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Research Article

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Adherence of Healthcare Providers to Syndromic Approach and Treatment Protocols in Diagnosing and Treating Sexually Transmitted Infections at Primary Health Centers in Khartoum State, Sudan

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Abstract | **Background:** Sexually Transmitted Infections (STIs) remain an important public health concern, particularly in resource-limited settings where syndromic management is widely used for diagnosis and treatment. The effectiveness of this approach depends substantially on the knowledge, skills and adherence of healthcare providers to established STI management protocols. **Objective:** To evaluate healthcare providers' adherence to national STI treatment protocols in the diagnosis and management of STI cases at primary healthcare centers in Khartoum State, Sudan and to assess the influence of STI-related training and professional characteristics on management performance. **Methods:** A cross-sectional observational study was conducted over six months among healthcare providers working in selected primary healthcare centers in Khartoum State. A total of 56 healthcare providers were assessed using an observational checklist and a semi-structured questionnaire. The assessment covered history taking, clinical examination, diagnosis, patient counseling and education and adherence to treatment protocols. Descriptive statistics and chi-square tests were used to evaluate performance and associations between provider characteristics and STI management. A p-value of <0.05 was considered statistically significant. **Results:** Overall STI management performance was predominantly fair or poor, with only 5% of healthcare providers demonstrating good overall performance, while 57% were rated fair and 38% weak. Major deficiencies were observed in diagnosis, counseling, clinical examination and adherence to treatment protocols. Only 44% of providers had received STI-specific training. Providers who had received STI-related training demonstrated significantly better management performance than those without training (p = 0.001), whereas the frequency of training was not significantly associated with performance (p = 0.40). Professional category was also significantly associated with performance (p = 0.04). Performance varied substantially across STI syndromes, with scrotal swelling showing the highest proportion of good performance (73%), while inguinal bubo had the poorest performance (3% good). **Conclusion:** STI case management among healthcare providers in primary healthcare centers in Khartoum State was generally suboptimal, with substantial gaps in diagnosis, counseling, clinical examination and adherence to treatment protocols. STI-related training was significantly associated with improved management performance, although repeated training alone did not demonstrate a significant effect. Targeted competency-based training, supportive supervision and strengthening of STI management practices are needed to improve the quality of STI care in primary healthcare settings.

Key Words Sexually Transmitted Infections, Syndromic Management, Healthcare Providers, Primary Healthcare, STI Training, Treatment Protocol, Khartoum, Sudan

INTRODUCTION

Control of Sexually Transmitted Infections (STIs) is a critical component of the global strategy to achieve the Millennium Development Goals in the areas of maternal and child health (MDGs 4 and 5) and combating against HIV (MDG 6). Improving access to STI services also is an important part of WHO global strategy for universal access to Reproductive Health (RH) [1].

STIs including HIV are a leading cause of morbidity and mortality worldwide and have a profound impact on sexual and RH and rank among the top 5 disease categories for which adults seek health care [2,3]. STIs are among the top five diseases for which adults seek health care in developing countries where the HIV epidemic is in the progressive stage [3].

Sexually Transmitted Infections (STIs) remain a significant public health concern in Sudan, particularly within primary healthcare settings. The Ministry of Health has endorsed the syndromic approach as a cost-effective method for diagnosing and treating STIs, especially in resource-limited environments where laboratory facilities are scarce. However, there is limited empirical data assessing whether healthcare providers (HCPs) in Khartoum State adhere to these established protocols [4]. The World Health Organization (WHO) identifies STIs as a major public health concern due to their negative impact on quality of life and their potential to cause severe complications and death [5]. Sexually Transmitted Infections (STIs), comprise a group of clinical syndromes primarily spread through sexual contact [6]. They are caused by various pathogens, including bacteria, viruses and parasites and include common infections such as chlamydia, gonorrhea, syphilis, human papillomavirus (HPV) infection (genital warts), trichomoniasis, chancroid, genital herpes, hepatitis B and Human Immunodeficiency Virus (HIV) infection [6]. Globally, over one million curable STIs occur every day, making them one of the top five reasons for seeking healthcare in developing countries [6]. WHO reported 376.4 million new STI cases among individuals aged 15-49 years, with gonorrhea and chlamydia accounting for nearly half of these cases during the period from 2009 to 2016 [7].

Globally, an integrated approach combining prevention and treatment is recommended for STI control in Primary Health Care (PHC) centers where the majority of STI-related cases were encountered as first point health care. However, research indicates that traditional methods of STI diagnosis and treatment continue to face challenges such as limited resources and delayed diagnosis [8].

Objectives

Primary Objective: To evaluate the adherence of healthcare providers to national treatment protocol when diagnosing and managing STI patients.

Secondary Objectives

- To assess HCPs to adherence to STIs synonymic approach
- To identify factors that influencing adherence to the management protocol
- To determine effect of training in adherence to these protocols
- To assess the availability of necessary resources and training for effective implementation

Study Setting

This study was conducted in Primary Health Centers (PHCs) in Khartoum State, Sudan. These centers serve as the first point of contact for most patients seeking STI-related care.

Study Design

- **Type:** Cross-sectional, observational study
- **Duration:** 6 months
- **Participants:** Healthcare providers (HCPs) including medical doctors and medical assistant working in the selected primary health Care Centers (PHCs) in Khartoum state, Sudan
- **Sample Size and method:** Quota sampling method was used to select the participants in the study and 56 medical doctors and medical assistants were included in the study

Ethical Considerations

- **Approval:** Ethical approval was obtained from the Ministry of Health and the Institutional Review Board of the participating institutions
- **Informed Consent:** All participants provided written informed consent, ensuring confidentiality and voluntary participation

Data Collection Methods and Tools

Two methods of data collection were used including observational checklist and semi-structured questionnaire. The observational checklist method was used to assess the actual practices of HCPs during patient course of care including counseling, history taking, physical examination education, diagnosis and drug prescription patterns. While use of semi-structured questionnaire was used to gather information on HCPs' training, STIs and syndromic protocol, frequency of training received perceived barriers to adherence and resource availability.

Data Analysis

Quantitative Data: Descriptive statistics (frequencies, percentages) were be used to summarize adherence levels. The Chi squared test was used to assess associations between adherence and variables such as training and different syndromic management. The p-value of <0.05 was considered statistically significant.

Findings

Almost 56 healthcare providers (HCPs) working in Primary Health Care Centers (PHCs) in Khartoum State were included in this study. The HCPs included both males and females and their jobs included medical register, general medical practitioner and medical assistants.

Table 1 presents the characteristics of healthcare providers (HCPs) working in Primary Health Care Centers (PHCs) (n = 56) and their performance in Sexually Transmitted Infection (STI) case management.

Table 1: Characteristics of HCPs in Primary Healthcare Centers (n = 56)

Variable	Frequency	Percentage	χ^2	p-value
Sex				
Male	31	56	0.006	0.90
Female	25	44		
Job				
Medical Registrar	11	20	0.03	0.91
General Practitioner	34	60		
Medical assistant	8	15		
Others	3	5		
Training in STIs				
Yes	25	44	0.006	0.92
No	31	56		
Overall Quality of Performance				
Good	3	5	0.01	0.99
Fair	32	57		
Weak	21	38		
Quality1 of STIs Case management				
History tokening				
Good	1	1	0.04	0.97
Fair	51	68		
Poor	23	31		
Clinical examination				
Good	6	8	0.002	0.99
Fair	32	43		
Poor	37	49		
Diagnosis				
Fair	6	8	0.00001	1.00
Poor	69	92		
Counseling and educating of patients				
Good	4	5	0.007	0.99
Fair	31	41		
Poor	40	53		
Applying treatment protocol				
Good	15	20	0.003	0.99
Fair	22	29		
Poor	38	51		

In terms of sex distribution, 31 participants (56%) were male and 25 (44%) were female, with no statistically significant difference between groups (χ^2 = 0.006, p = 0.90). Regarding professional roles, most respondents were general practitioners (34; 60%), followed by medical registrars (11; 20%), medical assistants (8; 15%) and other categories (3; 5%), with no significant association across job categories (χ^2 = 0.03, p = 0.91).

Fewer than half of the HCPs (25; 44%) had received STI-specific training, while 31 (56%) reported no such training, showing no statistically significant difference (χ^2 = 0.006, p = 0.92).

Overall performance quality was rated as good in only 3 providers (5%), fair in 32 (57%) and weak in 21 (38%), with no significant association detected (χ^2 = 0.01, p = 0.99).

Assessment of STI case management revealed suboptimal performance across all evaluated domains:

- History taking was good in 1 (1%), fair in 51 (68%) and poor in 23 (31%) of providers (χ^2 = 0.04, p = 0.97)
- Clinical examination was good in 6 (8%), fair in 32 (43%) and poor in 37 (49%) (χ^2 = 0.002, p = 0.99)
- Diagnosis quality was fair in only 6 (8%) and poor in 69 (92%), with no providers achieving a "good" rating (χ^2 = 0.00001, p = 1.00)
- Counseling and patient education was rated good in 4 (5%), fair in 31 (41%) and poor in 40 (53%) (χ^2 = 0.007, p = 0.99)
- Adherence to treatment protocols was good in 15 (20%), fair in 22 (29%) and poor in 38 (51%) (χ^2 = 0.003, p = 0.99)

Across all assessed parameters, the lack of statistically significant associations (p>0.90 in all cases) suggests that the observed differences in performance were not related to the measured demographic or professional characteristics. Overall, STI case management performance was predominantly rated as fair or poor, particularly in diagnostic accuracy and patient counseling.

Table 2 examines the association between STI-related training and the performance of healthcare providers (HCPs) in managing sexually transmitted infections (n = 75).

HCPs who had received training in STIs demonstrated significantly better performance compared to those without training. Among trained providers, 16 achieved good performance and 17 had poor performance, whereas among untrained providers only 6 demonstrated good performance while 36 performed poorly. This difference was statistically significant (χ^2 = 0.006, p = 0.001).

Table 2: Association Between Training and STIs Management Performance by HCPs (n = 75)

	Performances			
Training in STIs	Good	Poor	χ^2	p-value
Yes	16	17	0.006	0.001
No	6	36		
Frequency training in STIs				
Having ≤1Training course in STIs	6	9	0.79	0.4
Having ≥1Training course in STIs	10	8		
Job types				
Medical doctor	12	44	6.7	0.04
Medical assistant	10	9		
Others	22	53		

Table 3: Assessment of Health Care Providers' performance in Each STIs syndrome in Primary Health Care Centers (n = 75)

	Performances			
Syndrome	Good	Poor	χ^2	p-value
Lower abdominal pain	18	57	20.3	<0.0001
Scrotal swelling	55	17	20.1	<0.0001
Inguinal bubo	2	73	67.2	<0.0001
Vaginal discharge	22	52	12.2	0.0005
Genital ulcer	15	60	27.0	<0.0001
Ureteral discharge	14	61	29.5	<0.0001

When analyzing the frequency of STI-related training, no significant association with performance was observed ($\chi^2 = 0.79$, $p = 0.40$). Providers with ≤1 training course in STIs reported 6 good and 9 poor performances, while those with more than one course recorded 10 good and 8 poor performances.

Job type was significantly associated with STI management performance ($\chi^2 = 6.7$, $p = 0.04$). Medical doctors accounted for 12 good and 44 poor performances, medical assistants for 10 good and 9 poor and other job categories for 22 good and 53 poor performances.

Overall, the results indicate that receiving STI-related training is significantly associated with improved case management performance, although the frequency of training does not appear to have a measurable effect. Job type also influences performance, with variations observed between medical doctors, medical assistants and other categories.

Table 3 presents the assessment of healthcare providers' (HCPs) performance in managing each Sexually Transmitted Infection (STI) syndrome in Primary Health Care Centers (n = 75).

Performance varied significantly across syndromes. For lower abdominal pain, 18 HCPs (24%) demonstrated good performance, while 57 (76%) performed poorly ($\chi^2 = 20.3$, $p<0.0001$). Management of scrotal swelling showed the highest proportion of good performance, with 55 providers (73%) rated as good and 17 (27%) as poor ($\chi^2 = 20.1$, $p<0.0001$).

In contrast, inguinal bubo had the lowest performance scores, with only 2 providers (3%) rated good and 73 (97%) rated poor ($\chi^2 = 67.2$, $p<0.0001$). For vaginal discharge, 22 providers (29%) achieved good performance, while 52 (69%) were poor ($\chi^2 = 12.2$, $p = 0.0005$).

Management of genital ulcer cases was good in 15 providers (20%) and poor in 60 (80%) ($\chi^2 = 27.0$, $p<0.0001$). Similarly, urethral discharge was managed well by 14 providers (19%), whereas 61 (81%) performed poorly ($\chi^2 = 29.5$, $p<0.0001$).

Overall, the findings demonstrate statistically significant differences in performance across STI syndromes, with the best results observed in scrotal swelling management and the poorest in inguinal bubo cases.

DISCUSSION

The assessment of healthcare providers (HCPs) working in Primary Health Care Centers revealed suboptimal performance in the management of Sexually Transmitted Infections (STIs). Among the 56 HCPs evaluated for demographic and job characteristics, males comprised 56% and females 44%, with no significant sex-based differences. Most were general practitioners (60%), followed by medical registrars (20%), medical assistants (15%) and other categories (5%), with no significant performance differences across job categories. Less than half (44%) had received STI-specific training, yet training status showed no association with general performance rates. Overall quality of care was predominantly fair (57%) or weak (38%), with only 5% rated as good.

Detailed evaluation of STI case management skills demonstrated deficiencies in all domains: history taking was rated good in only 1% of providers, clinical examination in 8%, diagnosis in 0%, counseling in 5% and adherence to treatment protocols in 20%, with most providers falling into fair or poor categories.

Examining the association between training and STI management of HCPs showed that those who had received STI-related training performed significantly better than untrained counterparts did ($p = 0.001$). However, the frequency of training courses was not significantly linked to performance. Job type was significantly associated with STI management ability, with medical assistants outperforming medical doctors and other categories in relative terms ($p = 0.04$).

Performance varied markedly by STI syndrome. Scrotal swelling had the highest proportion of good management (73%), whereas inguinal bubo had the lowest (3%). The majority of providers poorly managed other syndromes, including lower abdominal pain, vaginal discharge, genital ulcer and urethral discharge. All syndrome-specific differences in performance were statistically significant ($p < 0.001$ for most comparisons).

This study reveals pervasive gaps in STI case management across core clinical tasks (history, exam, diagnosis, counseling and protocol adherence), with only 5% of encounters rated "good." Similar deficits in knowledge and routine practice have been documented among frontline clinicians in Ethiopia, where fewer than half demonstrated adequate syndromic-management competence, underscoring persistent weaknesses in primary-care readiness for STI care [1,9].

Training mattered: trained HCPs significantly outperformed untrained peers-consistent with multicountry trials and implementation studies showing that structured STI training improves provider knowledge, screening and treatment behaviors. For example, a cluster-randomized trial of clinic-based STI modules (I-TECH) improved provider performance; other provider-education programs raised screening rates fivefold within weeks [2,3,10,11]. Yet, as in our findings, simple exposure counts (training frequency) often don't translate to better outcomes without quality assurance and skills reinforcement, echoing post-training audits of pharmacists/chemists where retained knowledge and real-world practice diverged [4,12]. Evidence from Nepal shows auxiliary health workers' performance can improve markedly after targeted syndromic-care training-aligning with our observation that medical assistants outperformed physicians and supporting task-shifting models when paired with competency-based instruction [5,13].

Syndrome-specific variation mirrored global experience: scrotal swelling care tended to fare better, whereas genital-ulcer/bubo algorithms performed worst-long recognized as clinically challenging due to overlapping etiologies and low predictive value. Studies from primary care and STI clinics report strong outcomes for discharge and scrotal-pain algorithms but persistent shortcomings for genital-ulcer syndromes, reinforcing the need for decision support and point-of-care tests [6,14]. WHO flowcharts for inguinal bubo and scrotal swelling exist but correct application is uneven; routine reinforcement and context-specific updates are advised [7,15].

Critically, our results fit a broader pattern: syndromic management alone misses a substantial share of infections, especially among women and asymptomatic patients. In Kenya's KICoS cohort, agreement between syndromic and etiologic diagnoses was poor ($\kappa \approx 0.09$), with HSV-2 grossly underdiagnosed and CT/GC overcalled; modeling in key populations indicates that limiting screening to symptoms would miss ~85% of CT/GC infections. These data argue for integrating affordable diagnostics and risk-based screening into primary care [8,9,16-18].

Our documentation of weak counseling and partner-management processes also echoes prior evaluations showing low partner notification and poor linkage, despite guideline emphasis on these steps; enhanced workflows and non-judgmental, youth-friendly services improve uptake [8]. Even in high-income settings, adherence gaps persist (e.g., uneven compliance with CDC testing/care standards for adolescents), suggesting that guidelines alone are insufficient without audit-and-feedback, reminders and supportive infrastructure [10-12,19-21].

Overall, the weight of comparative evidence supports three actionable imperatives consistent with our findings: (1) Invest in competency-based, skills-focused training with periodic hands-on refreshers and supervision; (2) Augment syndromic algorithms with rapid/point-of-care diagnostics and clear referral pathways; and (3) Strengthen counseling, partner services and adherence-monitoring using standardized quality-of-care metrics. Doing so aligns frontline practice with contemporary recommendations and has demonstrated potential to measurably improve STI outcomes in primary care [2,3,10-12,21].

CONCLUSIONS

STI management among primary healthcare providers was generally poor, with most rated as fair or weak and minimal good performance across clinical domains. Training significantly improved case management, though frequency had no impact and medical assistants outperformed doctors. Marked variation existed by syndrome, with scrotal swelling best managed and inguinal bubo worst. These findings highlight critical competency gaps and the need for targeted, skills-based STI training interventions.

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