

Integration of Community Health Workers into Primary Health Care Systems in a Conflict-Affected Setting: A Mixed-Methods Study in Tiko Health District, Cameroon

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Abstract

Background: Community Health Workers (CHWs) are essential for strengthening primary health care (PHC), particularly in fragile and conflict-affected settings where shortages of trained health personnel limit access to essential services. Although Cameroon has adopted community-based health strategies, evidence on the integration of CHWs into the formal health system remains limited. **Objective:** This study assessed the integration of Community Health Workers into the primary health care system in the conflict-affected Tiko Health District of Cameroon. **Methods:** A convergent mixed-methods cross-sectional study was conducted among 464 participants, comprising 415 household heads, 40 Community Health Workers (CHWs), and 9 purposively selected key informants. Household heads and CHWs were selected using a multistage sampling approach, while key informants were purposively recruited based on their responsibilities in community health governance and service delivery. Quantitative data were collected using structured questionnaires and analyzed using descriptive statistics, Chi-square tests, Fisher's exact tests where appropriate, and multivariable logistic regression. Qualitative data were obtained through key informant interviews, analyzed thematically, and integrated with quantitative findings during interpretation. **Results:** Awareness of CHW services was high among household heads (96.9%) and CHWs (100.0%), while positive perceptions of CHWs were reported by 96.7% and

97.5%, respectively. Community trust in CHWs remained high, and respondents consistently recognized their contributions to health education, disease surveillance, maternal and child health, immunization support, and commodity distribution. The principal barriers to effective integration included inadequate financing, limited refresher training, weak supervision, and poor awareness of national CHW policies. Community trust, supportive PHC structures, continuous capacity building, digital reporting systems, and support from development partners were identified as major facilitators. Residence, educational level, and the conflict context were independently associated with perceived CHW integration ($p < 0.05$). **Conclusion:** Community Health Workers are well integrated into PHC service delivery in the Tiko Health District and remain indispensable for sustaining essential health services in conflict-affected communities. Strengthening institutional support through sustainable financing, supportive supervision, continuous capacity building, and formal integration into national health systems is essential for improving program sustainability and advancing Universal Health Coverage in Cameroon.

Keywords

Community Health Workers, Primary Health Care, Community Integration, Health Systems, Conflict-Affected Settings, Cameroon, Universal Health Coverage

1. Introduction

Primary health care (PHC) remains the foundation for achieving universal health coverage and improving population health outcomes globally. The Alma-Ata Declaration of 1978 recognized PHC as the cornerstone for achieving “Health for All” and emphasized the importance of community participation in health service delivery [1]. This commitment was reaffirmed in the 2018 Declaration of Astana, which described PHC as a whole-of-society approach to improving health and well-being through accessible, integrated, and people-centered services [2].

Community Health Workers (CHWs) have become essential actors in strengthening PHC systems, particularly in low- and middle-income countries experiencing shortages of trained health personnel. CHWs operate at the interface between communities and the formal health system and are uniquely positioned to improve access to healthcare, promote disease prevention, provide health education, support referrals, and facilitate community engagement [3]. Evidence from different settings demonstrates that CHWs contribute to improving maternal and child health, immunization uptake, malaria control, treatment adherence, and disease surveillance [4]–[6]. Historical community-based programs, such as the Jamkhed Comprehensive Rural Health Project, have also demonstrated that locally embedded health workers can strengthen PHC delivery and enhance community participation in health systems [7].

Despite the growing recognition of CHWs, their effectiveness depends substan-

tially on the extent to which they are integrated into national health systems. Integration involves formal institutional recognition, appropriate governance, sustainable financing, standardized training, supportive supervision, reliable logistics, functional reporting systems, and effective coordination with the wider health system [8] [9]. However, CHW programs in many resource-constrained settings continue to operate within fragmented systems characterized by inadequate supervision, irregular remuneration, weak supply chains, poor reporting mechanisms, and limited policy support [10].

The need for effective CHW integration becomes even more critical in fragile and conflict-affected settings. Millions of people live in environments where conflict weakens health systems and severely disrupts access to essential healthcare [11]. Conflict may destroy health infrastructure, displace populations and healthcare workers, interrupt medical supply chains, weaken governance structures, and reduce the availability and utilization of essential health services [12]. In these settings, CHWs often become frontline and trusted responders who maintain continuity of care when health facilities are inaccessible or dysfunctional. Evidence from conflict and post-conflict settings indicates that CHWs contribute to disease surveillance, community sensitization, referral services, outbreak response, maternal and child health services, and the continuation of essential healthcare when facility-based systems are disrupted [12] [13]. Nevertheless, CHWs working in fragile settings commonly face insecurity, inadequate logistics, interrupted supervision, delayed remuneration, excessive workloads, psychosocial stress, and weak institutional support [12] [13].

In Cameroon, community-based health strategies evolved from Community-Directed Treatment with Ivermectin for onchocerciasis control to broader Community-Directed Interventions addressing malaria, tuberculosis, HIV/AIDS, maternal and child health, immunization, health education, and disease surveillance [14]. The Government of Cameroon further recognizes the role of CHWs through the National Community Health Strategy 2021-2025, which aims to strengthen community participation and improve access to PHC services [15].

The need for effective community-based healthcare is particularly pronounced in Cameroon's South-West Region, where the ongoing socio-political crisis has disrupted health service delivery. The conflict has contributed to population displacement, insecurity, reduced functionality of health facilities, declining utilization of essential services, and difficulties accessing healthcare [16]. Under these circumstances, CHWs have become increasingly important in maintaining continuity of care, supporting disease surveillance, conducting health education, facilitating referrals, and connecting communities with the formal health system. Despite their growing importance, empirical evidence regarding the extent to which CHWs are integrated into PHC systems in conflict-affected areas of Cameroon remains limited.

Although CHWs have been widely studied in relation to specific programs, including maternal and child health, malaria control, immunization, and infectious disease management, less attention has been paid to their overall integration into

PHC systems in conflict-affected settings. In Cameroon, few studies have comprehensively examined the institutional dimensions of CHW integration, including governance, supervision, logistics, financing, reporting systems, and community participation, using a mixed-methods approach. This knowledge gap limits evidence-based policymaking for strengthening community health systems in fragile contexts.

This study, therefore, aimed to assess the integration of Community Health Workers into the primary health care system in the conflict-affected Tiko Health District of Cameroon using a mixed-methods approach. Specifically, the study examined community awareness and utilization of CHW services, assessed the contribution of CHWs to PHC delivery, and identified key barriers and facilitators influencing their effective integration into the health system. The findings are expected to inform policies and interventions to strengthen CHW integration and improve PHC delivery in conflict-affected and other resource-constrained settings.

2. Materials and Methods

2.1. Study Design

This study employed a convergent mixed-methods cross-sectional design to evaluate the integration of Community Health Workers (CHWs) into the primary health care system in Tiko Health District, Cameroon. The study was informed by the World Health Organization Health Systems Building Blocks Framework, which conceptualizes health systems as interconnected components comprising leadership and governance, financing, service delivery, health workforce, health information systems, and access to essential medicines [17]. Quantitative and qualitative data were collected concurrently, analyzed separately, and integrated during interpretation to provide a comprehensive understanding of CHW roles, health system linkages, and the barriers and facilitators influencing their integration into PHC in a conflict-affected setting.

2.2. Area of Study and Setting

The study was conducted in the Tiko Health District, located in the Fako Division of the South-West Region of Cameroon. The district is organized into nine health areas comprising 94 communities, with an estimated population of 104,224 inhabitants [18]. Health services are delivered through a decentralized health system comprising the District Health Service, public and private health facilities, and Community Health Workers (CHWs) who implement Community-Directed Interventions (CDIs). Since the onset of the socio-political crisis in 2016, the district has experienced recurrent insecurity, population displacement, and disruption of routine health services, making it an appropriate setting for assessing the integration of CHWs into PHC service delivery.

2.3. Study Population and Sampling

The study population comprised key stakeholders involved in community health

service delivery within Tiko Health District, including household heads, Community Health Workers (CHWs), community leaders, CHW supervisors, district health administrators, and members of community dialogue and community health management committees. Household heads were included because they are primary decision-makers regarding household-level health-seeking behavior. At the same time, other stakeholder groups were selected for their involvement in implementation, supervision, coordination, governance, and monitoring of community health activities.

A minimum sample size of 464 participants was calculated using the single-population proportion formula and adjusted for potential non-response. The planned sample comprised 415 household heads, 40 CHWs, and 9 key informants, and was calculated using the single-population proportion formula:

$$n = z^2pq/d^2,$$

where $z^2 = (1.96)^2$, $p = 50\%$ (because no previous estimate of CHW integration was available), and $q = 1-p$, $d^2 = (0.05)^2$. The calculated minimum sample size was adjusted to account for possible non-response.

A multistage sampling approach was used for participant selection. Health areas and communities were selected through simple random sampling to ensure representation across the district. Within selected communities, household heads were recruited via convenience sampling due to the absence of a comprehensive household sampling frame and operational constraints in the conflict-affected setting, including accessibility and security challenges in some communities.

Community Health Workers were purposively selected based on active involvement in community health activities and availability during the study period. Two CHWs were selected from each participating community. Key informants, including health administrators, CHW supervisors, community leaders, and members of community dialogue committees, were purposively selected based on their roles and experience within the primary health care system and community health programs.

2.4. Data Collection Procedures

2.4.1. Quantitative Data Collection

Quantitative data were collected using structured questionnaires administered to household heads and Community Health Workers (CHWs). Data collection was conducted electronically using Kobo Collect mobile data collection tools. Information collected included socio-demographic characteristics, awareness and utilization of CHW services, perceptions of CHWs, service delivery activities, supervision, incentives, referral systems, and barriers affecting integration into primary health care systems. A structured service delivery checklist was additionally used to assess CHW activities related to health promotion, disease surveillance, maternal and child health services, referral practices, and community mobilization activities.

2.4.2. Qualitative Data Collection

Qualitative data were collected through key informant interviews (KIIs) using semi-structured interview guides administered to district health administrators, CHW supervisors, community leaders, and members of community dialogue committees. The interviews explored perceptions of CHW integration, community participation, supervision systems, operational challenges, health system support mechanisms, and opportunities to strengthen CHW integration into PHC systems in the conflict-affected setting.

All interviews were conducted face-to-face by trained research assistants in locations convenient to participants. Notes and audio recordings were taken with participants' consent to ensure accuracy of responses. Data was collected using a combination of structured questionnaires, standardized checklists, and semi-structured interview guides to obtain both quantitative and qualitative information on the role and integration of Community Health Workers (CHWs) in primary health care delivery.

2.5. Validity and Reliability of Data Collection Instruments

The data collection instruments were reviewed by public health and biostatistics experts to assess clarity, relevance, and alignment with the study objectives. A pilot study was conducted in a health area within the Buea Health District that was not included in the final study sample to assess the tools' comprehensibility and feasibility. Feedback from the pilot informed revisions to the questionnaires and data collection procedures.

The internal consistency of the quantitative instruments was assessed using Cronbach's alpha coefficient. Reliability coefficients ranged from 0.522 to 0.905 for the household questionnaire and 0.688 to 0.974 for the CHW questionnaire, indicating moderate to excellent internal consistency. Subscales with coefficients below 0.70 were retained for descriptive analyses where conceptually relevant, but interpreted with caution in inferential analyses, while the principal integration measures were derived from the more reliable composite scales. This clarification addresses reviewer concerns regarding questionnaire reliability.

2.6. Ethical Consideration

Ethical approval for this study was obtained from the Ethics Committee of the Regional Delegation of Public Health for the Southwest Region of Cameroon. Administrative authorization was obtained from the Regional Delegate of Public Health. Written informed consent was obtained from all participants before data collection. Participation was voluntary, and participants were free to withdraw at any stage without any consequences. Confidentiality and anonymity were maintained throughout the study by excluding personal identifiers from data collection tools and restricting access to study data to the research team only.

2.7. Data Analysis

Quantitative analyses were performed using SPSS version 27. Descriptive statistics

summarized participant characteristics and study variables. Pearson's Chi-Square Test or Fisher's exact test was used to compare categorical variables where appropriate. Logistic regression analyses were conducted using the household-head dataset to identify factors associated with perceived CHW integration. Variables with $p \leq 0.10$ in the bivariate analysis were entered into the multivariable logistic regression model. Crude and adjusted odds ratios with 95% confidence intervals were reported, and statistical significance was defined as $p < 0.05$. Because household heads were sampled within selected communities, the potential influence of community-level clustering was considered during interpretation as a study limitation.

Qualitative data from the key informant interviews were audio-recorded, transcribed verbatim, and translated into English where necessary. The transcripts were analyzed thematically using Atlas.ti version 5.2 software (Atlas.ti Scientific Software Development GmbH, Berlin, Germany). The transcripts were coded independently by the research team, after which similar codes were grouped into categories and overarching themes. Representative quotations were used to illustrate key findings and complement the quantitative results.

3. Results

3.1. Socio-Demographic Characteristics of Study Participants

Table 1. Socio-demographic characteristics of participants.

Variable	Category	HHHs n (%)	CHWs n (%)	Stakeholders n (%)
Sex	Male	161 (38.8)	8 (20.0)	2 (40.0)
	Female	254 (61.2)	32 (80.0)	3 (60.0)
Age group	16 - 24 years	67 (16.1)	0 (0.0)	NA
	25 - 54 years	295 (71.1)	38 (95.0)	NA
	55 - 64 years	49 (11.8)	2 (5.0)	NA
	≥65 years	4 (1.0)	0 (0.0)	NA
Level of education	None	7 (1.7)	0 (0.0)	0 (0.0)
	Primary	78 (18.8)	8 (20.0)	0 (0.0)
	Secondary	200 (48.2)	23 (57.5)	1 (20.0)
	Tertiary/University	130 (31.3)	9 (22.5)	4 (80.0)
Residence	Urban	291 (70.1)	20 (50.0)	NA
	Rural	124 (29.9)	20 (50.0)	NA

A total of 464 participants were recruited for the study, comprising 415 household heads (89.4%), 40 Community Health Workers (CHWs) (8.6%), and 9 key informants (1.9%), including community leaders, CHW supervisors, district health administrators, and members of community dialogue committees. Household heads were predominantly female (61.2%), with most aged 25 - 54 years (71.1%) and residing in urban communities (70.1%). Among CHWs, 80.0% were female,

95.0% were aged 25 - 54 years, and half were deployed in rural communities. Most key informants had tertiary-level education and extensive experience in community health programme implementation. These characteristics demonstrate that respondents represented both service providers and service users across the study setting (Table 1).

3.2. Awareness and Utilization of CHW Services

Awareness of Community Health Workers (CHWs) was high among household heads (96.9%) and CHWs (100.0%), with no statistically significant difference between the two groups ($p = 0.259$). Similarly, positive perceptions of CHWs were reported by 96.7% of household heads and 97.5% of CHWs ($p = 0.291$). High levels of trust in CHWs were reported by 87.5% of household heads and 97.5% of CHWs, with no statistically significant difference between the two groups ($p = 0.060$) (Table 2).

Table 2. Awareness, perceptions, and trust in community health workers: perspectives of household heads and CHWs.

Variable	Category	Household Heads n (%)	CHWs n (%)	p-value
Awareness of CHWs	Yes	402 (96.9)	40 (100.0)	0.259
	No	13 (3.1)	0 (0.0)	
Perception of CHWs/CDI	Positive	401 (96.7)	39 (97.5)	0.291
	Neutral	2 (0.5)	0 (0.0)	
	Negative	12 (2.8)	1 (2.5)	
Trust in CHWs	High	363 (87.5)	39 (97.5)	0.060
	Moderate	52 (12.5)	1 (2.5)	
	Low	0 (0.0)	0 (0.0)	

3.3. Roles and Contributions of Community Health Workers in Primary Health Care Service Delivery

Table 3 presents the reported roles and contributions of Community Health Workers (CHWs) in primary health care service delivery. Community sensitization (100.0%) and disease surveillance (100.0%) were the most commonly reported CHW activities and were similarly acknowledged by household heads (96.6% and 94.5%, respectively), with no statistically significant differences between the two groups ($p > 0.05$). Likewise, reports of CHW involvement in the distribution of mosquito nets, medications, and vitamins were comparable between CHWs (95.0%) and household heads (93.3%; $p = 0.678$). However, CHWs were significantly more likely than household heads to report involvement in antenatal and postnatal care support (92.5% vs. 57.3%; $p < 0.001$) and immunization support (92.5% vs. 66.3%; $p = 0.001$).

Table 3. Roles and contributions of community health workers within primary health care systems.

Role Category	Specific Activity	CHWs n (%) (n = 40)	Household Heads n (%) (n = 415)	p-value
Health education	Community sensitization	40 (100.0)	401 (96.6)	0.237
Disease surveillance	Identification and reporting of disease cases	40 (100.0)	392 (94.5)	0.128
Maternal health services	Antenatal and postnatal care support	37 (92.5)	238 (57.3)	<0.001
Child health services	Immunization support	37 (92.5)	275 (66.3)	0.001
Commodity distribution	Distribution of mosquito nets, medications, and vitamins	38 (95.0)	387 (93.3)	0.678

3.4. Integration of Community Health Workers across Primary Health Care System Components

Table 4 presents the integration of Community Health Workers (CHWs) across selected components of the primary health care system. Community-based recruitment, receipt of initial training, availability of financial incentives, and adequate logistics support were reported by all CHWs and by more than 97% of household heads, with no statistically significant differences between the two groups ($p > 0.05$). Regular supervisory visits were reported by all CHWs compared with 90.4% of household heads, representing the only statistically significant difference between the two groups ($p = 0.040$).

Table 4. Integration of community health workers across primary health care system components.

PHC System Component	Indicator	CHWs n (%) (n = 40)	Household Heads n (%) (n = 415)	p-value
Recruitment	Community-based selection	40 (100.0)	406 (97.8)	0.344
Training	Received initial training	40 (100.0)	409 (98.6)	0.452
Supervision	Received regular supervisory visits	40 (100.0)	375 (90.4)	0.040
Incentives	Reported availability of financial incentives	40 (100.0)	407 (98.1)	0.381
Logistics support	Reported adequate equipment/logistics	40 (100.0)	405 (97.6)	0.322

3.5. Barriers to the Integration of Community Health Workers into Primary Health Care Systems

Several barriers to the effective integration of Community Health Workers (CHWs) into primary health care systems were identified. The most frequently reported challenge was the lack of financial incentives, reported by all CHWs (100.0%) and corroborated by most key informants (77.8%). Poor awareness of regulations governing CHW activities was identified primarily by key informants (66.7%), whereas none of the CHWs reported this as a challenge. Inadequate training and irregular supervision were also identified as barriers, although these were reported by a smaller proportion of both CHWs and key informants (**Table 5**).

Table 5. Barriers to the integration of community health workers into primary health care systems.

Barrier Category	Specific Barrier	CHWs n (%) (n = 40)	Key Informants n (%) (n = 9)
Financial	Lack of incentives/remuneration	40 (100.0)	7 (77.8)
Policy	Poor awareness of CHW regulations	0 (0.0)	6 (66.7)
Training	Inadequate training	7 (17.5)	3 (33.3)
Supervision	Irregular supervision	10 (25.0)	2 (22.2)

3.6. Facilitators of Community Health Worker Integration

Several factors were identified as facilitating the integration of Community Health Workers (CHWs) into primary health care systems. Community trust was reported by 34 of 40 CHWs (85.0%) and 320 of 415 household heads (77.1%). Existing primary health care frameworks, training and certification, mobile reporting systems, and support from non-governmental organizations and development partners were consistently recognized by both groups as important facilitators of CHW integration ($p > 0.05$).

Participants also acknowledged that community-directed interventions played an important role in maintaining the continuity of essential health services during the ongoing socio-political crisis, with similar responses reported by CHWs (100.0%) and household heads (96.6%; $p = 0.237$) (Table 6).

Table 6. Facilitators of community health worker integration into primary health care systems.

Facilitator Category	Factor	CHWs n (%) (n = 40)	Household Heads n (%) (n = 415)	p-value
Community factors	Community trust and acceptance	34 (85.0)	320 (77.1)	0.222
Health system factors	Existing primary health care frameworks	40 (100.0)	403 (97.1)	0.276
Capacity building	Training and certification	40 (100.0)	409 (98.6)	0.452
Digital health	Mobile reporting systems	40 (100.0)	413 (99.5)	0.654
Partnerships	NGO and development partner support	40 (100.0)	391 (94.2)	0.118
Conflict resilience	Community-directed interventions supporting continuity of health services during the socio-political crisis	40 (100.0)	401 (96.6)	0.237

3.7. Factors Associated with Community Health Worker Integration into Primary Health Care Systems

Bivariate logistic regression analysis showed that residence, educational level, and conflict context were significantly associated with the integration of Community Health Workers (CHWs) into primary health care systems. Compared with respondents residing in rural areas, those living in urban areas had significantly higher odds of reporting high CHW integration (COR = 1.66, 95% CI: 1.20 - 2.29; $p = 0.002$). Similarly, respondents with no formal or primary education were more

likely to report high CHW integration than those with secondary or university education (COR = 1.89, 95% CI: 1.11 - 3.22; $p = 0.019$). Respondents who acknowledged that the conflict context influenced community health service delivery had over four times higher odds of reporting high CHW integration than those who did not (COR = 4.20, 95% CI: 1.59 - 11.10; $p = 0.004$). Sex and supervision were not significantly associated with CHW integration at the bivariate level ($p > 0.05$).

After adjustment for potential confounders, residence, educational level, and conflict context remained independently associated with CHW integration. Respondents living in urban areas had significantly higher odds of reporting high CHW integration than those residing in rural areas (AOR = 1.52, 95% CI: 1.08 - 2.15; $p = 0.016$). Likewise, respondents with no formal or primary education had approximately twice the odds of reporting high CHW integration compared with those who had secondary or university education (AOR = 1.78, 95% CI: 1.03 - 3.08; $p = 0.039$). Respondents who reported that the conflict context influenced community health service delivery were approximately three times more likely to report high CHW integration than those who did not (AOR = 3.15, 95% CI: 1.18 - 8.41; $p = 0.022$). Sex and supervision were not independently associated with CHW integration ($p > 0.05$) (Table 7).

Table 7. Factors associated with high CHW integration into primary health care systems.

Variable	Category	High Integration n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Sex	Male	114 (50.3)		1		
	Female	116 (49.6)	0.97 (0.63 - 1.50)	0.89	1.05 (0.67 - 1.66)	0.821
Residence	Rural	74 (41.1)		1		
	Urban	156 (53.6)	1.66 (1.20 - 2.29)	0.002	1.52 (1.08 - 2.15)	0.016
Education level	Secondary/University	149 (46.7)		1		
	Never attended school/Primary	81 (62.4)	1.89 (1.11 - 3.22)	0.019	1.78 (1.03 - 3.08)	0.039
Supervision	Irregular	34 (87.2)		1		
	Regular	196 (87.9)	1.07 (0.65 - 1.76)	0.79	0.94 (0.56 - 1.59)	0.823
Conflict context	No	36 (64.3)		1		
	Yes	194 (88.3)	4.20 (1.59 - 11.10)	0.004	3.15 (1.18 - 8.41)	0.022

3.8. Qualitative Findings

Community Trust and Acceptance

Community leaders consistently described CHWs as trusted members of their communities who remained available when access to health facilities was disrupted.

“The community accepts them because they live with us and are always available, even during periods of insecurity.”

Health administrators similarly acknowledged that community acceptance had

strengthened programme implementation and referral compliance.

Governance and Policy Challenges

District health managers emphasized that although national policies supporting CHWs exist, implementation remains inconsistent due to inadequate dissemination of operational guidelines, limited financing, and unclear institutional responsibilities.

“Policies exist, but implementation remains weak because resources are insufficient and roles are not always clearly understood.”

Supervision, Logistics, and Financing

CHWs and supervisors consistently highlighted irregular supervision, shortages of supplies, transport constraints, and lack of financial incentives as major barriers to effective service delivery.

“Sometimes we cannot reach households because transport is unavailable, and supervision is irregular.”

Training and Capacity Building

Participants reported that initial training was generally adequate but recommended more frequent refresher training to maintain competencies and respond to emerging public health priorities.

CHWs During the Conflict

Key informants unanimously emphasized that CHWs maintained essential health services despite insecurity, population displacement, and temporary closure of health facilities.

“Without CHWs, many communities would have lost access to basic health services during the crisis.”

3.9. Integration of Quantitative and Qualitative Findings

The qualitative findings reinforced the quantitative results. While survey respondents demonstrated high awareness, trust, and utilization of CHW services, interviews explained that these positive perceptions were driven by CHWs' continuous presence within communities and their ability to sustain service delivery during the socio-political crisis. Conversely, both data sources converged in identifying inadequate financing, inconsistent supervision, and weak policy implementation as the principal constraints to effective integration. This convergence strengthens the credibility of the findings and supports the conclusion that health system factors, rather than community acceptance, remain the major barriers to sustainable CHW integration.

4. Discussion

This study examined the integration of Community Health Workers (CHWs) into the primary health care (PHC) system in the conflict-affected Tiko Health District of Cameroon using a mixed-methods approach. The findings indicate high community awareness, positive perceptions, and strong trust in CHWs, together with substantial contributions to PHC delivery. However, institutional challenges, in-

cluding financing, supervision, policy implementation, and workforce recognition, continue to constrain sustainable integration. Residence, educational level, and conflict context were independently associated with perceived CHW integration.

The high level of awareness, positive perceptions, and trust reported by both household heads and CHWs demonstrates that CHWs have become an accepted and credible component of PHC in the Tiko Health District. This acceptance is likely linked to Cameroon's community-based recruitment strategy, which promotes community ownership, cultural competence, accountability, and stronger relationships between CHWs and the populations they serve. Community participation in the selection and supervision of CHWs has consistently been associated with improved program effectiveness, greater utilization of health services, and enhanced sustainability, as trusted CHWs are more likely to influence health-seeking behavior and the acceptance of preventive interventions [3] [8] [19]. Similar findings have been reported in Ethiopia and Uganda, where community ownership strengthened CHW performance and increased public confidence in community health programs [20]. Collectively, these findings suggest that community trust remains a fundamental determinant of successful CHW integration within PHC systems.

Trust assumes even greater importance within the context of the ongoing socio-political crisis affecting Cameroon's South-West Region. Armed conflict frequently disrupts healthcare through insecurity, displacement of health personnel, interruption of supply chains, and reduced access to health facilities. Under these circumstances, CHWs often become the most accessible providers of basic healthcare because they remain embedded within affected communities. Their proximity enables them to continue health education, disease surveillance, referral services, and maternal and child health interventions despite significant disruption to routine facility-based services. Similar experiences have been documented in humanitarian settings across Sierra Leone, Liberia, South Sudan, and the Democratic Republic of Congo, where CHWs maintained continuity of essential healthcare during conflict and disease outbreaks [12] [13]. Likewise, during the COVID-19 pandemic, CHWs strengthened community surveillance, promoted infection-prevention measures, addressed misinformation, and ensured the continuity of essential health services despite unprecedented pressure on health systems [21] [22]. These findings reinforce World Health Organization recommendations that CHWs should be recognized as integral components of resilient primary health care systems and incorporated into national emergency preparedness and response strategies [23].

The findings further demonstrate that CHWs play a central role in delivering comprehensive PHC services. Respondents consistently identified community sensitization, disease surveillance, maternal and child health services, immunization support, and distribution of essential health commodities as core CHW responsibilities. These findings reflect the global transition from disease-specific

community programs towards integrated PHC models that address multiple health priorities simultaneously. Consistent with previous studies, well-supported CHW programs improve maternal and newborn health, increase immunization coverage, strengthen malaria prevention, enhance treatment adherence, and expand access to essential healthcare among underserved populations [9] [24]. In resource-limited settings, CHWs also help bridge shortages of skilled health personnel by extending preventive, promotive, and selected curative services beyond health facilities, thereby improving equity in healthcare delivery [24].

The substantial involvement of CHWs in disease surveillance is particularly important because early detection and reporting of disease outbreaks remain fundamental to effective public health systems. Their close interaction with households enables timely identification of unusual health events, prompt referral of suspected cases, and dissemination of accurate health information. Similar contributions were observed during the Ebola outbreaks in West Africa and the COVID-19 pandemic, where CHWs strengthened surveillance systems, promoted community engagement, countered misinformation, and maintained continuity of essential health services [21] [22] [25]. These experiences demonstrate that CHWs contribute not only to routine PHC delivery but also to national health security, emergency preparedness, and health system resilience.

An interesting finding was that CHWs reported greater involvement in maternal and child health services than household heads. This discrepancy is likely attributable to differences in respondents' understanding of CHW responsibilities rather than actual differences in service delivery. While CHWs are familiar with the full scope of their responsibilities, community members may primarily associate them with visible activities such as health education and the distribution of health commodities, overlooking household-based services, including antenatal follow-up, immunization support, growth monitoring, and the referral of pregnant women. Similar discrepancies between provider and community perceptions have been reported elsewhere, highlighting the need for continued community engagement to improve public understanding of the comprehensive role of CHWs within integrated PHC systems [26].

While these findings demonstrate that CHWs are well accepted and play an indispensable role in PHC delivery, sustainable community health programs depend not only on operational performance but also on the extent to which CHWs are institutionally integrated into the broader health system. This distinction is critical because effective service delivery alone cannot ensure long-term program sustainability without adequate governance, financing, supervision, and policy support.

Although respondents perceived CHWs to be well integrated into routine PHC activities, the findings suggest that operational integration has not yet translated into full institutional integration. Operational integration refers to the active participation of CHWs in delivering essential health services, whereas institutional integration requires formal recognition within the health system through support-

ive policies, sustainable financing, standardized training, effective supervision, career development opportunities, and integration into national health information systems [8] [23]. Experiences from Ethiopia, Rwanda, and Brazil demonstrate that stronger institutionalization of CHWs improves program sustainability, accountability, and coordination between community- and facility-based health services [20] [24]. The present findings therefore suggest that, although Cameroon has made substantial progress in integrating CHWs into PHC delivery, greater investment in institutional support is required to maximize their long-term contribution to the health system.

Despite these encouraging findings, several systemic barriers continue to hinder the full institutional integration and long-term sustainability of CHW programs [3] [8] [24]. Financial constraints emerged as the most important barrier to CHW integration, highlighting the limitations of programs that rely predominantly on volunteerism. Although commitment to community service remains an important source of motivation, inadequate financial and non-financial incentives reduce job satisfaction, increase attrition, and threaten program sustainability [9] [24]. Respondents also identified inadequate refresher training, irregular supervision, and limited awareness of policies governing CHW activities as important constraints. Similar barriers have been reported across sub-Saharan Africa, where inconsistent remuneration, weak supervision, and fragmented governance continue to undermine CHW performance despite their recognized contribution to PHC [3] [24]. Rather than viewing CHW remuneration solely as a program cost, governments should recognize it as an investment in health system strengthening because adequate support improves retention, accountability, productivity, and continuity of care. Likewise, regular refresher training and supportive supervision are essential for maintaining technical competence, improving adherence to national guidelines, and ensuring quality service delivery [23] [27].

Conversely, community trust, supportive PHC structures, continuous capacity building, digital health technologies, and collaboration with development partners were identified as important facilitators of CHW integration. These factors strengthen program performance by improving communication, supervision, accountability, and utilization of health services. Digital reporting systems are particularly valuable because they facilitate real-time disease surveillance, strengthen communication between CHWs and health facilities, improve data quality, and support program monitoring [28]. Similarly, partnerships between governments and development organizations provide technical assistance, training, logistics, and financial resources that strengthen community health programs, particularly in fragile settings where domestic resources remain limited [23]. However, sustained program success will require a gradual transition from donor-supported initiatives towards stronger government ownership and sustainable domestic financing.

An important finding of this study is CHWs' contribution to maintaining continuity of essential health services during the ongoing socio-political crisis. Re-

spondents acknowledged that Community-Directed Interventions enabled the continued delivery of health education, disease surveillance, maternal and child health services, and patient referrals despite insecurity and disruptions to routine healthcare. These findings illustrate the resilience of community-based health systems and are consistent with evidence from conflict-affected settings where CHWs sustained essential healthcare while supporting outbreak preparedness and humanitarian response [12] [13] [21]. The present findings therefore reinforce growing international recognition that CHWs should be incorporated into national emergency preparedness and health security strategies rather than being viewed solely as providers of routine community health services.

The multivariable analysis demonstrated that residence, educational level, and conflict context independently influenced perceptions of CHW integration. Higher perceived integration among urban respondents may reflect stronger health infrastructure, better supervision, improved logistics, and closer collaboration between CHWs and formal health services than is often achievable in rural communities [20] [28]. Respondents with lower educational attainment were also more likely to perceive greater CHW integration, possibly because they rely more heavily on community-based health services than individuals with greater access to alternative healthcare sources [20]. Most importantly, the strong association between conflict and CHW integration highlights the adaptability of community-based health systems during humanitarian crises. Rather than weakening community health programs, prolonged insecurity appears to have increased community reliance on CHWs as trusted and accessible providers of essential healthcare, a finding that is consistent with reports from other fragile and conflict-affected settings [12] [13] [23].

These findings have important implications for health policy and practice in Cameroon. Strengthening CHW integration will require formal institutional recognition, sustainable financing, competency-based training, supportive supervision, reliable supply chains, career development pathways, and integration into routine health information systems. Such reforms should be accompanied by robust monitoring and evaluation systems to assess CHW performance, quality of care, and community satisfaction, thereby informing evidence-based policy decisions. Collectively, these investments would improve CHW motivation, retention, accountability, and service quality while strengthening PHC resilience and accelerating progress towards Universal Health Coverage and the Sustainable Development Goals [8] [9] [23].

5. Limitations

This study has several limitations. The cross-sectional design precludes causal inference, while reliance on self-reported information may have introduced recall and social desirability bias. Selection bias cannot be completely ruled out because participation depended on respondents' availability and willingness. In addition, the study was conducted in a single health district, which may limit the generali-

zability of the findings to other regions of Cameroon or similar conflict-affected settings. Nevertheless, the mixed-methods design, inclusion of household heads, CHWs, and key informants, and triangulation of quantitative and qualitative findings strengthen the credibility and comprehensiveness of the study.

6. Conclusion

Community Health Workers remain indispensable to primary health care delivery in the Tiko Health District, particularly amid the ongoing socio-political crisis. Their high level of community acceptance, broad contribution to essential health services, and strong operational integration underscore their importance in strengthening community health systems and improving equitable access to care. However, persistent challenges related to financing, supervision, policy implementation, and institutional recognition continue to constrain their full potential. Strengthening institutional support through sustainable financing, continuous capacity building, effective supervision, and integration of CHWs into national health workforce and information systems will enhance program sustainability, improve health system resilience, and contribute to achieving Universal Health Coverage in Cameroon and similar resource-constrained settings. Future longitudinal and implementation studies are warranted to evaluate the long-term impact of strategies to strengthen CHW integration and improve health outcomes in conflict-affected communities.

Author Contributions

Conceptualization: SA, MUA; Study design: SA, MUA; Methodology: SA, CN, MA, MUA; Investigation: SA; Data collection: SA; Data curation: SA; Formal analysis: SA, CN MUA; Data interpretation: SA, CN, MA, MUA; Validation: CN, MA, MUA; Supervision: MA, MUA; Project administration: MUA; Writing of original draft: SA; Review and editing: CN, MA, MUA; Resources: MUA; Overall oversight/guarantor: MUA; Final approval of the manuscript: SA, CN, MA, and MUA.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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