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Community Knowledge, Attitudes, and Preventive Behaviors Regarding Chikungunya Virus Infection in Burao, Somaliland: Implications for Vector Control and Public Health Interventions

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Abstract

Background: Chikungunya virus (CHIKV) poses a significant public health threat in Somaliland; however, community knowledge and preventive practices remain understudied in this region. This study aimed to assess the knowledge, attitudes, and preventive behaviors regarding CHIKV infection among Burao residents.

Methods: A community-based analytical cross-sectional study was conducted from March to June 2025 among 422 adult residents of Burao City, Somaliland, using a multistage cluster sampling technique. Data were collected through face-to-face interviews with a structured questionnaire adapted and validated for the local context. Knowledge, attitude, and preventive practice (KAP) scores were calculated, with ≥70% of the maximum score indicating good knowledge, positive attitudes, or good preventive practices. Descriptive statistics, chi-square tests, and multivariate survey-adjusted logistic regression analyses were performed to identify sociodemographic factors associated with KAP levels. Model diagnostics included an assessment of goodness-of-fit and multicollinearity. Statistical significance was set at $p < 0.05$.

Results: Awareness of CHIKV was very high at 97.4% (411/422; 95% CI: 95.3–98.5%), with most participants correctly identifying mosquitoes as the transmission vector (85.1%) and recognizing common symptoms such as fever and joint pain (91.0%). However, only 32.7% (95% CI: 28.3–37.3%) of participants demonstrated positive attitudes toward CHIKV prevention, and 44.5% (95% CI: 39.8–49.3%) exhibited good preventive practices. Higher educational attainment was associated with better knowledge (AOR = 5.28; 95% CI: 1.08–25.82) than among those with no formal education, while preventive practices varied across sociodemographic groups in adjusted analyses. Students also had higher odds of good knowledge (AOR = 3.14; 95% CI: 1.35–7.29). Age groups of 25–34 years (AOR = 2.65) and 35–44 years (AOR = 3.03) were more likely to have good knowledge than those aged 16–24 years. Employment status was positively associated with positive attitudes (AOR = 3.09; 95% CI: 1.81–5.28) among employed/farmer participants. Men had higher odds of good preventive practices than women (AOR = 1.56; 95% CI: 1.01–2.42), and participants aged 25–34 years were more likely to engage in good preventive behavior (AOR = 2.45; 95% CI: 1.20–5.01). Educational status and employment were not significantly associated with preventive practices in the adjusted model. Model diagnostics confirmed a good fit and no multicollinearity.

Conclusion: Despite high CHIKV awareness in Burao, positive attitudes and preventive practices remain low, revealing a significant knowledge–behavior gap. Although education strongly predicts knowledge, higher education and employment do not consistently improve preventive practices because of socioeconomic and structural barriers. Effective control requires integrated interventions beyond health education, including improved waste management, water infrastructure, and environmental sanitation. Tailored communication for educated and employed groups, combined with active community engagement and strengthened public health systems, is essential to enhance prevention and reduce outbreak risks.

Keywords: Chikungunya virus, knowledge, attitudes, practices, vector control, Somaliland, public health, arbovirus, mosquito-borne disease

1. Background

Chikungunya virus (CHIKV) is an arthropod-borne alphavirus transmitted primarily by *Aedes aegypti* and *Aedes albopictus* mosquitoes, which are the vectors responsible for dengue and Zika virus transmission [1, 2]. These arboviruses are responsible for significant mosquito-borne diseases that impact public health globally [3]. Since its first isolation in Tanzania in 1952, the virus has caused multiple outbreaks across Africa, Asia, and the Americas, infecting millions of people worldwide [1, 4-6]. The disease typically presents with a sudden onset of high fever, severe polyarthralgia, myalgia, rash, and fatigue [7, 8]. Although mortality is rare, Chikungunya is notorious for its long-lasting joint pain and debilitating symptoms, which can persist for months or even years, leading to reduced productivity and a significant socioeconomic impact [9].

In Africa, CHIKV has re-emerged cyclically, with an expanding geographic range over the recent decades [10, 11]. Increasing urbanization, weak vector surveillance, and climate variability have facilitated the proliferation of *Aedes* mosquitoes, particularly in semi-arid areas with poor waste management and inadequate drainage [12-14]. Consequently, outbreaks have been reported in several East African countries, including Kenya, Ethiopia, and Somalia, underscoring the growing public health threat posed by arboviral diseases in the Horn of Africa [15-19].

In Somaliland, mosquito-borne diseases are common; however, public health efforts have historically focused on malaria and dengue, leaving emerging arboviral infections, such as chikungunya, underrecognized. Furthermore, the limited diagnostic capacity and absence of systematic surveillance in Somaliland mean that many CHIKV cases may go undetected or be misdiagnosed as malaria or other febrile illnesses, thereby masking the true burden of the disease.

Evidence from local health authorities and surveillance reports indicates that Burao City experienced notable CHIKV outbreaks in 2017 and 2019, resulting in numerous febrile illnesses consistent with CHIKV infection [20]. More recently, a chikungunya outbreak was confirmed in the Sool region between January and June 2025, with 488 suspected cases reported and eight out of ten samples laboratory-confirmed [21], highlighting the ongoing vulnerability of urban populations to vector-borne epidemics and exposing substantial gaps in community awareness, environmental sanitation, and mosquito control measures in Somaliland. Despite these events, no comprehensive research has evaluated the level of community understanding of or behavioral response to chikungunya in Burao.

Burao, the second-largest city in Somaliland, has environmental and infrastructural conditions that are highly conducive to *Aedes* mosquito breeding. Poor drainage, accumulation of stagnant water, open waste disposal, and the presence of water storage containers in households provide optimal sites for the development of mosquito larvae [22]. Coupled with rapid urban expansion, limited health education, and weak disease surveillance, these factors sustain the risk of recurrent arboviral transmissions [23]. However, community perceptions of chikungunya, attitudes toward its prevention, and the extent of protective practices remain largely undocumented.

This persistent knowledge gap limits the effectiveness of vector control and outbreak preparedness efforts in the region. Without an adequate understanding of how residents perceive chikungunya and the behaviors influencing its transmission, public health interventions remain reactive rather than preventive in nature. To our knowledge, no prior study has examined community knowledge of and behavioral responses to CHIKV in Somaliland. An adequate understanding of community knowledge, attitudes, and preventive behaviors toward CHIKV infection is essential for designing targeted health education, behavioral change communication, and integrated vector management programs to prevent future outbreaks. This study, therefore, aimed to assess the knowledge, attitudes, and preventive practices related to CHIKV among the Somaliland population, thereby filling a critical gap in the regional understanding of CHIKV epidemiology and informing tailored public health interventions

2. Methods

2.1. Study Design and Setting

A community-based analytical cross-sectional study was conducted in Burao City, the capital of the Togdheer Region in Somaliland, between March and June 2025, which experienced major chikungunya virus outbreaks in 2017 and 2019, underscoring the urgent need to evaluate community-level awareness and preventive behaviors toward mosquito-borne diseases. Burao is the second-largest city in Somaliland, with an estimated population of approximately 750,000 people. The city is administratively divided into several major zones and neighborhoods, which served as the basis for our multistage sampling. Burao City, the capital of the Togdheer Region, is divided into four major zones. Eleven neighborhoods were randomly selected across these zones for participant recruitment. Burao experiences a semi-arid climate with bimodal rainfall and average annual temperatures ranging from 24 to 32°C. Owing to intermittent rainfall, poor drainage, and open waste accumulation, standing water is common in residential and peri-urban areas, creating ideal breeding sites for Aedes mosquitoes. The city experienced two major chikungunya virus outbreaks in 2017 and 2019, underscoring the urgent need to evaluate community-level awareness and preventive behaviors toward mosquito-borne diseases.

2.2. Study Population

The study population comprised adult residents (≥18 years) living in selected neighborhoods in Burao City. Eligible participants were individuals aged 18 years and older who had resided in the selected neighborhoods for at least six months prior to the study and were willing and able to provide informed consent. Individuals were excluded if they were visitors or temporary residents with less than six months of residence in the area or if they were unable to provide informed consent due to illness, cognitive impairment, or communication difficulties at the time of data collection. Individuals who declined to participate were also excluded from the study.

2.3. Sample Size and Sampling Technique

A total of 422 participants were included in this study. The sample size was calculated using a single population proportion formula, assuming a 50% expected prevalence of good knowledge of chikungunya virus infection (due to the absence of prior KAP data for Somaliland), a 95% confidence level, and a 5% margin of error, with an additional 10% allowance for potential non-response. To account for the multistage cluster sampling design, a design effect of 1.5 was applied. We employed a multistage cluster sampling technique. Burao City is administratively divided into four major zones (districts), all of which were included in the sampling frame. Within these zones, a list of neighborhoods was compiled in collaboration with local administrative authorities. From this list, we selected 11 neighborhoods (clusters) using simple random sampling across the zones. The number of neighborhoods selected per zone was determined based on logistical feasibility and the overall required sample size rather than proportional allocation by zone population. Thus, neighborhoods were not equally selected from each zone, but all zones were represented in the final sample.

The final sample was distributed across the selected clusters, with cluster sizes ranging from 25 to 92 participants. The allocation of the sample across clusters was influenced by household availability and field implementation considerations rather than strict proportional allocation to population size. Within each selected cluster, a comprehensive household list was obtained or constructed with the assistance of local leaders to serve as the sampling frame. Households were then selected using systematic random sampling, with the sampling interval determined by dividing the total number of households in each cluster by the required sample size for that cluster. The first household was selected randomly within the interval, and subsequent households were selected using the fixed interval approach. Within each selected household, one eligible adult respondent (≥18 years) who had resided in the household for at least six months was selected. If more than one eligible individual was present, one participant was chosen using a simple random (lottery) method.

2.4. Data Collection Instrument and Procedure

Data were collected using a structured questionnaire adapted from previously published knowledge, attitudes, and practices (KAP) studies on mosquito-borne diseases [24-27] and modified for the local context of Burao, Somaliland. Data were collected using a structured questionnaire originally developed in English and then translated into Somali for administration. The translation process involved forward translation by bilingual experts fluent in English and Somali, followed by independent back-translation into English to ensure conceptual equivalence and linguistic accuracy. Discrepancies were resolved through consensus among the translators and the research team. The Somali version was pilot-tested on 20 adult respondents from a neighborhood outside the study sample to assess clarity, cultural relevance, and reliability. Feedback from the pilot led to minor wording and formatting adjustments. The internal consistency of the final Somali questionnaire was acceptable, with Cronbach's alpha values of 0.78 (knowledge), 0.74 (attitudes), and 0.76 (preventive practices). The questionnaire comprised sections on sociodemographic characteristics, knowledge about CHIKV transmission, symptoms, prevention, and treatment, attitudes toward disease seriousness and prevention, and preventive practices, including mosquito net and repellent use and environmental management. The English version of the final questionnaire is provided as Supplementary File 1 for reference (see Supplementary File 1). These measures support the validity and reliability of the instrument in this setting.

2.5. Measurement of Variables

Participants' knowledge, attitudes, and preventive practices (KAP) toward CHIKV infection were assessed using the structured questionnaire described in Section 2.4, which was adapted from previously validated KAP instruments [24, 27, 28]. Each item within the knowledge, attitude, and practice domains was scored dichotomously. For the knowledge domain, responses were coded based on established clinical and epidemiological evidence regarding CHIKV infection. Specifically, correct responses were assigned a score of 1, while incorrect and "do not know" responses were assigned a score of 0. The correct-response coding for key knowledge items was defined as follows: awareness of CHIKV (yes = correct), transmission by mosquitoes (yes = correct), CHIKV and dengue being the same disease (no = correct), person-to-person transmission (no = correct, as CHIKV is not transmitted through casual human contact), recognition of common symptoms such as fever and joint pain (yes = correct), absence of specific antiviral treatment or widely available vaccine (yes = correct), identification of standing water as a mosquito breeding source (yes = correct), and awareness that *Aedes* mosquitoes primarily bite during the daytime (yes = correct). These coding decisions are consistent with the current epidemiological understanding of CHIKV transmission dynamics and clinical presentation.

For attitude items, responses reflecting favorable perceptions toward disease severity, personal risk, and prevention (e.g., "Agree" or "Strongly Agree" for positively framed statements) were scored as 1, whereas unfavorable or neutral responses were scored as 0. For preventive practice items, responses indicating consistent engagement in recommended behaviors (e.g., "always" or "often") were scored as 1, whereas inconsistent or absent practices (e.g., "sometimes," "rarely," or "never") were scored as 0.

The maximum possible scores were 23 for knowledge, 22 for attitudes, and 16 for preventive practices. To categorize overall KAP levels, a threshold of ≥70% of the maximum score was applied for each domain, consistent with the commonly used criteria in KAP studies [29]. Accordingly, participants scoring ≥17 points for knowledge, ≥16 points for attitudes, and ≥12 points for preventive practices were classified as having "good knowledge," "positive attitudes," and "good preventive practices," respectively. These cutoffs balance sensitivity and specificity in identifying adequate KAP levels; however, they remain arbitrary conventions. To assess the robustness of our findings to the choice of threshold, sensitivity analyses were conducted using alternative cutoffs of 60% and 80%. These analyses showed consistent patterns in the distribution of KAP levels and associations with sociodemographic factors, confirming the stability of our main results.

The psychometric reliability of the questionnaire, evaluated during the pilot testing phase, demonstrated acceptable internal consistency across all domains. Cronbach's alpha values were 0.78 for knowledge, 0.74 for attitudes, and 0.76 for preventive practice. In the final sample ($n = 422$), the observed mean scores were 19.06 ± 2.04, 13.83 ± 4.37, and 10.93 ± 2.06 for knowledge, attitudes, and preventive practices, respectively. Score distributions for knowledge and preventive practices were approximately normal, whereas attitude scores exhibited mild skewness, a characteristic noted and accounted for in subsequent statistical analyses. While dichotomization of KAP responses facilitates analysis and comparison, it may reduce the variability and richness of the data, which is an acknowledged limitation of this approach

2.6. Data Processing and Analysis

Data were entered, cleaned, and analyzed using Stata version 17.0 (StataCorp, College Station, TX, USA). Prior to analysis, the dataset was checked for completeness, consistency, and accuracy. Questionnaires with substantial missing or incomplete responses were excluded during the data cleaning process. The final analytical dataset contained complete observations for all variables included in the descriptive and regression analyses. Descriptive statistics, such as frequencies and percentages, were used to summarize the variables. The association between sociodemographic characteristics and KAP levels was initially examined using the chi-square test. Variables with a p-value ≤ 0.25 in the bivariate analysis were considered for inclusion in the multivariate models to avoid excluding potentially important predictors, following established recommendations for variable selection in epidemiological studies [30-32].

Multivariate survey-adjusted logistic regression was performed to identify independent predictors of good knowledge, positive attitude, and good preventive practice, to account for clustering at the village level; all regression analyses were conducted using survey-adjusted (svy) commands in Stata, which provide robust standard errors that account for intraclass correlation. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were reported, and statistical significance was set at $p < 0.05$. Model diagnostics included the assessment of goodness-of-fit using the Hosmer-Lemeshow test and evaluation of multicollinearity among independent variables using variance inflation factors (VIF). Variables with VIF values greater than 10 were considered indicative of multicollinearity and addressed accordingly. No significant multicollinearity was detected in the final models. Owing to limitations in data completeness and collection scope, certain potentially relevant covariates, such as household size, detailed income levels, and access to health information, were not included in the multivariate models.

3. Results

3.1. Sociodemographic Characteristics of Participants

This study included 422 participants with a mean age of 35.9 ± 10.3 years (range, 18–72 years). Most respondents were aged 25–34 years (33.2%, n=140) and 35–44 years (32.0%, n=135), while 18–24 years accounted for 13.7% (n=58) and those aged 45+ represented 21.1% (n=89). Women constituted the majority of the sample (66.1%, n=279) compared to men (33.9%, n=143). More than half of the participants were married (58.8%, n=248), followed by single individuals (24.2%, n=102), with smaller proportions reporting being divorced (10.2%, n=43) or widowed (6.9%, n=29). Educational attainment varied, with nearly half of the participants having no formal education (45.0%, n=190), while others had completed primary/secondary (25.5%, n=108) or tertiary education (29.3%, n=124). Regarding employment status and occupational category, nearly half of the participants were unemployed (48.1%, n=203), followed by employed/farmers (37.4%, n=158), students (14.5%, n=61), (Table 1).

3.2. Knowledge of Chikungunya Virus Infection

Knowledge of CHIKV was high in the community. The high awareness of CHIKV among participants is consistent with the recent history of outbreaks in Burao, including the 2017 and 2019 events [20] and the ongoing outbreak in early 2025 in the Sool region [21]. This contextual backdrop likely contributed to the elevated knowledge levels observed. Almost all participants had heard of the disease (97.4%, n = 411), and most correctly identified mosquitoes as the transmission vector (85.1%, n = 359) and recognized fever and joint pain as symptoms **(**91.0%, n = 384**).** Awareness of mosquito-breeding risks was similarly high, with 91.9% (n = 388) identifying standing water as a contributing factor. However, knowledge gaps remained: only 39.6% (n = 167) correctly indicated that there is no specific treatment or vaccine, and 61.6% (n = 260) were aware that CHIKV-transmitting mosquitoes bite during the day. The mean knowledge score was 19.06 ± 2.04 (range, 8–23) (Table 2).

3.3. Attitudes Toward Chikungunya Virus and Its Prevention

Attitudes toward CHIKV prevention were mixed but overall less favorable. Most participants agreed or strongly agreed that CHIKV is a serious disease **(**87.7%, n = 370**)** and that mosquito control is important **(**79.4%, n = 335**).** However, only 32.7% met the threshold for an overall positive attitude. Perceived personal risk was reported by 68.5% (n = 289)**,** while 80.3% (n = 339) acknowledged potential long-term health effects. The average overall attitude score was 13.83 ± 4.37 (range, 5–22) (Table 3).

3.4. Preventive Practices Against Chikungunya Virus Infection

Preventive practices were also inconsistent. Night-time mosquito net use was reported by 66.1% (n = 279)**,** whereas regular use of repellents was low **(**24.9%, n = 105**).** Elimination of standing water was practiced by 47.4% (n = 200)**.** Regarding health-seeking behavior, 49.8% (n = 210) reported seeking medical care for mosquito-related illnesses in the past year, and 44.3% (n = 187) had received CHIKV-related health education in the past six months. The mean practice score was 10.93 ± 2.06 (range, 6–16) (Table 4).

3.5. The overall Knowledge, Attitude and Preventive Practices

Most participants demonstrated good knowledge **(**90.0%, 95% CI: 86.7–92.5%**),** while 10.0% (95% CI: 7.4–13.2%) had poor knowledge of the disease. Positive attitudes were observed in 32.7% (95% CI: 28.3–37.3%), whereas 67.3% (95% CI: 62.6–71.8%) had negative attitudes. Good preventive practices were reported by 44.5% (95% CI: 39.8–49.3%)**,** while 55.5% demonstrated poor practices of preventive measures. (Figure 1)

3.6. Summary of Bivariate (Chi-square) and Multivariate Logistic Regression Analysis of Sociodemographic Variables Associated with Knowledge, Attitude, and Preventive Practice

Bivariate analyses were conducted using chi-square tests to screen potential predictors for inclusion in the multivariate models. Variables with a P-value ≤ 0.25 were considered eligible for adjustment in the final regression models. In the bivariate analyses, educational and employment status/occupational categories were associated with knowledge levels. For attitudes, employment status/occupational category and age met the inclusion criterion, whereas preventive practices were associated with sex and age. All multivariate logistic regression models were fitted using survey-adjusted logistic regression (svy: logistic) with clustering at the village level. The following reference categories were used consistently across models: male sex was compared to female; unmarried participants were compared to married, single, and widowed categories as separate levels; no formal education was the reference for educational status; unemployed was the reference for employment status/occupational category; and age group 16–24 years served as the reference category. To address sparse data in some categorical levels identified during the preliminary analysis, occupational and educational categories were collapsed prior to modeling, and no zero-cell frequencies were present in the final analytic dataset.

In the knowledge model, tertiary education was strongly associated with higher odds of good knowledge compared to no formal education (AOR = 5.28; 95% CI: 1.08–25.82; $p = 0.042$), while primary/secondary education was not significant. Students had higher odds of good knowledge relative to unemployed participants (AOR = 3.14; 95% CI: 1.35–7.29; $p = 0.013$), whereas the employed/farmer category showed no significant association. Age was independently associated with knowledge, with participants aged 25–34 years (AOR = 2.65; 95% CI: 1.08–6.50; $p = 0.037$) and 35–44 years (AOR = 3.03; 95% CI: 1.12–8.19; $p = 0.033$) showing higher odds compared to the 16–24 years group. In the attitude model, employed/farmer participants had significantly higher odds of positive attitudes compared to unemployed individuals (AOR = 3.09; 95% CI: 1.81–5.28; $p = 0.001$), while students showed no significant difference. Age was inversely associated with attitudes among participants aged 25–34 years (AOR = 0.40; 95% CI: 0.20–0.79; $p = 0.014$), whereas other age categories were not significant.

In the preventive practice model, males had higher odds of good preventive practices than females (AOR = 1.56; 95% CI: 1.01–2.42; $p = 0.046$). Participants aged 25–34 years were also more likely to engage in good preventive practices than the 16–24 years reference group (AOR = 2.45; 95% CI: 1.20–5.01; $p = 0.019$), while older age groups were not significantly different. Educational status and employment status/occupational category were not significantly associated with preventive practices after adjustment. Model diagnostics confirmed the adequacy of all fitted models (Table 5). The Hosmer–Lemeshow goodness-of-fit test showed an acceptable fit for knowledge ($\chi^2 = 3.41$, $p = 0.906$), attitude ($\chi^2 = 4.59$, $p = 0.800$), and preventive practice ($\chi^2 = 4.75$, $p = 0.784$), with no evidence of lack of model fit. Multicollinearity diagnostics using variance inflation factors (VIF) indicated low collinearity among predictors (mean VIF = 2.39; range approximately 1.26–3.64), well below conventional thresholds. These findings confirm that the final models were stable, statistically robust, and free from significant multicollinearity or structural violations.

4. Discussion

This study comprehensively assessed community knowledge, attitudes, and preventive practices (KAP) regarding Chikungunya virus (CHIKV) infection in Burao, Somaliland, an area recently affected by recurrent arboviral outbreaks. The findings demonstrated a striking pattern of high community awareness and knowledge (90.0%), contrasted with low positive attitudes (32.7%) and suboptimal preventive practices (44.5%). This clear dissociation between knowledge and behavior highlights a persistent, structurally driven knowledge–practice gap in vector-borne disease prevention in this setting.

The high level of knowledge observed is consistent with repeated outbreak exposure in the region, particularly the documented chikungunya virus outbreaks in Burao City in 2017 and 2019 [20], as well as the more recent outbreak confirmed in the Sool region in early 2025 [21]. These events have likely contributed to the effective dissemination of basic information regarding CHIKV transmission and symptoms. Most participants correctly identified mosquito transmission (85.1%), recognized fever and joint pain as key symptoms (91.0%), and acknowledged environmental risk factors such as stagnant water (91.9%) [20, 21]. However, important misconceptions persisted, particularly regarding treatment availability and transmission dynamics, indicating that knowledge is broad but not fully comprehensive or clinically precise.

Despite this high level of awareness, preventive practices remained considerably lower, with fewer than half of respondents reporting good preventive behaviors. While mosquito net use was relatively common (66.1%), consistent use of repellents (24.9%) and environmental control measures, such as eliminating standing water (47.4%), was limited. This pattern is consistent with findings from other East African and South Asian settings, where high awareness does not translate into sustained behavioral change, largely due to structural, economic, and environmental constraints rather than informational deficits alone [24, 33-36].

The observed knowledge–practice gap in Burao appears to be more pronounced than in comparable settings, such as northern Tanzania, where higher proportions of the population report consistent preventive behavior [37]. This suggests that contextual determinants, particularly infrastructural limitations such as irregular water supply, inadequate drainage systems, and inefficient waste management, play a critical role in sustaining mosquito breeding environments and limiting individuals' capacity to act on knowledge. Importantly, water supply interruptions in this context primarily lead to household water storage in open or semi-covered containers, which inadvertently increases vector breeding risk [38-41].

Attitudes toward CHIKV prevention were also relatively weak, with only one-third of respondents demonstrating positive attitudes. Although a large proportion of participants acknowledged that CHIKV is a serious disease and that mosquito control is important, their willingness to actively participate in prevention campaigns was notably low. This indicates a disconnect between cognitive recognition of disease severity and behavioral motivation. Such gaps have been documented in other vector-borne disease contexts and are often associated with low perceived personal susceptibility, limited trust in public health initiatives, and competing socioeconomic priorities [33, 35, 42].

The multivariate analysis further clarifies the determinants of these KAP outcomes. Educational attainment emerged as a strong predictor of knowledge, with tertiary-educated individuals being more than five times more likely to demonstrate good knowledge than those with no formal education (AOR = 5.28, 95% CI: 1.08–25.82). Similarly, students showed higher knowledge levels, suggesting that exposure to formal learning environments significantly enhances awareness of infectious diseases. Age was also associated with knowledge, with individuals aged 25–34 and 35–44 years showing higher odds of good knowledge than younger respondents. However, higher knowledge levels were not consistently associated with improved preventive practices in the adjusted analysis. Interestingly, our analysis revealed that individuals with tertiary education and those who are employed were less likely to engage in preventive practices against

Chikungunya virus infection. Although this finding appears counterintuitive, it may reflect factors such as perceived lower personal risk or limited time availability to implement preventive measures. However, these interpretations remain speculative, as our data do not directly assess these factors. Therefore, we frame these explanations as hypotheses that warrant further investigation in future studies to better understand the underlying reasons for this association.

One plausible explanation is that individuals with higher socioeconomic status may perceive lower personal risk or rely more on structural interventions than on individual preventive actions. Additionally, time constraints associated with employment and urban lifestyles may reduce engagement in household vector control activities. However, these interpretations remain hypothetical and were not directly assessed in the present study. Similar paradoxical associations between higher education, employment status, and lower engagement in preventive behaviors have been reported in studies on vector-borne diseases conducted in different settings, where structural constraints, behavioral perceptions, and competing socioeconomic priorities may override knowledge-driven actions [24, 43-46]

Sex differences were also observed, with males being more likely to engage in preventive practices than females (AOR = 1.56, 95% CI: 1.01–2.42). This finding contrasts with several studies in which women are typically more engaged in household health practices [47-51], suggesting that sex roles in Burao may influence exposure patterns and responsibility for environmental management differently. The 25–34 years age group was associated with higher knowledge and preventive practices but lower positive attitudes, suggesting potential differences in how demographic factors influence KAP domains related to mosquito-borne diseases [24, 52, 53]. This may reflect a complex interaction between exposure to information, perceived invulnerability, and competing socioeconomic priorities during the economically active years.

Employment status showed mixed effects across KAP domains. While students demonstrated significantly higher knowledge (AOR = 3.14, 95% CI: 1.35–7.29), individuals in the employed/farmer category exhibited higher odds of positive attitudes (AOR = 3.09, 95% CI: 1.81–5.28) but lower engagement in preventive behavior [24, 54]. These inconsistencies indicate a gap between awareness and sustained preventive behavior, highlighting the need for further investigation of contextual barriers

Collectively, these findings have important implications for CHIKV control strategies in Somaliland. The persistence of a pronounced knowledge–practice gap suggests that conventional health education interventions alone are unlikely to achieve substantial behavior change. Instead, interventions should prioritize behaviorally informed approaches that address perceived risk, environmental constraints, and the feasibility of preventive actions. Importantly, strategies must be tailored to specific population subgroups, particularly educated and employed individuals who paradoxically demonstrate lower levels of preventive engagement.

The policy implications emerging from these findings emphasize the necessity of multifaceted strategies. Although health education remains important, it must be complemented by practical measures, such as improved waste management, reliable water infrastructure, and environmental sanitation, to reduce vector habitats. Additionally, tailored communication strategies should specifically engage educated and employed subgroups, addressing their unique perceptions and barriers to preventive behavior. The active involvement of community and religious leaders can enhance trust and motivation, whereas strengthening public health systems through enhanced surveillance and diagnostic capacity will support timely outbreak detection and response.

The use of a ≥70% threshold for categorizing KAP levels, although widely applied in similar studies, remains inherently arbitrary and may influence prevalence estimates, particularly the high proportion of participants classified as having good knowledge. This should be considered when interpreting the magnitude of KAP outcomes and when comparing the results with those of studies using different classification criteria [24, 33].

This study has several limitations. The cross-sectional design limits causal inferences between sociodemographic factors and KAP outcomes. Self-reported practices may be subject to social desirability bias, potentially leading to overestimation of preventive behaviors. Additionally, the study was conducted in an urban setting only, limiting its generalizability to rural and nomadic populations in Somaliland. Furthermore, the absence of key variables, such as household income, access to health information, and environmental risk mapping, may result in residual confounding and underestimation or misattribution of the effects of key determinants on KAP related to CHIKV infection. For instance, income levels could explain why highly educated individuals might still struggle with preventive practices if they cannot afford repellents or screened housing [20, 21].

Despite these limitations, this study provides novel empirical evidence of CHIKV-related KAP in a previously under-researched setting in the Horn of Africa. The findings underscore that knowledge alone is insufficient to drive preventive behavior and that structural and behavioral determinants play decisive roles in shaping community responses to vector-borne disease risks.

5. Conclusion

This study offers critical insights into community knowledge, attitudes, and preventive behaviors regarding Chikungunya virus infection in Burao, Somaliland. Despite high awareness of CHIKV (97.4%), positive attitudes (32.7%) and preventive practices (44.5%) remain substantially low, underscoring a significant disconnect between knowledge and behavior. Higher educational attainment was associated with improved knowledge levels; however, preventive practices varied across education and occupation groups in the adjusted analysis, indicating the influence of practical, socioeconomic, and structural barriers.

These findings support the need for integrated interventions that combine risk communication with practical environmental and service-delivery measures. These should include targeted improvements in waste management, water supply infrastructure, and environmental sanitation to reduce vector breeding sites. Tailored communication strategies that specifically address the unique perceptions and constraints of educated and employed subgroups, combined with the active engagement of community and religious leaders, are essential to enhance motivation and the adoption of preventive behaviors. Strengthening public health systems through enhanced surveillance, diagnostic capacity, and supportive urban policies will further bolster sustainable vector control efforts. Addressing both informational gaps and the underlying socioeconomic and infrastructural constraints is vital to bridge the knowledge–practice gap, thereby mitigating the risk of future CHIKV outbreaks in Burao and comparable settings.

List of abbreviations

AOR - Adjusted Odds Ratio

CHIKV - Chikungunya virus

CI - Confidence Interval

IRB - Institutional Review Board

KAP - Knowledge, Attitudes, and Practices

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the Faculty of Health Sciences at Burao Central University College, Somaliland (reference number: BCUC/22/25), prior to its implementation. All participants were informed about the study's purpose, procedures, potential risks, and benefits, and were assured of confidentiality and their right to withdraw at any time without penalty. Written informed consent was obtained from all literate participants prior to data collection. For participants without formal education, the consent form was read aloud in Somali by trained research assistants, and verbal consent was obtained in the presence of an independent witness, who signed the consent form to confirm the participant's agreement. The independent witness was selected from community members unaffiliated with the study team and without any vested interest in the research. All study procedures involving human participants were conducted in accordance with the ethical standards of the institutional and national research committees and the 1964 Declaration of Helsinki and its subsequent amendments.

Consent for publication

Not applicable

Clinical Trial Number

Not applicable

Availability of data and material

The datasets generated and/or analyzed in the current study are not publicly available owing to privacy considerations but are available from the corresponding author upon reasonable request. Both the final Somali-translated and original English versions of the questionnaire used in this study have been deposited in a public repository and are accessible via (https://doi.org/10.5281/zenodo.19714975), enabling transparency and reuse in similar research contexts.

Competing Interests

The authors declare no conflicts of interest.

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Authors' contributions

DKY served as the principal and corresponding author of this study. DKY designed the study, collected and analyzed the data, interpreted the results, drafted the manuscript, and critically reviewed and approved the final version of the manuscript. FOA, MOF, and MOA contributed to the study design, data collection, and manuscript review. All authors reviewed the manuscript, agreed on the target journal for submission, and accepted responsibility for all aspects of the study. Additionally, all authors contributed to the conceptualization of the study and critical revision of the manuscript for important intellectual content and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the study were appropriately investigated and resolved.

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Figure 1: The overall Knowledge, Attitude and Preventive Practices toward Chikungunya Virus Infection among Residents of Burao, Somaliland.

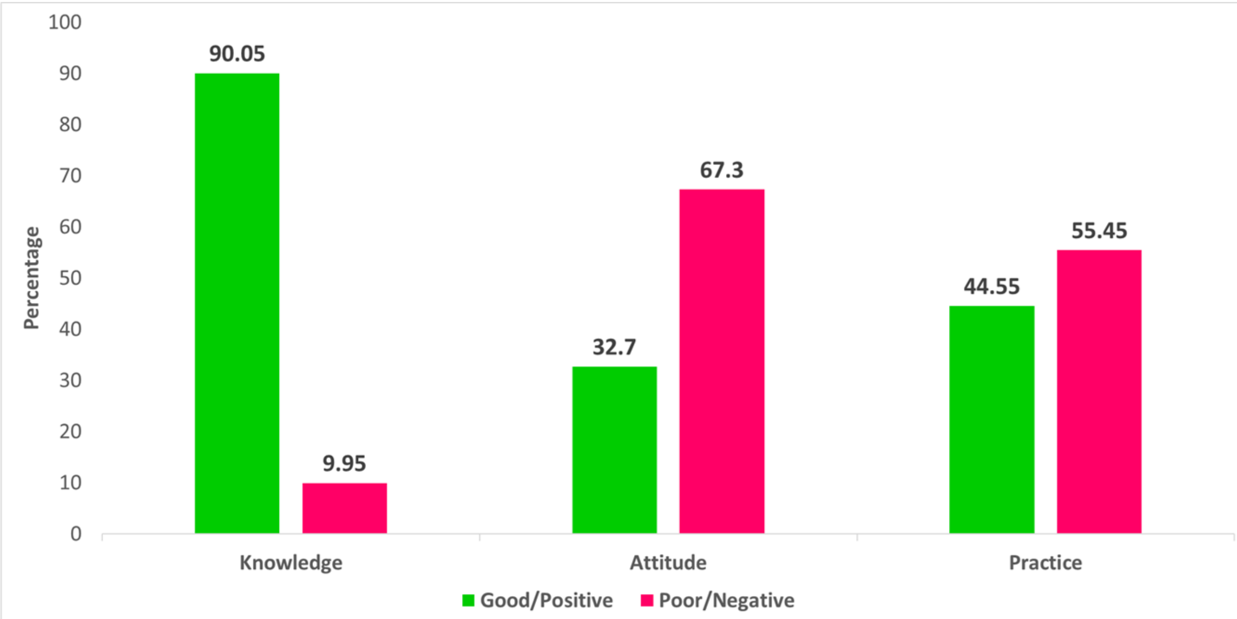

Table 1: **Sociodemographic Characteristics of Participants**

Variables	**Category**	**Frequency**	**Percentage**
Age category	18-24	58	13.74
	25-34	140	33.18
	35-44	135	31.99
	45+	89	21.09
Sex	Female	279	66.11
	Male	143	33.89
Marital status	Single	102	24.17
	Married	248	58.77
	Divorced	43	10.19
	widowed	29	6.87
Educational status	No formal education	190	45.02
	Primary/Secondary	108	25.59
	Tertiary	124	29.38
Employment status and occupational category	Unemployed	203	48.10
	Employed/farmer	158	37.44
	Student	61	14.45

Table 2: **Knowledge of Chikungunya Virus Infection**

Question / Item	**Yes**	**No**	**Not sure**
Have you ever heard of CHIKV?	411(97.39%)	11(2.61%)	
CHIKV is transmitted by mosquitoes.	359(85.07%)	25(5.92%)	38(9.00%
CHIKV and Dengue are the same disease.	137(32.46%)	225(53.32%)	60(14.22%)
CHIKV can be transmitted from person to person.	307(72.75%)	90(21.33%)	25(5.92%)
Fever and joint pain are symptoms of CHIKV.	384(91.00%)	13(3.08%)	25(5.92%)
CHIKV has no specific treatment or vaccine.	167(39.57%)	166(39.34%)	89(21.09%)
Standing water increases mosquito breeding.	388(91.94%)	18(4.27%)	16(3.79%)
Mosquitoes that transmit CHIKV bite during the day.	260(61.61%)	84(19.91%)	78(18.48%)
Overall knowledge score	Mean (±SD) = 19.06 ± 2.04 Range = 8-23		

Table 3: **Attitudes Toward Chikungunya Virus and Its Prevention**

Statement	Agree	Disagree	Neutral	Strongly agree	Strongly disagree
CHIKV is a serious disease.	122(28.91%)	20(4.74%)	26(6.16%)	248(58.77%)	6(1.42%)
I believe I am at risk of getting CHIKV.	195(46.21%)	57(13.51%)	56(13.27%)	94(22.27%)	20(4.74%)
I believe CHIKV can lead to long-term health problems.	129(30.57%)	38(9.00%)	35(8.29%)	210(49.76%)	10(2.37%)
I believe mosquito control is important in preventing CHIKV.	130(30.81%)	49(11.61%)	32(7.58%)	205(48.58%)	6(1.42%)
I am willing to participate in CHIKV prevention campaigns.	129(30.57%)	56(13.27%)	30(7.11%)	117(27.73%)	90(21.33%)
Overall attitude score	Mean (±SD) = 13.83 ± 4.37 Range = 5-22				

Table 4: **Preventive Practices Against Chikungunya Virus Infection**

Behavior / Practice	Always	Never	Sometimes
Do you use mosquito nets at night?	279(66.11%)	29(6.87%)	114(27.01%)
Do you use mosquito repellents or sprays?	105(24.88%)	30(7.11%)	287(68.015)

Do you eliminate standing water near your home?	200(47.39%)	70(16.59%)	152(36.02%)
Do you wear protective clothing to avoid mosquito bites?	181(42.89%)	32(7.58%)	209(49.53%)
	Yes	**No**	
Have you sought medical care for mosquito-related illness in the past year?	210(49.76%)	212(50.24%)	
Have you received any health education about CHIKV in the past 6 months?	187(44.31%)	235(55.69%)	
Overall practice score	Mean (±SD) = 10.93 ± 2.06 Range = 6-16		

Table 5: **Bivariate and Multivariable Survey-Adjusted Logistic Regression Analysis of Sociodemographic Factors Associated with KAP toward Chikungunya Virus**

Variables	Category	Good/Positive (n)	Poor/Negative (n)	Chi-square	P-value	AOR (95% CI)	P-value
Knowledge level	**Employment status**			6.64	0.036		
	Unemployed (Ref)	175	28			Ref	–
	Employed/Farmer	147	11			1.20 (0.40–3.63)	0.715
	Student	58	3			3.14 (1.35–7.29)	0.013*
	Educational status			11.17	0.004		

	No formal education (Ref)	162	28			Ref	–
	Primary/Secondary	98	10			1.76 (0.77–4.05)	0.159
	Tertiary	120	4			5.28 (1.08–25.82)	0.042*
	Age group (years)			2.78	0.427		
	16–24 (Ref)	50	8			Ref	–
	25–34	130	10			2.65 (1.08–6.50)	0.037*
	35–44	122	13			3.03 (1.12–8.19)	0.033*
	45+	78	11			2.41 (0.65–8.85)	0.164
Attitude level	**Employment status**			21.29	<0.001		
	Unemployed (Ref)	133	70			Ref	–
	Employed/Farmer	81	77			3.09 (1.81–	0.001*

						5.28)	
	Student	70	54			0.96 (0.34–2.70)	0.936
	Age group (years)			3.56	0.314		
	16–24 (Ref)	24	34			Ref	–
	25–34	43	97			0.40 (0.20–0.79)	0.014*
	35–44	39	96			0.45 (0.20–1.03)	0.058
	45+	32	57			0.55 (0.20–1.50)	0.214
Preventive practice level	**Sex**			0.79	0.374		
	Female (Ref)	120	159			Ref	–
	Male	68	75			1.56 (1.01–2.42)	0.046*
	Age group (years)			3.84	0.280		
	16–24 (Ref)	19	39			Ref	–

	25–34	64	76			2.45 (1.20–5.01)	0.019*
	35–44	63	72			2.24 (0.85–5.91)	0.094
	45+	42	47			2.28 (0.80–6.53)	0.112

asterisk (*) indicating statistically significant at $p < 0.05$
AOR = Adjusted Odds Ratio; CI = 95% Confidence Interval; Ref = Reference