satisfaction derived from certain intrinsic and extrinsic motivators (40). In addition, CHVs with good leadership are expected to motivate and encourage the community to be independently healthy (41).

Table 2.6.1 Individual factors influencing the performance of CHV in malaria interventions.

Variables	Key Findings	Reference
Socio-Demographic factors		
Age	• CHVs performed better in malaria diagnostics with the aged of CHVs of more than 50 years. • The overall performance of CHVs were higher in the older group (age more than 50 years).	(34, 66, 127)
Gender	• Female CHVs performed better than their male counterparts.	(37, 127, 128)
Marital status	□ The married CHVs gave a higher performance than other □ Having fewer household duties encourages CHVs to work more	(127, 128)
Household work		

Variables	Key Findings	Reference
Socio-Demographic factors		
	actively and reduces the dropout rate □ CHV who had availability of supporters for household chores gave a higher performance than others.	
Education	• CHVs who had good educational status, completed higher than primary school were more likely to have high-performance levels than those who had completed primary school.	(66, 127)
Occupation	• The CHV who was fewer household duties and only volunteers job encourages CHVs to work more actively and reduces the dropout rate.	(35-37)
Family income	• The CHV, who had good family income, that was sufficient for their livelihood had better performance than low family monthly income volunteers.	(66, 127)
Duration of working (Years of experiences)	□ CHVs longer work (more than 5 years) experience in malaria gave a higher performance than others.	(31, 127, 129)
Experience of training Attained in past	□ The CHV who had malaria training (more than 1 times) was	(31, 36, 37)

Variables	Key Findings	Reference
Socio-Demographic factors		
	significantly related to their performance of services. □ Adequately continuously trained and appropriately resourced CHVs are really motivated to perform their tasks like interpreting RDTs, and give treatment for Malaria.	
Competency about malaria disease	• CHVs who lacked knowledge in the guidelines could not perform certain tasks such as obtaining an accurate history of convulsions and recording cases.	(36, 37, 130)
Self-Ability in prevention and control of malaria diseases	• CHVs who had core skills in use of RDT, able to do RDT confidently and effectively in community case detection.	(36, 130)

3) Social support factors

Table 2.5.2 summarizes previous studies regarding social factors, namely social support, that affected the performance of CHVs. The social support factor is divided into four aspects as follows: emotional support, instrumental support, informational support, and appraisal support. Social support or community support increases the performance of volunteers. Social support as interactions with members of social networks that support behavior through emotions and appraisal of values, resources, and information. Receiving social support was related to the performance of volunteers in the community with statistical significance. The effect of social support processes on physical and mental health is improved. social support from family, community, and health providers is crucial for female community health volunteers (FCHVs) engaged in active malaria case surveillance.

Table 2.6.2 Social factors influencing performance**Social support**

Variables	Key Findings	Reference
Family support	Family support from their family members in household duties encourages CHVs to work more actively and reduces the dropout rate	(129, 131)
Community support	Community support as recognition, respect by community people towards CHVs had good performance in disease prevention and control among CHVs.	(37, 131)
Health provider support	Support from health providers as supportive supervision and feedback gave better performance of CHVs in the prevention and control of disease in the community. CHVs work not trusted by the health professional staff was influence the performance of CHVs in disease case detection in community.	(131)

2.7 Summary of Current evidence and Knowledge Gaps

2.7.1 Summary of literature review

FCHVs play an important role in facilitating access to healthcare for people living in hard-to-reach areas of low and middle-income countries. CHVs vary from fully paid, well-trained to occasional volunteers, unpaid and less trained. The range of their activities has evolved from health promoters to frontline clinicians in areas with limited human resources. Although FCHV programs reduced mortality and morbidity in different areas such as maternal and child health including family planning, and vector borne disease like kala-azar and malaria, less progress has been noticed after scale-up of the programs. In general, literature showed that the motivation of FCHVs waned when external donors stopped their funding. How to keep FCHVs motivated and focused on their work is under debate and few interventions ranging from giving salary to nonmonetary incentives are being explored.

A review of literature revealed that several supportive, motivational factors and CHVs factors could influence health volunteers in provision of malaria services. Supportive factors included the knowledge skills on prevention and control of disease, and supportive factors such as family, community, and health providers support during service provision.

Self- determination as work motivation, ability, and leadership skills and social support have shown a positive impact on health. CHVs who have support from their family, community and supervisors (support supervision including positive feedback and logistical support), the community members (emotional support) and who support each other (peer support, supervision by senior CHVs) could have better job performances.

2.7.2 Knowledge Gap

Malaria remains a significant public health challenge, particularly in regions where transmission rates are high. In such areas, community-based surveillance is crucial for early detection and prompt intervention for effective control. The existing studies revealed that female community health volunteers, who serve as a bridge between communities and formal health services, can play a crucial role in active malaria case surveillance including case detection, community education, and performing rapid diagnostic tests. However, existing challenges, such as limited knowledge, skills, training, and community support, including socioeconomic barriers hinder their optimal performance in malaria surveillance. Moreover, a range of strategies have been proposed to enhance the performance of community health volunteers in active malaria case surveillance including appropriate training, clear knowledge skills in guidelines, and regular supportive support. Therefore, empowering female CHVs through targeted interventions will not only strengthen the overall health system response to malaria but also foster gender-inclusive approaches to community health. By enhancing their skills in active case surveillance, these CHVs can become more effective advocates for preventive measures, facilitate early diagnosis, and improve the accessibility of healthcare services within their communities. This study, therefore, aims to empower them as vital contributors to malaria control strategies in high-endemic areas.

CHAPTER III

RESEARCH METHODOLOGY

This section outlines the methods and procedures used to assess the performance and analyze the causal relationship model of factors determining the performance using quantitative methods in active malaria case surveillance of female community health volunteers in the high-endemic areas of Nepal.

3.1 Research Design

A quantitative cross-sectional study design was adopted to assess the performance and causal relationship model of factors determining the performance of female community health volunteers in active malaria case surveillance.

The details of the research methods are divided into nine parts as below:

(3.2) Study area and settings, (3.3) Study population, (3.4) Sample size estimation, (3.5) Selection techniques, (3.6) Research instruments, (3.7) Measurements of study variables, (3.8) Data collection procedures, (3.9), Data processing and Statistical analysis, and (3.10) ethical consideration.

3.2. Study Area and Setting

This study was conducted in eight major endemic districts of three provinces in the western southern plain of Nepal, which shares a porous border with India. These districts are in the tropical zone and provide a favorable wet and moist climate (52). at for mosquito breeding. Based on microstratification in 2020, annual parasite incidence (API) was ≥ 1 case in 1000 population in these districts (49, 50). Hence, this study was conducted in eight high-risk malaria districts of three provincial areas, Lumbini Province including one district Bake, Sudurpaschim includes five districts as Achham, Baitadi, Bajura, Dadeldhura, and Kanchanpur, and Karnali Province includes two districts as Humla, Kalikot from 1 June to 30 August 2024.

In Nepal under the National Malaria Elimination Program (NMEP) trained and supported an average of 35-40 FCHVs in each rural municipality, a total of 3551 volunteers to provide malaria case surveillance among people of rural communities from 8 districts of western Nepal (132, 133) The selection criteria were usually used to recruit volunteers from high-risk areas who had been working as FCHVs for one year and could read and write in Nepali and the local language.

After choosing a malaria volunteer, the GoN with supporting agencies (USAID and GF) provided a two-day recruitment training and then they were responsible for malaria case management including diagnosis, treatment case, referring complicated cases, transfer of knowledge, distributing materials like pamphlets, posters, and long-lasting insecticide-treated nets (LLINs) to community people and reporting cases to local health facilities (134).

They also supported the incentives, either monetary (~10 USD monthly) or nonmonetary rewards such as umbrellas, backpacks, hats, and torch lights, for the volunteers according to the national malaria control program or budget availability. The organization also delivered monthly supportive monitoring and evaluation visits by field or local supervisors to ensure the quality of malaria care services as well as data recording and reporting feedback mechanisms and to solve any issues or challenges faced by the assigned volunteers.

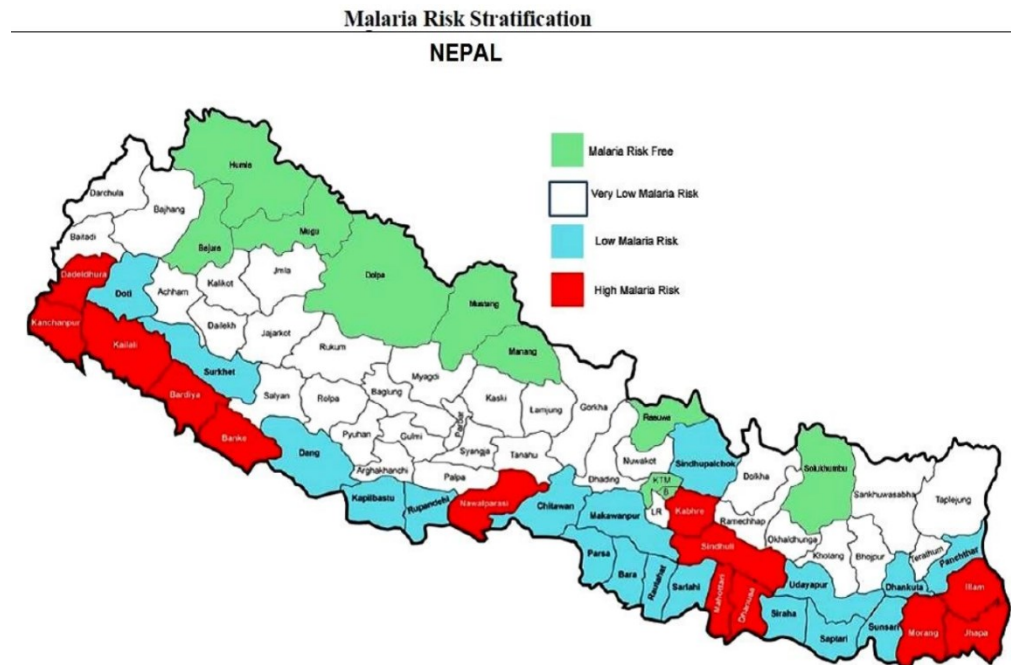


Figure 3.2 Study area and targeted implementation for the active malaria case surveillance in high-risk areas (red).

Source: Department of Epidemiology and Disease Control, MOHP, Nepal, 2021.

3.3 Study Population

The study was conducted exclusively on female community health volunteers (FCHVs) who meet the following eligible criteria was included in this study.

3.3.1 Inclusion Criteria

Individuals who meet the following criteria were eligible for this study inclusion:

- 1) The only female volunteers working in selected high-risk malaria districts as malaria FCHVs under the Ministry of Health system registered with their respective health offices for one year.
- 2) The FCHVs were between 25-60 years of age.
- 3) The sample frame of FCHVs was the willingness to participate in a survey.
- 4) FCHVs provided information to the researcher at the time of data collection.

3.3.2 Exclusion Criteria

- 1) FCHV, who were seriously ill (e.g., admission to the hospital during data collection) and could not communicate verbally were be excluded.
- 2) The FCHVs who took extended leave, for any reason, at the time of data collection were excluded from this study.

3.4 Sample Size Estimation

The population proportion following the formula calculated the sample size as,

$$n = \frac{Z_{\alpha}^2 p(1 - p)}{d^2}$$

n = estimated sample size, Z = 1.96 at 95% CI, p = Proportion of 64 %

Knowledge and ability on role action performance results from a previous study in Thailand (135).

d = allowable error = 2.83 (absolute precision of the study)

Then, The sample size n: 1094

Added, 10 % non-response rate $1094 \times 10/100 = 110$

The final sample size (n) = **1204**

A total sample size of 1204 participants was collected for data collection.

3.5 Selection of Participants

In this survey, the researchers followed the stratified random sampling technique to ensure unbiased participant selection as below:

On average, each District Health Office (DHO) has 150-200 FCHVs managing active malaria case surveillance in each rural/urban municipality under the National Malaria Elimination Program (NMEP), and thus, all FCHVs in the selected eight endemic (high-high, moderate, low) areas were included as:

The list of all rural municipalities and wards from each endemic area of the district was obtained from the local health coordinator, a focal person responsible for FCHV activities in the respective rural municipality.

Then, in each rural municipality and ward, Lists of FCHVs managing active malaria case surveillance were obtained from local health facilities and locations of FCHVs through their supervisors and local mothers' groups. Then, proportionate and volunteers from each district were selected using a random sampling method.

They were recruited during their FCHVs monthly meetings; in Nepal, FCHVs are linked with the peripheral health facilities in the communities. Each peripheral health facility usually supervises around ten to twelve FCHVs in their communities and facilitates a monthly FCHV meeting in the health facilities to document their monthly activities.

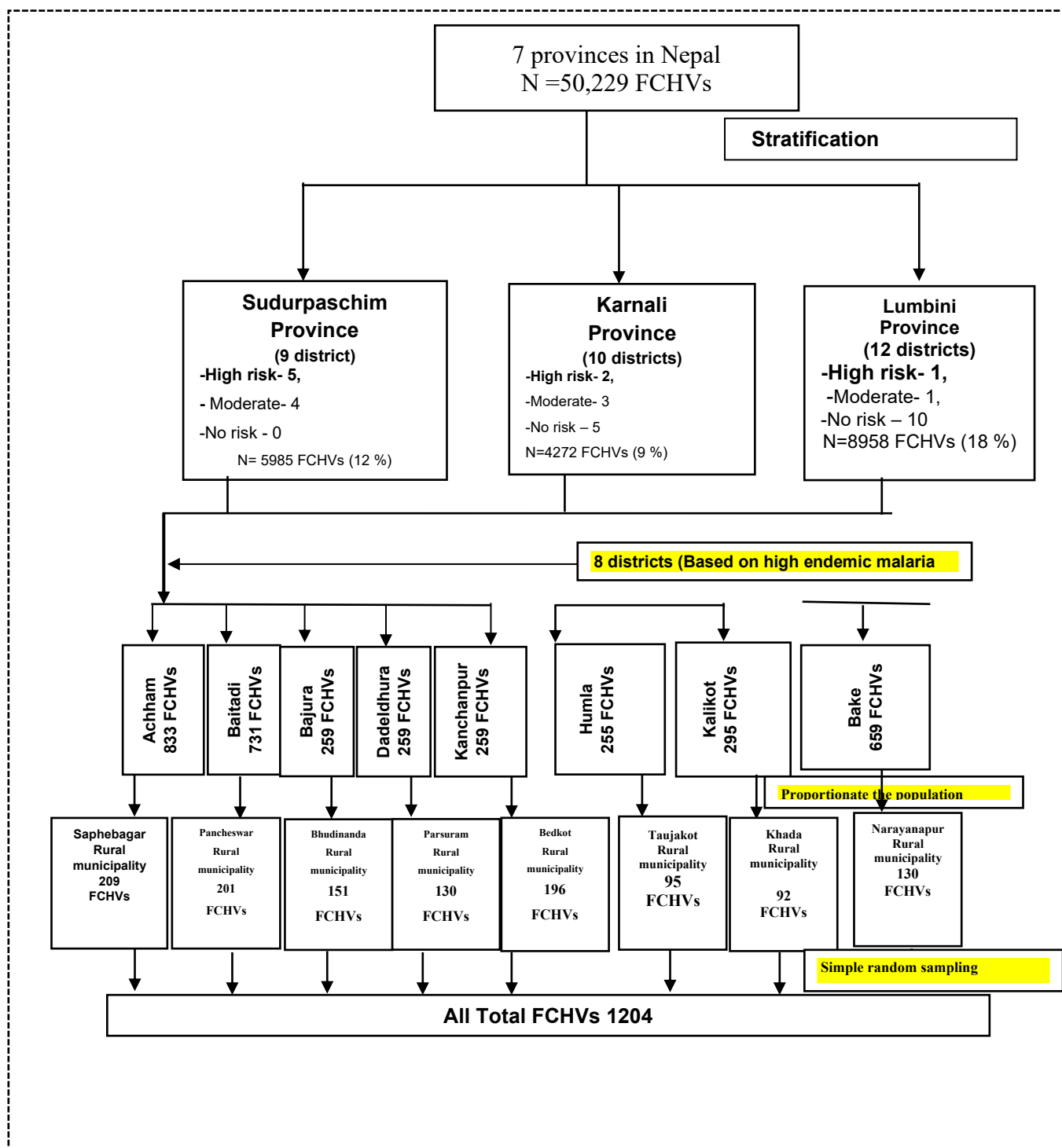


Figure 3.5 Process of Selected Participants

Table 3.5 Number of FCHVs randomly selected from each district

S.N.	Endemic districts	Catchment areas Rural/Municipality	Total catchment areas	Number FCHVs	Sample number
1	Bake	Narainapur	1	230	130
2	Humla,	Tanjakot	3	30	95
		Aadanchuli		35	
		Chankheli		30	
3	Kalikot,	Khandachakra	1	92	92
4	Achham,	Safhebagar	2	150	209
		Mangalsen		159	
5	Baitadi	Melauli	3	121	201
		Shivanath		60	
		Pancheshwor		50	
6	Bajura,	Budhinanda	1	259	151
7	Dadeldhura,	Parsuram	1	130	130
8	Kanchanpur	Bhimdatta	2	101	196
		Bedkot		95	
Total	8 districts	14 catchment rural/municipality	14		1204 FCHVs

3.6 Data Collection Methods and Tools

For this survey, primary data was collected through a structured interview questionnaire as a data collection tool. The questionnaire was developed consistent with operational definitions of variables after reviewing the literature and theory and also modified from other research studies.

The questionnaire was used for data collection through a face-to-face interview method. The responses were collected one by one. The questions were in the Nepali version, closed-ended questions, and rating scales for scale parts.

The questionnaire package included a six-part questionnaire with 70 items as follows:

Part I: Socio-economic status questionnaire: 6 items

Part II: Work motivation in active malaria case surveillance questionnaire: 20 items

Part III: Perceived leadership skills in active malaria case surveillance questionnaire: 12 items

Part IV: Perceived Self-efficacy in active malaria case surveillance questionnaire: 10 items

Part V: Perceived Social Support in Active Malaria Case Surveillance Questionnaire: 15 items

Part VI: self-reported Performance in Active Malaria Case Surveillance Questionnaire: 7 items

Part I: Socio-economic status of FCHVs questionnaire

The socio-economic status consists of general characteristics of FCHVs, this part contained six-item questions that were asked to query FCHVs about age, education level, family income, occupation, number of trainings on malaria in the past, and duration of working as a volunteer.

The question items were presented as multiple-choice items and fill-in-the-blank items.

Part II: Work motivation of FCHVs in active malaria case surveillance questionnaire

Motivation for volunteering work was measured using the Motivation at Work Scale– Revised (MAWS-R) (102).

In this scale, participants were asked to rate the reasons for engaging in volunteer work according to the different forms of autonomous and controlled motivation, on a scale from 1 (strongly disagree) to 5 (strongly agree): For this study five components of work motivation, (3 autonomous motivations as intrinsic motivation, integrated regulation, and identified regulation), and (2 controlled motivations as introjected regulation, and external regulation).

Each component consisted 4 items, a total of 20 sub-items such as external regulation (four items, e.g., “Because others put pressure on me”), introjected regulation (four items, e.g., “Because it makes me feel proud of myself”), identified regulation (four items, e.g., “Because what I do in this job has a lot of personal meaning to me”), integrated regulation (four items, e.g., “Because I am made for this type of work”), and intrinsic motivation (four items, e.g., “Because I enjoy this work very much”).

The scores for each question were added together to get the total possible score for work motivation, autonomous (1 to 60), and control motivation (1 to 40). The total scores for each respondent were then split into the median. If the responses were equal or more than the median score, the FCHV’s work motivation was considered “High.” If the responses were less than the median, the motivation was considered “Low.”

Part III: Perceived leadership skills of FCHVs in active malaria case surveillance questionnaire

Four (4) components of leadership skills including transformational competence, political competence, trans-organizational competence, and team-building competence were used to assess the leadership skills in active malaria case surveillance.

For this study, a 12-item leadership skills questionnaire used a 5-point Likert scale (1= strongly disagree to 5 =strongly agree) scales (104), to assess perceived leadership among FCHVs.

The scores for each item were added together to obtain the total possible score for leadership (ranging from 1 to 15). The total scores for each respondent were then split into the median. If the responses were equal or more than the median score, the FCHV's each leadership was considered "High." If the responses were less than the median, the leadership was considered "Low."

Part IV: Perceived Self-efficacy of FCHVs in active malaria case surveillance questionnaire

For this part, the generalized self-efficacy scale (GSE) (114, 136) was used to assess a general sense of perceived self-efficacy among FCHVs in active malaria case surveillance.

For this study, ten ten-item self-efficacy questionnaires were scored using a five-point scale (1= strongly disagree to 5 =strongly agree). Each of the ten items on the General Self-Efficacy (GSE) scale had a point value between 1 and 5. The scores for each item were added together to obtain the possible total score for self-efficacy (ranging from 1 to 50).

The total scores for each respondent were then split into the median. If the responses were equal or more than the median score, the FCHV's self-efficacy was considered "High." If the responses were less than the median, the self-efficacy was considered "Low."

Part V: Perceived Social Support of FCHVs in Active Malaria Case Surveillance Questionnaire

This information was obtained through perceived social support as emotional, informational, instrumental, and supervision support from their family, community, and health providers/personnel respectively.

Social support was consisted four domains: (1) emotional support refers to the experience of receiving empathy, care, and love from family, community, and health providers; (2) information support refers to the experience of receiving advice, suggestions, and malaria-related information from family, community, and health providers; (3) instrumental support refers to the experience of receiving tangible aids

and services from family, community, and health providers and (4) supervision support refers to the experience of receiving information useful to decide on malaria diagnosis, treatment, a referral from family, community, and health providers (137).

Each domain had four items on a five-point rating scale: 1 = always, to 5= never. For this, 9 items perceived social support questionnaire was used based on the Multidimensional Scale of Perceived Social Support (MSPSS) for emotional, informational, and material support from family, community, and health providers, and, 6 items of Work Climate Questionnaire scale (WCQ) (40) for supportive and controlling supervision from supervisors in active malaria case surveillance.

The scores for each item were added together to obtain the possible total score for each support (ranging from 1 to 15). The total scores for each respondent were then split into the median. If the responses were equal or more than the median score, the FCHV's social support was considered "High." If the responses were less than the median, the social support was considered "Low."

Part VI: Performance of FCHVs in active malaria case surveillance

Self-reported performance activities were used to measure participants' performance. Participants were asked about their participation, methods, and frequency with which they engage in seven dimensions of active malaria case detection activities; diagnosis, treatment, refer, transferring knowledge, prevention practices, IEC distribution, recording and reporting the malaria cases by female community health volunteers in high endemic areas of Nepal, for each dimension of FCHV participant responses used 0 (never) and 1(ever), for use of methods response 0 (no perform and not follow guideline), 1 (correct method/perform), and for frequency response used 0 (not perform case/last year), and 1 (perform case/according to the guideline).

The scores for each item were added together to obtain the possible total score for performance (ranging from 0 to 21). The overall scores of the level of performance were compiled and categorized into two groups using the total scores for each respondent that were then split into the median. If the responses were equal or more than the median score, the FCHV's performance was considered "High." If the responses were less than the median, the performance was considered "Low."

3.6.1 Tool Validity and Reliability

3.6.1.1 Validity

- **Construct validity**

The questionnaire corresponds with the layout of the conceptual framework which was based on the self-determination theoretical model and previous study. The operational definitions are matched with conceptual definitions based on literature. The construct was validated by an expert working in the community management of the malaria field.

- **Content validity**

The items included in the study questionnaire were derived from literature and the National Malaria Policy, MOHP Nepal guideline. Therefore, it was raw. It was validated by three experts in malaria: two from the ASEAN Institute for Health Development, Mahidol University, and one local expert from EDCCD, Nepal. Then, the researcher translated the questionnaires into Nepali.

- **Face validity**

After translation, the experts checked face validity was checked to ensure the transparency and relevance of the test during pilot testing.

- **Pilot testing**

Pre-testing of the questionnaire was conducted in a pilot study to check respondents' comprehension, duration to complete the questionnaire, flow of the questions and to identify any sensitive or offending wording that could demotivate the respondents. The target sample for pilot testing was 30 respondents, FCHVs in the Dhansusha district of Nepal, an endemic district other than the study area.

3.6.1.2 Reliability test

After pilot testing, the internal consistency of the items was conducted reliability test function of SPSS 26.0. For the scale items, namely motivation, leadership, self-efficacy, social support, and performance, the computed Cronbach's alpha score. The minimum Cronbach's Alpha Coefficient of 0.7 was accepted, and some parts of the questionnaire were organized and revised.

3.7 Data Collection Procedures

3.7.1 The data collection process was as follows:

1. The researcher submitted the proposal to the Mahidol University-Central Institutional Review Board (MU-CIRB).

2. After the approval of MU-CIRB is guaranteed, the researcher will submit the proposal to the Nepal Health Research Council Ethical Review Board (NHRC-ERB) Nepal along with the MU-IRB for approval.

3. After approval was guaranteed, the researcher was asked for permission to collect data from the director of the respective district health office/ local health authority. The researcher was informed about the objectives and details of the data collection process regarding the research.

4. With FCHVs, those who meet the inclusion criteria of this research was informed to take part in this research before data collection. Verbal and written informed consent were taken from the respondents after indicating their willingness to participate in this study. The process of data collection was performed by a trained assistant researcher.

5. A research team was formed with twelve research assistants; they were bachelor's in public health and community health assistants/Staff nurses and were local health personnel working as health centre staff. Research assistants were trained to understand the questionnaires, the objectives and methodology, how to explain the study purpose, how to inform, how to keep confidentiality, and how to ask questions to respondents.

6. After completing survey questionnaires, researchers continuously collect observation data on the performance in active malaria case surveillance activities at their peripheral health facilities. All information will be recorded by using the KoBo Toolbox.

The KoBo Toolbox is a widely used, free, and open-source toolkit designed for data collection and management in challenging environments, particularly in social science in humanitarian emergencies. The platform offers various features such as a questionnaire form development tool, an offline data collection mobile application, data visualization, and project management tools.

3.8 Statical Analysis

Data was first transferred into a Microsoft Excel sheet. After cross-checking and necessary adjustments were done, the data was coded in all items using a coding table and the consistency of data in all variables was checked. Data was analyzed using the IBM Statistical Package for Social Science (SPSS) version 26.0, and SPSS AMOS 29.0 Graphics (Mahidol University license) Before analyzing the data, the normal distribution was checked.

All composite variables were categorized based on criteria into groups, such as High/low (based on score). Descriptive and analytical statistics were used to answer the research objectives. To examine the motivation, leadership, self-efficacy, social support, and performance level of FCHVs, was used descriptive statistics including median, quartile deviation (QD), mean, minimum, maximum, and number and percentage of each variable.

To analyze the data, An Exploratory factors analysis (EFA) was performed using a principal component analysis first then confirmatory factor analysis (CFA) was performed to validate all study variables; structural equation modeling (SEM) was then used to test causal relationships among SDT constructs and role performance activities. Based on the SEM, the overall model fit was measured by calculating the following indexes: the model chi-square (X^2), the ratio of chi-square to the degree of freedom (X^2/df), the standardized root mean square residual (SRMR), the normed fit index (NFI), the Tucker–Lewis index (TLI), the comparative fit index (CFI), the goodness-of-fit index (GFI), and the incremental fit index (IFI). SPSS 26.0 and Amos 29 were used to perform the data analyses (138). SPSS was utilized for the frequency, correlation, and reliability analyses, while AMOS was used for the confirmatory factor analysis (CFA) and structural equation modeling (SEM).

3.9 Ethical Consideration

Ethical approval was approved from the Committee for Research Ethics (Central IRB-approval no.2024/132.0104) of Mahidol University and the local Ethics Review Committee of Nepal Health Research Council (ERB-NHRC-approval no.034-2024/2025) in Nepal before collecting data.

The data collection process and the study's purpose were clarified by the researcher. The respondents voluntarily participated in the study. Written and verbal Informed consent was obtained from each participant before the interview. All information on the study subjects was kept confidential to protect their right to privacy. The process was as below.

Verbal and written consent with FCHVs, those who meet the inclusion criteria of this research were informed to take part in this research before data collection.

A written informed consent with their signature was taken from the respondents after their volunteer willingness to participate in this study.

Trained enumerators/research assistants of data collectors have received written consent from the participants.

CHAPTER IV

RESULTS

This study aimed to assess the performance and analyze factors determining the performance using quantitative methods in active malaria case surveillance behaviors of female community health volunteers in endemic areas of Nepal. The theory of Self-determination (SDT) was used to test whether perceived autonomy motivation, self-efficacy, leadership skills, social support, and supervision could affect behavior, which then leads to performance towards active malaria case surveillance in endemic areas of Nepal.

This cross-sectional survey was conducted from 1 June to 30 August 2024 among FCHVs in three provinces: Lumbini, Karnali, and Sudurpaschhim, and eight high-risk malaria districts of three provinces, including Baitadi, Bajura, Dadeldhura, and Kanchanpur of Nepal. A total of 1204 complete data were used for analysis. To examine the performance of FCHVs in active malaria case surveillance in endemic areas of Nepal, self-reported performance activities were used to measure participants' performance. Participants were asked about their participation, methods, and frequency with which they engage in seven dimensions of active malaria case detection activities; diagnosis, treatment, refer, transferring knowledge, prevention practices, IEC distribution, recording and reporting the malaria cases by female community health volunteers in high endemic areas of Nepal. Moreover, the theory of Self-determination (SDT) was used to test whether perceived autonomy motivation, leadership (autonomy), self-efficacy (competence), social support, and supportive and controlling supervision (relatedness) could affect performance towards active malaria case surveillance.

A questionnaire was used to assess performance behaviors, their influencing factors, and Self-Determination Theory (SDT) constructs. Data analysis began with descriptive then Exploratory Factor Analysis (EFA) using principal component analysis, followed by Confirmatory Factor Analysis (CFA) to validate study variables. Structural Equation Modeling (SEM) was then employed to examine causal relationships between SDT constructs and role performance activities. Model fit was evaluated using multiple indices, including chi-square (X^2), X^2/df ratio, standardized root mean square residual

(SRMR), normed fit index (NFI), Tucker-Lewis index (TLI), comparative fit index (CFI), goodness-of-fit index (GFI), and incremental fit index (IFI). Data analysis was conducted using SPSS 26.0 for frequency, correlation, and reliability analyses, and AMOS 29 for CFA and SEM. The results of this study are described as follows:

4.1 Description of socioeconomic status of the respondents.

4.2 Description of performance of FCHVs in active malaria surveillance.

4.3 Description of Perceived motivation, leadership, self-efficacy, social support, and supervision in active malaria case surveillance among FCHVs.

4.4 Description of the level of performance, perceived motivation, leadership, self-efficacy, and social support by FCHVs in active malaria case surveillance.

4.5 Description of the relationships between socioeconomic factors, perceived motivation, leadership, self-efficacy, social support from family, community, health providers, supervision from the supervisor, and performance level of FCHVs.

4.6 Results of the Exploratory Factors Analysis (EFA)

4.7 Results of the Confirmatory Factors Analysis (CFA)

4.8 Results of the Structural Equations Models (SEM)

4.9 Results of the Path Analysis

4.10 Results of the Analysis of Hypotheses

4.11 Summary of the results

4.1 Description of the Socioeconomic Status of the Respondents

This study involved 1,204 female community health volunteers (FCHVs) from six districts in malaria-endemic areas of Nepal. The Socioeconomic status of the respondents is presented in Table 4.1. The average age of the participants was 40.92 years (SD = 10.179, range 25-60 years). The age distribution revealed that 45.9% of participants were middle-aged 35-44 years, 45% aged 45-60, and 9.1% aged 25-34. Regarding education, about half of the participants (44.9%) completed primary education, followed by secondary (35.1%), and higher secondary (19.9). Regarding major occupations other than volunteer work, most respondents were engaged in agriculture (58.2%), followed by housekeeping (21.8%) and trading/business (14.6%). Most participants (69.9%) reported a monthly family income of less than 15,000 NRS.

Experience levels among FCHVs revealed that about half of the participants had served for 6-10 years (44.1%), 36.6% for 1-5 years, and a minority (19.1%) working in malaria-endemic areas for 1-5 years. Moreover, two-thirds of participants had worked as malaria volunteers for 1-5 years (64.1%). However, more than half (53.6%) of participants did not receive refresher training last year.

Table 4.1 Percentage of respondents by socio-economic status (n= 1204)

Socio-economic factors	Number	Percent
Age group (years)		
25-34	109	9.1
35-44	553	45.9
45-60	542	45.0
Mean age 40.92 (SD10.179), Min 25.0 Max = 60.0		
Education		
Primary school	541	44.9
Secondary school	423	35.1
Higher Secondary	240	19.9
Occupation		
Agriculture	701	58.2
Trader/Business	176	14.6
Housekeeper	263	21.8
Labor	12	1.0
Government staff	5	0.4
Private employee	47	3.9
Family income per month (Rupees)		
Less than 15000	842	69.9
15000 -25000	297	24.7
More than 25000	65	5.4
Duration of working as a FCHV (years)		

1-5 years	441	36.6
6- 10 years	531	44.1
>10 years	232	19.3
Duration as Malaria volunteer (Years)		
1-5 years	772	64.1
>5 years	432	35.9
Refresher training last year		
No	645	53.6
Yes	559	46.4

4.2 Perceived motivation in active malaria case surveillance among FCHVs

Table 4.2 shows the responses of 1,204 Female Community Health Volunteers (FCHVs) regarding their work motivation in active malaria case surveillance. The responses were measured on a 5-point Likert scale, ranging from Strongly Agree (SA) to Strongly Disagree (SD). The motivation statements were divided into 2 parts; controlled motivation refers to external pressures or internalized obligations that drive individuals to perform their work. This category was further divided into external regulation and introjected regulation. Regarding, **external Regulation** (reflects motivation driven by external pressures or rewards), the results indicate that FCHVs generally disagreed with statements suggesting external pressure from family or supervisors. Half of the respondents, 50.6% (n = 609) strongly disagreed and 29.3% (n = 353) disagreed with the statement, "Your family puts pressure on you." Similarly, 41.7% (n = 502) strongly disagreed and 29.7% (n = 358) disagreed with the statement, "Your supervisor puts force on you." However, FCHVs strongly agreed that recognition and appreciation from their community, such as mother's club meetings, motivated them. A significant majority (41.7%, n = 502 strongly agreed; 51.8%, n = 624 agreed) supported the statement, "Your mother's club meeting put in effort and appreciated you

more." Additionally, 45.9% (n = 553) strongly agreed and 48.2% (n = 580) agreed that incentives motivated them to put effort into their work. The results of **Introjected Regulation** (involving internal pressures, such as guilt or pride, that influence behavior) revealed that FCHVs expressed strong agreement with statements related to pride and personal satisfaction. For instance, 37.2% (n = 448) strongly agreed and 57.6% (n = 693) agreed with the statement, "You feel proud of yourself." Similarly, 45.2% (n = 544) strongly agreed and 47.8% (n = 576) agreed that their work made them feel good. However, fewer FCHVs felt guilty about not advocating malaria knowledge in endemic areas, with 27.3% (n = 329) strongly agreeing and 34.0% (n = 409) agreeing with this statement.

Regarding, autonomy motivation, reflects self-determined behavior driven by personal values, goals, and interests. This category was divided into identified regulation, integrated regulation, and intrinsic motivation. For identified regulation (motivation derived from the personal importance or value of the work), a significant proportion of FCHVs agreed that their job had personal meaning and significance. Such as, 31.6% (n = 381) strongly agreed and 38.0% (n = 458) agreed with the statement, "You do this job because this job has a personal meaning to you." Similarly, 40.2% (n = 484) strongly agreed and 30.1% (n = 362) agreed that putting effort into their job had personal significance. Additionally, 46.7% (n = 562) strongly agreed and 30.1% (n = 363) agreed that humanitarian services were an important aspect of their work. For **Integrated Regulation** (aligning work with personal values and life goals), FCHVs expressed moderate agreement with statements in this category. For instance, 20.4% (n = 246) strongly agreed and 35.8% (n = 431) agreed that they were trained for this type of work. Similarly, 24.2% (n = 291) strongly agreed and 40.0% (n = 482) agreed that their job provided them with skills for case detection in their community. However, fewer FCHVs strongly agreed that their work aligned perfectly with their life goals (31.4%, n = 378), and regarding **Intrinsic Motivation** (motivation reflects enjoyment and interest in the work itself), FCHVs demonstrated high levels of intrinsic motivation, with a majority expressing enjoyment and interest in their work. 42.4% (n = 511) strongly agreed and 39.3% (n = 473) agreed with the statement, "You enjoy this work very much." Similarly, 47.3% (n = 570) strongly agreed and 35.4% (n = 426) agreed that their job aligned with their interests and humanitarian values. A significant majority

(57.7%, n = 695) strongly agreed that their work involved meaningful human social services.

Table 4.2 Perceived motivation in active malaria case surveillance among FCHVs (n=1204)

Statements	SA		A		NS		D		SD	
	n	%	n	%	n	%	n	%	n	%
1. Autonomy Motivation										
AM1: I do this job because this job has a personal meaning to me.	381	(31.6)	458	(38.0)	288	(23.9)	75	(6.2)	2	(0.2)
AM2: Putting effort into this job has personal significance to me.	484	(40.2)	362	(30.1)	54	(4.5)	228	(18.9)	76	(6.3)
AM3: It is useful to put malaria training effort into my job.	384	(31.9)	542	(45.0)	169	(14.0)	100	(8.3)	9	(0.7)
AM4: I consider it important for humanitarian services to put effort into this job.	562	(46.7)	363	(30.1)	191	(15.9)	87	(7.2)	1	(0.1)
AM5: I trained to made for this type of work.	246	(20.4)	431	(35.8)	251	(20.8)	214	(17.8)	62	(5.1)
AM6: This job provides me with skills in case detection with my community.	291	(24.2)	482	(40.0)	310	(25.7)	117	(9.7)	4	(0.3)
AM7: I actualize myself fully through this work.	342	(28.4)	479	(39.8)	306	(25.4)	72	(6.0)	5	(0.4)
AM8: This work fits perfectly well with my life goals.	378	(31.4)	415	(34.5)	309	(25.7)	93	(7.7)	9	(0.7)
AM9: I enjoy this work very much.	511	(42.4)	473	(39.3)	153	(12.7)	41	(3.4)	26	(2.2)
AM10: The work I do is interesting.	481	(40.0)	490	(40.7)	162	(13.5)	55	(4.6)	16	(1.3)

AM11: This job aligns with my interests and humankind.	570 (47.3)	426 (35.4)	171 (14.2)	15 (1.2)	22 (1.8)
AM12: The work I do is a lot of human social services and serving others.	695 (57.7)	348 (28.9)	113 (9.4)	23 (1.9)	25 (2.1)

Note: SA = Strongly agree, A= Agree, NS= Not sure, D= Disagree, SD= Strongly disagree

Table 4.2.1 shows the control and autonomy motivation level of FCVHVs to work in active malaria case surveillance. According to the results, more than half of FCHVs had high levels of control motivation (51.7%) and autonomy motivation (53.1%) respectively toward the active malaria case surveillance.

Table 4.2.1 Percentage of respondents classified by the level of motivation

Levels of motivation (n = 1204)	Number	Percent
Control motivation		
High (≥ 29)	622	51.7
Low (<29)	582	48.3
Median =29.0 (QD= 3), Min = 13.0, Max = 40.0		
Autonomy motivation (n = 1204)		
High (≥ 49)	639	53.1
Low (<49)	565	46.9
Median =49.0 (QD= 6.5), Min = 26.0, Max = 60.0		

4.3 Perceived Leadership in Active Malaria Case Surveillance in FCHVs.

The table 4.3 presents the responses of 1,204 Female Community Health Volunteers (FCHVs) regarding their perceived leadership roles in active malaria case surveillance. The responses are categorized into four leadership dimensions: transformative leadership, political leadership, trans-organizational leadership, and team-building leadership. Each dimension is measured on a 5-point Likert scale, ranging from Strongly Agree (SA) to Strongly Disagree (SD).

The results of transformative leadership (refers to the ability to inspire and motivate others to achieve meaningful change), indicate mixed perceptions among FCHVs regarding their transformative leadership roles. For instance, only 18.3% (n = 220) strongly agreed and 10.2% (n = 123) agreed that their CHV role inspires individuals in early diagnosis and treatment of malaria, while a significant proportion (45.1%, n = 543) disagreed. Similarly, 11.3% (n = 136) strongly agreed and 20.0% (n = 241) agreed that their role in recording and reporting cases helps health providers make necessary decisions, but 42.8% (n = 515) disagreed. Regarding fostering motivation for behavior change communication (as use of LLINs), 14.8% (n = 178) strongly agreed and 19.8% (n = 238) agreed, while 39.6% (n = 477) disagreed.

Regarding political leadership (engaging with community leaders and stakeholders to advocate for resources and support for malaria control initiatives), the results reveal that FCHVs generally do not perceive themselves as strong political leaders. Such as, only 7.6% (n = 92) strongly agreed and 11.5% (n = 139) agreed that their role in diagnosing cases initiates community political leaders to support malaria control initiatives, while 39.6% (n = 477) disagreed and 30.9% (n = 372) strongly disagreed. Similarly, 4.7% (n = 57) strongly agreed and 14.2% (n = 171) agreed that their role builds strong relationships with key stakeholders, but 45.6% (n = 549) disagreed. Additionally, only 0.4% (n = 5) strongly agreed and 13.7% (n = 165) agreed that they effectively communicate with local leaders to advocate for resources, while 44.9% (n = 541) disagreed.

Moreover, the results of trans-organizational leadership (focuses on promoting collaboration, knowledge sharing, and adapting strategies across communities and organizations), indicate that FCHVs have limited confidence in their trans-organizational leadership roles. For instance, only 5.7% (n = 69) strongly agreed and 12.7% (n = 153) agreed that their role promotes collaboration and knowledge sharing across communities, while 45.3% (n = 546) disagreed. Similarly, 7.4% (n = 89) strongly agreed and 10.4% (n = 125) agreed that their role adapts strategies from successful malaria control programs, but 49.9% (n = 601) disagreed. Additionally, 6.8% (n = 82) strongly agreed and 11.9% (n = 143) agreed that their role facilitates the exchange of best practices, while 48.2% (n = 580) disagreed, and the results of team-building leadership (involves fostering teamwork, resolving conflicts, and creating a supportive environment within the CHV team), in contrast to the other leadership dimensions, FCHVs strongly agreed with their team-building leadership roles. 30.9% (n = 372) strongly agreed and 57.6% (n = 694) agreed that their role promotes teamwork with the health system. Similarly, 30.9% (n = 372) strongly agreed and 57.6% (n = 694) agreed that their role in monthly reporting effectively resolves conflicts within the CHV team. Additionally, 29.3% (n = 353) strongly agreed and 61.0% (n = 734) agreed that their role creates a supportive environment and motivates them to contribute to malaria surveillance efforts.

Table 4.3 Perceived Leadership in Active Malaria Case Surveillance in FCHVs.

	SA		A		NS		D		SD	
	n	%	n	%	n	%	n	%	n	%
1. Transformative Leadership										
TC1: My CHV role inspires individuals in early diagnosis and treatment in malaria case surveillance.	221	(18.3)	123	(10.2)	159	(13.2)	543	(45.1)	158	(13.2)
TC2: My CHV role in recording and reporting cases helps to decision process to take necessary action by health providers.	136	(11.3)	241	(20.0)	174	(14.5)	515	(42.8)	138	(11.5)

TC3: My CHV role fosters motivation in behavior changes communication (Use of LLIN) in tackling malaria in the community.	178 (14.8)	238 (19.8)	156 (13.0)	477 (39.6)	155 (12.9)
2. Political Leadership					
PC1: My CHV role as diagnosis of cases initiates community political leaders to support malaria control initiatives.	92 (7.6)	139 (11.5)	124 (10.3)	477 (39.6)	372 (30.9)
PC2: My CHV role builds strong relationships with key stakeholders involved in malaria control efforts.	57 (4.7)	171 (14.2)	167 (13.9)	549 (45.6)	260 (21.6)
PC3: My CHV role effectively communicate with local leaders and authorities to advocate for resources for malaria surveillance.	5 (0.4)	165 (13.7)	137 (11.4)	541 (44.9)	356 (29.6)
3. Trans organization Leadership					
TOC1: My CHV role promotes collaboration and knowledge sharing across different communities for enhanced malaria surveillance.	69 (5.7)	153 (12.7)	125 (10.4)	546 (45.3)	311 (25.8)
TOC2: My CHV role adapts strategies from successful malaria control programs in other regions to suit our community's needs.	89 (7.4)	125 (10.4)	141 (11.7)	601 (49.9)	248 (20.6)
TOC3: My CHV role facilitates the exchange of best practices and lessons learned among local teams to improve malaria surveillance outcomes.	82 (6.8)	143 (11.9)	128 (10.6)	580 (48.2)	271 (22.5)

4. Team Building Leadership

TBC1: My CHV role promotes teamwork with the health system.	372 (30.9)	694 (57.6)	102 (8.5)	31 (2.6)	5 (0.4)
TBC2: My CHV role as monthly reporting cases effectively resolves conflicts within our CHV team to maintain focus on malaria control objectives.	372 (30.9)	694 (57.6)	102 (8.5)	31 (2.6)	5 (0.4)
TBC3: My CHV role creates a supportive environment and motivates me to contribute to malaria surveillance efforts.	353 (29.3)	734 (61.0)	82 (6.8)	30 (2.5)	5 (0.4)

Table 4.3.1 presents the distribution of respondents by levels of leadership across four categories: Transformative, Political, Trans-organization, and Team building. The results show that the highest level of leadership was in Team building, with 81.7% scoring high, followed by Political at 61.3%, Trans-organizational at 59.4%, and Transformative Leadership had the lowest high score at 53.8%.

Table 4.3.1 Percentage of respondents classified by the level of Leadership

Levels of leadership (n = 1204)	Number	Percent
Transformative (n = 1204)		
High (≥ 9)	648	53.8
Low (<9)	556	46.2
Median = 9.0 (QD= 2.5), Min = 3.0, Max = 15.0		
Political (n = 1204)		
High (≥ 7)	738	61.3
Low (<7)	466	38.7
Median = 7.0 (QD= 2.0), Min = 3.0, Max = 15.0		

Trans organization (n = 1204)

High (≥ 8)	715	59.4
Low (<8)	489	40.6
Median =8.0 (QD= 2.5), Min = 3.0, Max = 15.0		

Teambuilding (n = 1204)

High (≥ 12)	1020	81.7
Low (<12)	184	15.3
Median =12.0 (QD= 0.5), Min = 6.0, Max = 15.0		

4.4 Perceived Self-efficacy in Active Malaria Case Surveillance in FCHVs.

Table 4.4 below on perceived self-efficacy in active malaria case surveillance among 1,204 FCHVs reveals varied levels of confidence across different tasks. The highest confidence was observed in engaging people during home visits (SE7: 83.9% agreed or strongly agreed) and continuing case searches despite initial setbacks (SE8: 77.6% agreed or strongly agreed). Confidence was also high in referring cases to health facilities (SE3: 73.7%) and adapting to community situations while distributing IEC materials (SE5: 78.1%). However, the lowest self-efficacy was in using Rapid Diagnostic Tests (RDTs) for malaria detection (SE2: 11.9% agreed or strongly agreed), additionally, confidence was moderate in reporting malaria cases (SE6: 58.1%) and making decisions related to case detection (SE9: 67.4%).

	SA		A		NS		D		SD	
	n	%	n	%	n	n	%	n	%	n
3. Self-efficacy										
SE1: I am confident in my ability to identify malaria cases effectively.	198	(16.4)	569	(47.3)	143	(11.9)	189	(15.7)	105	(8.7)
SE2: I am confident in using RDT to detect cases.	77	(6.4)	67	(5.6)	107	(8.9)	252	(20.9)	701	(58.2)
SE3: I am confident to refer the cases to the health facility after identifying malaria cases.	214	(17.8)	673	(55.9)	148	(12.3)	125	(10.4)	44	(3.7)

SE4: I am confident to ask my supervisor to follow the malaria cases even if initial efforts are unsuccessful.	56 (4.7)	631 (52.4)	111 (9.2)	105 (8.7)	301 (25.0)
SE5: I am confident in my ability to adapt to community situations while engaging or distributing IEC materials among community people.	239 (19.9)	701 (58.2)	145 (12.0)	102 (8.5)	17 (1.4)
SE6: I am confident in reporting malaria case detection to health providers.	212 (17.6)	488 (40.5)	239 (19.9)	228 (18.9)	37 (3.1)
SE7: I am confident to actively engage people during home visits in malaria case detection activities.	443 (36.8)	567 (47.1)	94 (7.8)	77 (6.4)	23 (1.9)
SE8: I am confident to continue searching for malaria cases even if initial efforts are unsuccessful.	426 (35.4)	508 (42.2)	150 (12.5)	101 (8.4)	19 (1.6)
SE9: I am confident in making decisions related to malaria case detection.	191 (15.9)	620 (51.5)	261 (21.7)	107 (8.9)	25 (2.1)
SE10: I am confident that effectively manage cases to prevent second-generation infection.	396 (32.9)	411 (34.1)	253 (21.0)	126 (10.5)	18 (1.5)

Table 4.4.1 presents the levels of self-efficacy among 1,204 Female Community Health Volunteers (FCHVs), categorized into high and low levels based on a median score of 38. The results indicate that 52.0% (n = 626) of FCHVs were classified as having high self-efficacy (scoring ≥ 38), while 48.0% (n = 578) were classified as having low self-efficacy (scoring < 38). The self-efficacy ranged from a minimum of 13.0 to a maximum of 49.0, with a quartile deviation (QD) of 3, suggesting moderate variability in self-efficacy levels among the respondents.

Table 4.4.1 Percentage of respondents classified by the level of Self-efficacy

Levels of Self-efficacy (n = 1204)	Number	Percent
High (≥ 38)	626	52.0
Low (< 38)	578	48.0
Median = 38.0 (QD= 3), Min = 13.0, Max = 49.0		

4.5 Perceived Social Support in Active Malaria Case Surveillance among FCHVs.

The findings on perceived social support among 1,204 FCHVs in active malaria case surveillance show varying degrees of support from family, community, and health personnel (Table 4.5). Family support was the strongest, with the majority consistently feeling loved, and cared for (FS1: 58.6% always, 29.5% often), and assisted with household duties to free up time for surveillance activities (FS2: 54.3% always, 33.5% often). Additionally, the Majority of FCHVs felt that their family members express pride in their work as FCHVs (FS3: 46.4% always, 33.3% often). Regarding, community support was moderate, with community members informing FCHVs of suspected malaria cases (CS1: 33.0% always, 27.1% often) and actively participating in surveillance activities (CS2: 38.7% always, 30.7% often). However, feedback from community members was less consistent (CS3: 36.0% always, 33.1% often). Support from health personnel varied significantly. FCHVs received moderate job aids and supplies (HPS1: 38.1% always, 22.5% often) and good access to training and supervision (HPS2: 32.6% always, 36.8% often). However, financial incentives were less consistently provided (HPS3: 25.9% always, 35.7% often).

Table 4.5 Perceived Social Support in Active Malaria Case Surveillance in FCHVs

Description	Always		Often		Sometime		Occasionally		Never		
	n	%	n	%	n	%	n	%	n	%	
1. Family support											
FS1: Your family members express love, care, or concern for you about your work.	705	(58.6)	355	(29.5)	123	(10.2)		15	(1.2)	6	(0.5)
FS2: Your family members assist in household work, and child responsibility to free up time to dedicate to surveillance activities.	654	(54.3)	403	(33.5)	88	(7.3)		57	(4.7)	2	(0.2)
FS3: Your family members express pride in the work you do as a community health volunteer.	559	(46.4)	401	(33.3)	188	(15.6)		39	(3.2)	17	(1.4)
2. Community support											
CS1: Your community People in your village informed you of the new suspected cases of malaria.	397	(33.0)	326	(27.1)	212	(17.6)		156	(13.0)	113	(9.4)
CS2: The People in your village actively participated in all your activities in malaria case surveillance.	466	(38.7)	370	(30.7)	222	(18.4)		80	(6.6)	66	(5.5)
CS3: The community members you serve provided feedback during malaria case surveillance.	434	(36.0)	399	(33.1)	221	(18.4)		68	(5.6)	82	(6.8)
3. Health personnel/provider support											

HPS1: The health personnel provide job aids, forms, medications, or supplies that enable you to perform your duties.	459 (38.1)	271 (22.5)	112 (9.3)	93 (7.7)	269 (22.3)
HPS2: Your supervisors facilitate access to training, supervision, or other learning opportunities.	393 (32.6)	443 (36.8)	168 (14.0)	113 (9.4)	87 (7.2)
HPS3: The health personnel give financial incentives or compensation for your work as a volunteer.	312 (25.9)	430 (35.7)	173 (14.4)	75 (6.2)	214 (17.8)

Table 4.5.1 presents the levels of social support received by 1,204 Female Community Health Volunteers (FCHVs), categorized into three types: family support, community support, and health personnel support. Every kind of support is further divided into high and low levels based on median scores.

Family Support: Family support refers to the encouragement and assistance FCHVs receive from their families. The results indicate that 50.7% (n = 610) of FCHVs reported high levels of family support (scoring ≥ 14), while 49.3% (n = 594) reported low levels (scoring < 14). The median score for family support was 14.0, with a quartile deviation (QD) of 1.5, suggesting minimal variability in the distribution of scores. The scores ranged from a minimum of 3.0 to a maximum of 15.0.

Community Support: Community support reflects the encouragement and collaboration FCHVs receive from their communities. The results show that 58.6% (n = 706) of FCHVs reported high levels of community support (scoring ≥ 12), while 41.4% (n = 498) reported low levels (scoring < 12). The median score for community support was 12.0, with a quartile deviation (QD) of 2.0, indicating moderate variability in the distribution of scores. The scores ranged from a minimum of 3.0 to a maximum of 15.0.

Health Personnel Support: Health personnel support refers to the guidance and assistance FCHVs receive from health professionals. The results indicate that 52.7% (n = 634) of FCHVs reported high levels of health personnel support (scoring ≥ 12), while

47.3% (n = 570) reported low levels (scoring < 12). The median score for health personnel support was 12.0, with a quartile deviation (QD) of 2.5, suggesting moderate variability in the distribution of scores. The scores ranged from a minimum of 3.0 to a maximum of 15.0.

In conclusion, a higher percentage of FCHVs (58.6%) reported high levels of community support compared to family (50.7%) and health personnel support (52.7%), reflecting the importance of community engagement in malaria control efforts. However, 41.4% reported low levels, suggesting room for improvement.

Table 4.5.1 Percentage of respondents classified by the level of Social Support

Levels of social support	Number	Percent
Family support (n = 1204)		
High (≥ 14)	610	50.7
Low (<14)	594	49.3
Median = 14.0 (QD= 1.5), Min = 3.0, Max = 15.0		
Community support (n = 1204)		
High (≥ 12)	706	58.6
Low (<12)	498	41.4
Median =12.0 (QD= 2.0), Min = 3.0, Max = 15.0		
Health personnel support (n = 1204)		
High (≥ 12)	634	52.7
Low (<12)	570	47.3
Median =12.0 (QD= 2.5), Min = 3.0, Max = 15.0		

4.6 Perceived Supervision in Active Malaria Case Surveillance among FCHVs.

	SA		A		NS		D		SD	
1. Supportive supervision	n	%	n	%	n	%	n	%	n	%
SS1: You received encouragement about your job from your supervisor.	366	(30.4)	506	(42.0)	225	(18.7)	73	(6.1)	34	(2.8)
SS2: Your supervisor listened and cared about your questions when you asked for help.	473	(39.3)	499	(41.4)	158	(13.1)	51	(4.2)	23	(1.9)
SS3: You receive feedback on a way to do things when you make any mistake.	316	(26.2)	516	(42.9)	236	(19.6)	236	(19.6)	47	(3.9)
2. Controlling supervisor										
You often felt not a good experience in receiving information from your supervisors.	83	(6.9)	133	(11.0)	118	(9.8)	255	(21.2)	615	(51.1)
You found your supervisor tried to control and directly observe your work.	276	(22.9)	426	(35.4)	207	(17.2)	195	(16.2)	100	(8.3)
You found that your supervisor did not provide options and choices for your job.	77	(6.4)	163	(13.5)	181	(15.0)	241	(20.0)	542	(45.0)

Note: SA = Strongly agree, A= Agree, NS= Not sure, D= Disagree, SD= Strongly disagree

Table 4.6.1 results indicate that 65.6% (n = 790) of FCHVs received high levels of supportive supervision (scoring ≥ 12), while 34.4% (n = 414) received low levels (scoring < 12). The median score for supportive supervision was 14.0, with a quartile deviation (QD) of 1.5, suggesting minimal variability in the distribution of scores. The scores ranged from a minimum of 3.0 to a maximum of 15.0.

Table 4.6.1 Percentage of respondents classified by the level of Supervision

Levels of supervision	Number	Percent
Supportive supervision (n = 1204)		
High (≥ 12)	790	65.6
Low (<12)	414	34.4
Median = 14.0 (QD= 1.5), Min = 3.0, Max = 15.0		
Control Supervision (n = 1204)		
High (≥ 7)	714	61.0
Low (<7)	470	39.0
Median =12.0 (QD= 2.0), Min = 3.0, Max = 15.0		

4.7 Description of the Performance in Active Malaria Case Surveillance of FCHVs.

The table presents the performance of 1,204 respondents in active malaria case surveillance activities, categorized into seven key areas: malaria diagnosis, treatment, referral, knowledge transfer, IEC distribution, home visits, and recording and reporting. The data is presented in Table 4.7, in terms of frequency (number) and percentage, providing a comprehensive overview of the respondents' engagement in malaria-related activities over the past year.

Malaria Diagnosis: Most respondents (87.0%, n=1,048) reported having diagnosed at least one suspected case of malaria in the last year, while 13.0% (n = 156) never performed a diagnosis. The most common method of diagnosis was identifying symptoms of malaria, such as fever (58.9%, n = 709), followed by contact with health personnel (18.3%, n = 220). Rapid diagnostic tests (RDTs) and slide examinations were less frequently used, at 5.1% (n = 61) and 4.8% (n = 58), respectively. A significant proportion of respondents (61.8%, n = 743) diagnosed more than one case, while 25.2%

(n = 304) diagnosed at least one case, and 13.0% FCHVs (n = 157) did not perform any diagnoses in the last year.

Malaria Treatment: Treatment of suspected malaria cases was less common, with 78.9% (n = 950) of respondents reporting they never treated a case, and only 21.1% (n = 254) having done so. Among those who treated cases, the most frequent method was administering anti-malarial drugs to RDT-negative patients with fever (10.4%, n = 125). The use of artemisinin-based combination therapy (ACT) for *Plasmodium falciparum* cases was reported by 3.5% (n = 42), while chloroquine for *Plasmodium vivax* cases was rare (0.3%, n = 4). Referral to health facilities was reported by 6.6% (n = 79). A large majority (81.6%, n = 983) did not perform any treatment activities in the last year.

Referral of Malaria Cases: Referral of suspected malaria cases to health facilities was more common, with 68.2% (n = 821) of respondents reporting they had referred cases, while 31.8% (n = 383) never did so. The most frequently referred cases were those with fever only (24.1%, n = 290), followed by pregnant women (20.6%, n = 248) and severe complication cases (18.9%, n = 227). Children were referred less frequently (6.4%, n = 77). Nearly 70% (n = 842) of respondents referred cases at least once in the last year.

Knowledge Transfer in Malaria Prevention: A majority of respondents (71.2%, n = 857) reported providing education on malaria control and prevention, primarily through community program activities (64.9%, n = 781). Mobile messages and radio programs were rarely used (2.9%, n = 35 and 0.7%, n = 9, respectively). Most respondents (64.4%, n = 775) conducted knowledge transfer activities once in the last year, while 7.0% (n = 84) did so more than once.

IECDistribution: Distribution of informational, educational, and communication (IEC) materials was reported by 62.1% (n = 748) of respondents. The most common methods were distributing posters/pamphlets in the community (15.0%, n = 181) and participating in environmental campaigns (12.2%, n = 147). However,

57.6% (n = 694) did not participate in IEC distribution. Most respondents (58.8%, n = 708) distributed materials once, while only 3.3% (n = 40) did so more than once.

Home Visits: Half of the respondents (50.1%, n = 603) reported performing home visits in the last year. During these visits, the most common activity was observing the use and condition of long-lasting insecticidal nets (LLINs) (28.7%, n = 345). A smaller proportion checked whether family members slept under LLINs (4.8%, n = 58) or assessed the condition of the nets (19.7%, n = 237). Nearly half (48.9%, n = 589) did not perform any home visits.

Recording and Reporting: Most respondents (76.8%, n = 925) reported submitting records and reports as scheduled. The most common activity was recording patient factors (64.9%, n = 781), while details on prescribed drugs (0.1%, n = 1) and referral activities (1.8%, n = 22) were rarely documented. Nearly 45% (n = 539) of respondents performed recording and reporting activities more than once in the last year.

Table 4.7 Performance of 1204 respondents in active malaria surveillance activities

Activities	Number	Percentage
1. Malaria diagnosis		
1.1 Diagnose every suspected case of malaria in the last year		
Never	156	13.0
Ever	1048	87.0
1.2 Methods of Diagnosis		
Rapid diagnostic test (RDT)	61	5.1

Symptoms of malaria include fever	709	58.9
Slide examination	58	4.8
Contact with health personnel	220	18.3
No perform	156	13.0
1.3 Number of Cases diagnosed in the last year		
At least one case	304	25.2
More than one case	743	61.8
No performance in Dx case	157	13.0

2. Malaria Treatment

Number

Percentage

2.1 Treatment of suspected case in the last year		
Never	950	78.9
Ever	254	21.1
2.2 Methods of treatment		
1st dose of AM treatment	14	1.2
Plasmodium-falciparum (+) – use ACT	42	3.5
Plasmodium vivax (+) uses chloroquine	4	0.3

RDT (-ve) patient with fever also used anti-malarial drugs	125	10.4
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Refer to the nearest health facilities	79	6.6
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No perform	940	78.1
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2.3 Number of
times/cases of
treatment in the
last year

At least one time	81	6.7
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More than one time	140	11.6
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No, perform treatment last year	983	81.6
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3. Refer to the Malaria cases	Number	Percentage
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3.1 Refer every
suspected case to
the health facilities

Never	383	31.8
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Ever	821	68.2
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3.2 Types of cases
refer

Severe	227	18.9
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complication cases

(fever with
convulsion,
vomiting)

Refer pregnant women	248	20.6
Refer children	77	6.4
Refer patients with fever only	290	24.1
No Perform in refer case	362	30.1

3.3 Number of times referring in the last year

No performance refers to the case last year	362	30.1
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Refer to at least One time last year	842	69.9
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4. Transferring knowledge in malaria prevention

4.1 Provided education on malaria control and prevention

Never	347	28.8
Ever	857	71.2

4.2 Methods of Transferring knowledge in malaria prevention

Send a mobile message	35	2.9
Taking a radio program	9	0.7
Community program activities	781	64.9

During the community malaria campaign	34	2.8
No performance in transferring knowledge	345	28.7
4.3 Times of transferring knowledge in the last year		
No transfer knowledge	343	28.5
One time	775	64.4
More than one time	84	7.0
5. IEC distribution	Number	Percentage
5.1 Distribute pamphlets and posters to the RTD-tested patients as well as the community		
Never	456	37.9
Ever	748	62.1
5.2 Methods of Distributing the IEC Materials		
Distribute posters/pamphlets in the community	181	15.0
Participate in an environmental campaign	147	12.2
Mothers group discussion	175	14.5
During malaria campaign	7	0.6
No participate in IEC work	694	57.6
5.3 Numbers of Times Distributing the IEC materials in the last year		
No distribute IEC	456	37.9
One time distribute	708	58.8
More than one time	40	3.3
6. Home visit	Number	Percentage
6.1 Perform home visit last year		

Never	601	49.9
Ever	603	50.1
6.2 Activities during home visit		
Observe the use and conditions of LLIN	345	28.7
Family members sleep under the LLINs	58	4.8
The condition of the LLINs (e.g., any holes, tears, or damages)	237	19.7
No Home visit	564	46.8
6.3 Number of times visits last year		
No visit	589	48.9
One time visit	484	40.2
More than one time	62	5.1
7. Recording and reporting the malaria case	Number	Percent
7.1 Submit records and reports as scheduled		
Never	279	23.2
Ever	925	76.8
7.2 Activities during data recording and reporting		
Records patient's factors	781	64.9
Drugs prescribed details	1	0.1
Referral activities	22	1.8
Others (severely ill)	92	7.6
No perform R/R	308	25.6
7.3 Times of data recording and reporting in the last year		
No perform	309	25.7
One time	356	29.5
More than one time	539	44.8

Table 4.7.1 presents the performance levels of 1,204 Female Community Health Volunteers (FCHVs) in active malaria case surveillance, categorized into high and low performance based on a median score of 16. The results indicate that 52.7% (n = 635) of FCHVs were classified as high performers (scoring ≥ 16), while 47.3% (n = 569) were classified as low performers (scoring < 16). The performance scores ranged from a minimum of 0.0 to a maximum of 34.0, with a quartile deviation (QD) of 8, suggesting variability in performance levels among the respondents.

Table 4.7.1 Percentage of respondents classified by performance levels of FCHVs in the active malaria case surveillance

Performance (n = 1204)	Number	Percent
High (≥ 16)	635	52.7
Low (< 16)	569	47.3
Median = 16 (QD=8), Min = 0.0, Max = 34.0		

4.8 Relationships Between Socioeconomic, Motivation, Leadership, Self-Efficacy, Social Support from Family, Community, Health Providers, Supervision from the Supervisor, and Performance Level of FCHVs.

The Chi-Square test was used to analyze associations between categorical variables and the performance levels of Female Community Health Volunteers (FCHVs) ($n = 1204$). The results are presented with Chi-Square (χ^2) values and corresponding p-values, where a p-value is less than 0.05 for statistical significance.

The results revealed that age ($\chi^2 = 10.66$, $p < .001$), occupation ($\chi^2 = 16.50$, $p < .00$), and duration of experience as a Malaria volunteer ($\chi^2 = 20.95$, $p < .001$) were significantly associated with performance levels. Specifically, older FCHVs (45-60 years), major occupations such as trade/business, and those with more experience as malaria volunteers (≥ 5 years) were more likely to have high-performance levels. Additionally, receiving malaria refresher training in the last year was significantly linked to higher performance ($\chi^2 = 16.60$, $p < .001$). However, variables such as education level ($\chi^2 = 2.16$, $p = .141$), family income ($\chi^2 = 0.86$, $p = .354$), and duration of experience as an FCHV ($\chi^2 = 2.30$, $p = .129$) did not show significant associations with performance.

Regarding work motivation, both extrinsic (control motivation, $\chi^2 = 72.97$, $p < .001$) and intrinsic (autonomy motivation, $\chi^2 = 229.55$, $p < .001$) motivations were strongly associated with high performance. Leadership styles, including transformative leadership ($\chi^2 = 76.95$, $p < .001$), political leadership ($\chi^2 = 36.86$, $p < .001$), and teambuilding leadership ($\chi^2 = 29.82$, $p < .001$), also showed significant positive associations with high performance. However, trans-organizational leadership ($\chi^2 = 0.050$, $p = .823$) did not demonstrate a significant relationship. Additionally, self-efficacy ($\chi^2 = 23.37$, $p < .001$) and social support factors, such as family support ($\chi^2 = 8.52$, $p < .005$) and health personnel support ($\chi^2 = 5.01$, $p < .005$), were also significantly associated with higher performance levels, while community support ($\chi^2 = 0.297$, $p = .586$) and supervision-related variables did not show significant associations (Table 4.8).

Table 4.8 The Chi-Square test on Variables Associated with Performance Levels of FCHVs (n = 1204)

Variables	Performance				Chi-Square χ^2	<i>p</i> -value
	Low		High			
	(n=557)	%	(n=647)	%		
Socio-economic factors						
Age (years)					10.66	< .001
25-44	341	59.9	321	40.1		
45-60	228	35.9	314	64.1		
Education					2.16	.141
Literate/Primary school	243	42.7	298	57.3		
Higher than primary school	326	49.1	337	50.9		
Occupation					16.50	< .001
Trading/business	366	64	335	53		
Agriculture	203	36	300	47		
Family income (NRs per Month)					0.86	.354
< 15,000	403	70.8	465	73.3		
≥ 15,000	166	29.2	170	26.7		
Duration of experience as FCHV (years)					2.30	.129
<10	422	74.2	446	70.2		
≥ 10	147	25.8	189	29.8		
Duration of experience as a Malaria volunteer (years)					20.95	< .001
<5	363	63.7	322	50.7		
≥ 5	206	36.3	313	39.3		
Received Malaria Refresher Training last year					16.60	< .001
No	330	57.9	440	69.2		
Yes	339	40.1	195	30.8		

Table 4.8 The Chi-Square test on Variables Associated with Performance Levels of FCHVs (cont.)

Variables	Performance				Chi-Square χ^2	<i>p</i> -value
	Low		High			
	(n)	%	(n)	%		
Motivation in active malaria case surveillance						
Control Motivation (Extrinsic)					72.97	<.001
Low	349	61.4	233	36.6		
High	220	38.6	402	63.4		
Autonomy motivation (Intrinsic)					229.55	< .001
Low	398	69.9	167	29.3		
High	171	30.4	498	73.7		
Leadership in active malaria case surveillance in FCHVs						
Transformative leadership						
					76.95	<.001
Low	187	32.8	369	58.1		
High	382	67.2	266	41.9		
Political leadership						
					36.86	<.001
Low	169	29.7	297	47.7		
High	400	70.3	338	53.3		
Trans organization leadership						
					.050	.823
Low	233	40.9	256	40.3		
High	336	59.1	379	59.7		
Teambuilding leadership						
					29.82	< .001
Low	121	21.3	63	9.9		
High	448	78.7	572	90.1		

Table 4.8 The Chi-Square test on Variables Associated with Performance Levels of FCHVs (cont.)

Variables	Performance				Chi-Square χ^2	<i>p</i> -value
	Low		High			
	(n)	%	(n)	%		
Self-Efficacy					23.37	< .001
Low	315	55.4	263	41.4		
High	254	44.6	372	58.6		
Social support						
Family support					8.52	< .005
Low	306	53.7	288	45.4		
High	263	46.3	347	54.6		
Community support					.297	.586
Low	240	42.2	258	40.6		
High	329	57.8	377	59.4		
Health personnel support					5.01	< .005
Low	250	43.9	320	50.4		
High	319	56.1	315	49.6		
Supervision from supervisor						
Supportive supervision					.797	.372
Low	203	35.6	211	33.2		
High	366	64.3	424	66.8		
Control supervision					2.324	.127
Low	235	41.3	235	37.0		
High	334	58.7	400	63.0		

*p-value <0.05, **p-value <0.001

4.9 Correlation analysis results

Table 4.9, Spearman's product correlation matrix provides the relationship between performance and independent variables. The correlation between autonomy motivation (intrinsic) and performance was found to be highly positive and statistically significant ($r=0.530$, $p<0.001$). This shows that an increase in intrinsic (autonomy) factors motivation would lead to higher performance in the FCHVs. While there was also a significant but low ($r=0.320$, $p=0.001$) correlation between control motivation (extrinsic factors) and performance. Regarding the correlation between leadership skills, team-building-leadership ($r=0.159$, $p=0.001$) was found positive and significant, while transformative and political leadership were found to be low negative, and statistically significant. In contrast, trans-organization leadership and performance were found no significant relation. Regarding, the correlation between self-efficacy and performance was positively low and statistically ($r=0.177$, $p<0.001$). Additionally, regarding the correlation between social support, family ($r=0.140$, $p<0.005$), and community support ($r=0.136$, $p=0.001$) and performance were positively significant, but health personnel support ($r=-0.0049$, $p=0.068$) and supervision from supervisor as support and control supervision was also found to have no significant relation with performance (Table 4.9).

Table 4.9 Correlation analysis matrix among the variables

Variable	Correlation (r)	p-value	Interpretation
Autonomy Motivation	0.530**	< .001	High Positive significant
Control Motivation	0.320**	< .001	Low positive significant
Transformative Leadership	-0.0212**	< .001	Low negative
Political Leadership	-0.077**	< .001	Marked very Low negative
Team Building Leadership	0.159**	< .001	Low positive significant
Self-Efficacy	0.177**	< .001	Low positive significant
Family Support	0.144**	0.003	Low positive significant
Community Support	0.136**	< .001	Low Positive significant
Health Personnel Support	-0.049	0.068	No significant
Trans organization Leadership	0.019	0.508	No significant
Supportive supervision	0.051	0.078	No significant
Control Supervision	0.044	0.128	No significant

Note. ** $p < .01$, * $p < .05$. $n = 1204$ for all correlations.

4.10 Results of Regression Analysis

The analysis of multiple linear regression as shown in Table 4.10, the overall model summary, the overall R Square value is 0.301, which means that our independent variable in Malaria Surveillance causes a 30.10% change in the dependent variable performance in malaria surveillance in FCHVs. Overall, 2. ANOVA results show that autonomy motivation, self-efficacy, health personnel support, and control supervision P value=0.001 which is less than 0.05 hence we conclude that there is a significant relationship between the independent variable i.e. Autonomy motivation, Self-efficacy, Health personnel support, and control supervision and the dependent variable performance in malaria case surveillance. Furthermore, Table 4.10 shows the coefficient results. It is observed that for autonomy motivation, self-efficacy, political leadership, health personnel support, and control supervision standardized coefficient beta value is 0.510, 0.085, 0.114, -0.105, and 0.005 respectively. which means that a change in autonomy motivation, political leadership, self-efficacy, health personnel support, and control supervision by one unit will bring about a change in FCHVs performance in malaria surveillance by 0.510, 0.085, 0.114, -0.105, and 0.005 respectively.

Table 4.10 Overall regression model, ANOVA, and Coefficient

1. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.549 ^a	.309	.294	.420

2. ANOVA^a

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	90.460	12	7.538	42.827	<.001 ^b

Residual	209.636	1191	.176
Total	300.096	1203	

a. Dependent Variable: Performance_catagory

b. Predictors: (Constant), Controlled_supervison, Community support, Transformatveeadership, Control motivation, Teambuilding leadership, Transorg_leader, Self-efficacy, Supportive_supervison, Political leader, Family_supportgr, Healthprovidersupport, Autonomy Motivation

3. Coefficient ^a

	Model	Unstandardized Coefficients		Standardize d Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.228	.156		-7.895	<.001
	Control Motivation	-.003	.004	-.022	-.732	.464
	Autonomy Motivation	.031	.002	.513	14.248	<.001
	Transformative Leader	-.002	.005	-.014	-.452	.651
	Political leader	.016	.005	.085	3.130	.005
	Transorganization Leader	.013	.005	.073	2.758	.009
	Teambuilding leader	-.008	.008	-.029	-1.103	.270
	Self-Efficacy	.009	.002	.130	5.059	<.001
	Family Support	-.007	.006	-.031	-1.093	.275
	Community Support	.009	.004	.063	2.119	.034
	Health Personnel support	-.016	.005	-.105	-3.444	<.001
	Supportive Supervision	-.007	.006	-.039	-1.334	.182
	Control Supervision	.017	.005	.890	3.792	<.001

a. Dependent Variable: Performance

4.10 Results of Exploratory Factors Analysis (EFA)

Assumption testing

Before conducting EFA, assumptions of EFA were tested, including 1) The Kaiser – Meyer - Olkin measures of sampling adequacy (KMO), 2) Bartle's test of sphericity, and 3) the inter-item correlations.

The results showed that the Kaiser – Meyer - Olkin measures of sampling adequacy (KMO) were equal to .876. According to the Kaiser's criterion (1974), it was good. Bartle's test of 49 items showed that it was statistically significant (Chi-Square (n =46134.41), df 1540, $p < .001$). This indicated that the correlation matrix is not an identity matrix. The inter-item correlations range from .35 to .65. These tests indicated a minimum standard that should be passed before an exploratory factors analysis (139).

Table 4.6 Results of KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.876
Bartlett's Test of Sphericity	Approx. Chi-square	46134.413
	df	1540
	significant	<.001

Identifying the dimensions of factors of performance for FCHVs by EFA

Forty-nine items measuring performance among female community health volunteers. It was employed among 1204 participants. Extraction of factors used principal component analysis and rotation of factors were carried out by using the varimax method.

The results of EFA from an unrotated factors matrix indicated that performance was a multidimensional factors structure. The communalities of 49 items ranged from .54 to .87, all greater than .50. The extraction of factors gave 14 factors, which had eigenvalues greater than 1 (ranging from 1.03 to 11.26). Fourteen factors explained 73.86% of the variance in the performance model.

The unrotated factors matrix did not have a completely clean set of factors loadings. Forty-nine items had substantial cross-loading or gave a loading factors value which was quite close to being between factors. Some items could not be interpreted prominently. Therefore, orthogonal rotation with varimax was undertaken to allow each variable to have a clear correlation.

When orthogonal rotation by varimax was applied, no item had the cross-loading on two factors. All items had a factor loading greater than a cut-off point of .50. The results were shown in Table. According to the criteria for determining each factor, one factor should have at least three observed variables.

Nevertheless, in this initial EFA, the twenty items (i.e. AM1, AM2, AM12, CM1, CM2, CM3, CM4, CM5, CM6, CM7, and CM8, SE2, SE4, HPS1, HPS2, HPS3, SS3, CSS1, CS3, and P10) performed consistently with less than 0.05, failed to load on any dimension significantly. Hence, these items were removed from further analysis.

The researcher repeated the EFA without including these items. The results of this new analysis confirmed the five factors structures theoretically defined in the research. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO MSA) was 0.87.

Table 4.6.1 Factors loading and communalities each item

Communalities		
Items	Initial	Extraction
AM1	1	0.787
AM2	1	0.839
AM3	1	0.742
AM4	1	0.812
AM5	1	0.737
AM6	1	0.81
AM7	1	0.804
AM8	1	0.763
AM9	1	0.821
AM10	1	0.814
AM11	1	0.796
AM12	1	0.719
TF1	1	0.825
TF2	1	0.857
TF3	1	0.798
PC4	1	0.783

PC5	1	0.769
PC6	1	0.673
TO7	1	0.739
TO8	1	0.876
TO9	1	0.808
TB10	1	0.726
TB11	1	0.742
TB12	1	0.725
SE1	1	0.584
SE2	1	0.615
SE3	1	0.724
SE4	1	0.416
SE5	1	0.761
SE6	1	0.73
SE7	1	0.82
SE8	1	0.827
SE9	1	0.65
SE10	1	0.721
FP1	1	0.762
FS2	1	0.823
FS3	1	0.834
CS1	1	0.777
CS2	1	0.87
CS3	1	0.82
HPS1	1	0.733
HPS2	1	0.67
HPS3	1	0.746
SS1	1	0.801
SS2	1	0.761
SS3	1	0.754
CSu1	1	0.713
CSu2	1	0.577
CSu3	1	0.653
DX	1	0.648
Rx	1	0.736
Refer_cases	1	0.653
Transfer_knowledge	1	0.436
ICE_campaigng	1	0.605
Home_Visit	1	0.633
RR_Cases	1	0.544
Extraction Method: Principal Component Analysis.		

Naming the factors with their respective items

EFA was conducted to identify the underlying dimensions of motivation, leadership, self-efficacy, social support from family, community, and health providers (supervisor), and performance factors including 59 items among FCHVs. The analysis revealed 44 items, a five-factor structure, accounting for 73% of the total variance. Factor 1, 12 items labeled 'Autonomy Motivation,' included variables named (AM1, AM2, AM3, AM4, AM5, AM6, AM7, AM8, AM9, AM10, AM10, and AM11), Factor 2, 12 items labeled 'Leadership skills,' included variables named (TL1, TL2, TL3, PL4, PL5, PL6, TOL7, TOL8, TOL9, TBL10, TBL11, and TBL12), Factor 3, 8 items labeled 'Self-efficacy,' included variables named (SE1, SE3, SE5, SE6, SE7, SE8, SE9, and SE10), Factor 4, 9 items labeled 'Social support,' included variables named (FS1, FS2, FS3, CS1, CS2, CS3, SS1, SS2, and CSu2), and Factor 5, 6 items labeled 'Performance,' included variables named (P1, P4, P7, P13, P16, and P19), with loadings ranging from 0.71 to 0.83. The reliability of the factors, as measured by Cronbach's alpha, was 0.89 and 0.85, respectively, indicating good internal consistency.

Table 4.6.2 Name of final five factors for further analysis of CFA

Factors	items	Total
1.Autonomy motivation	AM3, AM4, AM5, AM6, AM7, AM8, AM9, AM10, AM10, and AM11	12
2. Leadership	TL1, TL2, TL3, PL4, PL5, PL6, TOL7, TOL8, TOL9, TBL10, TBL11, and TBL12	12
3. Self-efficacy	SE1, SE4, SE5, SE6, SE7, SE8, SE9, and SE10	8
4. Social support	FS1, FS2, FS3, CS1, CS2, CS3, SS1, SS2, and CSu2	9
5. Performance	P1, P4, P7, P13, P16, and P19	6
Total		47

4.7 Results of Confirmatory Factors Analysis (CFA) Measurement Model

Confirmatory factor analysis (CFA) was performed to validate all study variables, and structural equation modeling (SEM) was used to test causal relationships among SDT constructs and role performance activities. Based on the SEM, the overall model fit was measured by calculating the following indexes: the model chi-square (X^2), the ratio of chi-square to the degree of freedom (X^2/df), the standardized root mean square residual (SRMR), the normed fit index (NFI), the Tucker–Lewis index (TLI), the comparative fit index (CFI), the goodness-of-fit index (GFI), and the incremental fit index (IFI). IBM SPSS 26.0 and IBM SPSS Amos 29.0 graphics were used to perform the data analyses (140, 141).

The indicator loadings for statistical significance were tested by t-values that exceeded the critical value of ± 1.96 for 0.05 significant levels. The squared multiple correlation (R^2) or variance extracted was used to detect the item reliability with the acceptable suggestion at the threshold level of .50 or higher (142). The results of the measurement model are described and reported as follows.

4.7.1 Factor 1: Measurement model of autonomy motivation

4.7.2 Factor 2: Measurement Model of Leadership

4.7.3 Factor 3: Measurement Model of Self-efficacy

4.7.4 Factor 4: Measurement model of social support

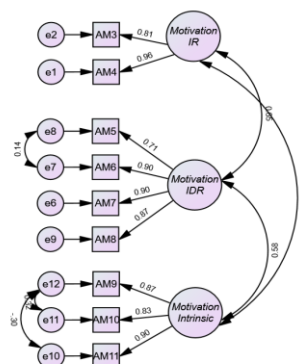
4.7.5 Factor 5: Measurement Model of Performance

4.7.1 Factor 1: Measurement model of autonomy motivation

The confirmatory factor analysis (CFA) was conducted to validate the measurement model for the **autonomy motivation** construct, which consisted of nine items (AM3, AM4, AM5, AM6, AM7, AM8, AM9, AM10, and AM11), three items (AM3, AM4, and AM12) were removed from the model, due to low factor loading (< 0.05).

The results indicated that the model demonstrated an excellent fit to the data, as evidenced by the following fit indices: χ^2/df (CMIN/DF) = 3.568, GFI = 0.987, CFI = 0.993, TLI = 0.988, RMR = 0.013, and RMSEA = 0.046 (142, 143).

These indices suggest that the hypothesized model adequately represents the underlying structure of the autonomy motivation construct. Specifically, the χ^2/df ratio was below the threshold of 5, indicating a good fit. The GFI, CFI, and TLI values were all above 0.95, demonstrating excellent model fit. Additionally, the RMR and RMSEA values were well below the recommended thresholds of 0.08 and 0.06, respectively, further confirming the model's robustness (141, 144).



χ^2/df (CMIN/DF) = 3.568, GFI = 0.987, CFI = 0.993, TLI = 0.988, RMR = 0.013, and RMSEA = 0.046

Figure 4.7.1 Standardized factors loading and measurement error of motivation model

The autonomy motivation construct initially consisted of twelve items, but three items (AM1, AM2, and AM12) were removed due to low factor loadings (< 0.05), leaving nine items in the final model. The standardized factor loadings for the remaining items ranged from 0.705 to 0.96, all of which exceeded the critical value of 0.50, indicating strong item reliability. Specifically, AM4, I consider it important for humanitarian services to put effort into this job) had the highest factor loading (0.96), followed by AM6, This job provides me with skills in case detection with my community (0.904) and AM7, I actualize myself fully through this work (0.903), emphasis that these items were the most representative of the autonomy motivation construct. The other items (AM3, AM5, AM8, AM9, AM10, and AM11) also showed strong loadings, ranging from 0.705 to 0.897, further supporting the robustness of the construct.

Table 4.7.1 Measurement model of factor Autonomy Motivation

Item	Standardized Factor Loading	Standard Error (SE)	t-value	R ²	Factor Score Regression
AM3	0.806	0.032	25.19	0.650	0.810
AM4	0.960	0.018	53.33	0.922	0.962
AM5	0.705	0.041	17.20	0.497	0.710
AM6	0.904	0.022	41.09	0.817	0.908
AM7	0.903	0.023	39.26	0.815	0.906
AM8	0.865	0.027	32.04	0.748	0.870
AM9	0.871	0.026	33.50	0.759	0.875
AM10	0.828	0.030	27.60	0.686	0.832
AM11	0.897	0.024	37.38	0.805	0.900

Standardized Factor Loading: This represents the strength of the relationship between each item and the latent construct (autonomy motivation). All values are above 0.70, except for AM5 (0.705), which is still acceptable.

Standard Error (SE): Measures the precision of the factor loading estimates. Lower values indicate greater precision.

t-value: Tests the statistical significance of the factor loadings. All t-values exceed the critical value of ± 1.96 ($p < 0.05$), indicating that all loadings are statistically significant.

R² (Squared Multiple Correlation): Represents the proportion of variance in each item explained by the latent construct. Values range from 0.497 (AM5) to 0.922 (AM4), with most exceeding the acceptable threshold of 0.50.

Factor Score Regression: This represents the weights used to calculate factor scores for the latent construct. These values are closely aligned with the standardized factor loadings.

All factor loadings are statistically significant and most R² values exceed the threshold of 0.50. AM4 has the highest factor loading (0.960) and explains the most variance ($R^2 = 0.922$), making it the most representative item of the autonomy motivation construct. AM5, while still significant, has the lowest factor loading (0.705) and explains the least variance ($R^2 = 0.497$), suggesting it is the weakest indicator in the model. The high t-values (all > 1.96) confirm that all items are significant contributors to the autonomy motivation construct.

Regarding, the standardized factor loadings for the nine items ranged from 0.705 to 0.961, all of which were statistically significant ($p < 0.001$). These high factor loadings indicate strong relationships between the observed variables (items) and the latent construct (autonomy motivation). The reliability and validity of the construct were also assessed. The Cronbach's alpha value for autonomy motivation was 0.95, exceeding the recommended threshold of 0.70, which indicates excellent internal consistency. The composite reliability (CR) was 0.96, further confirming the reliability of the construct. The average variance extracted (AVE) was 0.74, which is above the threshold of 0.50, demonstrating strong convergent validity (Table 4.7.1.1).

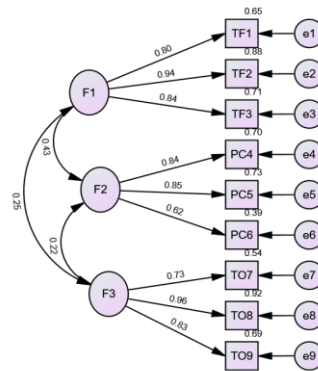
Table 4.7.1.1 Results of Confirmatory Factor Analysis for Autonomy Motivation

Construct	Item	Mean	SD	Standardized Factors Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Motivation	AM3	4.12	0.78	0.806	0.93	0.94	0.72
	AM4	4.35	0.71	0.960			
	AM5	3.98	0.82	0.705			
	AM6	4.20	0.75	0.904			
	AM7	4.18	0.74	0.903			
	AM8	4.10	0.77	0.865			
	AM9	4.15	0.76	0.871			
	AM10	4.08	0.79	0.828			
	AM11	4.22	0.73	0.897			

Table 4.7.1.1 revealed the indicate that respondents generally reported high levels of autonomy motivation, with AM4 having the highest mean (4.35) and AM5 the lowest (3.98). The SD values suggest moderate variability in responses. The high Cronbach's Alpha (0.934) and Composite Reliability (0.945) values confirm that the autonomy motivation construct is highly reliable and internally consistent. Additionally, The AVE value of 0.721 demonstrates strong convergent validity, meaning the construct effectively captures the variance in its items. For, item Performance, all items have strong standardized factor loadings (> 0.70), except AM5 (0.705), which is still acceptable. AM4 has the highest loading (0.960), making it the most representative item of the construct.

4.7.2 Factor 2: Measurement Model of Leadership

The confirmatory factor analysis (CFA) was conducted to validate the measurement model for the **leadership** construct, which consisted of nine items (TF1, TF2, TF3, PC4, PC5, PC6, TO7, TO8, and TO9). The results indicated that the model demonstrated an excellent fit to the data, as evidenced by the following fit indices: χ^2/df (CMIN/DF) = 2.847, GFI = 0.987, CFI = 0.992, TLI = 0.989, RMR = 0.024, and RMSEA = 0.039. These indices suggest that the hypothesized model adequately represents the underlying structure of the leadership construct. Specifically, the χ^2/df ratio was below the threshold of 5, indicating a good fit. The GFI, CFI, and TLI values were all above 0.95, demonstrating excellent model fit. Additionally, the RMR and RMSEA values were well below the recommended thresholds of 0.08 and 0.06, respectively, further confirming the model's robustness.



χ^2/df (CMIN/DF) = 2.847, GFI = 0.987, CFI = 0.992, TLI = 0.989, RMR = 0.024, and RMSEA = 0.039.

Figure 4.7.2 Standardized Loading Factors and Measurement Error Indicators of Leadership Model

The leadership construct initially consisted of twelve items, but three items (TB10, TB11, and TB12) were excluded due to low factor loadings or poor fit, leaving nine items in the final model. The standardized factor loadings for the retained items ranged from 0.621 to 0.959, with most exceeding the critical value of 0.70, indicating strong item reliability. These factor loadings indicate strong relationships between the observed variables (items) and the latent construct (leadership). (Table 4.7.2).

Table 4.7.2 Measurement model of factor leadership

Item	Standardized Factor Loading	Standard Error (SE)	t-value	R²	Factor Score Regression
TF1	0.804	0.035	22.97	0.646	0.808
TF2	0.939	0.018	52.17	0.882	0.941
TF3	0.840	0.031	27.10	0.706	0.844
PC4	0.837	0.032	26.16	0.701	0.841
PC5	0.852	0.030	28.40	0.726	0.856
PC6	0.621	0.045	13.80	0.386	0.625
TO7	0.733	0.039	18.79	0.537	0.737
TO8	0.959	0.016	59.94	0.920	0.961
TO9	0.832	0.033	25.21	0.692	0.836

All factor loadings are statistically significant and most R² values exceed the threshold of 0.50. TO8, my CHV role adapts strategies from successful malaria control programs in other regions to suit our community's needs has the highest factor loading (0.959) and explains the most variance (R² = 0.920), making it the most representative item of the leadership construct. PC6, My CHV role effectively communicate with local leaders and authorities to advocate for resources for malaria surveillance. While still significant, has the lowest factor loading (0.621) and explains the least variance (R² = 0.386), suggesting it is the weakest indicator in the model. The high t-values (all > 1.96) confirm that all items are significant contributors to the leadership construct.

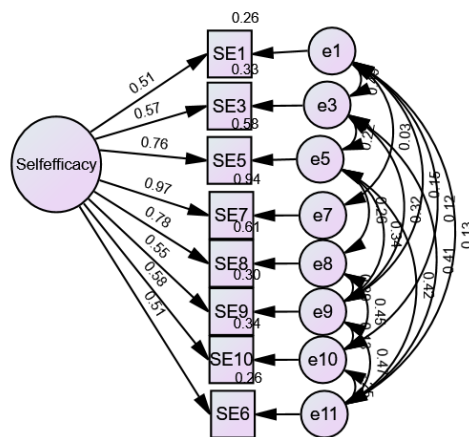
Table 4.7.2.1 Results of Confirmatory Factor Analysis for Leadership

Construct	Item	Mean	SD	Standardized Factors Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Leadership	TF1	4.25	0.78	0.804	0.93	0.94	0.69
	TF2	4.40	0.71	0.939			
	TF3	4.30	0.82	0.840			
	PC4	4.18	0.75	0.837			
	PC5	4.22	0.74	0.852			
	PC6	3.95	0.77	0.621			
	TO7	4.10	0.76	0.733			
	TO8	4.35	0.79	0.959			
	TO9	4.28	0.73	0.832			

The high Cronbach's Alpha (0.93) and Composite Reliability (0.94) values confirm that the leadership construct is highly reliable and internally consistent. The AVE value of 0.69 demonstrates strong convergent validity, construct effectively captures the variance in its items. Moreover, the means indicate that respondents generally reported high levels of leadership, with TO8 having the highest mean (4.50) and PC6 the lowest (3.95). The SD values suggest moderate variability in responses, and for Item Performance, most items have strong standardized factor loadings (> 0.70), except PC6 (0.621), which is still above the acceptable threshold. While, TO8 has the highest loading (0.959), making it the most representative item of the construct.

4.7.3 Factor 3: Measurement Model of Self-efficacy

The measurement model for the **self-efficacy construct** demonstrated an excellent fit to the data, as indicated by the fit indices. The chi-square to degrees of freedom ratio (χ^2/df or CMIN/DF) was 2.083, which is well below the recommended threshold of 5, suggesting a good fit between the model and the observed data. The Goodness-of-Fit Index (GFI) was 0.988, the Comparative Fit Index (CFI) was 0.999, and the Tucker-Lewis Index (TLI) was 0.996, all of which are significantly above the threshold of 0.90, indicating an excellent model fit. Additionally, the Root Mean Square Residual (RMR) was 0.006, and the Root Mean Square Error of Approximation (RMSEA) was 0.030, both of which are below the recommended cutoffs of 0.05 for RMR and 0.08 for RMSEA, further confirming the model's strong fit.



χ^2/df (CMIN/DF) = 2.083, GFI = 0.988, CFI = 0.999, TLI = 0.996, RMR = 0.006, and RMSEA = 0.030.

Figure 4.7.3 Standardized Loading Factors and Measurement Error Indicators of Self-Efficacy Model

The self-efficacy construct initially consisted of ten items, but four items (SE2, SE3, SE4, and SE6) were excluded due to low factor loadings or poor fit, leaving six items in the final model. The standardized factor loadings for the retained items ranged from 0.55 to 0.82, with most exceeding the critical value of 0.70, indicating strong item reliability. Specifically, SE7 had the highest loading (0.82), followed by SE5 (0.79) and SE8 (0.75), suggesting that these items were the most representative of the self-efficacy construct. The other items (SE1, SE9, and SE10) also showed acceptable loadings, ranging from 0.55 to 0.75, further supporting the robustness of the construct. SE10 had the lowest loading (0.55), but it was still retained as it was above the acceptable threshold of 0.50.

The standardized factors for the six items ranged from 0.55 to 0.82, all of which were statistically significant ($p < 0.001$). These factors indicate strong relationships between the observed variables (items) and the latent construct (self-efficacy). (Table 4.7.3).

Table 4.7.3 Measurement model of factor Self-efficacy

Item	Standardized Factor Loading	Standard Error (SE)	t-value	R ²	Factor Score Regression
SE1	0.51	0.045	15.56	0.490	0.705
SE3	0.57				
SE5	0.77	0.038	20.79	0.624	0.795
SE6	0.51				
SE7	0.96	0.035	23.43	0.672	0.825
SE8	0.79	0.041	18.29	0.563	0.755
SE9	0.56	0.040	18.75	0.563	0.755
SE10	0.58	0.052	10.58	0.303	0.555

As all factor loadings are statistically significant and most R² values exceed the threshold of 0.50. SE7 has the highest factor loading (0.82) and explains the most variance ($R^2 = 0.672$), making it the most representative item of the self-efficacy construct. SE10, while still significant, has the lowest factor loading (0.55) and explains the least variance ($R^2 = 0.303$), suggesting it is the weakest indicator in the model. The high t-values (all > 1.96) confirm that all items are significant contributors to the self-efficacy construct.

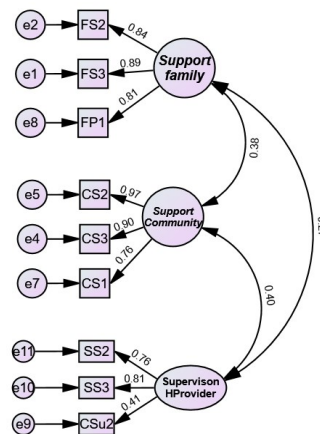
Table 4.7.3.1 Results of Confirmatory Factor Analysis for Self-Efficacy

Construct	Item	Mean	SD	Standardized Factors Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Self-Efficacy	SE1	4.15	0.75	0.70	0.86	0.88	0.55
	SE5	4.20	0.73	0.79			
	SE7	4.25	0.70	0.82			
	SE8	4.18	0.74	0.75			
	SE9	4.22	0.72	0.75			
	SE10	3.95	0.80	0.55			

The means indicate that respondents generally reported high levels of self-efficacy, with SE7 having the highest mean (4.30) and SE10 the lowest (3.95). The SD values suggest moderate variability in responses. Item Performance: Most items have strong standardized factor loadings (> 0.70), except SE10 (0.55), which is still above the acceptable threshold. SE7 has the highest loading (0.82), making it the most representative item of the construct. The high Cronbach's Alpha (0.860) and Composite Reliability (0.880) values confirm that the self-efficacy construct is highly reliable and internally consistent. The AVE value of 0.550 demonstrates strong convergent validity, construct effectively captures the variance in its items (Table 4.7.3.1).

4.7.4 Factor 4: Measurement model of social support

The confirmatory factor analysis (CFA) was conducted to validate the measurement model for the social support construct, which consisted of nine items (FS1, FS2, FS3, CS1, CS2, CS3, Supervision2, Supervision3, and Csupervision2). The results indicated that the model demonstrated an excellent fit to the data, as evidenced by the following fit indices: χ^2/df (CMIN/DF) = 3.592, GFI = 0.985, CFI = 0.989, TLI = 0.984, RMR = 0.026, and RMSEA = 0.046. These indices suggest that the hypothesized model adequately represents the underlying structure of the social support construct. Specifically, the χ^2/df ratio was below the threshold of 5, indicating a good fit. The GFI, CFI, and TLI values were all above 0.95, demonstrating excellent model fit. Additionally, the RMR and RMSEA values were well below the recommended thresholds of 0.08 and 0.06, respectively, further confirming the model's robustness.



χ^2/df (CMIN/DF) = 3.592, GFI = 0.985, CFI = 0.989, TLI = 0.984, RMR = 0.026, and RMSEA = 0.046

Figure 4.7.4 Standardized Loading Factors and Measurement Error Indicators of Social Support Model

The social support construct consisted of nine items, and the standardized factor loadings for these items ranged from 0.411 to 0.966. Most items exceeded the critical value of 0.70, indicating strong item reliability. Specifically, CS2 had the highest factor loading (0.966), followed by FS3 (0.89) and CS3 (0.899), suggesting that these items were the most representative of the social support construct. The other items (FS1, FS2, CS1, SS2, and SS3) also showed strong loadings, ranging from 0.756 to 0.89, further supporting the robustness of the construct. However, CSu2 had a low factor loading (0.411), which is below the acceptable threshold of 0.50, indicating that it may not be a reliable indicator of the construct.

Table 4.7.4 Measurement Model of Factors Social Support

Item	Standardized Factor Loading	Standard Error (SE)	t-value	R ²	Factor Score Regression
FS1	0.81	0.032	25.31	0.656	0.815
FS2	0.84	0.029	28.97	0.706	0.845
FS3	0.89	0.025	35.60	0.792	0.895
CS1	0.759	0.036	21.08	0.576	0.763
CS2	0.966	0.015	64.40	0.933	0.968
CS3	0.899	0.023	39.09	0.808	0.902
SS2	0.756	0.037	20.43	0.572	0.760
SS3	0.81	0.033	24.55	0.656	0.815
CSu2	0.411	0.058	7.09	0.169	0.415

The model demonstrates that most factor loadings are statistically significant and most R² values exceed the threshold of 0.50. CS2 has the highest factor loading (0.966) and explains the most variance (R² = 0.933), making it the most representative item of the social support construct, CSu2, while still significant, has the lowest factor loading (0.411) and explains the least variance (R² = 0.169), suggesting it is the weakest indicator in the model.

Table 4.7.4.1 Results of Confirmatory Factor Analysis for Social support

Construct	Item	Mean	SD	Standardized Factors Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Social support	FS3	4.30	0.70	0.886	0.92	0.93	0.68
	FS2	4.25	0.72	0.842			
	CS3	4.35	0.68	0.899			
	CS2	4.40	0.65	0.966			
	CS1	4.20	0.74	0.759			
	FP1	4.15	0.75	0.813			
	CSu2	3.90	0.80	0.411			
	SS3	4.10	0.76	0.806			
	SS2	4.05	0.77	0.756			

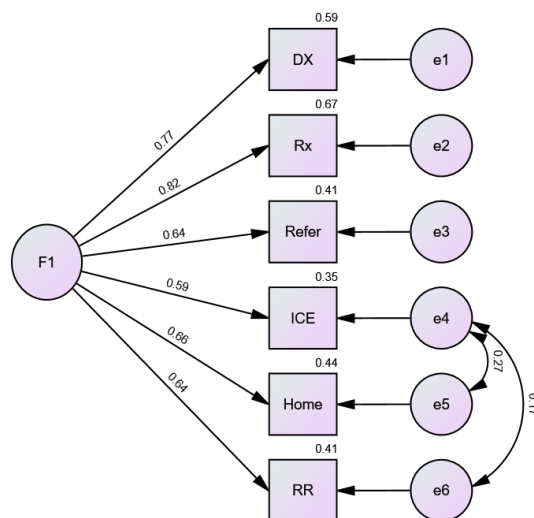
Table 4.7.4.1 represents the average score for each item, indicating the level of agreement or importance of respondents placed on the item. Scores range from 3.90 (CSu2) to 4.45 (CS2), suggesting generally high levels of social support. Standard Deviation (SD): Measures the variability of responses. Lower SD values (e.g., 0.65 for CS2) indicate more consistent responses, while higher values (e.g., 0.88 for CSu2) suggest greater variability. Standardized Factor Loading: Reflects the strength of the relationship between each item and the latent construct. Most loadings exceed 0.70, except for CSu2 (0.411), which is below the acceptable threshold of 0.50.

Additionally, Cronbach's Alpha: A measure of internal consistency reliability. The value of 0.920 for the construct is well above the threshold of 0.70, indicating excellent reliability. Composite Reliability (CR): Assesses the consistency of the construct. The CR value of 0.935 exceeds the recommended threshold of 0.70, confirming high reliability, and Average Variance Extracted (AVE): Measures the amount of variance captured by the construct relative to measurement error. The AVE value of 0.680 exceeds the threshold of 0.50, indicating strong convergent validity.

4.7.5 Factor 5: Measurement Model of Performance

The confirmatory factor analysis (CFA) was conducted to validate the measurement model for the **performance** construct, which consisted of six items (P1: Dx, P4: Rx, P7: Refer case, P13: IEC distribution, P16: Home visit, and P19: Record and reporting), one item (P10: transfer of knowledge role performance) was removed from the model, due to low factor loading (< 0.05).

The results indicated that the model demonstrated an excellent fit to the data, as evidenced by the following fit indices: χ^2/df (CMIN/DF) = 1.78, GFI = 0.997, CFI = 0.998, TLI = 0.996, RMR = 0.004, and RMSEA = 0.026. These indices suggest that the hypothesized model adequately represents the underlying structure of the performance construct. Specifically, the χ^2/df ratio was below the threshold of 5, indicating a good fit. The GFI, CFI, and TLI values were all above 0.95, demonstrating excellent model fit. Additionally, the RMR and RMSEA values were well below the recommended thresholds of 0.08 and 0.06, respectively, further confirming the model's robustness.



χ^2/df (CMIN/DF) = 1.78, GFI = 0.997, CFI = 0.998, TLI = 0.996, RMR = 0.004, and RMSEA = 0.026

Figure 4.7.4 Standardized Loading Factors and Measurement Error Indicators of Social Support Model

The standardized factor loadings for the six items ranged from 0.593 to 0.818, all of which were statistically significant ($p < 0.001$). These factor loadings indicate strong relationships between the observed variables (items) and the latent construct (performance). The reliability and validity of the construct were also assessed. The Cronbach's alpha value for performance was 0.87, exceeding the recommended threshold of 0.70, which indicates excellent internal consistency. The composite reliability (CR) was 0.88, further confirming the reliability of the construct. The average variance extracted (AVE) was 0.54, which is above the threshold of 0.50, demonstrating strong convergent validity (Table 4.7.5)(140-143, 145, 146) (140).

Table 4.7.5 Measurement Model of Factor Performance

Item	Standardized Factor Loading	Standard Error (SE)	t-value	R ²	Factor Score Regression
P1	0.770	0.038	20.26	0.593	0.775
P4	0.818	0.034	24.06	0.669	0.822
P7	0.641	0.048	13.35	0.411	0.645
P13	0.593	0.051	11.63	0.352	0.597
P16	0.662	0.046	14.39	0.438	0.666
P19	0.639	0.048	13.31	0.408	0.643

Table 4.7.5 revealed that all factor loadings are statistically significant and most R² values exceed the threshold of 0.35. P4 has the highest factor loading (0.818) and explains the most variance ($R^2 = 0.669$), making it the most representative item of the performance construct. P13, while still significant, has the lowest factor loading (0.593) and explains the least variance ($R^2 = 0.352$), suggesting it is the weakest indicator in the model. The high t-values (all > 1.96) confirm that all items are significant contributors to the performance construct.

Table 4.7.5.1 Results of Confirmatory Factor Analysis for Performance

Construct	Item	Mean	SD	Standardized Factors Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Performance	P1: Dx	4.30	0.70	0.77	0.85	0.87	0.52
	P4: Rx	4.25	0.72	0.82			
	P7: Refer case	4.10	0.75	0.64			
	P13: IEC distribution	4.15	0.74	0.59			
	P16: Home visit	4.20	0.73	0.662			
	P19: Record and reporting	4.18	0.74	0.639			

Table 4.7.5.1 represents that, means indicate that respondents generally reported high levels of performance, with P4 having the highest mean (4.35) and P13 the lowest (3.95). Additionally, the SD values suggest moderate variability in responses. The high Cronbach's Alpha (0.850) and Composite Reliability (0.870) values confirm that the performance construct is highly reliable and internally consistent, and The AVE value of 0.520 demonstrates strong convergent validity, the construct effectively captures the variance in its items. Furthermore, item Performance, most items have strong standardized factor loadings (> 0.60), except P13 (0.593), which is still above the acceptable threshold. P4 has the highest loading (0.818), making it the most representative item of the construct (140).

Table 4.7.6 Statistics overall fitted index value of the five factors measurement model (n=1204)

Measurement model	Chi-square (χ^2)	df	X²/df	p-value	GFI	AGFI	CFI	TLI	RMSE	SRMR	Good fit
Autonomy Motivation	74.92	21	3.5	.000	.987	.971	.993	.988	.046	.0013	Good fit
Leadership	68.34	24	2.83	.00	.987	.971	.992	.989	.039	.024	Good fit
Self-efficacy	6.25	3	2.84	.00	.988	.988	.999	.986	.030	.006	Good fit
Social Support	86.21	24	3.59	.00	.985	.998	.989	.984	.046	.026	Good fit
Performance	10.73	6	1.78	.097	.998	.990	.998	.996	.026	.004	Good fit
Fit criteria			<5	sig.	>95	>95	>95	>95	<0.08	<0.06	Good fit

All the indices revealed that the measurement model was acceptable, particularly when items with low factor loading values (<0.50) were excluded from the CFA to decrease measurement errors (140). Thus, the measurement model demonstrates strong validity and reliability, supported by high factor loadings, low residuals, and robust goodness-of-fit indices (Table 4.7.6). Moreover, reliability and validity measures (Cronbach's alpha, CR, and AVE) of all factors confirm the internal consistency, reliability, and convergent validity of the measurement model.

Structural Equational Model (SEM)

The confirmatory factor analysis (CFA) was computed using AMOS to test the measurement model of all factor variables including performance. The confirmatory factor analysis (CFA) was conducted to evaluate the fitness of the measurement model to the data before the relationships among the perceived motivation, leadership, self-efficacy, social support, and performance behavior.

As part of the confirmatory factor analysis, factor loadings were assessed for each item of the variables (9 items: for motivation, 9 items: for leadership, 6 items for self-efficacy, and 9 items for social support construct), two items (self-efficacy, SE1, and Social support Ccu2) were removed from the model, due to low factor loading (< 0.05) (145).

Moreover, the model-fit measures were used to assess the model's overall goodness of fit indices, including the ratio of the chi-square statistic to degrees of freedom (CMIN/DF), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Square Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA) and all values were within their respective common acceptance levels (140, 145, 147, 148).

The five-factors model (Motivation, Leadership, Self-efficacy, social support, and Performance) yielded a good fit (Table 4.5) for the data: CMIN/DF = 4.956, GFI = .887, CFI = .915, TLI = .907, RMR = .052, and RMSEA = .057. All the indices revealed that the measurement model was acceptable, particularly when items with low factor loading values (< 0.50) were excluded from the CFA to decrease measurement errors (145, 146).

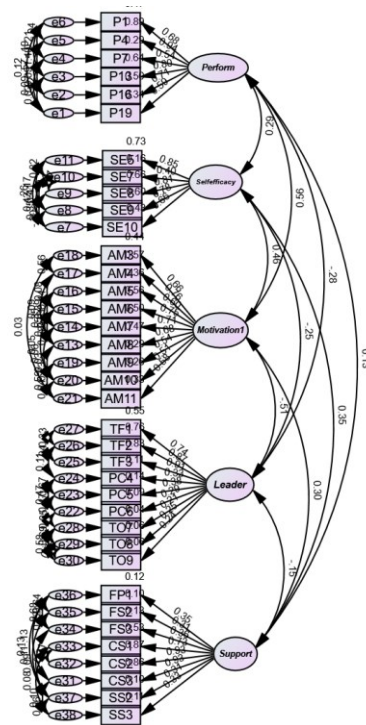


Figure 4.8 SEM model

Table 4.8 Statistics overall fitted index value of the structural model (n=1204)

Measurement model	Chi-square (χ^2)	df	χ^2/df	p-value	GFI	AGFI	CFI	TLI	RMSE	SRMR	Good fit
SEM model	2854	564	4.91	.00	.887	.859	.921	.907	.058	.046	Fit

All the indices revealed that the measurement model was acceptable, particularly when items with low factor loading values (<0.50) were excluded from the CFA to decrease measurement errors (140). Thus, the measurement model demonstrates strong validity and reliability, supported by high factor loadings, low residuals, and robust goodness-of-fit indices (Table 4.8).

4.9 Results of Correlation Analysis

The correlation analysis examined the relationships among the five constructs including autonomy motivation, leadership, self-efficacy, social support, and performance. The results revealed significant positive correlations among all constructs, indicating that higher levels of one construct are associated with higher levels of the others. These findings align with the Self-Determination Theory (SDT) theoretical framework, which emphasizes that intrinsic motivation, supportive environments, and individual competencies are interrelated and contribute to enhanced performance behaviors.

Table 4.9 presents the **square root of AVE** (on the diagonal) and the **correlation coefficients** between the constructs (off-diagonal). The constructs analyzed include the independent variables (**Autonomy Motivation, Leadership, Self-Efficacy, and Social Support**) and the dependent variable (**Performance**).

Table 4.9 Results of Correlation Analysis among Constructs

Construct	Autonomy Motivation	Leadership	Self- Efficacy	Social Support	Performance
Autonomy Motivation	0.849	0.62	0.58	0.55	0.64
Leadership	0.62	0.835	0.67	0.61	0.70
Self-Efficacy	0.58	0.67	0.742	0.59	0.66
Social Support	0.55	0.61	0.59	0.825	0.60
Performance	0.64	0.70	0.66	0.60	0.721

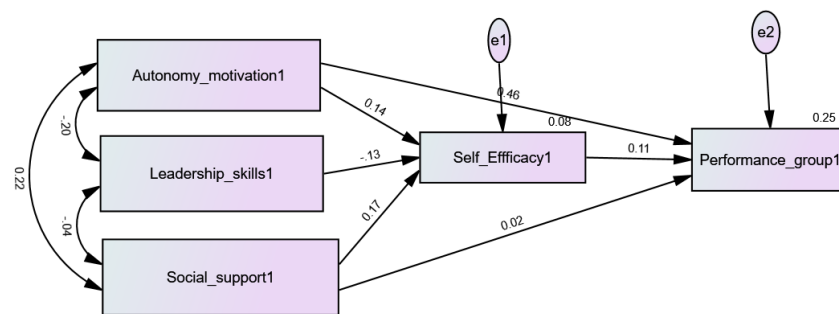
Diagonal Values (Bold): Represent the **square root of AVE** for each construct. These values indicate the amount of variance captured by the construct relative to measurement error. Autonomy Motivation: $\sqrt{0.721} = \mathbf{0.849}$, Leadership: $\sqrt{0.698} = \mathbf{0.835}$, Self-Efficacy: $\sqrt{0.550} = \mathbf{0.742}$, Social Support: $\sqrt{0.680} = \mathbf{0.825}$, and Performance: $\sqrt{0.520} = \mathbf{0.721}$, and **Off-Diagonal Values:** Represent the **correlation coefficients** between the constructs. These values indicate the strength and direction of the relationships between the constructs.

The square root of AVE for each construct (diagonal values) is greater than the correlation coefficients between that construct and all other constructs (off-diagonal values). This satisfies the Fornell and Larcker criterion, confirming that each construct is distinct and demonstrates discriminant validity (142). Such as the square root of AVE for Autonomy Motivation (0.849) is greater than its correlation coefficients with Leadership (0.62), Self-Efficacy (0.58), Social Support (0.55), and Performance (0.64). Similarly, the square root of AVE for Performance (0.721) is greater than its correlation coefficients with Autonomy Motivation (0.64), Leadership (0.70), Self-Efficacy (0.66), and Social Support (0.60).

Autonomy Motivation shows moderate to strong correlations with all other constructs, particularly with Performance (0.64), indicating that higher autonomy motivation is associated with better performance. Leadership has the strongest correlation with Performance (0.70), suggesting that effective leadership significantly influences performance. Self-efficacy and Social Support also show moderate correlations with Performance (0.66 and 0.60, respectively), indicating that these factors contribute to performance but to a lesser extent than leadership. The correlations between the independent variables (such as; Leadership and Self-Efficacy: 0.67) suggest some degree of overlap, but the discriminant validity criterion confirms that each construct is distinct.

4.10 Results of Path Analysis

The model consists of three exogenous variables: Autonomy Motivation (Autonomy_motivation1), Leadership Skills (Leadership_skills1), and Social Support (Social_support1), which influence Self-Efficacy (Self_Efficacy1) (Figure 4.10).



χ^2/df : 2.45, GFI: 0.98, CFI: 0.99, TLI: 0.98, RMR: 0.018 RMSEA: 0.032 (good fit)

Figure 4.10 Path diagram

The explained variance (R^2) for each endogenous variable can be calculated based on the standardized path coefficients (Table 4.10).

Predictors of Self-Efficacy (Self_Efficacy1):

Autonomy Motivation → 0.14

Leadership Skills → -0.13

Social Support → 0.17

Residual variance (error term e1) → 0.46

Explained Variance (R^2) for Self-Efficacy = $1 - 0.46 = 0.54$

This indicates that Autonomy Motivation, Leadership Skills, and Social Support explain 54% of the variance in Self-Efficacy.

Predictors of Performance (Performance_group1):

Self-Efficacy → 0.11

Social Support → 0.02

Residual variance (error term e2) → 0.25

Explained Variance (R^2) for Performance = $1 - 0.25 = 0.75$

This emphasizes that Self-Efficacy and Social Support explain 75% of the variance in Performance.

Therefore, this model reveals that **Social Support and Autonomy Motivation significantly influence Self-Efficacy**, while **Self-Efficacy largely explains Performance**. The high explained variance for **Performance (0.75)** suggests that Self-Efficacy plays a crucial role in determining group performance (Table 4.10).

Table 4.10 Explained Variance (R^2)

Endogenous Variable	R^2 Value	Interpretation
Self_Efficacy1	0.54	54% variance explained by Autonomy Motivation, Leadership Skills, and Social Support
Performance_group1	0.75	75% variance explained by Self-Efficacy and Social Support

4.11 Contribution of the Model

Hypothesis Testing

The statistical significance of each hypothesis (H1–H5) was tested by using the p-values ($p < 0.05$ indicates significance), and t-values ($t > 1.96$ indicates significance at a 95% confidence level).

The standardized path coefficients (β) and their significance (p-values) were used to test the hypotheses and determine the strength and direction of the relationships. The results are summarized in Table 4.11.

Table 4.11 Path Coefficients and Hypotheses Testing

Hypothesis	Path	Standardized Coefficient (β)	Significance	Interpretation
H1	A_motivation1 → Self_Efficacy1	0.14	<.001	Positive, moderate effect
H2	Leadership_skills1 → Self_Efficacy1	-0.13	<.001	Negative, weak effect
H3	Social_support1 → Self_Efficacy1	0.17	<.001	Positive, moderate effect
H4	Self_Efficacy1 → Performance_group1	0.11	<.001	Positive effect
H5	Social_support1 → Performance_group1	0.02	.562	No significant effect

Hypotheses one, and three states that motivation ($\beta = 0.14$, $p < 0.01$), and social support ($\beta = 0.17$, $p < 0.01$) significantly impact self-efficacy, which then tends to performance. Additionally, hypothesis four states that self-efficacy ($\beta = 0.11$, $p < 0.01$) has a positive effect on performance. Therefore, hypotheses one, three, and four are accepted. While social support ($\beta = 0.02$, $p = 0.562$) states that negative and no significant effect on performance, these reject hypothesis five.

In summary, the analysis of the path coefficient revealed that Self-efficacy is influenced positively by autonomy motivation and social support, but negatively by leadership skills. Performance is influenced positively by self-efficacy, but social support does not significantly contribute to performance. The model suggests that self-efficacy plays a mediating role between autonomy motivation/social support and performance.

CHAPTER V

DISCUSSION

In this cross-sectional study, a quantitative method was used to determine the level of performance and factors related to performance in active malaria case surveillance of female community health volunteers in the high-endemic areas of Nepal. This study was conducted from 1 June to 30 August 2024 among FCHVs in three provinces: Lumbini, Karnali, and Sudurpaschhim, and eight high-risk malaria districts of three provinces, including Bako, Humla, Kalikot, Achham, Baitadi, Bajura, Dadeldhura, and Kanchanpur of Nepal. A total of 1204 complete data were used for analysis. To examine the performance of FCHVs in active malaria case surveillance in endemic areas of Nepal, self-reported performance activities were used to measure participants' performance. Participants were asked about their participation, methods, and frequency with which they engage in seven dimensions of active malaria case detection activities; diagnosis, treatment, refer, transferring knowledge, prevention practices, IEC distribution, recording and reporting the malaria cases by female community health volunteers in high endemic areas of Nepal. Moreover, the theory of Self-determination (SDT) was used to test whether perceived autonomy motivation, leadership (autonomy), self-efficacy (competence), social support, and supportive and controlling supervision (relatedness) could affect performance towards active malaria case surveillance.

A structured questionnaire was employed to measure performance behaviors and their factors and SDT constructs. The data were described by mean, median, quartile deviation (QD), minimum, and maximum values. The chi-square test was used to examine the association between the performances of FCHVs and each independent variable. Additionally, an Exploratory factors analysis (EFA) was performed using a principal component analysis first then confirmatory factor analysis (CFA) was performed to validate all study variables; structural equation modeling (SEM) was then used to test causal relationships among SDT constructs and role performance activities. Based on the SEM, the overall model fit was measured by calculating the following indexes: the model chi-square (χ^2), the ratio of chi-square to the degree of freedom

(χ^2/df), the standardized root mean square residual (SRMR), the normed fit index (NFI), the Tucker–Lewis index (TLI), the comparative fit index (CFI), the goodness-of-fit index (GFI), and the incremental fit index (IFI). IBM Statistical Package for Social Science (SPSS) version 26.0 and IBM SPSS Amos 29 Graphics (Mahidol University license) were used to perform the data analyses.

The research results showed the FCHV's performance level in the active malaria case surveillance in high endemic areas of Nepal and determined the association with independent variables (socio-economic characteristics, work motivation, leadership, self-efficacy, and receiving social support) and measurement model of SDT constructs items by CFA. The results are discussed below.

5.1 Socioeconomic characteristics factors and Performance

The results indicate that age ($p = 0.090$), education level ($p = 0.921$), and family income ($p = 0.709$) do not have a statistically significant relationship with performance levels. However, occupation ($p < 0.001$) shows a strong association, with private employees and businesspersons performing better than those engaged in agriculture. Additionally, experience in the role of an FCHV significantly influences performance, with those serving for over ten years demonstrating higher levels of performance ($p < 0.001$). Similarly, experience as a malaria volunteer for more than five years is associated with better performance outcomes ($p < 0.001$). However, refresher training in the last year has not significantly impacted performance ($p = 0.145$).

Previous studies have reported mixed findings on the role of socioeconomic factors in volunteer performance. For instance, Brown et al. (2017) found that higher education levels were linked to better decision-making skills, while White et al. (2021) suggested that practical experience compensates for lower formal education. This study's findings support the latter, emphasizing the importance of long-term engagement over formal education. Additionally, Patel & Singh (2022) argued that financial stability might enhance performance by reducing stress-related distractions, but our findings do not support this claim. Our results emphasize the importance of long-term engagement over formal education and economic background. A study by Anderson & Kumar (2023) further highlights that while socioeconomic stability can facilitate volunteer

retention, it does not necessarily lead to higher performance, aligning with our study's conclusions.

The finding that FCHVs engaged in trade or business demonstrated higher performance than other occupations is consistent with studies highlighting the role of transferable skills in enhancing CHV effectiveness. Such as a study by Singh et al. (2018) found that CHVs with prior experience in roles requiring communication and organizational skills, such as small business owners, were more effective in delivering health education and services (149). This suggests that occupational background can influence the adaptability and efficiency of CHVs in their roles. This result was different from the previous study in Thailand by Yaebkai et al. (2022) who found that the performance of the VHV's significant association with agricultural occupation and predicted the performance of the VHV's at 26.5% with a statistical significance (135). Also, the results of Wirinya et al. (2023) found a statistically significant relationship between the performance motivation of the VHV's and occupation ($p < .05$). This may be because CHVs with business/trade are ready for community service that they can manage time for the community.

The positive association between longer tenure and higher performance is supported by literature emphasizing the importance of experience in building competence and confidence. For instance, a study by Nkonki et al. (2017) found that CHVs with more than five years of experience were better at managing complex health tasks and building trust within communities. This aligns with the current findings, reinforcing the value of retaining experienced volunteers. The result showed the same pattern as the study of Otambo et al. (2023) study in Western Kenya. The findings demonstrated that CHVs who performed proper malaria diagnostics had a significant influence on their service quality, with the CHVs more experience in malaria disease of more than ten years. Similarly, as shown in Kawakatsu et al. (2016) study in Kenya, findings revealed that the CHVs have a long work experience, they have had more opportunities to receive effective training, supervision, and incentives and to build a confidential relationship with community members.

5.2 Motivation Factors and Performance

Motivational factors exhibit a significant influence on performance. Overall motivation is highly associated with better performance ($p < 0.001$). Additionally, autonomy ($p < 0.001$) is more significant than control ($p = 0.012$) to higher performance. This aligns with the studies by Smith et al. (2020) and Jones & Lee (2019), indicating that high motivation and autonomy contribute significantly to performance. However, a contrasting view by Rogers et al. (2021) suggests that external motivation, such as financial incentives, might play a more substantial role in volunteer performance than intrinsic motivation alone. This result was supported by the Sakeah et al. (2023) study in Ghana, findings that the incentives effectively motivate VHVs to improve their performance, thereby improving access to health services in the community. However, previous studies showed mixed results that revealed that monetary and non-monetary performance incentives could improve both the use and quality of VHVs' health care services. Providing non-monetary incentives to work motivating VHVs could be enablers in improving the performance of VHVs, such as training, rewards, and community recognition cost less to implement. Also, the results of Chatio et al. (2019) study in Northern Ghana found that the incentives motivated the performance of VHVs involved in health intervention activities at the community level. The lack of these non-monetary incentives discouraged health volunteers and thereby affected their performance. CHVs receive these non-monetary incentives, including awards to hard-working volunteers, it will encourage them to work with pride. In addition, providing non-monetary incentives will enhance CHVs performance and motivate them to continue to provide health services to their people at the community level.

Therefore, the results of this study showed that the proportion of CHVs with high performance was found in CHVs with extrinsic motivation. This is consistent with the literature review and research related to CHV motivation. It was found that CHVs currently receive compensation of 1500 Nepalese rupees per month, welfare, a badge of honor for CHVs who have worked as CHVs for more than five years and over, and the retirement fund, social security, free health insurance, and travel allowance, which is considered an extrinsic motivation that affects the performance of CHVs and creates pride.

5.3 Leadership and Performance

Leadership also plays a crucial role, as higher leadership levels ($p < 0.001$) correspond with improved performance. Political leadership ($p < 0.001$), trans-organizational leadership ($p = 0.002$), and team-building leadership ($p = 0.002$) all have significant positive associations with performance. However, transformative leadership ($p = 0.055$) does not show a statistically significant relationship with performance. A study by Patel (2018) regarding the skill of leadership among CHVs also emphasized that leadership training is a key factor in improving volunteer effectiveness, further aligning with the study result. Additionally, The positive impact of transformative and team-building leadership on performance echoes findings from studies on leadership in community health programs. A study by Gilson et al. (2019) found that transformational leadership, which focuses on inspiring and empowering team members, was associated with higher levels of CHW motivation and performance. This supports the current findings, emphasizing the need for leadership training to foster supportive and collaborative environments. Furthermore, Tanaka et al. (2023) found that decentralized leadership models, where volunteers have greater decision-making power, can be more effective than hierarchical structures, which partially contrasts with these study findings on political and trans-organizational leadership.

5.4 Self-efficacy and Performance

Higher self-efficacy is significantly associated with better performance outcomes ($p=0.029$). This aligns with studies emphasizing the importance of confidence in task execution. Such as a study by Bandura (1997) on self-efficacy theory found that individuals with higher self-efficacy are more likely to set challenging goals and persist in the face of difficulties. This supports the current findings, highlighting the need for training programs that build the skills and confidence of FCHVs. Furthermore, the belief in one's ability to successfully perform a task is a significant determinant of CHV performance (17). Training and capacity-building initiatives equip CHVs with the skills and knowledge required for tasks such as identifying disease cases, collecting data, and educating community members. Regular feedback and recognition further reinforce their sense of competence, boosting their confidence and willingness to take on complex challenges. High self-efficacy enables CHVs to remain motivated and effective even in resource-constrained or high-pressure environments (18).

5.5 Social Support and Performance

Among social support factors, family support has a significant positive impact on performance ($p=0.004$). A study by Alam et al. (2020) found that CHWs with strong family support were more likely to remain committed to their roles despite challenges. This underscores the importance of addressing the social and familial context of volunteers to improve retention and performance. However, support from the community ($p = 0.378$) and health providers ($p=0.824$) does not show a statistically significant association with performance. Our findings on family support align with Wilson & Clark (2022), who found that strong familial encouragement enhances volunteer commitment. However, the lack of a significant impact from community and health provider support contrasts with previous studies, suggesting that different cultural or structural settings may affect the perceived usefulness of external support systems.

While this study found no significant association between community or health provider support and performance, this contrasts with some existing literature. For instance, a study by Glenton et al. (2013) found that community recognition and support were critical for CHW motivation and effectiveness. This discrepancy may be due to differences in context or measurements.

This study further explains that receiving social support from health personnel is a critical mechanism, especially training to educate FCHVs in active malaria case detection in the community. This affects self-efficacy, motivation to work, the performance of CHVs, productivity, and sustainability in the community. This result was supported by the study on factors that influenced the sustainability of a community health volunteer program across the globe (42, 150). This can be explained that involve assigning FCHVs to areas where they have local knowledge and community connections, enhancing their ability to perform tasks like active case detection and response. The findings corresponded with Aqil et al., (2023). In addition, previous studies by Karuga et al., (2023) found that community participation in the health system and community health committee policies in Kenya established a policy that included an agenda for the community health committee annual meetings to address and review the performance of the volunteers (151). Therefore, from the results of this study, it was shown that social support was an influencing factor in the performance of CHV especially from the support from the health personnel.

5.6 Supervision and Performance

The findings indicate that supervisory support, whether supportive ($p = 0.376$) or control-based ($p = 0.592$), does not significantly influence performance levels. This suggests that other factors, such as motivation, leadership, and experience, may play a more crucial role in determining performance outcomes.

Taylor & Adams (2020) reached similar conclusions, arguing that intrinsic motivation is more influential in volunteer performance than external supervision. These results imply that policy interventions should focus on fostering motivation and leadership rather than solely improving supervision mechanisms. In contrast, Fernandez & Gupta (2022) suggested that effective mentorship-based supervision models could improve performance, indicating that the structure and nature of supervision may influence outcomes differently across various contexts. Moreover, recent research by López et al. (2023) has shown that hybrid supervision models, which blend supportive and control-based mechanisms, might be more effective in balancing autonomy and accountability, a perspective that warrants further investigation in our context.

Hence, the result of this study regarding supportive supervision emphasizes that placing FCHVs under supportive supervision, such as encouragement and feedback can foster a conducive work environment that enhances their performance. This is alien to the previous study on the role of supportive supervision and the role performance in CHVs (152). Therefore, supportive supervision plays a critical role in enhancing the performance of Community Health Volunteers (CHVs) by providing ongoing guidance, feedback, training, and motivation, which helps them deliver quality healthcare services within their communities, improving their knowledge, skills, and overall job satisfaction while fostering a sense of accountability and commitment to their roles.

5.7 Measurement Model (CFA)

The results of the CFA indicate that all measurement models demonstrate a good fit to the data. The chi-square values, although significant for most models, are within acceptable limits when considering the ratio of chi-square to degrees of freedom (X^2/df). The GFI, AGFI, CFI, and TLI values are all close to 1, indicating a strong fit. Additionally, the RMSEA and SRMR values are well below the threshold for a good fit, further supporting the validity of the models (145, 146).

The **Autonomy Motivation** model shows a good fit with a chi-square value of 74.92 ($df = 21$, $X^2/df = 3.5$) and a p-value of .000. The fit indices (GFI = .987, AGFI = .971, CFI = .993, TLI = .988) are all within the acceptable range, and the RMSEA (.046) and SRMR (.0013) values indicate a good fit. The **Leadership** model also demonstrates a good fit with a chi-square value of 68.34 ($df = 24$, $X^2/df = 2.83$) and a p-value of .00. The fit indices (GFI = .987, AGFI = .971, CFI = .992, TLI = .989) are strong, and the RMSEA (.039) and SRMR (.024) values are within the acceptable range. The **Self-efficacy** model shows an excellent fit with a chi-square value of 6.25 ($df = 3$, $X^2/df = 2.84$) and a p-value of .00. The fit indices (GFI = .988, AGFI = .988, CFI = .999, TLI = .986) are very close to 1, and the RMSEA (.030) and SRMR (.006) values indicate a very good fit. The **Social Support** model demonstrates a good fit with a chi-square value of 86.21 ($df = 24$, $X^2/df = 3.59$) and a p-value of .00. The fit indices (GFI = .985, AGFI = .998, CFI = .989, TLI = .984) are within the acceptable range, and the RMSEA (.046) and SRMR (.026) values indicate a good fit. Finally, the **Performance** model shows a good fit with a chi-square value of 10.73 ($df = 6$, $X^2/df = 1.78$) and a p-value of .097. The fit indices (GFI = .998, AGFI = .990, CFI = .998, TLI = .996) are very strong, and the RMSEA (.026) and SRMR (.004) values indicate a very good fit (141, 146).

The CFA results indicate that all measurement models for Autonomy Motivation, Leadership, Self-efficacy, Social Support, and Performance demonstrate a good fit for the data. The fit indices support the validity of the models, suggesting that the constructs are well-represented by the observed variables. These results provide a strong foundation for further analysis and interpretation of the relationships between the constructs in the study (140).

The results of the Confirmatory Factor Analysis (CFA) in this study demonstrate strong evidence for the validity and reliability of the measurement models for Autonomy Motivation, Leadership, Self-efficacy, Social Support, and Performance. The fit indices, including GFI, AGFI, CFI, TLI, RMSEA, and SRMR, consistently indicate a good fit across all models, which aligns with findings from other studies that have used CFA to validate similar constructs (141, 144). For instance, previous research on self-efficacy and leadership has also reported strong fit indices, suggesting that these constructs are robust and well-measured in various contexts (Bandura, 1997; Avolio et al., 2009). The RMSEA values in this study, ranging from .026 to .046, are particularly noteworthy as they fall below the commonly accepted threshold of 0.05, indicating excellent model fit. This is consistent with studies that emphasize the importance of RMSEA in assessing model fit (Hu & Bentler, 1999). Similarly, the SRMR values, all below 0.08, further support the models' validity, as low SRMR values are indicative of minimal discrepancies between observed and predicted correlations (140).

One of the strengths of this measurement model is its comprehensive evaluation using multiple fit indices, which provides a more robust assessment of model fit compared to relying on a single index. The high CFI and TLI values (ranging from .984 to .999) suggest that the models are a significant improvement over a null model, which is consistent with findings from other CFA studies that emphasize the importance of incremental fit indices (Bentler, 1990). Additionally, the large sample size ($n=1204$) enhances the reliability of the results, as larger samples reduce the risk of Type II errors and provide more stable estimates of model parameters (145).

However, there are some limitations to consider. While the chi-square values are significant for most models, indicating a potential misfit, the chi-square test is highly sensitive to sample size, and even minor discrepancies can lead to significant results in

large samples (Kline, 2015). This is a common issue in CFA studies, and researchers often rely more on other fit indices, such as RMSEA and CFI, which are less sensitive to sample size. Another potential weakness is the cross-sectional nature of the data, which limits the ability to infer causality or assess the stability of the constructs over time. Longitudinal studies could provide further insights into the temporal stability of these measurement models.

In terms of implications, Performance is influenced positively by self-efficacy, but social support does not significantly contribute to performance. The model suggests that self-efficacy plays a mediating role between autonomy motivation/social support and performance. Additionally, the strong fit indices suggest that these models can be confidently used in future research to explore relationships between constructs, such as the impact of leadership on performance or the role of social support in enhancing self-efficacy. The results also highlight the importance of using multiple fit indices to evaluate model fit, as relying solely on chi-square values can be misleading. Future studies could build on these findings by testing the models in different cultural or organizational contexts to assess their generalizability. Additionally, incorporating more advanced techniques, such as multi-group CFA, could help determine whether the models hold across different subgroups within the sample. Overall, this study contributes to the growing body of literature on measurement validation and provides a solid foundation for further research on these important constructs.

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

6.1 Summary of the Research Study

The objective of this study was to analyze the causal relationship model of factors determining the performance of female community health volunteers in active malaria case surveillance in the high-endemic areas of Nepal. For this, the role theory of Self-determination (SDT) was used as a model to test whether perceived autonomy motivation, self-efficacy, leadership skills, social support, and supportive and controlling supervision could affect behavior, which leads to performance towards active malaria case surveillance in endemic areas of Nepal. This study used a cross-sectional quantitative method design that used EFA to test the dimension of performance and the psychometric properties of SDT constructs by CFA. Additionally, socioeconomic characteristics of FCHVs towards performance in active malaria case surveillance.

The performance of Female Community Health Volunteers (FCHVs) in active malaria case surveillance, was assessed in seven distinct activities. The study reported that about half of the total FCHVs had low performance in active malaria case surveillance-related activities. Additionally, less than half of the respondents perceived supportive supervision, team-building leadership, and community support level. Nevertheless, two-thirds of respondents perceived a low level of self-efficacy and leadership in active malaria case surveillance.

Regarding factors associated with performance, perceived motivation and leadership were significant predictors of performance. Additionally, social support, particularly from family, emerged as a key factor influencing performance. FCHVs who reported high levels of family support were more likely to perform well. Furthermore, the study emphasizes self-efficacy, positively associated with performance. Moreover, regarding individual characteristics of FCHVs, FCHVs engaged in trade or business and the long years of experience as volunteers had higher performance.

The Exploratory Factor Analysis (EFA) was conducted to identify the underlying factor structures of key constructs related to the performance of Female Community Health Volunteers (FCHVs) in malaria case surveillance. The analysis focused on five main constructs: perceived work motivation, leadership skills, self-efficacy, social support, supervision, and role performance. The EFA revealed clear factor structures for all constructs, with strong factor loadings and high explained variance, indicating the reliability and validity of the measurement models. Perceived work motivation, leadership skills, self-efficacy, social support, supervision, and role performance were all found to be multidimensional constructs, consistent with theoretical frameworks and empirical studies. The EFA results revealed the importance of autonomy, leadership, self-efficacy, social support, and supervision in enhancing FCHV performance in malaria surveillance.

The Confirmatory Factor Analysis (CFA) on a sample of 1,204 respondents results indicated that all measurement models for Autonomy Motivation, Leadership, Self-efficacy, Social Support, and Performance demonstrate a good fit for the data. The results of this study provide strong evidence for the validity and reliability of the measurement models for Autonomy Motivation, Leadership, Self-efficacy, Social Support, and Performance, as demonstrated by the robust fit indices across all constructs. The CFA results indicate that the models are well-specified and fit the data adequately, with RMSEA values below 0.05, SRMR values below 0.08, and CFI and TLI values close to 1. Moreover, Performance is influenced positively by self-efficacy, but social support does not significantly contribute to performance. The model suggests that self-efficacy plays a mediating role between autonomy motivation/social support and performance.

In conclusion, this study provides validated measurement models that can be confidently applied in future research to explore relationships between these constructs, such as the impact of leadership on performance or the role of social support in enhancing self-efficacy.

6.2 Recommendations

Based on the results of this study, which validated the measurement models for key constructs such as Autonomy Motivation, Leadership, Self-efficacy, Social Support, and Performance, several recommendations can be made to enhance the performance of community health volunteers (CHVs). These recommendations are grounded in the strong relationships between these constructs and performance, as evidenced by the robust fit indices in the CFA models.

This structural equation model (SEM) analysis highlights key factors influencing **self-efficacy and performance** in a group setting. The findings suggest:

1. **Autonomy motivation ($\beta = 0.14$) and social support ($\beta = 0.17$) positively influence self-efficacy**, indicating that individuals who have intrinsic motivation and strong support systems tend to believe in their capabilities.
2. **Leadership skills ($\beta = -0.13$) unexpectedly have a negative effect on self-efficacy**, suggesting that leadership roles might create additional responsibilities or pressures that reduce confidence.
3. **Self-efficacy ($\beta = 0.11$) has a positive but weak influence on performance**, implying that while believing in one's abilities is important, other factors may play a stronger role in determining performance outcomes.
4. **Social support ($\beta = 0.02$) has no significant direct effect on performance**, suggesting that while support networks are essential for self-efficacy, they do not directly translate into improved performance outcomes.

Overall, self-efficacy acts as a mediating factor between autonomy, motivation/social support, and performance. However, the weak direct influence of self-efficacy on performance suggests the presence of additional mediators or moderators that should be explored. This study reinforces the crucial role of self-efficacy in performance but also highlights gaps where leadership skills and social support may not always contribute positively. Future research should refine the model by incorporating additional factors, testing alternative relationships, and using longitudinal or mixed method approaches to validate findings.

Recommendation towards enhancing performance based on model fit:

1. Foster Autonomy and Motivation

- Recommendation: Implement programs that enhance autonomy and intrinsic motivation among CHVs. This can be achieved by providing them with greater decision-making authority and opportunities to take ownership of their tasks.
- Rationale: The study's validation of the Autonomy Motivation model suggests that fostering a sense of autonomy can significantly improve performance. When CHVs feel empowered and motivated, they are more likely to be proactive and committed to their roles.

2. Strengthen Leadership and Supervision

- Recommendation: Develop leadership training programs for supervisors and coordinators of CHVs to improve their leadership skills, including communication, support, and motivational techniques.
- Rationale: The Leadership model's strong fit indices indicate that effective leadership is crucial for enhancing performance. Strong leadership can provide CHVs with the guidance, support, and encouragement they need to perform their duties effectively.

3. Enhance Self-efficacy

- Recommendation: Provide regular training and capacity-building workshops to boost CHVs' self-efficacy. This includes skill development, problem-solving exercises, and confidence-building activities.
- Rationale: The Self-efficacy model's excellent fit suggests that higher self-efficacy is associated with better performance. When CHVs believe in their abilities, they are more likely to tackle challenges and perform their tasks efficiently.

4. Build Strong Social Support Networks

Recommendation: Create and strengthen social support networks among CHVs, including peer support groups, mentorship programs, and community engagement activities.

Rationale: The Social Support model's good fit highlights the importance of social support in enhancing performance. A strong support network can provide CHVs with emotional and practical assistance, reducing stress and increasing job satisfaction.

5. Monitor and Evaluate Performance

Recommendation: Establish a robust monitoring and evaluation system to regularly assess CHVs' performance and provide constructive feedback. Use the validated Performance model to identify areas for improvement and recognize outstanding contributions.

Rationale: The Performance model's strong fit indices indicate that regular assessment and feedback are essential for maintaining high performance levels. Continuous evaluation helps identify gaps and implement targeted interventions to enhance performance.

6. Promote Community Engagement

Recommendation: Encourage community involvement and participation in health programs to create a supportive environment for CHVs. Engage community leaders and members in planning and implementing health initiatives.

Rationale: Community engagement can enhance the effectiveness of CHVs by fostering a collaborative environment and increasing community trust and cooperation.

6.3 Recommendation for future research

Based on the findings and limitations of this study, several recommendations can be made to guide future research in this area. These recommendations aim to build on the current study's strengths, address its limitations, and explore new avenues for understanding the relationships between key constructs such as Autonomy Motivation, Leadership, Self-efficacy, Social Support, and Performance.

1. Investigate Additional Mediators or Moderators: Future studies should examine other psychological or environmental factors that may strengthen the relationship between self-efficacy and performance (e.g., job satisfaction, task complexity, or stress levels) and organizational culture, team dynamics, or work environment could provide deeper insights.

2. Explore the Negative Effect of Leadership Skills on Self-Efficacy: The unexpected negative relationship suggests a potential burnout effect or leadership burden and A qualitative study, or a larger sample could help understand whether leadership demands reduce self-efficacy by increasing stress or responsibility.

3. Examine the Direct Impact of Social Support on Performance: Since social support did not significantly impact performance, future studies should investigate whether this effect is indirect (via motivation, well-being, or collaboration). Additional longitudinal studies could track how sustained social support influences performance over time.

4. Expand the Model with Additional Performance Indicators: Instead of measuring performance as a single construct, breaking it down into individual vs. team-based performance, innovation, productivity, or goal achievement might yield different results. The relationships between motivation, self-efficacy, and performance may vary across different cultures or professional environments. A comparative study across different industries or regions could reveal context-specific insights.

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APPENDICES

APPENDIX A: QUESTIONNAIRE (ENGLISH VERSION)

ASSESSMENT OF PERFORMANCE IN ACTIVE MALARIA CASE SURVEILLANCE OF FEMALE COMMUNITY HEALTH VOLUNTEERS IN THE HIGH ENDEMIC AREAS OF NEPAL - A NATIONAL SURVEY

The questionnaire is prepared for collecting data to achieve a better understanding of role performance in active malaria case surveillance of female community health volunteers in the high-endemic areas of Nepal. This is a partial fulfillment of the requirements for the degree of doctoral in health and sustainable development program, ASEAN Institute for Health Development, Mahidol University.

You are invited to participate in this research project as you are female community health volunteers who are engaged in active malaria case surveillance in high-endemic areas of Nepal. Please provide the answer to these questions best on your last year's role activities in malaria surveillance activities. All information will be kept confidential and used for research purposes only. Thank you very much for your participation.

Name of interviewer:	Date of interview:
Questionnaire no:	Name of Health facility and rural municipality:

.....

Name and signature of the FCHVs.

The questionnaire consists of six parts including 70 items as follows:

Part I: Scio-Economic Status (SES) of the respondents: 6 items

Part II: Work motivation of FCHVs in active malaria case surveillance: 20 items

Part III: Leadership of FCHVs in active malaria case surveillance: 12 items

Part IV: Self-efficacy of FCHVs in active malaria case surveillance: 10 items

Part V: Social support of FCHVs in active malaria case surveillance: 15 items

Part VI: Role performance in active malaria case surveillance: 7 items

Part I: Socio-economic Status of the Respondents (SES)

Please mark (✓) in ☐ or fill in words or statements in the blank space to answer the questions.

Q.N.	Questions/statements	Responses/Status
1.	What is your age?	Age in completed Years old
2.	What is your high education attainment?	1. ☐ None 2. ☐ Literate 3. ☐ Primary school 4. ☐ Secondary school 5. ☐ Higher Secondary
3.	What is your main occupation apart from FCHV?	☐ 1. Agriculture ☐ 2. Trader/Business ☐ 3. Housekeeper ☐ 4. Labor ☐ 5. Government staff ☐ 6. Private employee
4.	What is your average monthly income from all resources?	 (NRs) (Rupees/Month)
5.	How long have you been working as an FCHV in a malaria surveillance activities role?	Total years as malaria volunteers..... Years (Total periods of work as FCHV..... Years)
6.	Did you attain malaria-related refresher training in the past?	1. Yes ☐times (numbers of training in past) 2. None ☐

Part II: Work Motivation of FCHVs in Active Malaria Case Surveillance

No.	Statements					
		Strongly agree	Agree	Not sure	Disagree	Strongly disagree
	1. External regulation					
	You put effort into volunteering activities in active malaria case surveillance activities because....					
1.1	Your family put pressure on you.					
1.2	Your supervisor puts force on you.					
1.3	Your mother's club meeting put effort and appreciated you more.					
1.4	Your incentive put effort into yourself.					
	2. Introjected regulation					
	You put effort into volunteering in active malaria case surveillance activities because....					
2.1	I feel proud of myself.					
2.2	It makes me feel good myself.					
2.3	I will feel bad about myself if people do not get services.					
2.4	I will feel guilty. If not advocate people about malaria knowledge in endemic areas.					
	3. Identified regulation					
	You put effort into volunteering in active malaria case surveillance activities because....					
3.1	I do this job because this job has a personal meaning to me.					
3.2	Putting effort into this job has personal significance to me.					
3.3	It is useful to put malaria training effort into my job.					

3.4	I consider it important for humanitarian services to put effort into this job.					
	4. Integrated regulation					
	You put effort into volunteering in active malaria case surveillance activities because....					
4.1	I trained to made for this type of work.					
4.2	This job provides me with skills in case detection with my community.					
4.3	I actualize myself fully through this work.					
4.4	This work fits perfectly well with my life goals.					
	5. Intrinsic motivation					
	You put effort into volunteering in active malaria case surveillance activities because....					
5.1	I enjoy this work very much.					
5.2	The work I do is interesting.					
5.3	This job aligns with my interests and humankind.					
5.4	The work I do is a lot of human social services and serving others.					

Part III: Leadership Skills in Active Malaria Case Surveillance

Item No.	Statements	Responses				Strongly disagree
		Strongly agree	Agree	Neutral	Disagree	
	Leadership skills					
1.	Transformational competence					
1.1	My CHV role inspires individuals in early diagnosis and treatment in malaria case surveillance.					
1.2	My CHV role in the recording and reporting cases helps to decision process to take necessary action by health providers.					
1.3	My CHV role fosters motivation in behavior changes communication (Use of LLIN) in tackling malaria in the community.					
2.	Political competence					
2.1	My CHV role as diagnosis of cases initiates community political leaders to support malaria control initiatives.					
2.2	My CHV role builds strong relationships with key stakeholders involved in malaria control efforts.					
2.3	My CHV role effectively communicate with local leaders and authorities to advocate for resources for malaria surveillance.					

3.	Trans-organizational competence					
3.1	My CHV role promotes collaboration and knowledge sharing across different communities for enhanced malaria surveillance.					
3.2	My CHV role adapts strategies from successful malaria control programs in other regions to suit our community's needs.					
3.3	My CHV role facilitates the exchange of best practices and lessons learned among local teams to improve malaria surveillance outcomes.					
4.	Team-building competence					
4.1	My CHV role promotes teamwork with the health system.					
4.2	My CHV role as monthly reporting cases effectively resolves conflicts within our CHV team to maintain focus on malaria control objectives.					
4.3	My CHV role creates a supportive environment and motivates me to contribute to malaria surveillance efforts.					

Part IV: Self-efficacy of FCHVs in active malaria case surveillance

Item No.	Statements	Responses				Strongly disagree
		Strongly agree	Agree	Neutral	Disagree	
1.	I am confident in my ability to identify malaria cases effectively.					
2.	I am confident in using RDT to detect cases.					
3.	I am confident to refer the cases to the health facility after identifying malaria cases.					
4.	I am confident to ask my supervisor to follow the malaria cases even if initial efforts are unsuccessful.					
5.	I am confident in my ability to adapt to community situations while engaging or distributing IEC materials among community people.					
6.	I am confident in reporting malaria case detection to health providers.					
7.	I am confident to actively engage people during home visits in malaria case detection activities.					
8.	I am confident to continue searching for malaria cases even if initial efforts are unsuccessful.					
9.	I am confident in making decisions related to malaria case detection.					
10.	I am confident that effectively manage cases to prevent second-generation infection.					

Part V: Social support in active malaria case surveillance

Item No.	Statements	Responses				
		Always	Often	Sometimes	Occasionally	Never
1.	Emotional/mental support from family					
1.1	Your family members express love, care, or concern for you about your work.					
1.2	Your family members assist in household work, and child responsibility to free up time to dedicate to surveillance activities.					
1.3	Your family members express pride in the work you do as a community health volunteer.					
2.	Informational support from the community					
2.1	Your community People in your village informed you of the new suspected cases of malaria.					
2.2	The People in your village actively participated in all your activities in malaria case surveillance.					
2.3	The community members you serve provided feedback during malaria case surveillance.					
3.	Materials support from health provider					
3.1	The health personnel provide job aids, forms, medications, or supplies					

	that enable you to perform your duties.					
3.2	Your supervisors facilitate access to training, supervision, or other learning opportunities.					
3.3	The health personnel give financial incentives or compensation for your work as a volunteer.					
4.	Perceived supervision from health providers					
	Supportive supervision					
4.1	You received encouragement about your job from your supervisor.					
4.2	Your supervisor listened and cared about your questions when you asked for help.					
4.3	You receive feedback on a way to do things when you make any mistake.					
	Controlling supervision					
4.4	You often felt not a good experience in receiving information from your supervisors.					
4.5	You found your supervisor tried to control and directly observe your work.					
4.6	You found that your supervisor did not provide options and choices in your job.					

Part VI: Perceived self-reporting performance in active malaria case surveillance**Instruction** Please ✓ choose your answer and fill in the numbers/times in a blank....

Item Numbers	Questions/ Statements items	RESPONSES		
1.	Diagnosis of malaria cases			
1.1	Have you ever used RDTs in malaria diagnosis in your area?	1. ☐ Never 2. ☐ Ever		
1.2	How do you diagnose malaria in your community?		Yes	NO
		1. Rapid diagnostic test (RDT)		
		2. Symptoms of malaria as fever		
		3. Blood Slide examination		
		4. Contact with health personnel		
1.3	How many cases/times have you been diagnosed with malaria case last year?	cases/yearTimes/year		
2.	Treatment the cases			
2.1	Have you ever treated malaria cases in the community?	1. ☐ Never 2. ☐ Ever		
2.2	How do you treat the malaria cases in the community?		Yes	NO
		1. 1st dose of AM treatment		
		2. Plasmodium-falciparum (+) – use ACT		
		3. Plasmodium vivax (+) uses chloroquine		
		4. RDT (-ve) patient with fever also used anti-malarial drugs		

2.3	How many cases/times have you treated in the last year?	 cases/year Times/year															
3.	Refer to the cases																
3.1	Have you ever referred positive and severe cases at a health facility in the last year?	1. ☐ Never 2. ☐ Ever															
3.2	What types of cases do you refer to as malaria cases at a health facility?	<table border="1"> <thead> <tr> <th></th><th>Yes</th><th>NO</th></tr> </thead> <tbody> <tr> <td>1. Severe complication cases (fever with convulsion, vomiting)</td><td></td><td></td></tr> <tr> <td>2. Refer pregnant women</td><td></td><td></td></tr> <tr> <td>3. Refer children</td><td></td><td></td></tr> <tr> <td>4. Refer patients with fever only</td><td></td><td></td></tr> </tbody> </table>		Yes	NO	1. Severe complication cases (fever with convulsion, vomiting)			2. Refer pregnant women			3. Refer children			4. Refer patients with fever only		
	Yes	NO															
1. Severe complication cases (fever with convulsion, vomiting)																	
2. Refer pregnant women																	
3. Refer children																	
4. Refer patients with fever only																	
3.3	How many cases/times have you been referred to the cases?	 cases/yearTimes/year															
4.	Transferring knowledge in malaria prevention																
4.1	Have you ever participated in transferring knowledge skills on malaria prevention in the community in the last year?	1. ☐ Never 2. ☐ Ever															
4.2	How do you transfer knowledge skills such as talking about malaria prevention?	<table border="1"> <thead> <tr> <th></th><th>Yes</th><th>NO</th></tr> </thead> <tbody> <tr> <td>1. Send a mobile message</td><td></td><td></td></tr> <tr> <td>2. Taking a radio program</td><td></td><td></td></tr> <tr> <td>3. Community program activities</td><td></td><td></td></tr> <tr> <td>4. During the community malaria campaign</td><td></td><td></td></tr> </tbody> </table>		Yes	NO	1. Send a mobile message			2. Taking a radio program			3. Community program activities			4. During the community malaria campaign		
	Yes	NO															
1. Send a mobile message																	
2. Taking a radio program																	
3. Community program activities																	
4. During the community malaria campaign																	
4.3	How many times have you been transferring knowledge skills about malaria prevention?	Times/year															
5.	Distributing the IEC materials																

5.1	Have you participated in distributing the IEC materials as community campaign activities?	1. ☐ Never 2. ☐ Ever		
5.2	How do you participate in IEC campaign activities?		Yes	NO
		1. Distribute posters/pamphlets in the community		
		2. Participate in an environmental campaign		
		3. Mothers group discussion		
		4. During malaria campaign		
5.3	How many times have you participated in the IEC distribution campaign?	Times/year		
6.	Home visits (house-to-house visits) in malaria risk wards			
6.1	Have you visited the household of the community to observe the use of LLIN?	1. ☐ Never 2. ☐ Ever		
6.2	What do you observe about the condition and uses of LLIN during home visits?		Yes	NO
		1. Observe the use and conditions of LLIN		
		2. Family members sleep under the LLINs		
		3. The condition of the LLINs (e.g., any holes, tears, or damages)		
		4. Family members do not use the LLIN		
6.3	How many houses/times did you participate in a home visit last year? Times/year	houses/year Times/year		

7.	Recording and reporting the malaria case			
7.1	Have you participated in recording and reporting the malaria case?	1. ☐ Never 2. ☐ Ever		
7.2	What did you do during the recording and reporting of the case?		Yes	NO
		1. Records patient's factors		
		2. Drugs prescribed details		
		3. Referral activities		
		4. Others (severe ill)		
7.3	How many times did you report the case last year?	Times/year		
	Verify records at health facilities by the supervisor	Signature of Interviewer.....		

Thank you very much for your time and kind information!

APPENDIX B: NEPALI VERSION QUESTIONNAIRE

प्रश्नावली

(नेपाली संस्करण)

सक्रिय मलेरिया केस निगरानी सन्दर्भमा नेपालका उच्च महामारी ग्रस्त क्षेत्रहरूमा सामुदायिक महिला स्वास्थ्य स्वयंसेविकाद्वारा सम्पादित कार्यको मूल्याङ्कन - एक राष्ट्रिय सर्वेक्षण यो प्रश्नावलीमा निम्नानुसार ६ ओटा भाग तथा ८४ ओटा विषयवस्तुहरू समावेश गरिएका छन् :

भाग १: सहभागी(जवाफदेही)हरूको सामाजिक आर्थिक स्थिति : ६ ओटा विषयवस्तु

भाग २: सक्रिय मलेरियाको समस्या निगरानीमा सामुदायिक महिला स्वास्थ्य स्वयंसेविका हरुको प्रेरक कार्य सर्वेक्षण: २० ओटा विषयवस्तु

भाग ३: सक्रिय मलेरिया समस्या निगरानीमा सामुदायिक महिला स्वास्थ्य स्वयंसेविकाको नेतृत्व सर्वेक्षण: १२ ओटा विषयवस्तु

भाग ४: सक्रिय मलेरिया समस्या निगरानीमा सामुदायिक महिला स्वास्थ्य स्वयंसेविकाको आत्म प्रभावकारिता सर्वेक्षण: १० ओटा विषयवस्तु

भाग ५: सक्रिय मलेरिया समस्या निगरानीमा सामुदायिक महिला स्वास्थ्य स्वयंसेविकाको सामाजिक समर्थन सर्वेक्षण : १५ ओटा विषयवस्तुहरू

भाग ६: सक्रिय मलेरिया समस्या निगरानीमा पर्यवेक्षकको भूमिका प्रस्तुतीकरण: २१ ओटा विषयवस्तुहरू

भाग १: जवाफदाता (सहभागी)हरुको आर्थिक सामाजिक स्थिति

कृपया कोष्ठकमा (√) चिह्न लगाउनुहोस् वा प्रश्नको उत्तर दिन खालीठाउँमा शब्द वा वाक्य लेख्नुहोस्:

क्र सं	प्रश्न	प्रतिक्रिया जवाफ
१	तपाईंको उमेर कतिवर्ष भयो?	पार गरिसकेको उमेर.....
२	तपाईंले कुन तहसम्मको शिक्षा प्राप्त गर्नुभएको छ ?	१. ☐ छैन २. ☐ साक्षर ३. ☐ प्राथमिक विद्यालय ४. ☐ माध्यमिक विद्यालय ५. ☐ उच्च माध्यमिक विद्यालय
३	सामुदायिक महिला स्वास्थ्य स्वयंसेविका बाहेक तपाईंको अर्को पेसा के हो ?	☐ १. कृषि ☐ २. व्यापार / व्यावसाय ☐ ३. गृहिणी ☐ ४. मजदुर ☐ ५. सरकारी जागिरे ☐ ६. निजी क्षेत्रमा कार्यरत
४	सबै स्रोतबाट उपलब्ध हुने तपाईंको मासिक आम्दानी कति हो ?	 (रु) (रकम / महिना)
५.	सक्रिय मलेरिया समस्या निगरानीका गतिविधिमा सामुदायिक महिला स्वास्थ्य स्वयंसेविकाका रूपमा कति समयदेखि काम गरिरहनु भएको छ ?	स्वयंसेविकाका रूपमा कुल..... वर्ष (सामुदायिक महिला स्वास्थ्य स्वयंसेविका रूपमा कुल..... वर्ष)
६.	के तपाईं विगतमा मलेरिया सम्बन्धी कुनै ताजकीकरण प्रशिक्षण कार्यक्रममा सहभागी हुनु भएको छ?	१. छु ☐ पटक (वितेको समयमा सहभागी भएका तालिमको सङ्ख्यात) . छैन ☐

भाग २: सक्रिय मलेरिया समस्याको निगरानीमा सामुदायिक महिला स्वस्थ स्वयंसेविकाको प्रेरक कार्य सर्वेक्षण :

क्र.सं.	कथनहरू					
		पूर्णतः सहमत	सहमत	तरस्थ	असहमत	पूर्णतः असहमत
	१. बाह्य नियमन					
	मैले सक्रिय मलेरिया समस्याको निगरानी /सर्वेक्षण गतिविधिमा स्वैच्छिक प्रयास गरें किनकि					
१.१	मेरो परिवारले मलाई दबाब दियो ।					
१.२	मेरा पर्यवेक्षकले मलाई दबाब दिए।					
१.३	आमा समूहको बैठकले म र मेरो प्रयासको प्रशंसा गर्‍यो ।					
१.४	मेरो अन्तःप्रेरणाले मलाई प्रोत्साहित गर्‍यो ।					
	२. आन्तरिक नियमन					
	तपाईंले सक्रिय मलेरिया समस्याको निगरानी गतिविधिमा आफूले स्वैच्छिक योगदान दिनुभयो किनभने....					
२. १	मैले आफैमा गर्वको अनुभूति गरें ।					
२. २	यसबाट मैले खुसी पाएँ.					
२. ३	जनताले सेवा नपाएको देख्दा म दुःखी भएँ ।					
२. ४	मलेरिया प्रभावित क्षेत्रका जनताले यो समस्याबारे ज्ञान नपाएकामा मैले आफूलाई दोषी ठानें ।					
	३. पहिचान भएको नियमन					
	तपाईं सक्रिय मलेरिया निगरानी गतिविधिहरूमा स्वैच्छिक योगदान दिनुहुन्छ किनभने....					
३. १	यो काम मेरा लागि अर्थपूर्ण छ ।					

३.२	यो काम मेरा लागि महत्त्वपूर्ण छ।					
३.३	यो काम मलेरिया समस्यासम्बन्धी प्रशिक्षणका लागि उपयोगी हुन्छ।					
३.४	म मानवीय सेवाको काम महत्त्वपूर्ण ठान्छु।					
	४. एकीकृत (समग्र) नियमन					
	तपाईँ सक्रिय मलेरिया समस्या निगरानी गतिविधिमा स्वैच्छिक योगदान दिनुहुन्छ किन भने....					
४.१	म यस्ता कामका लागि प्रशिक्षित छु।					
४.२	यस कार्यले मलाई मेरो समुदायमा रहेका यस्ता समस्या पत्ता लगाउने क्षमता प्रदान गर्छ।					
४.३	म यस कामबाट आफूलाई सार्थक बनाउँछु।					
४.४	यो काम मेरो जीवनको लक्ष्यसँग पूर्णतः मेल खान्छ।					
	५. आन्तरिक उत्प्रेरणा					
	तपाईँ सक्रिय मलेरिया समस्या निगरानी गतिविधिहरूमा स्वैच्छिक रूपमा योगदान दिनुहुन्छ किन भने....					
५.१	मलाई यो काम रमाइलो लाग्छ।					
५.२	मैले गर्ने यो काम रोचक / मनोरञ्जक छ					
५.३	यो काम मेरो रुचि र मानवतासँग मिल्ने खालको छ।					
५.४	मेरो काम समाजसेवा र मानवसेवा नै हो।					

भाग ३: सक्रिय मलेरिया समस्या निगरानीमा नेतृत्व क्षमता

क्रम सं.	प्रश्न /नेतृत्व क्षमता	प्रतिक्रिया				पूर्णतः असहमत
		पूर्णतः सहमत	सहमत	तरस्थ	असहमत	
१	परिवर्तन क्षमता					
१.१	मेरो सामुदायिक स्वास्थ्य स्वयंसेवक भूमिकाले मलेरिया समस्याको प्रारम्भिक निदान र उपचारमा व्यक्तिलाई प्रेरित गर्छ।					
१.२	मेरो सामुदायिक स्वास्थ्य स्वयंसेवक भूमिकाले समुदायमा समस्याको अभिलेखन र सम्प्रेषण प्रक्रियामा आवश्यक कार्य गर्न मद्दत गर्छ।					
१.३	मेरो सामुदायिक स्वास्थ्य स्वयंसेवक भूमिकाले समुदायमा सक्रिय मलेरियाको सामना गर्न ,सङ्घर्ष गर्न र सञ्चार (LLIN) को प्रयोग गर्न प्रेरित गर्छ।					
२.	राजनैतिक क्षमता	पूर्णतः सहमत	सहमत	तरस्थ	असहमत	पूर्णतः असहमत
२.१	म मेरो सामुदायिक स्वास्थ्य स्वयंसेवक भूमिकामार्फत् सक्रिय मलेरिया समस्याको निदानका लागि समुदायको नेतृत्वसँग पहल गर्छु ।					
२.२	म सामुदायिक स्वास्थ्य स्वयंसेवक भएका नाताले सक्रिय मलेरिया समस्या नियन्त्रणमा संलग्न व्यक्तिहरूसँग असल सम्बन्ध बनाउँछु।					

२.३	म सामुदायिक स्वास्थ्य स्वयंसेवक भएका नाताले मलेरिया समस्या नियन्त्रणका लागि आवश्यक स्रोतसाधन जुटाउन स्थानीय नेतृत्वसमक्ष प्रभावकारी सञ्चार /पहल गर्छु ।					
३.	सङ्गठन प्रबन्ध क्षमता	पूर्णतः सहमत	सहमत	तरस्थ	असहमत	पूर्णतः असहमत
३.१	मेरो सामुदायिक स्वास्थ्य स्वयंसेवक भूमिकाले सक्रिय मलेरिया समस्या निगरानीमा विभिन्न क्षेत्रमा ज्ञान र सहयोग आदानप्रदानलाई बढावा दिन्छ ।					
३.२	मेरो सामुदायिक स्वास्थ्य स्वयंसेवक भूमिकाले अन्य समुदायमा भएका सक्रिय मलेरिया समस्या नियन्त्रण कार्यअनुकूल आफ्नो समुदायका रणनीति बनाउन मद्दत गर्छ ।					
३.३	सामुदायिक स्वास्थ्य स्वयंसेवकको भूमिकाले मैले सक्रिय मलेरिया समस्या निर्मूल गर्ने नीतिको परिणाम सुधार्न राम्रा अभ्यासहरूलाई समुदायबिच आदानप्रदान गर्ने रणनीति बनाउनुपर्छ ।					
४	टोली निर्माण क्षमता					
४.१	मेरो सामुदायिक स्वास्थ्य स्वयंसेवक भूमिकाले स्वास्थ्य व्यवस्था (प्रणाली) सँग सहकार्यलाई प्राथमिकता दिन्छ ।					
४.२	मैले सामुदायिक स्वास्थ्य स्वयंसेवकका नाताले मासिक					

	रूपमा गर्ने सम्प्रेषण (रिपोर्टिङ) ले टोली भित्रका विवादलाई प्रभावकारी रूपमा समाधान गर्छ र सक्रिय मलेरिया समस्याको नियन्त्रणतर्फ ध्यान केन्द्रित गर्छ ।					
४.३	मेरो सामुदायिक स्वास्थ्य स्वयम् सेवी भूमिकाले सक्रिय मलेरिया समस्या नियन्त्रणका लागि सहयोगी वातावरण बनाउँछ र यसमा योगदान गर्न उत्प्रेरित गर्छ ।					

**भाग ४ : सक्रिय मलेरिया समस्याको निगरानीमा महिला सामुदायिक स्वास्थ्य स्वयंसेविकाको आत्म -
प्रभावकारीता(क्षमता)**

क्रसं .	भनाइहरू					पूर्णतः असहमत
		पूर्णतः सहमत	सहमत	तरस्थ	असहमत	
1.	सक्रिय मलेरिया समस्या प्रभावकारी रूपमा पहिचान गर्ने मेरो क्षमतामा म विश्वस्त छु।					
2.	म समस्या पत्ता लगाउन आर डि टी (RDT) प्रयोग गर्नेमा विश्वस्त छु।					
3.	मलेरियाका विरामीहरू पहिचान गरी उपचारका लागि स्वास्थ्य संस्थामा पठाउनेमा म विश्वस्त छु।					

4.	प्रारम्भिक प्रयासहरू असफल भएपनि मेरा पर्यवेक्षकलाई मलेरियाका समस्याहरू पछ्याउने कुरा मनाउनेमा म विश्वस्त छु।					
5.	समुदायमा(IEC) सामग्रीहरू संलग्न वा वितरण सामुदायिक परिस्थिति अनुकूल गर्ने मेरो क्षमतामा म विश्वस्त छु।					
6.	म मलेरिया समस्या निदान गरी स्वास्थ्य प्रदायकहरूलाई विवरण दिने / रिपोर्ट गर्नेमा विश्वस्त छु।					
7.	म मलेरिया समस्या पत्तालगाउन घरदैलो कार्यक्रममा मानिसहरूलाई सक्रिय रूपमा संलग्न गर्नेमा विश्वस्त छु।					
8.	म प्रारम्भिक प्रयास विफल भएपनि मलेरिया					

	समस्याको खोजी जारी राख्ने कुरामा विश्वस्त छु					
9.	मलेरिया समस्या पत्ता लगाउँदा लिइने निर्णयमा म विश्वस्त छु ।					
10.	दोस्रो पुस्तामा मलेरिया सङ्क्रमण हुन नदिने कुरामा म विश्वस्त छु।					

भाग ५ : सक्रिय मलेरिया समस्या निगरानीमा सामाजिक समर्थन

क्र.सं.	भनाइहरू					
		सधैं छ	प्राय जसों	कहिलेकाहीँ	विरलै	कहिल्यै छैन
१.	परिवारबाट भावात्मक तथा मानसिक सहयोग					
१.१	तपाईंको परिवारका सदस्यहरूले कयौँ पटक तपाईंप्रति चिन्ता, प्रेम र हेरचाह व्यक्त गर्नुहुन्छ ?					
१.२	तपाईंको घरपरिवारले कतिपटक घरायसी काम र बालबालिकाको जिम्मेवारीमा सहयोग गरेर यो काममा सक्रिय हुन स्वतन्त्र गरिदिनु हुन्छ?					
१.३	तपाईंको परिवारका सदस्यहरूले तपाईंले सामुदायिक स्वास्थ्य स्वायंसेवकका रूपमा					

	गर्नुभएको कामप्रति कति पटक गर्व व्यक्त गर्छन् ।					
२	समुदायबाट सूचनागत समर्थन					
२.२	तपाईंको समुदायले तपाईंलाई मलेरियाका सन्दिग्ध समस्याबारे कतिपटक जानकारी गराए ?					
२.२	मलेरिया समस्या निगरानीमा तपाईंका सपूर्ण क्रियाकलापमा तपाईंको समुदायका मानिसहरुले कतिपटक सक्रिय सहभागिता जनाए?					
२.३	मलेरिया समस्या सम्बन्धमा तपाईंको समुदायका मानिसहरुले तपाईंलाई कतिपटक निजी प्रतिक्रिया दिनुभयो ?					
३.	स्वास्थ्य प्रदायकहरुबाट सामग्री सहयोग					
३.१	स्वास्थ्यकर्मीहरुले तपाईंलाई आफ्नो कर्तव्य पूर्ण गर्न आवश्यक पर्ने स्वास्थ्य सामग्री, फारम, औषधी वा आपूर्ति कतिपटक उपलब्ध गराउँछन्?					
३.२	तपाईंका पर्यवेक्षकहरुले कतिपटक प्रशिक्षण पर्यवेक्षण वा अन्य सिकाइ					

	अवसरहरूमा पहुँचको सुविधा दिन्छन्?					
३.३	स्वयंसेवका रूपमा तपाईंले गर्नुभएको कामका लागि स्वास्थ्य कर्मीहरूले तपाईंलाई कति पटक आर्थिक प्रोत्साहन तथा क्षतिपूर्ति उपलब्ध गराउँछन्?					
४ .	स्वास्थ्य प्रदायकबाट पर्यवेक्षण					
	सहायक पर्यवेक्षण					
४ . १	के तपाईंले आफ्ना पर्यवेक्षकबाट आफ्नो कामका लागि प्रोत्साहन पाउनुभएको छ ?					
४ . २	तपाईंका पर्यवेक्षकले तपाईंका प्रश्नको उत्तर दिने र साथसहयोग दिने गर्नुभएको छ?					
४ . ३	के तपाईंले कामका क्रममा गल्ती भए कुनै प्रतिक्रिया पाउनुभएको छ ?					
	नियन्त्रणात्मक पर्यवेक्षण					
४ . ४	तपाईंले आफ्ना पर्यवेक्षकबाट कुनै जानकारी पाउँदा नमजा महसुस गर्नुभएको छ?					
४ . ५	के तपाईंका पर्यवेक्षकले तपाईंको कामलाई नियन्त्रण र प्रत्यक्ष					

	निगरानी गरेको पाउनुभएको छ?					
४.६	के तपाईंको पर्यवेक्षकले तपाईंको काममा विकल्प र छनोट प्रदान नगरेको पाउनुभएको छ ?					

भाग ६ : सक्रिय मलेरिया समस्या निगरानीको अनुभूति प्रदर्शन

कृपया आफ्नो उत्तरमा ✓ चिह्न लगाउनुहोस् वा खालीठाउँमा लेख्नुहोस्....

क्र सं	प्रश्न र कथनहरू	प्रतिक्रिया															
१	मलेरिया समस्याको निदान र उपचार																
१.१	के तपाईंले आफ्नो क्षेत्रमा मलेरिया उपचार गर्न आरडीटी (RDT) प्रयोग गर्नुभएको छ?	१. ☐ छ १. ☐ छैन															
१. २	तपाईं समुदायमा मलेरियाको निदान कसरी गर्नुहुन्छ?	<table border="1"> <thead> <tr> <th></th><th>हो</th><th>होइन</th></tr> </thead> <tbody> <tr> <td>१. आरडीटी (RDT) गरेर</td><td></td><td></td></tr> <tr> <td>१. मलेरिया ज्वरोका लक्षणहरू हेरेर</td><td></td><td></td></tr> <tr> <td>३. रगत परीक्षण गरेर</td><td></td><td></td></tr> <tr> <td>४ स्वास्थ्यकर्मीसँग परामर्श गरेर</td><td></td><td></td></tr> </tbody> </table>		हो	होइन	१. आरडीटी (RDT) गरेर			१. मलेरिया ज्वरोका लक्षणहरू हेरेर			३. रगत परीक्षण गरेर			४ स्वास्थ्यकर्मीसँग परामर्श गरेर		
	हो	होइन															
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४ स्वास्थ्यकर्मीसँग परामर्श गरेर																	
१.३	गतवर्ष कतिओटा मलेरियाका समस्या पत्ता लागेका छन् ?	 समस्या / वर्ष पटक / वर्ष															
२.	मलेरिया समस्याको उपचार																
२. १	के तपाईंले मलेरियाका विरामीको उपचार गर्नुभएको छ?	१. ☐ छैन २. ☐ छ															
२. २	तपाईं समुदायमा मलेरियाक विरामीहरूको उपचार कसरी गर्नुहुन्छ?	<table border="1"> <thead> <tr> <th></th><th>हो</th><th>होइन</th></tr> </thead> <tbody> <tr> <td>१. एएम (AM) उपचार विधिको पहिलो खुराक दिएर</td><td></td><td></td></tr> <tr> <td>२ .एसीटी (Plasmodium-falciparum (+) – use ACT) को प्रयोग गरेर</td><td></td><td></td></tr> </tbody> </table>		हो	होइन	१. एएम (AM) उपचार विधिको पहिलो खुराक दिएर			२ .एसीटी (Plasmodium-falciparum (+) – use ACT) को प्रयोग गरेर								
	हो	होइन															
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		३ मलेरिया विरोधी औषधी (Plasmodium vivax (+) uses chloroquine) दिएर																	
		४ आडीटी (RDT (-ve) patient with fever also used anti-malarial drugs) दिएर																	
२ . ३	तपाईंले गतवर्ष मलेरियाका विरामीको उपचार गर्नुभयो?	 समस्या / साल (वर्ष) पटक / साल (वर्ष)																	
३.	उपचारका लागि पठाइएका विरामी																		
३. १	के तपाईंले गतवर्ष मलेरियाका कुनै विरामीलाई स्वास्थ्य संस्था केन्द्रमा पठाउनुभएको छ?	१. ☐ छैन १. ☐ छ																	
३. २	स्वास्थ्य संस्था केन्द्रमा पठाइएका विरामी कस्ता प्रकृतिका हुन्छन्?	<table border="1"> <tr> <td></td><td>हो</td><td>होइन</td></tr> <tr> <td>१. गम्भीर (वान्तासँगै ज्वरो)</td><td></td><td></td></tr> <tr> <td>२. गर्भवती महिला</td><td></td><td></td></tr> <tr> <td>३. बालबालिका</td><td></td><td></td></tr> <tr> <td>४. ज्वरोमात्र आएका</td><td></td><td></td></tr> </table>				हो	होइन	१. गम्भीर (वान्तासँगै ज्वरो)			२. गर्भवती महिला			३. बालबालिका			४. ज्वरोमात्र आएका		
	हो	होइन																	
१. गम्भीर (वान्तासँगै ज्वरो)																			
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३. बालबालिका																			
४. ज्वरोमात्र आएका																			
३. ३	तपाईंले उपचारका लागि कतिओटा समस्या (विरामी) पठाउनुभएको छ?	 विरामी / साल (वर्ष) समय/ साल (वर्ष)																	
४.	मलेरिया रोकथाममा शिक्षाको आदानप्रदान																		
४ . १	के तपाईंले गतवर्ष समुदायमा मलेरिया रोकथाम सम्बन्धी ज्ञान आदानप्रदान गर्ने कुनै कार्यक्रममा भाग लिनुभयो?	१. ☐ छैन २. ☐ छ																	

४. २	तपाईं समुदायमा मलेरिया रोकथामको विषयमा ज्ञान कसरी प्रवाह गर्नुहुन्छ ?	<table border="1"> <tr> <td></td><td>हो</td><td>होइन</td></tr> <tr> <td>१. मोबाइलमा सन्देश पठाएर</td><td></td><td></td></tr> <tr> <td>२. रेडियो कार्यक्रम प्रसारण गरेर</td><td></td><td></td></tr> <tr> <td>३. समुदायमा कार्यक्रम गरेर</td><td></td><td></td></tr> <tr> <td>४. सामुदायिक मलेरिया अभियानद्वारा</td><td></td><td></td></tr> </table>		हो	होइन	१. मोबाइलमा सन्देश पठाएर			२. रेडियो कार्यक्रम प्रसारण गरेर			३. समुदायमा कार्यक्रम गरेर			४. सामुदायिक मलेरिया अभियानद्वारा		
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४. ३	मलेरिया रोकथामका सन्दर्भमा समुदायमा कति पटक ज्ञान प्रदान गर्नुभयो?	 पटक / वर्ष															
५.	आईईसी (IEC) सामग्री वितरण सम्बन्धमा																
५. १	के तपाईंले आईईसी (IEC) सामग्री वितरणमा भाग लिनुभएको छ?	१. ☐ छैन २. ☐ छ															
५. २	तपाईं आईईसी (IEC) जस्ता गतिविधिमा कसरी भाग लिनुहुन्छ?	<table border="1"> <tr> <td></td><td>हो</td><td>होइन</td></tr> <tr> <td>१. समुदायमापोस्टर पम्प्लेटहरूको वितरण गरेर</td><td></td><td></td></tr> <tr> <td>२. वातावरणीय अभियानमा सहभागी भएर</td><td></td><td></td></tr> <tr> <td>३. आमा समूहमा छलफल गरेर</td><td></td><td></td></tr> <tr> <td>४. मलेरिया अभियानद्वारा</td><td></td><td></td></tr> </table>		हो	होइन	१. समुदायमापोस्टर पम्प्लेटहरूको वितरण गरेर			२. वातावरणीय अभियानमा सहभागी भएर			३. आमा समूहमा छलफल गरेर			४. मलेरिया अभियानद्वारा		
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५. ३	तपाईं आईईसी (IEC) कार्यक्रममा कतिपटक सहभागी हुनुभयो?	 पटक/ वर्ष															
६.	मलेरिया जोखिमयुक्त वडाहरूमा घरदैलो कार्यक्रम																
६. १	तपाईं एल एलआइ एन (LLIN) को अवलोकन गर्न समुदायका घरहरूमा जानुभएको छ?	१. ☐ छैन २. ☐ छ															

६. २	तपाईंले घरदैलोको क्रममा एल एल आई एन (LLIN) को प्रयोग र अवस्थाबारे के देख्नुभयो?	<table border="1"> <tr> <td></td><td>हो</td><td>होइन</td></tr> <tr> <td>१. एलएलआई एन (LLIN) को प्रयोग र अवस्था राम्रै देखिँ</td><td></td><td></td></tr> <tr> <td>२. परिवारका सदस्यहरू एलएलआई एन । LLIN) भित्र सुत्छन् ।</td><td></td><td></td></tr> <tr> <td>३. एलएलआई एन (LLIN) भित्र प्वालजस्ता क्षति देखियो</td><td></td><td></td></tr> <tr> <td>४. परिवारका सदस्य एलएलआई एन (LLIN) को प्रयोग गर्दैनन्</td><td></td><td></td></tr> </table>		हो	होइन	१. एलएलआई एन (LLIN) को प्रयोग र अवस्था राम्रै देखिँ			२. परिवारका सदस्यहरू एलएलआई एन । LLIN) भित्र सुत्छन् ।			३. एलएलआई एन (LLIN) भित्र प्वालजस्ता क्षति देखियो			४. परिवारका सदस्य एलएलआई एन (LLIN) को प्रयोग गर्दैनन्		
	हो	होइन															
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४. परिवारका सदस्य एलएलआई एन (LLIN) को प्रयोग गर्दैनन्																	
६. ३	गतवर्ष घरदैलो कार्यक्रममा तपाईंले कतिओटा घर कति पटक समावेश गर्नुभयो ?	 घर/ वर्ष पटक/ वर्ष															
७.	मलेरिया समस्या अभिलेखन र सम्प्रेषण																
७. १	के तपाईंले मलेरिया समस्या अभिलेखन र सम्प्रेषणमा भाग लिनुभएको छ ?	१.[] छैन २. □ छ															
७. २	समस्याको अभिलेखन र सम्प्रेषण गर्दा के के कुरा समावेश गर्नुहुन्छ?	<table border="1"> <tr> <td></td><td>हो</td><td>होइन</td></tr> <tr> <td>१. विरामीको अवस्था र अन्य जानकारी</td><td></td><td></td></tr> <tr> <td>२. निर्धारित औषधिको विवरण</td><td></td><td></td></tr> <tr> <td>३. सम्प्रेषकको विवरण</td><td></td><td></td></tr> <tr> <td>. अन्य (अन्य गम्भीर विरामी)</td><td></td><td></td></tr> </table>		हो	होइन	१. विरामीको अवस्था र अन्य जानकारी			२. निर्धारित औषधिको विवरण			३. सम्प्रेषकको विवरण			. अन्य (अन्य गम्भीर विरामी)		
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	पर्यवेक्षकद्वारा स्वास्थ्य संस्थामा अभिलेखहरू प्रमाणित गर्नुहोस् ।	प्रश्नकर्ता /अन्तर्वार्ताकारको हस्ताक्षर.....
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तपाईंबाट प्राप्त सहयोग र सूचनाका लागि हार्दिक धन्यवाद!

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