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Evaluation of Neglected Tropical Diseases Surveillance System in Gadarif State

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ABSTRACT: Sudan continues to face major public health challenges due to escalating violence, natural disasters, and recurrent outbreaks of neglected tropical diseases (NTDs). This study aimed to evaluate the NTD Surveillance System in Gadarif State, Sudan, in 2024, with specific objectives to assess the core surveillance functions and supportive activities at three administrative levels, Health Facilities (HFs), Heads of Localities, and the State Ministry of Health (SMoH).

A cross-sectional study followed by a one-group pre-test post-test intervention design.The study population included surveillance sentinel sites and health workers operating within the NTD surveillance system across 12 localities in Gadarif State. Data were collected from 19 Health Facility Surveillance Units (HFSUs) and 12 locality units using a modified and adapted version of the World Health Organization (WHO) surveillance system evaluation questionnaire. The process involved three phases: preparatory (literature review and tool development), operational (data collection), and analytical (data analysis using the Statistical Package for Social Sciences SPSS and Kobo Toolbox). The assessment focused on core surveillance functions (case detection, confirmation, and response) and supportive functions (training, supervision, and resource availability).

Pre-intervention findings showed high compliance with core activities at the HF level, where all 19 HFs (100%) had mechanisms to capture unusual events and ensured prompt sample submission. However, 10.53% of staff had not received training in disease surveillance and response. At the locality level, 91.67% had standardized case definitions, and 83.33% maintained a rumor register. Post-intervention assessment at the SMoH level demonstrated 100% compliance across all core and supportive functions, including the presence of a rapid response team, comprehensive training plans, and functional communication facilities—indicating substantial system improvement following the intervention.

Sudan's persistent NTDs burden is compounded by fragmented and resource-limited surveillance systems. The evaluation demonstrated that targeted interventions can significantly strengthen surveillance capacity, particularly at the state level. Sustained commitment from national authorities, donors, and communities is crucial to integrating NTDs surveillance within the Primary Health Care (PHC) framework, thereby reducing disease burden and enhancing outbreak response capacity.

INTRODUCTION

Public health surveillance is the ongoing, systematic collection, analysis, and interpretation of health data essential for planning, implementation, and evaluation of public health practice. Its main goal is to reduce morbidity and mortality and to improve overall community health outcomes (Beauté & Kramarz, 2022). The effectiveness of surveillance systems depends on available resources, and the inclusion of new neglected tropical diseases (NTDs) without corresponding financial or human resource expansion can undermine performance (1).

According to the World Health Organization (WHO), NTDs include 20 chronic, disabling infections caused by bacteria, protozoa, fungi, viruses, and helminths. These diseases disproportionately affect poor communities in tropical and subtropical regions, particularly in Africa (2).

Data collected from the Public Health Surveillance System (PHSS) guide decision-making and implementation of health interventions, assist in treatment and prevention strategies, and improve service delivery efficiency (Lau et al., 2021). A functional PHSS depends on adequate financing, effective leadership, and good governance (Wuhib et al., 2022). Efficient surveillance systems also contribute to achieving Sustainable Development Goal 3 (SDG 3), which promotes good health and well-being (3,12).

Evaluating the effectiveness of disease surveillance considers attributes such as simplicity, flexibility, timeliness, completeness, and data quality (Jiang et al., 2022). A well-functioning surveillance system enhances the health sector's ability to plan and implement appropriate responses to outbreaks, reducing the risk of widespread epidemics (4,11).

AIM OF THE STUDY

General Objective

To evaluate the Neglected Tropical Diseases Surveillance System in Gadarif State, Sudan (2024).

Specific Objectives

To assess the core activities and support functions at health facility levels.
To assess core activities and support functions at locality levels.
To assess core activities and support functions at the Ministry of Health (state level) in Gadarif.

MATERIALS AND METHODS

Study Design

A cross-sectional study followed by a one-group pre-test/post-test intervention was conducted.

Study Area

El-Gadarif, located in eastern Sudan, borders Ethiopia and is characterized by diverse ethnicities and agricultural activities. The State Ministry of Health (SMoH) oversees policy, planning, and management, while localities handle primary healthcare delivery. Gadarif State covers 75,000 km² with a population of about 2.4 million, distributed across 12 localities. It experiences a rainy season from July to October, with rainfall ranging from 300–900 mm.(5,6)
Kalazar (visceral leishmaniasis) is a major health concern, along with other NTDs such as tuberculosis, filariasis, trachoma, schistosomiasis, and soil-transmitted helminths. Surveillance operates through 158 sentinel sites across health facilities (Guillot, 2022).(7,8)

Target Population

Surveillance sentinel sites at health facilities and administrative levels.
Health workers responsible for surveillance operations at facility, locality, and state levels.

Sampling and Study Phases

All 11 localities and 158 surveillance units were included. The study was executed in three phases:
Preparatory Phase (Feb–Apr 2023): Literature review, protocol writing, ethical approval, and pilot testing of tools.

Operational Phase: Data collection using WHO-adapted questionnaires across health facilities, locality offices, and the Ministry of Health.
Analytical Phase (Jul 2023–Aug 2024): Data cleaning, coding, and analysis using KOBO Toolbox and SPSS. Statistical analyses included frequency distributions, cross-tabulations, and Kruskal–Wallis tests for non-parametric data.

Ethical Considerations

Ethical approval was obtained from the Federal Ministry of Health, Sudan, and the Institute of Tropical Medicine. Written and oral informed consent was obtained from all participants. Confidentiality and anonymity were maintained throughout.

Limitations

Challenges included unstable internet connectivity and logistical difficulties such as lack of vehicles for supervision.(9,10)

RESULTS

The results are organized into four main sections representing findings from health facilities, locality heads, and state-level surveillance units, both pre- and post-intervention.

Health Facilities (Pre-Intervention)

A total of 19 health facilities were assessed.
Case Detection: All (100%) facilities included unusual health events in immediate reporting systems. Laboratory officers could promptly send samples for case confirmation (100%).
Case Confirmation: All facilities had proper mechanisms for laboratory confirmation and immediate reporting of detected cases (100%).
Training: 89.47% of staff were trained in Integrated Disease Surveillance and Response (IDSR), modern lab techniques, and infection control. 10.53% had not received training.
Supervision and Communication: 84.21% reported regular supervision, and all (100%) had been overseen by higher authorities in the previous year.
Locality Surveillance Units (Pre-Intervention)
Case Detection: 91.67% had standardized case definitions.

Case Registration: 83.33% maintained rumor registers; 8.33% lacked such systems.
Case Confirmation: 83.33% had lists of reference labs and facilities for specimen collection and transport.
Response and Control: 83.33% maintained rapid-response medicines.
Guidelines and Standards: 83.33% had treatment protocols, and 58.33% had manuals for specimen handling.
Supervision and Communication: 91.67% had supervision plans and communication facilities; 50% had vehicles for supervision and sample transport.

State-Level Surveillance Unit (Post-Intervention)

After the intervention, the Gadarif State Ministry of Health demonstrated full (100%) compliance in all evaluated indicators:
Case Confirmation All laboratory officers could send samples to reference labs within 48 hours.
Response and Control The state established a fully functional Rapid Response Team (RRT).
Training All staff received training or refresher courses in surveillance and laboratory techniques.
Supervision and Communication 100% of units conducted regular supervisory visits, had operational communications, and dedicated budgets for surveillance.
Resources All units possessed working computers, vehicles, and communication systems for reporting.

DISCUSSION

Sudan faces increasing public health threats due to conflicts, natural disasters, and recurrent NTD outbreaks. The Ministry of Health has established multiple, fragmented surveillance systems that are poorly integrated and underfunded. Conversely, community-based initiatives often play crucial roles in managing outbreaks, despite limited formal support.

The evaluation of Gadarif's NTD surveillance system across three administrative levels revealed significant variations before intervention, which were largely corrected post-intervention.

At the health facility level, 100% of centers were able to detect, record, and report unusual health events promptly. Laboratory staff were proficient in confirming cases and knew correct sample handling procedures.

At the locality level, 91.67% had adopted standardized case definitions, and 83.33% had established mechanisms for case registration and laboratory confirmation. However, limitations in logistics (e.g., transport vehicles) hindered timely specimen movement and supervision.

At the state level, post-intervention findings showed substantial improvements, with all evaluated parameters achieving 100% compliance. This included training, supervision, communication infrastructure, laboratory capacity, and emergency response readiness.

The study aligns with global evidence. Similar evaluations in Kenya and Nigeria found that well-trained personnel, standardized reporting tools, and strong laboratory links significantly enhance surveillance quality. The WHO Communicable Disease Surveillance and Response Systems framework also emphasizes simplicity, flexibility, and timeliness as essential system attributes. Furthermore, One Health principles—linking human, animal, and environmental health—are critical to NTD management, particularly in border regions like Gadarif. The state's experience underscores the need for integrated surveillance systems that address multiple diseases through shared resources and community engagement.

Economic evaluations suggest that strengthening surveillance is cost-effective for low- and middle-income countries, as early detection prevents widespread outbreaks and reduces treatment costs (Hotez et al., 2021).

The intervention in Gadarif illustrates that with modest investments in training, coordination, and infrastructure, significant improvements in NTD surveillance performance can be achieved even in resource-limited settings.

CONCLUSION

This study highlights the challenges and achievements of NTD surveillance in Gadarif State, Sudan. The country's surveillance landscape is characterized by fragmentation, limited resources, and poor integration among vertical disease programs. However, targeted interventions—focusing on training, supervision, and communication—resulted in a fully functional surveillance system at the state level.

Community participation emerged as a critical component, demonstrating that grassroots health workers and volunteers play indispensable roles in early detection and response. Integrating these community networks with formal systems can bridge gaps in data flow and resource limitations.

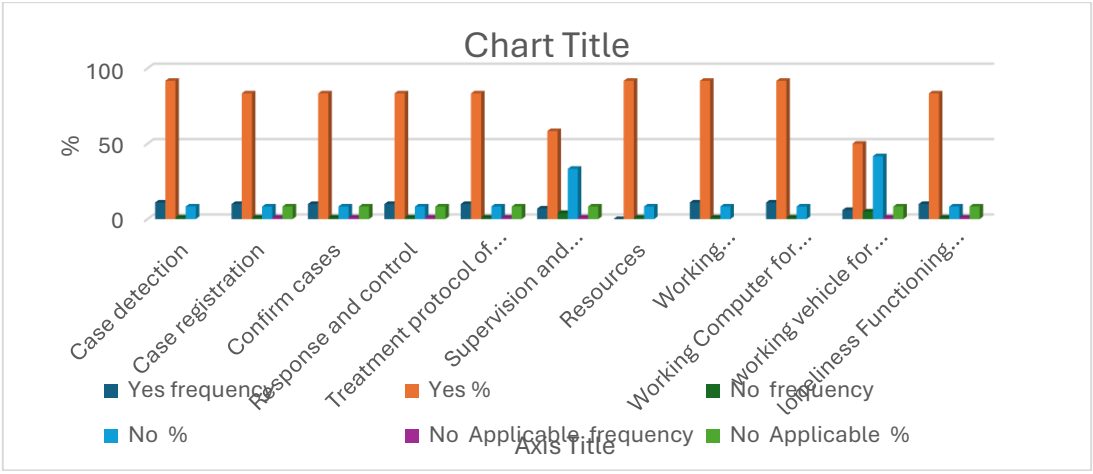
The study concludes that strengthening surveillance through sustainable capacity-building, resource allocation, and inter-sectoral collaboration is both feasible and essential for achieving SDG 3 targets. The long-term payoff will be a more resilient primary healthcare system capable of addressing both endemic and emerging diseases.

To ensure sustainability, NTD surveillance in Sudan should be integrated with other disease programs, supported by continuous staff training, and strengthened through improved laboratories, transport, and communication systems. Community-based reporting

should be institutionalized to enhance early detection and response. A joint donor-government funding strategy and a unified national policy aligned with the Integrated Disease Surveillance and Response (IDSR) system are essential for long-term success. With coordinated efforts among all stakeholders, Sudan can build a resilient and cost-effective surveillance system using existing resources and expertise.

Table 4.1 Shows the distribution of the indicators of the core surveillance functions (9 indicators) in (19) HFSUs of the Gadarif locality.2024.

Indicators	Yes		No		Not Applicable	
	frequency	%	frequency	%	frequency	%
Case detection						
recording of health events (unusual/abnormal) in a system for immediate reporting	19	100				
Confirm cases						
(laboratory leader) have the ability to send samples promptly to the reference laboratory for case confirmation	19	100				
(Laboratory Officer) can confirm priority cases within the laboratory or in reference laboratories	19	100				
surveillance system Can at once report NTD cases detected during the past year and report to the local level upon case detection	19	100				
(laboratory manager) know where to send samples correctly	19	100				
Training						
All Staff of the neglected tropical diseases surveillance system Trained in disease surveillance or integrated disease surveillance and response	17	89.47	2	10.53		
NTD Surveillance System at once reports NTD cases detected during the past year and reported to the local level during case detection	16	84.21	3	15.79		
NTD surveillance system has a laboratory officer trained in modern techniques for confirming NTD cases	16	84.21	3	15.79		
NTD surveillance system has a laboratory officer trained in modern techniques for confirming NTD cases	16	84.21	3	15.79		
NTD surveillance system staff trained in infection control	15	78.95	4	21.05		
Supervision and communication						
NTD surveillance was overseen at higher levels (local, state, and federal) during the previous year	19	100				



Figures (4. 1) show the Distribution of the indicators of the core and supportive surveillance functions at the head of the Gadarif state Neglected Tropical Diseases surveillance unit.

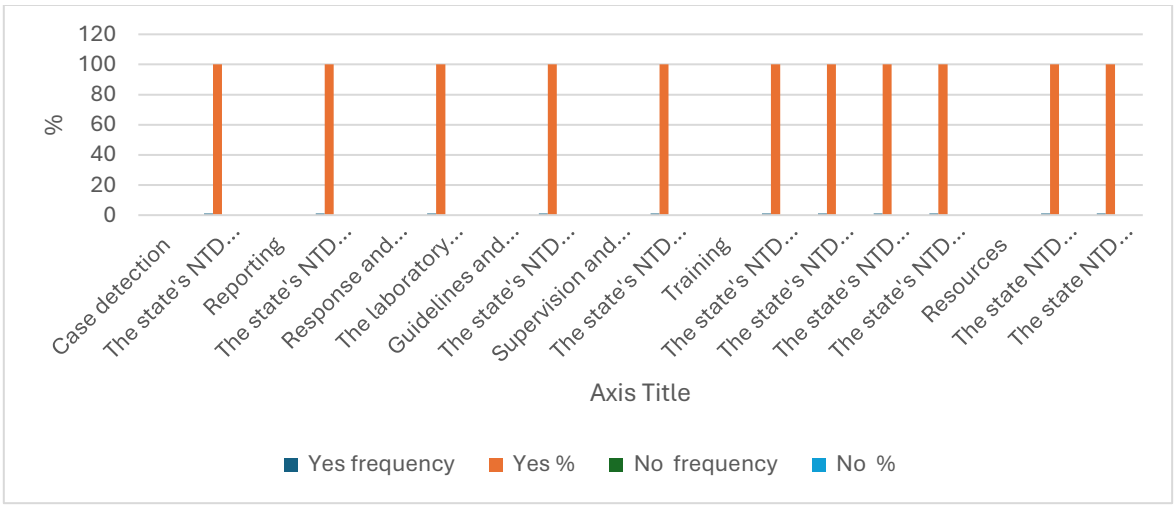


Figure (4. 2) Shows the distribution of the Checklist indicators of the core surveillance functions (9 indicators) in (19) HFSUs of the Gadarif locality.

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