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Clinicians' Knowledge, Attitude, and Practice on Rheumatic Heart Disease Prevention in Bomet County, Kenya

Annette MARCELLA AKINYI[1*], Jonathan NTHUSI[1] and Jonathan STEEN[2]

Authors' Affiliation

[1] Department of Family Medicine, School of Medicine and Health Sciences, Kabarak University
[2] Department of Medical Services, Tenwek Hospital, Bomet

[*] Corresponding author: marcellaannette@gmail.com

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ABSTRACT

Rheumatic Heart Disease (RHD), a complication of Beta-Hemolytic Streptococcal infection, is a leading cause of cardiovascular mortality globally, particularly in Sub-Saharan Africa (SSA). While prevention strategies are increasingly emphasized, there is a recognized gap in assessing clinicians' knowledge, attitude, and practice (KAP) towards RHD prevention, especially in high-burden settings like Kenya. This study aimed to evaluate the KAP of clinicians regarding RHD prevention in Chepalungu, Bomet County, addressing this specific research gap. This was a cross-sectional study involving 98 clinicians from peripheral facilities in Chepalungu, Bomet County, conducted over four months. Data were collected using a questionnaire that assessed demographics, knowledge, attitude, and practice related to RHD prevention. Data analysis involved descriptive statistics (frequencies and proportions), Odds Ratios, and Chi-Square tests to determine associations between variables. The majority of participants demonstrated good overall knowledge, attitude, and practice concerning RHD prevention. However, critical knowledge gaps were identified in areas vital for patient management. Specifically, only 4% (4 out of 98 participants) had good knowledge of the diagnostic tests for bacterial pharyngitis and the correct duration of antibiotic prophylaxis. A statistically significant relationship was found between knowledge and practice (CI 95%, p=0.024) and between attitude and practice (CI 95%, p=<0.001). The study reveals generally positive attitudes and practices towards Acute Rheumatic Fever (ARF) and RHD management but also highlights significant knowledge deficits among clinicians. These findings underscore the critical need for continued medical education and ensuring accessible treatment guidelines across all healthcare levels to enhance RHD prevention efforts.

Keywords: Group A Streptococcus, Acute Rheumatic Fever, Rheumatic Heart Disease, Primary Health Care Workers

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INTRODUCTION

Rheumatic Heart Disease (RHD) is a major preventable cause of cardiovascular morbidity and mortality worldwide, arising as a complication of untreated or inadequately treated Group A Streptococcus (GAS) throat infections that progress to Acute Rheumatic Fever (ARF) (Auala et al., 2022). Children and young adults aged 3–15 years from low socioeconomic backgrounds are especially vulnerable due to factors such as overcrowding, malnutrition, and limited access to quality healthcare (Kumar et al., 2020). Globally, an estimated 40 million people live with RHD, which contributes to over 300,000 deaths and millions more living with disability each year (Bimerew et al., 2021; Dougherty et al., 2023). Sub-Saharan Africa (SSA) bears a disproportionate burden, with prevalence rates as high as 5–7 per 1,000 children compared to 0.5 per 1,000 in high-income countries (Kumar et al., 2020; Melaku et al., 2021).

In Kenya, studies indicate high rates of GAS throat infections, with a prevalence of 38.4% at Kenyatta National Hospital (Kunga et al., 2018) and 9.5% among children in Bomet County (Murugami et al., 2021). According to the Global Burden of Disease Study, Kenya exceeds the endemicity threshold for RHD (Watkins et al., 2015), which is reflected in the significant impact on school attendance, quality of life, and long-term health outcomes for affected children.

Prevention strategies are well established and span primordial, primary, secondary, and tertiary levels. These include improving living conditions to reduce transmission, timely diagnosis and treatment of GAS infections, prophylaxis with Benzathine Penicillin, and surgical interventions for advanced cases (Auala et al., 2022; Watkins et al., 2016). However, implementation remains weak at primary care levels in many SSA settings, despite policy commitments such as the Addis Ababa and Abuja Communiqués emphasizing decentralized diagnosis and treatment services (Watkins et al., 2016).

Persistent high prevalence suggests significant gaps in clinicians' knowledge, attitudes, and practices (KAP) regarding RHD prevention. Few studies in SSA have systematically evaluated these gaps, and evidence is mixed: research in Sudan and Cameroon indicates average to low knowledge levels among medical professionals, often improved only with targeted interventions (Osman et al., 2015; Nkoke et al., 2020). A Nigerian study showed poor KAP scores among primary health workers (Isezuo et al., 2023), and research in Zambia highlighted the consequences of poor clinical assessment, with children often treated for sore throats without skilled evaluation (Musuku et al., 2017).

Despite Kenya's high RHD burden, there is a lack of context-specific studies assessing KAP among frontline clinicians especially in rural counties where primary care providers are the first point of contact. Understanding these gaps is critical for informing capacity-building initiatives and ensuring that prevention strategies translate into practice.

In response, this study evaluates the knowledge, attitudes, and practices of clinicians regarding RHD prevention in peripheral healthcare facilities in Chepalungu Sub County, Bomet County, Kenya addressing a significant research gap and providing evidence to strengthen local and regional prevention efforts.

METHODOLOGY

Research Design

The study was a prospective cross sectional survey study. This study design was selected as the research was conducted over a specified time period and involved all the primary health care workers in a specific sub county. The prevention of Rheumatic Heart Disease is a continuous process involving many stakeholders in the primary care field hence a prospective cross-sectional survey was considered best suited design for the study.

Location of the Study

The study was conducted in Chepalungu Sub County of Bomet County (Figure 3). At levels 2, 3 and 4 facilities within the Sub County. Chepalungu Sub County is among the five sub counties of Bomet County. It is situated south of the county and is among the populous of the sub counties contributing to 18.8% of the County's population (Bomet County Spatial Plan, 2023).

Preliminary studies assessing distribution patterns of Rheumatic Heart Disease patients attending cardiac clinic at Tenwek Hospital show that the majority of the patients are from Chepalungu Sub County in Bomet County. This made for reasonable grounds to evaluate if there were any gaps in what the health care providers in the sub county knew and practiced in a bid to address Rheumatic Heart Disease burden.

Population of the Study

The study population was derived from health care workers based in level 2, 3 and 4 facilities in Chepalungu Sub County in Bomet County. This is because often when patients are unwell their first point of contact to seek health services is often the

lower cadre care facilities before they are referred up the chain of care to larger and more specialized hospitals. These include nurses, clinical officers and medical officers who for the purpose of this study, are collectively referred to as clinicians since they all form the first point of contact for patients in facilities.

Sampling Technique

The study population was sampled through a convenience sampling method, the primary health care workers in the sub county were considered appropriate study participants and were conveniently sampled based on them being the first point of contact for patients. The health care workers totaled 132; 3 Medical Officers, 33 Clinical Officers and 96 Nursing Officers. They all were then randomly sampled through stratified random sampling as per their cadre with the aim to have them all represented and still achieve the requisite sample size as calculated below.

Sample Size

The sample size was calculated using the formula: $n = z^2P(1–P)/d^2$. A confidence interval of 95%, an expected frequency of 50%, and an acceptable margin of error of 5% were used. The minimum sample size was determined to be 384 and was adjusted for a finite population (N=132) using the formula $n = N \times n/N+n$. The final sampled population was thus 98.

Data Collection Instruments

The data collection tool used in this study was adopted and modified from a questionnaire previously used to conduct a similar study on Knowledge, Attitude and Practice on Rheumatic Heart Disease among Medical Students in Cameroon but was modified to fit the context of this study and to be in keeping with the Kenya Cardiovascular Management Guidelines.The modified data collection tool was piloted at Tenwek Hospital with data presets generated helping to guide tool application.

Data Collection procedures

The study participants consented prior to being asked to fill the data collection tool which was a questionnaire that had 4 sections: Demographic data, Knowledge, attitude and practice assessment areas.

The respondents were given serial numbers to retain anonymity and to prevent bias during data analysis. The questionnaires were administered face to face and in instances where the facilities were far, the questionnaires would be dropped and picked a day or two after. The consent form was on the first page of the questionnaire with details of ethical approvals as well to allow the sampled participants to decide whether to be part of the study or not. The face-to-face questionnaires were checked for completion prior to being collected. The physical forms were collected, sorted and stored in a safe cabinet under lock and key. The data was then entered onto an excel sheet for ease of analysis. The questionnaires have been stored in a safe accessible only by the researcher in case of need for future reference.

Data Analysis

Data were analyzed using STATA version 14. Descriptive statistics involved frequencies and proportions, presented using tables and charts for univariate analysis. Bivariate analysis was done using Chi-square analysis or Fisher's exact test at a 95% confidence interval to assess the relationship between knowledge, attitude, and practice grades (dependent variables) and independent variables such as institution level, gender, and age. Outcomes generating categorical data were also analyzed using Odds Ratios. Statistical significance was determined by a P-value of 0.05.

Ethical Considerations

Ethical clearance was obtained from Tenwek Hospital Institutional Ethics Review Committee; Protocol 2024-0012; as well as the National Commission for Science, Technology and Innovation (NACOSTI); License No; NACOSTI/P/24/36464. Study participants were consented and identities serialized to retain anonymity and to prevent bias during data analysis. There was expected minimal environmental impact from the study. The papers used for the physical questionnaires have been stored in a safe only accessible by the researcher once the data from them had been tabulated onto excel sheets.

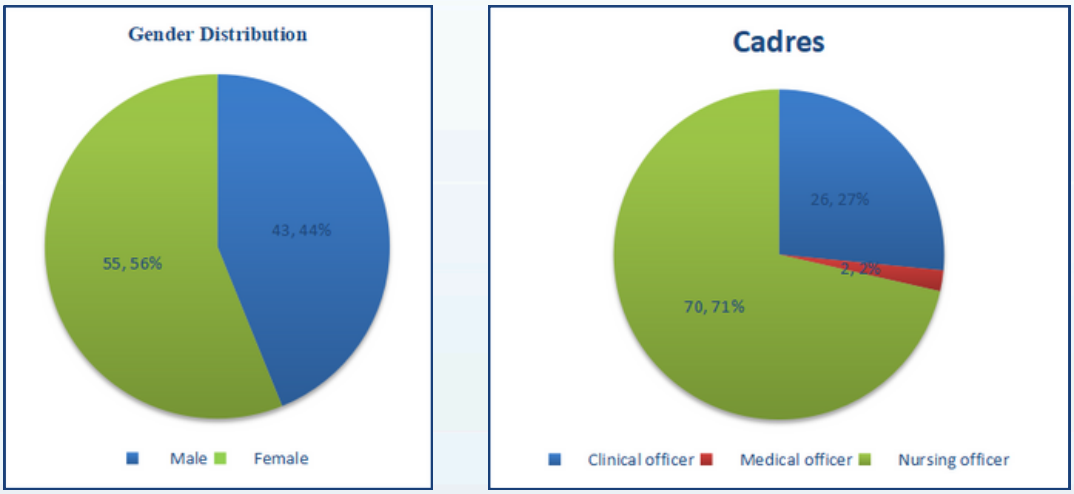
RESULTS

Demographics

A total of 98 participants were involved in this study, with more females than males captured. The distribution of the cadres and gender is as summarized in the charts below.

Figure 1:

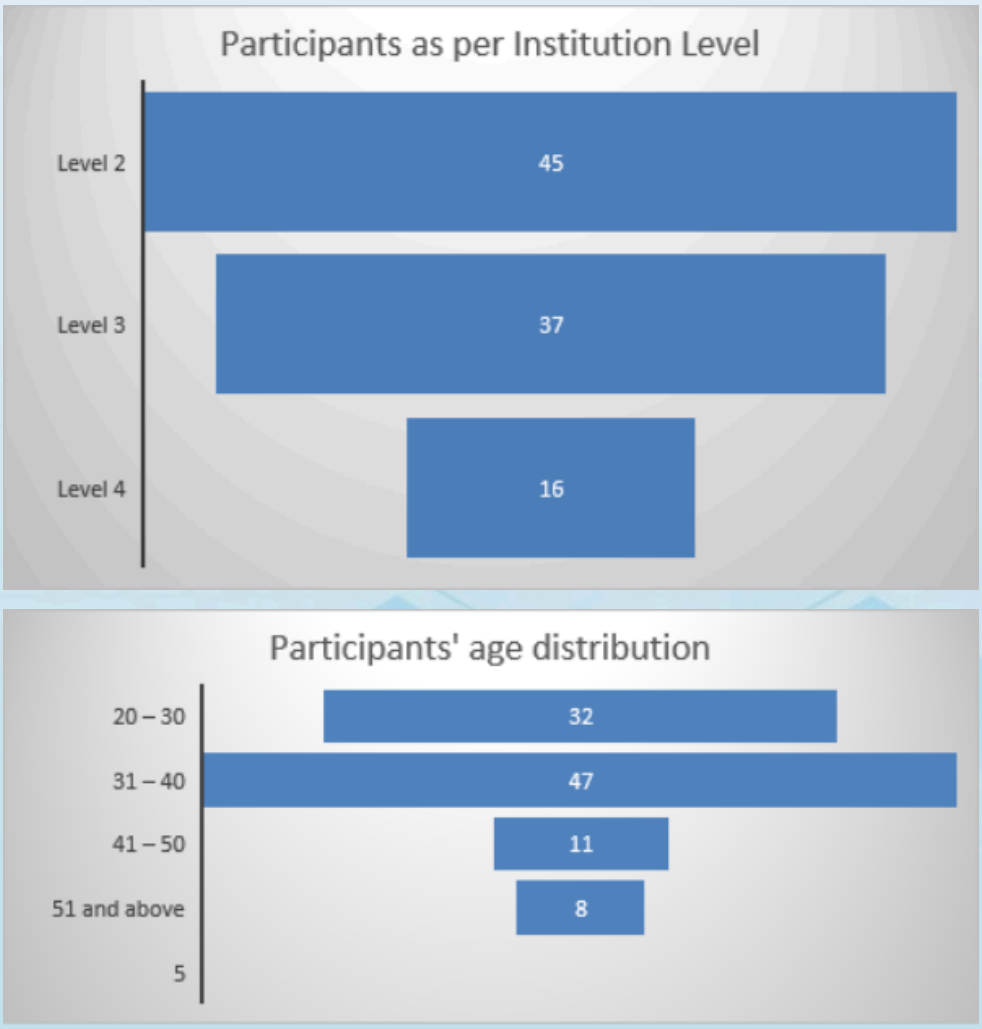
Summary of the Distribution of Gender and Cadre of the Participants



The total number of facilities that were involved in the study were 28. Majority of the participants were in level 2 facilities where most diagnostic services are limited. It is vital to note that medical officers were only in level 4 facilities. The majority of the participants were aged between 31-40 years. The length of service was however not linked to their responses thus it would be hard to assess whether experience had any influence on their attitude, practice or knowledge. This distribution is summarized in the table below.

Figure 2:

Summary of Age Distribution and Participants per Institution



Association between Knowledge and Demographic characteristics

The analysis reveals significant associations between knowledge of Acute Rheumatic Fever (ARF) and certain demographic characteristics. Participants aged 31-40 years are significantly more likely to have good knowledge compared to those aged 20-30 years, with both unadjusted (Un-OR 3.79, 95% CI 1.35-10.65, p=0.01) and adjusted odds ratios (AOR 3.80, 95% CI 1.07-13.44, p=0.04) showing strong associations. Gender analysis reveals that males are less likely to have good knowledge compared to females after adjustment (AOR 0.26, 95% CI 0.08-0.85, p=0.03).

The results for cadre show that the likelihood of having good knowledge of ARF does not significantly differ between Clinical Officers, Nursing Officers, and Medical Officers after adjusting for other demographic characteristics. This can be attributed to few observations in the medical officer cadre as few were sampled. Further research with a larger sample size might be needed to better understand the relationship between cadre and knowledge of ARF. Regarding institution type, participants from Level 3 institutions initially appear more likely to have good knowledge (Un-OR 3.78, 95% CI 1.31-10.84, p=0.014), though this association is not significant after adjustment.

Table 1:

Association Between Knowledge Towards ARF and Demographic Characteristics

Participant characteristics		Un-OR 95% CI	P-value		AOR 95% CI	P-value	P-value
Age	20 – 30	RC	RC	0.07	RC		0.09
	31 - 40	3.79 (1.35 to 10.65)	0.01*		3.80 (1.07 to 13.44)	0.04*	
	41 – 50	1.36 (0.33 to 5.59)	0.67		1.98 (0.39 to 10.10)	0.41	
	>51 years	2.33 (0.41 to 13.37)	0.34		4.95 (0.71 to 34.58)	0.11	
Gender	Female	RC	RC	0.22	RC		
	Male	0.58 (0.23 to 1.40)	0.224		0.26 (0.08 to 0.85)	0.03*	
Cadre/Designation	Medical Officer	RC		0.04*	RC		
	Clinical Officer	10.6 (0.17 to 58.32)	0.26		1.78(0.22 to 38.78)	0.21	
	Nursing Officer	0.30(0.01 to 6.44)	0.44		0.05(0.001 to 2.16)	0.46	
Institution	Level 2	RC	RC	0.02*	RC		
	Level 3	3.78 (1.31 to 10.84)	0.014*		2.40 (0.69 to 8.35)	0.17	
	Level 4	3.12 (0.79 to 12.69)	0.104		0.48 (0.07 to 3.10)	0.44	

*Note: RC = Reference Category. $p < 0.05$ *indicates statistical significance.*

Association between Knowledge and Attitude, Attitude and Practice, and Knowledge and Practice

While the analysis of the association between knowledge and attitude towards Acute Rheumatic Fever (ARF) showed no statistically significant relationship, that between knowledge and practices towards Acute Rheumatic Fever (ARF) revealed a statistically significant relationship ($\chi^2 = 5.104$, $p = 0.024$), suggesting that better knowledge is linked to better practices towards ARF among clinicians in this study population. The analysis of the association between attitude and practices towards Acute Rheumatic Fever (ARF) also revealed a highly significant relationship ($\chi^2 = 48.49$, $p < 0.001$), indicating that a positive attitude is closely linked to better practices towards ARF among clinicians.

Table 2:

Association Between Knowledge and Attitude Towards RHD Prevention

Variable	Attitude - Negative n (%)	Attitude - Positive (%)	N	Chi square statistic (df)	P-value
Knowledge - Poor	1	27	28	2.526	**0.112**
Knowledge – Good	0	70	70		

Table 3:

Association Between Knowledge and Practices Towards RHD Prevention

Variable	Practices - Poor n (%)	Practices - Good (%)	N	Chi square statistic (df)	P-value
Knowledge - Poor	2	26	28	5.104	**0.024***
Knowledge – Good	0	70	70		

Table 4:

Association Between Attitude and Practice in RHD Prevention

Variable	Practices - Poor n (%)	Practices - Good (%)	N	Chi square statistic (df)	P-value
Attitude - Negative	1	0	1	48.49	**0.000***
Attitude – Positive	1	96	97		

DISCUSSION

Knowledge, Attitudes, and Practices of Healthcare Professionals: A Comparative Perspective

The study included a diverse cohort of healthcare professionals, with a predominant representation of nursing officers (71%), followed by clinical officers (27%) and a smaller proportion of medical officers (2%). This cadre distribution mirrors the typical staffing pattern in many low- and middle-income countries (LMICs), particularly in Sub-Saharan Africa, where nurses constitute the backbone of primary healthcare delivery (Chelo et al., 2020; Techane et al., 2022). The fact that most participants were drawn from Level 2 and Level 3 facilities settings that are primarily responsible for primary and secondary care underscores the pivotal role these cadres play in early diagnosis and management of Group A Streptococcus (GAS) infections, Acute Rheumatic Fever (ARF), and Rheumatic Heart Disease (RHD).

The relatively low number of medical officers in Chepalungu Sub-County aligns with broader trends in rural Kenyan health systems, which often face challenges in attracting and retaining higher-cadre healthcare workers (Murugami et al., 2021). This staffing imbalance suggests an

urgent need for policy interventions to address workforce gaps, particularly for specialized care that requires advanced diagnostic and management skills for RHD prevention.

Prevalence and Exposure

A significant proportion of the clinicians reported having managed cases of acute pharyngitis (84%) and ARF (74%), indicating that these conditions are prevalent in the region and frequently encountered at primary care levels. This finding is consistent with Murugami et al. (2021), who reported a 9.5% prevalence of GAS pharyngeal carriers among school-going children in Bomet County. Such prevalence rates highlight the critical need for robust knowledge and evidence-based practice among frontline clinicians to prevent disease progression to ARF and RHD

Knowledge Gaps and Regional Comparisons

The study demonstrated encouraging levels of knowledge regarding the causative agent of ARF Group A Streptococcus with 87% correctly identifying Benzathine Penicillin G as the appropriate prophylactic treatment. This finding parallels studies from Ethiopia and Sudan, where targeted training interventions significantly improved clinicians' diagnostic and management knowledge (Osman et al., 2015; Techane et al., 2022). However, this study also uncovered substantial gaps: only 44% of respondents knew the Jones criteria for ARF diagnosis, and just 4% were aware of the recommended duration of antibiotic prophylaxis. Similarly, knowledge of appropriate diagnostic tests for bacterial pharyngitis was remarkably low (4%), echoing trends noted by Techane et al. (2022), where only 48% of cardiac nurses demonstrated good knowledge of RHD prevention.

In the Sub-Saharan African context, these findings emphasize a persistent pattern: while awareness of general principles may be fair, practical application especially for nuanced diagnostic criteria remains a challenge. This aligns with evidence from a Sudanese study (Osman et al., 2015), which found that an educational intervention significantly elevated clinicians' knowledge from an average to a good level, underscoring the value of continuous professional development.

Attitudes Towards Prevention and Socioeconomic Determinants

Overall, the healthcare professionals exhibited positive attitudes towards the prevention and management of ARF and RHD. A large majority agreed that bacterial pharyngitis warrants antibiotic treatment and recommended physician consultations for sore throats. However, perspectives diverged concerning the association between RHD and socioeconomic factors such as overcrowding and low income. Only about 46% of respondents acknowledged this relationship, with medical officers showing greater agreement than clinical and nursing officers. This variability aligns with the standard deviation observed in the responses, reflecting diverse perceptions shaped by cadre-specific training and patient exposure.

These findings resonate with insights from Chelo et al. (2020) and Nkoke et al. (2020), which highlighted that medical students and early-career clinicians often lack awareness of the social determinants driving RHD prevalence in resource-limited contexts. In contrast, Techane et al. (2022) demonstrated that nurses working in specialized cardiac settings exhibited stronger appreciation for the socioeconomic dimensions of RHD. The variability seen in the current study signals an urgent need to integrate training on social determinants of health into routine professional development and to reinforce the role of clinicians in educating communities about modifiable risk factors such as overcrowding and poor living conditions.

Practice Patterns and Public Health Engagement

The study revealed generally sound preventive and management practices across the cadres. Most clinicians reported that they were likely to suspect RHD in patients with heart murmurs and would recommend secondary prophylaxis, aligning with best practices outlined in national cardiovascular guidelines (Kenya Ministry of Health, 2018). There was robust support for integrating RHD awareness into routine health promotion campaigns and for the establishment of an RHD register to facilitate better surveillance and case management.

These proactive practices echo findings by Nkoke et al. (2020), who reported good practices among Cameroonian medical students, in contrast to Isezuo et al. (2023), who found that Nigerian primary healthcare workers demonstrated inadequate practice often due to insufficient diagnostic expertise and poor guideline accessibility. Notably, this study's results suggest that medical and clinical officers demonstrated higher likelihoods of employing advanced diagnostic measures, such as echocardiography, compared to nursing officers, which may reflect differences in scope of practice and training.

A concerning practice identified was the relatively high proportion (38%) of clinicians who would recommend home remedies for sore throats. This raises the risk of delayed or inappropriate

treatment, which may facilitate the progression from GAS pharyngitis to ARF and RHD. Tellawy et al. (2021) found similar trends among parents in Saudi Arabia, where 15.5% reported using traditional remedies rather than seeking medical treatment for sore throats. Furthermore, Isezuo et al. (2023) noted inappropriate antibiotic prescription patterns, highlighting the complex balance between under-treatment and overuse of antibiotics in low-resource settings. This suggests that antimicrobial stewardship should be embedded within clinician training to address prescriber hesitancy and combat rising antibiotic resistance.

Implications for Regional Policy and Practice

Taken together, these findings emphasize the critical need for tailored, cadre-specific continuous medical education (CME) that strengthens clinicians' practical skills in diagnosing GAS pharyngitis and ARF and reinforces adherence to evidence-based treatment protocols. Emphasizing the integration of social determinants of health into clinical encounters could further enhance patient education and community-level prevention efforts.

Moreover, the data suggest that public health interventions such as RHD registers and routine screening of high-risk populations are feasible and would likely be supported by clinicians, especially if institutional barriers like resource constraints and staffing gaps are addressed. Lessons can be drawn from successful regional initiatives, such as the Addis Ababa Communiqué, which advocated for decentralized diagnostic services and regular training of primary care providers to strengthen RHD control in Sub-Saharan Africa (Watkins et al., 2016).

Limitations

The study had some limitations that should be considered. The small sample size of medical officers (only 2) limits the generalizability of findings for this group. The study was conducted in one sub county of Bomet County, which may not be representative of the entire County or Country.

Future Directions

A larger study involving many primary health care workers; medical officers, clinical officers and nursing officers in different health care facilities in multiple sub counties of counties within South Rift Valley of Kenya would help to provide more data that can be generalized to the whole Country. This would also help ascertain the true burden of Rheumatic Heart Disease in South Rift Valley of Kenya and therefore allow for targeted prevention strategies.

Conclusion

In conclusion, this study in Chepalungu, Bomet County, revealed that while clinicians generally demonstrate positive attitudes and practices towards Rheumatic Heart Disease (RHD) prevention, significant gaps exist, particularly in knowledge of diagnostic tests for bacterial pharyngitis and duration of antibiotic prophylaxis. These findings underscore that understanding clinicians' knowledge, attitude, and practice is vital for addressing the persistently high prevalence of RHD in Kenya. Addressing these identified knowledge gaps through targeted interventions has direct implications for improving early diagnosis and appropriate management of RHD. Moving forward, continued medical education and ensuring access to national treatment guidelines are crucial steps to reduce the RHD burden.

Recommendations

Policy Recommendations

- The Ministry of Health, through the County Health Departments, should develop targeted strategies to address the shortage of higher cadre healthcare workers particularly medical officers in Sub-County and rural health facilities. This includes equitable deployment and retention policies for qualified personnel.

- Integrate Rheumatic Heart Disease (RHD) prevention and management into national and county-level Non-Communicable Disease (NCD) frameworks and ensure its inclusion in the Kenya Essential Package for Health (KEPH).

- Establish mandatory continuous professional development (CPD) credits on ARF/RHD for clinical officers, nurses, and medical officers as part of licensure renewal requirements by regulatory bodies such as the Nursing Council of Kenya and the Clinical Officers Council.

Training Applications

- County health departments and facility managers should implement routine in-service training and mentorship programs focusing on the diagnosis and management of Group A Streptococcal pharyngitis, ARF, and RHD including proper application of the Jones Criteria and appropriate use of Benzathine Penicillin G.

- Develop capacity-building programs for frontline healthcare providers particularly nurses and clinical officers aimed at

improving knowledge, clinical suspicion, and case management of pharyngitis and RHD in line with local treatment guidelines and national policies.

- Medical and health training institutions in Kenya should incorporate comprehensive content on RHD, including etiology, diagnostic criteria, and its relationship with social determinants of health, into nursing, clinical medicine, and medical curricula.
- The Kenya Medical Training College (KMTC), universities, and other training institutions should provide regular CPD workshops and short courses to enhance healthcare workers' skills in sore throat evaluation, RHD prevention, and public health messaging.

Research Recommendations

- Future studies in Kenya should adopt longitudinal or cohort designs to assess the long-term impact of healthcare worker training on RHD incidence and patient outcomes.
- Expand research to include other counties and healthcare levels (Levels 4–6) to capture diverse regional perspectives and inform national-level interventions.
- Investigate prescriber behavior in the context of antimicrobial resistance (AMR), including factors like patient expectations, drug availability in public facilities, and adherence to Kenya's AMR policy and treatment guidelines.

Institutional Strategies

- Foster partnerships between the Ministry of Health, County Governments, academic institutions, professional associations (e.g., Kenya Cardiac Society), and NGOs to support RHD-related education, outreach, and surveillance programs.
- Promote interdisciplinary research collaborations involving public health experts, clinicians, and community stakeholders to explore the role of poverty, education, and healthcare access in RHD prevalence—supporting context-specific interventions aligned with Kenya's Universal Health Coverage (UHC) agenda.
- Involve Family Physicians in Primary Care Networks as they ensure patients access quality evidence-based care at the level 2 and 3 facilities. They would also plan and implement prompt and appropriate referrals of patients as needed.
- Strengthen existing Integrated Disease Surveillance and Response (IDSR) systems to ensure RHD is recognized as a notifiable condition where applicable and promote timely case reporting.

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Conflict of Interest

All authors declare no conflict of interest.

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