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TOOLS AND METHODS OF ROUTINE HEALTH INFORMATION SYSTEM IN OSUN STATE, NIGERIA

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ABSTRACT

Background: Tools and methods of Routine Health Information Systems (RHIS) play a critical role in the data collection, analysis and use in health. Nigeria faces issues of RHIS effectiveness due to lack of infrastructure, lack of consistency in availability of RHIS tools and poor data management practices.

Objectives: This study assessed the tools and methods of RHIS in Osun State, Nigeria.

Methods: A cross-sectional study was carried out in 22 public health facilities (14 primary, 6 secondary and 2 tertiary) via multistage sampling. 317 health workers were sampled with 297 (93.69% response rate). Questionnaires based on PRISM and an observation guide were used for data collection. It was tested and found reliable (Cronbach's alpha = 0.790). Descriptive and inferential statistics were used for data analysis (SPSS 30.0).

Findings: RHIS tools were readily available and used, with 60.6% strongly agreeing that standard Ministry of Health registers were used and 47.8% agreeing that monthly summary forms were completed. But 13.0% of facilities didn't have standard registers and 39.1% didn't have IDSR tools. The tools mean score (14.19 ± 5.47) was good but less than optimal. RHIS methods were organised with processes such as end of the month reporting (67.3%) and DHIS2 reporting (67.0%) but there were gaps in the daily recording (40.8% non-compliance) and verification (32.7% non-compliance) of reports. The methods score (40.57 ± 12.17) indicated good but variable methods. Observations revealed hybrid systems (82.6%) with moderate verification (65.2%) and partial implementation of timelines (73.9%).

Conclusion: RHIS tools and methods are well institutionalised but lack in consistency of tool presence, verification and hybrid systems to achieve optimal data quality.

KEYWORDS: Routine Health Information System (RHIS), RHIS Tools, RHIS Methods, Data Reporting and Verification, DHIS2

Key Highlights in the Study

- ✓ RHIS tools widely used, but gaps in availability persist
- ✓ Hybrid paper-digital systems dominate across facilities
- ✓ Weak daily recording and data verification affect quality
- ✓ Improved supervision, training, and tools needed for RHIS efficiency

1. BACKGROUND TO THE STUDY

Health Information Systems (HIS) are sets of tools, processes and structures that enable data generation, analysis, storage and communication to inform health decisions (1). HIS as a critical component of the health system (2) play a crucial role in planning and delivering services, with poor systems resulting in suboptimal outcomes and low trust (3). In Nigeria, the National Health Management Information System (NHMIS), launched in 1999 and upgraded to DHIS2 in 2010, improves data reporting and use at all levels (4).

Routine Health Information Systems (RHIS) are crucial for gathering and managing health data for service delivery and decision-making (5). They rely on standardised tools and data use but encounter data quality and reporting issues, and lack real-time use, particularly in developing nations (6,7).

The PRISM model explains RHIS performance, with technical, behavioural and organisational factors affecting data processes and utilisation (8,9,10). Despite the rollout of DHIS2, sub-Saharan African RHIS, such as in Nigeria and Osun State, continue to struggle with paper-based data collection, poor infrastructure, lack of training and standardised data tools (11,12,13,14,15). Barriers such as poor staff motivation and supervision also hinder implementation and data use (16,17,18).

2. STATEMENT OF PROBLEM

Routine Health Information Systems (RHIS) are designed to produce quality data for appropriate health planning and management. Yet, in low- and middle-income countries like Nigeria, RHIS tools and approaches are not always optimal for generating and using quality

data. Data quality issues have been attributed to poor infrastructure, lack of trained staff and substandard data collection (19,5).

In Osun State, the evidence suggests possible issues with technology, human resource capacity and data management that may impact the use of RHIS tools such as DHIS2 and reporting formats (20). The use of both paper-based and electronic data collection and reporting systems may also pose challenges in data collection, transmission and analysis, which may result in inconsistent reporting.

Also, the lack of standardised processes, monitoring, and training of health workers to use RHIS tools and interpret data have been reported to affect data quality and its application to decision-making (1).

To address these concerns, it is important to assess the RHIS tools and methods used in Osun State to identify potential gaps in data collection, reporting and utilisation, and to inform strategies to enhance health information systems and evidence-based decision-making (1,5).

3. OBJECTIVE OF THE STUDY

To examine the tools and methods of routine health information system in Osun State.

4. THEORETICAL FRAMEWORK

The Organisational Information Theory (OIT) offers a useful perspective on the tools and techniques of the Routine Health Information System (RHIS) in Osun State. It describes how organisations process information in a systematic manner through the information environment, information equivocality, and communication cycles (21,22).

The information environment includes data collection instruments, reporting forms, and information systems such as electronic data capture systems used in RHIS to collect, store and share health data at various levels (13). Information equivocality describes issues like lack of standardised tools and reporting forms, and confusion in data interpretation that may affect RHIS implementation (23). The communication cycle, act, response, and adjustment, involves the processing, communication, and feedback loop for refining health data and enhancing decision-making (13).

In summary, OIT offers a framework for examining how RHIS tools and methods interact and impact data quality and effectiveness of health information management in Osun State.

5. METHODS

The study evaluated RHIS tools and techniques in public health facilities in Osun State, Nigeria, via cross-sectional survey. The 22 facilities (14 primary, 6 secondary, 2 tertiary) in

three senatorial districts were selected by multistage sampling. Of 1,139 eligible health workers, 317 were randomly selected (simple random sampling) using Cochran's formula for finite population with 10% attrition.

We gathered data over three months with two PRISM-based instruments: questionnaire for health workers, and observation checklist for RHIS tools, process and practice at facility level. Development of instruments included expert review for face and content validity, with construct validity indicated by Bartlett's test ($p < 0.05$), high communalities and acceptable variance explained. Cronbach's alpha (0.790) indicated good internal consistency.

Data were analyzed using SPSS 30.0 with descriptive statistics (frequency and percentage) for RHIS tools and methods and inferential statistics (simple and multiple regression) to explore relationships. The study was approved, with confidentiality, voluntary consent, and privacy assured.

6. RESULTS

6.1: Socio-demographic characteristics of the structured questionnaire respondents

We distributed 317 questionnaires, and received 297, for a response rate of 93.69%.

The results present in Table 1 revealed that most respondents were females (74.7%) and males (25.3%). Most of the respondents were in the age group of 30-39 years (33.7%) and 40-49 years (27.9%). Educationally, almost half had a Bachelor's degree (47.5%) while those with PD/ND and HND made up 21.2% respectively. The majority of respondents were married (68.0%).

In terms of experience, many of the respondents had 1-5 years of experience (30.0%) or 6-11 years of experience (19.2%). The most common occupations were Health Information Management officers and nurses (28.3% each). The majority hailed from primary health care facilities (42.7%) with secondary health care facilities (36.4%) next.

Table 1: Socio-Demographical Characteristics of the Respondents from the selected Facilities across the tiers of Healthcare Deliveries in Osun State.

Variable	Frequency (n=297)	Percentage (%)
Sex		
Male	75	25.3
Female	222	74.7
Age Group		
18-29	82	27.6
30-39	100	33.7
40-49	83	27.9
50 and above	32	10.7

Level of Education	63	21.2
PD/ND	63	21.2
HND	141	47.5
Bachelor's degree	30	10.1
Post Graduate degree (Master/PhD)		
Marital Status	91	30.6
Single	202	68.0
Married	4	1.3
Divorced/Separated/Widowed		
Duration of Employment	24	8.1
<1 year	89	30.0
1-5 years	57	19.2
6-11 years	54	18.2
12-17 years	29	9.8
18-24 years	44	14.8
25 & above		
Profession	84	28.3
HIM	84	28.3
Nurse	36	12.1
CHO	22	7.4
CHEW	32	10.8
MLS	10	3.4
Medical Officer	14	4.7
Pharmacist	15	5.0
No Response		
Facility Category	127	42.7
Primary	108	36.4
Secondary	62	20.9
Tertiary		

6.2. Section B: Tools and Methods of routine health information system in Osun State

6.2.1 Tools of routine health information system (RHIS) in Osun State

The results presented in Table 2 show that most respondents strongly agreed on the use of standard Ministry of Health (MOH) registers (60.6%) and completion of summary forms (47.8%), suggesting overall compliance with the RHIS tools. But there were significant shortcomings as 12.1% did not agree on the use of MOH registers and 28.6% did not consistently complete summary forms. Although half of respondents agreed on the use of IDSR tools, some (15.1%) still disagreed. The overall mean performance of the RHIS tools, 14.19 (SD = 5.47), shows that while there is good performance, it can be improved.

Table 2: Tools of Routine Health Information System in Osun State.

Tools of RHIS (f = 297)	Frequency	Percent
The facility uses the standard Ministry of Health (MOH) registers (e.g., outpatient, ANC, delivery, immunization).		
Strongly disagree	12	4.0
Disagree	24	8.1
Neither disagree nor agree	4	1.3
Agree	77	25.9
Strongly agree	180	60.6
The facility completes two monthly summary forms for reporting.		
Strongly disagree	28	9.4
Disagree	57	19.2
Neither disagree nor agree	9	3.0
Agree	61	20.5
Strongly agree	142	47.8
The facility uses IDSR templates/tools for disease surveillance reporting.		
Strongly disagree	36	3.7
Disagree	73	11.4
Neither disagree nor agree	12	13.5
Agree	53	49.2
Strongly agree	123	22.2
The facility uses locally modified forms when national forms are not available.		
Strongly disagree	65	21.9
Disagree	130	43.8
Neither disagree nor agree	22	7.4
Agree	24	8.1
Strongly agree	56	18.9

RHIS Tools mean score + SD = 14.19+5.47

Max obtainable score (is 4 items x 5max score) = 20. Average score is 10. Therefore, <10 = Poor status; >10 = Good status etc.

6.2.2: Methods of routine health information system (RHIS) in Osun State

The results shown in Table 3 indicate that RHIS methods have varying degrees of performance across health facilities. Although, the majority of respondents reported that monthly summary reports are compiled (67.3%) and data are submitted to DHIS2 (67.0%), there are notable deficiencies in consistent daily data recording (40.8% non-compliance) and monthly summary verification (32.7% non-compliance). The health facilities largely use registers and collect essential health indicators such as maternal and child health, HIV, malaria and IDSR data. Just over half reported timely reporting (57.6%) and facility-specific data entry (50.8%). On average, the mean score of the RHIS methods (40.57, SD = 12.17) suggests good but variable implementation and room for improvement.

Table 3: Methods of Routine Health Information System in Osun State.

Methods of RHIS (N = 297)	Frequency	Percent
Recording of service data is done daily at service points (e.g., outpatient, ANC, immunization).	40	13.5
Strongly disagree	81	27.3
Disagree	14	4.7
Neither disagree nor agree	49	16.5
Agree	113	38.0
Strongly agree		
Staff use paper-based registers as the primary source before digital entry.	16	5.4
Strongly disagree	32	10.8
Disagree	5	1.7
Neither disagree nor agree	73	24.6
Agree	171	57.6
Strongly agree		
Data entry is service-specific (e.g., separate registers/entries for ANC, vaccination, malaria, etc.).	24	8.1
Strongly disagree	49	16.5
Disagree	8	2.7
Neither disagree nor agree	65	21.9
Agree	151	50.8
Strongly agree		
The facility routinely collects maternal and child health (RMNCH) indicators.	8	2.7
Strongly disagree	16	5.4
Disagree	3	1.0
Neither disagree nor agree	81	27.3
Agree	189	63.6
Strongly agree		
The facility routinely collects IDSR and vaccination data.	20	6.7
Strongly disagree	40	13.5
Disagree	7	2.4
Neither disagree nor agree	69	23.2
Agree	161	54.2
Strongly agree		
The facility routinely collects HIV and malaria service data.	32	10.8
Strongly disagree	65	21.9
Disagree	11	3.7
Neither disagree nor agree	57	19.2
Agree	132	44.4
Strongly agree		
The facility prepares an end-of-month summary report by compiling daily records.	5	1.7
Strongly disagree	10	3.4
Disagree	2	0.7
Neither disagree nor agree	80	26.9
Agree	200	67.3
Strongly agree		

The Officer-in-Charge or an M&E staff member verifies the monthly summary for correctness.		
Strongly disagree	32	10.8
Disagree	65	21.9
Neither disagree nor agree	12	4.0
Agree	57	19.2
Strongly agree	131	44.1
Monthly summaries/data are submitted to the LGA or entered into the DHIS2 platform.		
Strongly disagree	4	1.3
Disagree	8	2.7
Neither disagree nor agree	1	0.3
Agree	85	28.6
Strongly agree	199	67.0
The facility adheres to a time-bound reporting window (typically 1st–5th of each month).		
Strongly disagree	16	5.4
Disagree	32	10.8
Neither disagree nor agree	5	1.7
Agree	73	24.6
Strongly agree	171	57.6

RHIS Methods mean score + SD = 40.57+ 12.17

Max obtainable score (is 10 items x 5max score) = 50. Average score is 25. Therefore, <25 = Poor status; >25 = Good status etc.

6.3 Observational Checklist Report on Tools and Methods of RHIS in Osun State

As revealed in Table 4, our results show that most facilities had standard Ministry of Health (MOH) registers (87.0%) and monthly summary forms (69.6%), suggesting routine RHIS documentation systems. But there were also gaps, with 13.0% not having standard registers, 30.4% having only partial summaries and almost 40% not using IDSR tools, suggesting variability in tool usage. The majority (73.9%) of facilities did not create alternative forms if the standard tools were missing.

As for RHIS approaches, most (56.5%) collected daily encounters and a majority (82.6%) used mixed paper-digital systems. Data on key health indicators was commonly collected, particularly for maternal and child health (91.3%), IDSR/vaccination (78.3%) and HIV/malaria (65.2%). But report verification (65.2%) and timeliness (73.9%) of reporting were moderate. In summary, while core RHIS tools and methods are in place, verification, IDSR use and availability of tools suggest that we need better supervision, resource allocation and training.

Table 4: Tools and Methods of RHIS in Osun State. (Observational Checklist Report)

Tools and Methods of RHIS (f = 23 Facilities)	No	Yes
RHIS Tools	F (%)	F (%)
Standard MOH registers available	3 (13.0)	20 (87.0)
Two monthly summary forms available	7 (30.4)	16 (69.6)
IDSR templates/tools available	9 (39.1)	14 (60.9)
Locally modified forms used only when national forms unavailable	17 (73.9)	6 (26.1)
RHIS Methods		
Daily recording of patient encounters	10 (43.5)	13 (56.5)
Paper-based registers used before digital reporting	4 (17.4)	19 (82.6)
Data entry is service-specific	6 (26.1)	17 (73.9)
Maternal and child health indicators recorded	2 (8.7)	21 (91.3)
IDSR & vaccination data recorded	5 (21.7)	18 (78.3)
HIV & malaria data recorded	8 (34.8)	15 (65.2)
End-of-month summary reports prepared	2 (8.7)	21 (91.3)
Officer-in-Charge / M&E verifies summaries	8 (34.8)	15 (65.2)
Monthly summaries submitted to LGA/DHIS2	4 (17.4)	19 (82.6)
Facility adheres to time-bound reporting (1st–5th)	6 (26.1)	17 (73.9)

7. DISCUSSION

The results suggest that the Routine Health Information System (RHIS) in Osun state is largely aligned with standards, as Ministry of Health (MOH) approved registers and summary tools were used in all the major service areas, with good awareness and adherence to standard documentation practices. This reinforces the presence of a robust framework for uniform data collection, comparability, and consistency, in line with Morris (13) and Salihu (24), and backed by the studies of Yehula (30) and Agazia (31) which emphasise the importance of standardised tools for better usability and reporting efficiency, while confirming the earlier findings of Shama (32) and Tulu (33) regarding the benefits of uniform data collection. However, the lack of availability and completeness of these tools in some facilities suggest logistical constraints and lack of uniformity, which is similar to what was reported by Negera (34), Moukenet (35), Rumisha (36) and Koumamba (37), but different from Chekol et al. (25) and Moloko and Ramukumba (26). Locally-developed tools are sometimes used, which adds variability that could affect data comparability in line with arguments that this flexibility might aid in continuity in constrained settings (27,28,38).

Regarding RHIS methods, the study reveals that daily data collection and monthly reporting are mostly institutionalized, thereby facilitating data accuracy and continuity, which aligns with the findings of Salihu (24), Ubalaeze (29), Yehula (30), and Chekol (25). However, the inconsistencies in daily recording, supervisory checking and reporting timeliness suggest inconsistencies in compliance, which is partly affected by staffing and capacity challenges as

suggested by Negera (34) and Hlaing (38); in contrast, Moloko and Ramukumba (26) indicated that compliance was consistent. The continued use of the hybrid reporting, involving both paper and electronic systems, suggests that it is an intermediate phase in the process of digitalization, which is fraught with potential delays and inaccuracies in data recording, in line with Chekol et al. (25), Koumamba (37), Adeyemi (14), and Sewunet (39). Reporting timetables are generally followed, but there is a lack of verification in the processes, which identifies a lack of quality assurance, in contrast to Morris (13), and consistent with Moukenet (35) and Whyte (40).

8. APPLICATION OF THE THEORETICAL FRAMEWORK TO THE FINDINGS OF THIS STUDY

Theoretically, the findings are explained by the Diffusion of Innovation Theory (41), Organizational Information Theory (21), and PRISM Framework (9) which collectively point out that structured systems do exist, but technical infrastructure, organizational support and behavioral factors limit optimal performance in RHIS, in line with the findings of Whyte (40), Marcel (42) and Bakotic (43). In particular, the findings suggest that the incomplete and inconsistent use of DHIS2 and other reporting tools is a manifestation of uneven adoption of innovations across health facilities, which is a result of variations in perceived usefulness, access to, and capacity for the innovations. Because documentation is inconsistent, hybrid paper-digital systems, and feedback loops are irregular, organizational Information Theory suggests that there is more uncertainty within the system, that information equivocality is higher, and that the act–response–adjustment cycle is weaker, thus reducing uncertainty reduction and effective decision making. The PRISM Framework also details how technical, organisational and behavioural constraints that interact at the technical level contribute to gaps in tool distribution, and low use of IDSR tools and poor data verification processes, which in turn affect RHIS data quality.

9. CONCLUSION

This study suggests that RHIS tools and methods in Osun State are generally in line with national standards, with many using MOH-approved registers and reporting systems. But the absence of tools, inconsistencies in documentation and the use of mixed (paper-electronic) systems restrict data standardisation and effectiveness. Although data collection and reporting at a daily level are institutionalised, compliance and supervision rates vary, affecting the system's effectiveness, suggesting a need for logistical and methodological improvements.

10. RECOMMENDATIONS

1. The Osun State Ministry of Health (SMOH) should ensure regular stocking and systematic use of MOH-approved registers and IDSR templates in facilities to avoid the use of locally modified tools, which affect data consistency and quality.
2. Regular data reconciliation should be institutionalized at facility and LGA levels between service registers, summary reports and DHIS2 to detect errors and address discrepancies.
3. Facility and departmental heads should review reports before submission to higher levels to ensure quality, completeness and timeliness of the RHIS reports.
4. Primary and secondary facilities with paper-based systems should equip their facilities with digital resources such as computers, internet services and workstations for DHIS2.
5. Osun State health education institutions, like the School of Health Information Management, School of Community Health Programmes and School of Nursing, should develop competency-based refresher training using adult learning principles to improve staff productivity in data management, data validation and use of electronic tools.

11. LIMITATION

The study faced challenges in data collection because of timing constraints for both the health facilities and the availability of staff, restricting access to detailed information on the RHIS tools and reporting systems. Further, factors such as response bias, in which participants may have overestimated the functionality and implementation of RHIS tools, and the discrepancy between responses to the questionnaires and the checklists could influence the quality and generalizability of the results.

Other Information

1. Funding Statement: This research was self-funded by the authors, and no external financial support was received for the conduct of this study.

2. Ethical Statement

Ethics Approval and Participant Consent

Ethical approval for this study was obtained from the appropriate institutional review authority of Obafemi Awolowo University Teaching Hospitals Complex prior to data collection. Informed consent was obtained from all participating patients, ensuring voluntary participation. Strict measures were implemented to maintain confidentiality and anonymity of all respondents, and all procedures were conducted in accordance with established ethical standards for research involving human participants.

3. Conflict of Interest Statement

Disclosure of conflict of interest: The authors declare that there are no conflicts of interest or competing interests associated with this study.

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5. Author Contribution Statements

SAO conceived the study, initiated the study design, participated in data analysis and coordination, and drafted the manuscript. ADO contributed to the study design and coordination and critically reviewed the manuscript for intellectual content. KCE also contributed to the study design and coordination and reviewed the manuscript. AOO participated in the study design and coordination and was actively involved in data collection and data analysis. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work in line with the recommendations of the International Committee of Medical Journal Editors.

6. Clinical Trial Registration

Not applicable (NA). This study did not involve a clinical trial and therefore was not subject to registration in accordance with the recommendations of the International Committee of Medical Journal Editors.

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