International Journal of Spectrum Research in Medical and Clinical Practice (IJSRMC)
2(2), April-June, 2026, Pages 38-52

 ISSN: 3092-975X

https://doi.org/10.5281/zenodo.20104976

Organizational Factors Affecting Osun State's Routine Health Information System' Data Quality

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ABSTRACT

Organisational factors play a key role in the quality of data in Routine Health Information Systems (RHIS), especially in low- and middle-income countries. In Nigeria, recurring problems including poor governance, supervision, and a lack of information-use culture, impact data quality. This research assessed the impact of organisational factors on data quality of RHIS in Osun State, impacting health service delivery at primary, secondary and tertiary levels of care. In a cross-sectional study, 317 health workers were surveyed from 22 public health facilities in Osun State using multistage sampling. A questionnaire and a checklist based on the Performance of Routine Information System Management (PRISM) framework were used for data collection. The questionnaire and checklist were valid and reliable (alpha = 0.790). Data were summarised using descriptive statistics to report on organisational practices and RHIS data quality dimensions, and multiple regression (SPSS version 30.0) analysed the impact of organisational factors on data quality. Organisational and managerial practices were overall positive (mean = 54.57 ± 8.15), with the majority of respondents stating they had supportive supervision (86.2%), regular feedback (85.2%) and emphasised data completeness and timeliness. Most facilities had management structures (73.9%), RHIS standards (91.3%) and supervision (>87%). But there were shortcomings in the visibility of RHIS mission statements (30.4%) and use of performance improvement tools (43.5%), suggesting poor institutionalisation of continuous quality improvement processes. RHIS data quality was adequate in terms of completeness (8.78 ± 2.0), timeliness (9.11 ± 1.7) and reliability (13.04 ± 3.2), but inaccurate in terms of accuracy, with only 21.7% of facilities reporting accurate data, and inconsistencies between source registers and summary reports. Primary health facilities had the highest overall levels of data quality (43.59 ± 5.78) despite having less sophisticated organisational structures than tertiary facilities, revealing the importance of service delivery settings where most rural people can access care. Organisation was found to positively influence the quality of RHIS (β = 0.203, t = 3.529, p < 0.05) and account for 4.1% of the variance (R^2 = 0.041) in regression analysis. While Osun State has relatively well-developed organisational structures to support RHIS, weak continuous quality improvement, staff training and performance monitoring affect the quality of RHIS data. The system is still compliance-focused rather than learning-focused and its impact on evidence-based decision-making, especially at primary healthcare level in rural areas.

Keywords: *Organizational Factors, Health Information, Data Quality, Health, Osun State*

Background to the Study

The lack of access to high-quality data at national, state and local government levels continues to pose a critical challenge in effective health service management, with poor data quality affecting health planning, service delivery and policymaking (Omole, 2019; Daneshkohan, 2022). The generation, collection, analysis, and reporting of information in Health Information Systems (HIS) are critical for decision making; yet, ineffective systems may lead to poor resource allocation, inappropriate clinical decisions and erode confidence in health services (Adejumo, 2017; Sylla, 2024). Routine Health Information Systems (RHIS) are specifically tailored to deliver ongoing data for governance, accountability and quality improvement; however, lack of information support remains a barrier to health system strengthening (Leon, 2020). The

Performance of Routine Information System Management (PRISM) framework suggests that organisational determinants, such as information culture, governance, leadership, resource allocation, and clear roles and responsibilities of stakeholders are key factors affecting routine health information systems (RHIS) performance (USAID & MEASURE Evaluation, 2008).

Organisational factors have a profound impact on data quality through data collection, management and use. The availability of policy guidelines, standard operating procedures, sufficient budget, and effective leadership and governance promotes data quality, while their lack undermines the data management system (Cheburet, 2016; Glette and Wiig, 2021; Lemma et al., 2020). Similarly, capacity building, supportive supervision and feedback play a critical role in enhancing data accuracy and completeness by detecting errors and building capacity. In developing nations, including Nigeria, lack of adequate funding, poor governance and lack of coordination among stakeholders, hinder the performance and accountability of RHIS. Likewise, in sub-Saharan Africa, the absence of institutional structures and standardised processes leads to inconsistent reporting and lack of data reliability (Morris, 2024). In Osun State, these challenges are further compounded by inadequate infrastructure, funding, and social services, which limit data management practices (Adeyemi, 2022). Moreover, poor information culture and lack of clarity in the roles of stakeholders contribute to low prioritisation and use of data in decision making, resulting in poor documentation, reporting, and data flow. In general, organisational factors (leadership, governance, supervision, and funding) play a major role in determining the quality of the data generated from the RHIS; overcoming these challenges is critical to improving data accuracy, completeness and reliability.

Statement of Problem

Organisational factors play a significant role in the quality of data produced from the Routine Health Information Systems (RHIS) in Nigeria and poor organisational structures, limited funding and governance are key drivers of poor quality data (McKing, 2021; WHO, 2023). In Osun State, poor funding, lack of supportive supervision and inadequate enforcement of policies on data management affect data collection and reporting, resulting in inconsistencies and errors. Insufficient training and capacity-building activities also impact data quality, with health personnel potentially lacking skills for effective data management. Lack of feedback loops and accountability also decreases the incentive to achieve data quality. Lack of effective communication and coordination between stakeholders also affects the flow of data, leading to delays, overlap, and inconsistencies at various health system levels. To address these challenges, it is essential to explore the role of organisational factors on RHIS data quality in Osun State. Governance, leadership, resource allocation, supervision and institutional arrangements play critical roles in improving data quality and health information systems (Adejimi, 2017; WHO, 2023).

Objective of the Study

To investigate organizational factors affecting Osun State's RHIS data quality.

Theoretical Framework

The Total Quality Management (TQM) and Lean Six Sigma (LSS) approaches help to identify organisational elements influencing the quality of RHIS data in Osun State. TQM stresses the importance of continuous improvement, stakeholder participation and quality management, emphasising the need for leadership support, documented policy and procedures, training and standard operating procedures to achieve quality data (ISO, 1996; Kanji, 1994; Cheburet, 2016; Glette and Wiig, 2021). Lean Six Sigma emphasises the elimination of process inefficiencies and variability through techniques like DMAIC, leading to more accurate, complete and reliable data (Snee, 2010; Munyai, 2017). Both approaches highlight the need for organisational factors like leadership commitment, resource allocation, supervision and training to improve the performance of RHIS (Lemma et al., 2020). In all, these frameworks offer systematic approaches to identify organisational factors, optimise data management practices, and build a quality culture that strengthens RHIS data quality.

METHODS

The research used a cross-sectional study design to evaluate the impact of health facility organizational factors on the quality of RHIS data in public health facilities in Osun State. Multistage sampling was used to select 22 health facilities (14 primary, 6 secondary and 2 tertiary) from the three senatorial districts, with representation of all levels of care, and 317 health workers were chosen using simple random sampling out of a total of 1,139 health workers. The study used a questionnaire and an observational checklist based on the PRISM framework to measure the organizational factors including policies, supervision, training and resource allocation. The tools were reviewed by experts to ensure face and content validity, and construct validity was supported by statistical analyses (Bartlett's test of sphericity and factor analysis) showing items were well represented. Testing of reliability indicated good internal consistency (Cronbach's alpha = 0.790). Data were collected for three months by trained data collectors following a pre-tested questionnaire. The data were analysed using SPSS version 30.0 with descriptive statistics providing an overview of the organizational factors and multiple regression analysis determining the impact of these factors on RHIS data quality. Informed consent and confidentiality were adhered to.

RESULTS

Socio-demographic characteristics of the structured questionnaire respondents

A total of 317 copies of the questionnaire were distributed and 297 copies were retrieved (a response rate of 93.69%). Table 1 displays the characteristics of the respondents, where most were females (74.7%) and aged between 30-39 years old (33.7%). The majority had a Bachelor degree (47.5%) and were mostly married (68.0%). Most (30.0%) had been in the profession for 1-5 years. The majority of the respondents were Health Information Management officers and nurses (28.3% each), and most came from primary (42.7%) and secondary (36.4%) health facilities.

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		
PD/ND	63	21.2
HND	63	21.2
Bachelor’s degree	141	47.5
Post Graduate degree (Master/PhD)	30	10.1
Marital Status		
Single	91	30.6
Married	202	68.0
Divorced/Separated/Widowed	4	1.3

Duration of Employment		
<1 year	24	8.1
1-5 years	89	30.0
6-11 years	57	19.2
12-17 years	54	18.2
18-24 years	29	9.8
25 & above	44	14.8
Profession		
HIM	84	28.3
Nurse	84	28.3
CHO	36	12.1
CHEW	22	7.4
MLS	32	10.8
Medical Officer	10	3.4
Pharmacist	14	4.7
No Response	15	5.0
Facility Category		
Primary	127	42.7
Secondary	108	36.4
Tertiary	62	20.9

The Current State of Data Quality in Osun State's RHIS (Accuracy, Completeness, Timeliness and Reliability)

Data Accuracy in Osun State's RHIS

As per table 2, practices for data accuracy in Osun State's RHIS were satisfactory (mean = 10.68 ± 4.3). Of the respondents, 31.0% always and 23.2% often compared register to computer reports, while 24.6% rarely or never performed this practice. Likewise, 31.0% always and 23.6% often checked data from the register against reports in the past three months while 27.3% rarely or never did so. Trend monitoring was somewhat better with 46.8% always and 21.5% often performing this activity, while 16.5% rarely or never did. In summary, while overall performance was satisfactory, there are still significant deficiencies in data verification at facilities.

Table 2: Data Accuracy in Osun State's RHIS

Data Accuracy Check (F= 297)	Frequency	Percent
How often do you compare the information from the register with the computer-generated reports?		
Never	55	18.5
Rarely	18	6.1
Sometimes	63	21.2
Often	69	23.2
Always	92	31.0
How frequently have you compared the information from the register with the computer-generated reports over the last three months?		
Never	62	20.9
Rarely	19	6.4
Sometimes	54	18.2
Often	70	23.6
Always	92	31.0

How often does this facility compare data over time (monitoring over time)?		
Never		
Rarely	31	10.4
Sometimes	18	6.1
Often	45	15.2
Always	64	21.5
	139	46.8

Data Quality status (mean score ± SD) = 10.68 ± 4.3

Max obtainable score (is 3 items x 5max score) = 15. Average score is 7.5. Therefore, <7.5 = Poor status; >7.5 = Good status

Data Completeness in Osun State's RHIS

Data completeness in Osun State's RHIS was satisfactory (mean 8.78 ± 2.0) as shown in table 3. Most respondents (60.3%) reported always and 25.6% often fully completed their monthly report forms but 6.7% rarely or never completed them. Likewise, in the last three months, 67.3% reported always and 19.9% often completing reports; 6.7% of respondents rarely or never completed them. In conclusion, while RHIS performance was good, some facilities still have incomplete reporting.

Table 3: Data Completeness in Osun State's RHIS

Data Completeness (F=297)	**Frequency**	**Percentage**
How often do you fill the monthly report form completely?		
Never	12	4.0
Rarely	8	2.7
Sometimes	22	7.4
Often	76	25.6
Always	179	60.3
How frequently have you filled in the monthly report form completely in the last three months?		
Never	14	4.7
Rarely	6	2.0
Sometimes	18	6.1
Often	59	19.9
Always	200	67.3

Data Quality status (mean score ± SD) = 8.78 ± 2.0

Max obtainable score (is 2 items x 5max score) = 10. Average score is 5. Therefore, <5 = Poor status; >5 = Good status

Data Timeliness in Osun State's RHIS

The RHIS data timeliness in Osun State was generally high (mean = 9.11 ± 1.7) as shown in table 4. Most respondents always (73.7%) and often (18.5%) submitted reports on time, but 3.4% rarely or never submitted them on time. Likewise, in the past three months, 68.4% always and 22.9% often submitted reports timely while 5.1% reported rarely or never achieving timeliness. In summary, while performance was satisfactory, a few facilities still faced some delay in reporting.

Table 4: Data Timeliness in Osun State's RHIS

Data Timeliness (F=297)	Frequency	Percentage
How often does this facility submit its report by the specified deadline?		
Never	7	2.4
Rarely	3	1.0
Sometimes	13	4.4
Often	55	18.5
Always	219	73.7
How frequently have you submitted the monthly report by the specified deadline in the last three months?		
Never	10	3.4
Rarely	5	1.7
Sometimes	11	3.7
Often	68	22.9
Always	203	68.4

Data Quality status (mean score $\pm$ SD) = 9.11 $\pm$ 1.7

Max obtainable score (is 2 items x 5max score) = 10. Average score is 5. Therefore, <5 = Poor status; >5 = Good status

Data Reliability in Osun State's RHIS

Table 5 shows that Data reliability in Osun State's RHIS was mostly satisfactory (mean = 13.04 ± 3.2). The majority of facilities reported they always maintained copies of monthly reports to the district office (62.3%) and often (23.9%) but 7.1% rarely or never had them. Likewise, 63.6% indicated that data processing tools (such as tally sheets) always exist, 21.5% often exist and 6.1% rarely or never have them. Also, 61.6% reported that data collection procedure manuals always exist, 21.2% often exist, and 9.1% rarely or never have them. In summary, although data reliability is good, some facilities lack documentation and tools for procedures.

Table 5: Data Reliability in Osun State's RHIS

Data Consistency/Reliability (F=297)	Frequency	Percentage
How often does this facility keep copies of the RHIS monthly reports sent to the district office?		
Never	13	4.4
Rarely	8	2.7
Sometimes	20	6.7
Often	71	23.9
Always	185	62.3
How often do data processing procedures or a tally sheet exist in this facility?		
Never		
Rarely	13	4.4
Sometimes	5	1.7
Often	26	8.8
Always	64	21.5
	189	63.6
How often does a procedure manual for data collection (with definitions) exist in this facility?		
Never	20	6.7
Rarely	7	2.4
Sometimes	24	8.1
Often	63	21.2
Always	183	61.6

Data Quality status (mean score ± SD) = 13.04 ± 3.2

Max obtainable score (is 3 items x 5max score) = 15. Average score is 7.5. Therefore, <7.5 = Poor status; >7.5 = Good status

Observational Checklist Reports on the Current State of Data Quality in Osun State's RHIS (Accuracy, Completeness, Timeliness and Reliability)

As shown in Table 6, the accuracy of data is not very high as 21.7% of facilities have accurate reports and there is predominant mismatching between source registers and reports to the facilities like malaria (52.2% mismatched) and ANC (39.1% mismatched). It is also low in terms of accuracy in immunisation, measles, nutrition, diarrhoea, TB, HTN, URTI and DM where missing data is more than 65%. We also have low validation of registers with the computer generated report since only 39.1% of facilities compare. On the other hand, completeness is not very low with 78.3% of the facilities have complete reporting and good completeness for most of the items.

As to timeliness, most (73.9%) report within the first seven days of the following month and nearly all district offices (95.7%) report the date received. However, around 45% of the reports were submitted on-time in January and July 2024 and many of the missing data items were filled in the reports. In terms of accuracy and reliability of data, it is high as most of the facilities engage in calculating indicators (69.6%), comparing to district or national targets (78.3%) and monitoring trends (95.7%). The formal data processing procedures are not as common (34.8%), however procedures manuals (95.7) are present and there is the monitoring practise, which indicates a high level of reliability and systematic data management of the facilities.

Table 6: Current State of RHIS Data Quality across Healthcare Facilities in Osun State (Observational Checklist Report)

Data Quality Dimension (n = 23)	Response Summary	Key Findings (%)
A. Accuracy		
Copies of RHIS monthly reports sent to district office	Majority of facilities send copies to district office	**Yes (91.3)**
Availability of last 12 months' reports	Reports largely inaccurate or incomplete	Accurate (21.7), Inaccurate (60.9)
Malaria data match (register vs summary)	Moderate accuracy	Matched (34.8), Mismatched (52.2)
ANC data match	Relatively better performance	Matched (43.5), Mismatched (39.1)
Immunization, Measles, Nutrition, Diarrhoea, TB, HTN, URTI, DM	Very poor accuracy; high missing data	Missing data >65 for all
Comparison of register with computer-generated report	Most do not perform data comparison	Yes (39.1), No (60.9)
Overall Accuracy Impression	Accuracy performance is weak, with substantial mismatches and missing data across service areas	**<50 accurate reporting**
B. Completeness		
Facility completeness level (FCL)	High overall completeness levels	(78.3)
Completeness of data items	Most data items were fully reported	Complete (78.3), Incomplete (21.7)
Overall Completeness Impression	Data completeness is satisfactory in most facilities	**>75 completeness**
C. Timeliness		
Deadline for submitting RHIS monthly report	Majority submit within the first week of following month	Timely (73.9)

District office records receipt date	Nearly all district offices record receipt dates	Yes (95.7)
Timeliness (January 2024)	Around half submitted on time	Timely (43.5), Untimely (8.7), Missing (47.8)
Timeliness (July 2024)	Similar pattern to January	Timely (39.1), Untimely (8.7), Missing (52.2)
Overall Timeliness Impression	Reasonably timely submission pattern, but significantly missing reporting data	**≈45 timely reporting**
D. Data Consistency/reliability		
Availability of data-processing procedure/tally sheet	Limited use of formal tally sheets	Yes (34.8), No (65.2)
Facility calculates catchment indicators	Majority perform indicator calculations	Yes (69.6)
Facility compares data with district/national targets	Widespread use of comparative analysis	Yes (78.3)
Facility compares service coverage types	Common practice across facilities	Yes (73.9)
Facility monitors data over time	Almost all facilities track data trends	Yes (95.7)
Availability of procedure manual for data collection	Nearly universal presence of manuals	Yes (95.7)
Overall Data Consistency/reliability Impression	Data analysis and monitoring practices are strong, though procedural documentation is inconsistent	**>70 performance level**

6.4: Organizational Factors Affecting Osun State's RHIS Data Quality

Table 7 reports on organizational factors affecting the quality of RHIS data in Osun State, which shows that overall, leadership and management practices are positive but there is some variance in the style of decision-making. The majority disagreed or strongly disagreed (63.2%) that superiors decide on what to do based on "who likes me", but most agreed that decisions are based on evidence (47.1% agree; 38.4% strongly agree) and that leadership practices are data-driven (49.2% agree; 22.2% strongly agree). Also, 58.9% agreed or strongly agreed that decision-making style impacts the quality of data produced, although 27.9% disagreed.

With respect to management style, most respondents reported supportive supervision (46.1% agree; 40.1% strongly agree) and that superiors seek feedback (50.2% agree; 35.4% strongly agree). Data quality in monthly reports was also emphasised (49.8% agree; 40.1% strongly agree) and regular data quality checks were also reported (48.8% agree; 39.1% strongly agree). The majority of respondents reported that superiors emphasise filling out of monthly report forms (47.5% agree; 43.4% strongly agree) and timely reporting (41.1% agree; 47.1% strongly agree). Additionally, respondents indicated superiors use HMIS data for setting and monitoring targets (48.1% agree; 30.3% strongly agree) and superiors openly discuss conflicts (44.1% agree; 30.0% strongly agree) and give feedback to staff (49.2% agree; 36.0% strongly agree).

Generally, 72.4% agreed or strongly agreed that the management style impacts on data quality in their facility. The mean organizational status score of 54.57 (SD = 8.15), which is much higher than the cut-off for "good" status, suggests that management and organisational practices are generally conducive to the quality of RHIS data in Osun State. However, the dissenting responses indicates that there is room for further improvement of evidence-based and participatory management practices.

Table 7: Organizational Factors Influencing Osun State's RHIS Data Quality

Decision-making Style/Approach (f = 297)	Frequency	Percent
Superiors make decisions based on Personal liking		
Strongly disagree	94	31.6
Disagree	94	31.6
Neither disagree nor agree	12	4.0
Agree	68	22.9
Strongly agree	29	9.8

Superiors make decisions based on Evidence/facts		
Strongly disagree	8	2.7
Disagree	19	6.4
Neither disagree nor agree	16	5.4
Agree	140	47.1
Strongly agree	114	38.4
leadership practice data-driven decision-making		
Strongly disagree	11	3.7
Disagree	34	11.4
Neither disagree nor agree	40	13.5
Agree	146	49.2
Strongly agree	66	22.2
Decision-making style/approach affects data quality output in our facility.		
Strongly disagree		
Disagree	28	9.4
Neither disagree nor agree	55	18.5
Agree	39	13.1
Strongly agree	122	41.1
	53	17.8
Management Style/Approach		
Superiors give supportive supervision		
Strongly disagree	10	3.4
Disagree	19	6.4
Neither disagree nor agree	12	4.0
Agree	137	46.1
Strongly agree	119	40.1
Superiors seek feedback from concerned persons		
Strongly disagree	7	2.4
Disagree	16	5.4
Neither disagree nor agree	20	6.7
Agree	149	50.2
Strongly agree	105	35.4
Superiors emphasize data quality in monthly reports		
Strongly disagree	3	1.0
Disagree	8	2.7
Neither disagree nor agree	19	6.4
Agree	148	49.8
Strongly agree	119	40.1
Superiors check data quality regularly		
Strongly disagree	7	2.4
Disagree	17	5.7
Neither disagree nor agree	12	4.0
Agree	145	48.8
Strongly agree	116	39.1

Superiors emphasize that monthly report form be filled completely		
Strongly disagree	5	1.7
Disagree	9	3.0
Neither disagree nor agree	13	4.4
Agree	141	47.5
Strongly agree	129	43.4
Superiors emphasize that report be submitted by the specified deadline		
Strongly disagree		
Disagree	7	2.4
Neither disagree nor agree	15	5.1
Agree	13	4.4
Strongly agree	122	41.1
	140	47.1
Superiors use HMIS data for setting targets and monitoring		
Strongly disagree	13	4.4
Disagree	25	8.4
Neither disagree nor agree	26	8.8
Agree	143	48.1
Strongly agree	90	30.3
Superiors discuss conflicts openly to resolve them		
Strongly disagree	23	7.7
Disagree	25	8.4
Neither disagree nor agree	29	9.8
Agree	131	44.1
Strongly agree	89	30.0
Superiors provide regular feedback to their staff through		
Strongly disagree	7	2.4
Disagree	19	6.4
Neither disagree nor agree	18	6.1
Agree	146	49.2
Strongly agree	107	36.0
Management style/approach affects data quality output in our facility		
Strongly disagree		
Disagree	14	4.7
Neither disagree nor agree	40	13.5
Agree	28	9.4
Strongly agree	121	40.7
	94	31.7

Organizational status mean score $\pm$ SD = 54.57 $\pm$ 8.15
Max obtainable score (is 14 items x 5max score) = 70. Average score is 35. Therefore, <35 = Poor status; >35 = Good status etc.

Observational Checklist Reports Organizational Factors Affecting Osun State's RHIS Data Quality

As shown in Table 8, the majority of the facilities reported that they have a management structure on RHIS decisions (73.9%), organisational charts (87.0%) and report submission to the higher level (95.7%), which shows that their organisations are well managed. Also, the availability of the RHIS standards (91.3%), training manuals (91.3%) and supervisory reports (91.3%) is an indicator of the existence of data management and monitoring systems. However, the presence of RHIS mission in prominent points was as

low as 30.4% at the facilities, which shows that little of the organisational objectives and vision is visible. Similarly, the low performance improvement tools (43.5%) also means that there is a gap in continuous quality improvement.

Table 8: Descriptive Analysis of Organizational Factor Affecting Data Quality (Observational Checklist Report)

RHIS-Related Facility Structure/Tool (f = 23)	No F (%)	Yes F (%)
Presence of RHIS Mission displayed at prominent position(s)	16 (69.6)	7 (30.4)
Presence of management structure for dealing with RHIS-related decisions at facility level	6 (26.1)	17 (73.9)
Presence of updated district health management organizational chart showing RHIS functions	3 (13.0)	20 (87.0)
Presence of distribution list/documentation of RHIS report submissions to higher level	1 (4.3)	22 (95.7)
Presence of RHIS situation analysis report (< 3 years old)	3 (13.0)	19 (82.6)
Presence of RHIS targets at facility level	7 (30.4)	15 (65.2)
Presence of a copy of RHIS standards at facility	2 (8.7)	21 (91.3)
Presence of performance improvement tools (flow/control charts, etc.)	11 (47.8)	10 (43.5)
Facility has RHIS training manual	2 (8.7)	21 (91.3)
Presence of mechanisms for on-the-job RHIS training	5 (21.7)	18 (78.3)
Presence of RHIS supervisory checklist	2 (8.7)	20 (87.0)
Presence of supervisory reports	2 (8.7)	21 (91.3)

Comparison of Data Quality and Associated Organizational Factors Across Facility Levels

Primary health facilities achieved the highest mean overall data quality score (43.59 ± 5.78) followed by tertiary (40.31 ± 7.73) and secondary facilities (40.03 ± 7.48), as shown in table 9. Primary facilities also scored highest in accuracy (11.31 ± 3.72), completeness (9.13 ± 1.44), timeliness (9.25 ± 1.53) and consistency (13.91 ± 1.67), suggesting better adherence to the RHIS system data reporting guidelines at the lower levels. Conversely, tertiary facilities had higher organisational factor scores, such as decision-making style (14.03 ± 1.97), management style (42.11 ± 5.19) and the overall organisational factors (56.15 ± 5.82), than primary and secondary facilities. While higher-level facilities had better organisational factors, primary facilities had better overall data quality, which indicates that better data quality does not depend on better organisational factors.

Table 9: Comparison of Data Quality and Associated Factors Across Facility Levels

Assessed Parameters	Primary (mean ± SD)	Secondary (mean ± SD)	Tertiary (mean ± SD)
Data accuracy	11.31 ± 3.72	9.778 ± 3.78	10.95 ± 3.64142
Data completeness	9.13 ± 1.44	8.68 ± 1.85	8.27 ± 2.04994
Data timeliness	9.25 ± 1.53	9.10 ± 1.48	8.85 ± 1.74475
Data consistency	13.91 ± 1.67	12.49 ± 3.31	12.23 ± 2.98312
Decision making style	13.67 ± 3.27	13.65 ± 3.36	14.03 ± 1.96667
Management style	41.40 ± 6.56	39.43 ± 6.43	42.11 ± 5.19175
Data Quality	43.59 + 5.78	40.03 + 7.48	40.31 + 7.73451
Organizational factors	55.08 + 8.61	53.07 + 8.57	56.15 + 5.82490

Test of Hypothesis

The hypothesis tested in the regression analysis is that Organizational Factors do not influence the quality of RHIS data in Osun State. Table 10 reveals that there is a positive and significant relationship between Organizational Factors and RHIS data quality (B = 0.195, β = 0.203, t = 3.529, p < 0.001). There is a weak relationship between Organizational Factors and data quality (R = 0.203), explaining approximately 4.1% of the variance in the data quality (R^2 = 0.041, Adjusted R^2 = 0.038), and the model is significant (F = 12.451, p < 0.05). This indicates that improvements in organizational structures, processes and leadership can improve the quality of data in the RHIS, but to a modest degree.

H0: Organizational Factor has no significant effect of Data Quality in Osun State's RHIS

Table: 10

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.699	.239		15.468	.000
Organizational Factors in RHIS Data Quality	.195	.055	.203	3.529	.000

a. Dependent Variable: Level of RHIS Data Quality

R=0.203, R^2=0.041, Adjusted R^2= 0.038, F=12.451, P < 0.05

7. DISCUSSION

The report on organisational factors affecting data quality in Osun State's Routine Health Information System (RHIS) reveals that the system has a sound administrative and structural basis but, internally, a lack of performance assessment, human resource development and process improvement leads to sub-optimal performance. According to questionnaires and observational checklists, most facilities have established management structures, adhere to RHIS standards, and have supervision arrangements that encourage data accountability, completeness, timeliness and accuracy. This is consistent with the views of Morris (2024), Chekol et al. (2023) and Ubalaeze (2024) on the need for efficient management systems to support RHIS. Yet the lack of RHIS mission statements, formalised performance improvement tools, and regular internal reviews indicates that processes for self-evaluation, use of feedback and quality improvement are weak. This is in contrast to Salihu (2024) and Ghalavand (2024), who emphasised the importance of continuous feedback and internal monitoring in maintaining data quality. While supervision is generally institutionalised, it is unevenly practised, especially in remote or resource-poor health facilities, which affects its effectiveness, consistent with Moloko and Ramukumba (2022) but not with Adeyemi (2022), who found more consistent supervision in well-resourced facilities.

Also, institutional processes, including compliance with standard operating procedures (SOPs), training and leadership commitment vary among facilities. Some facilities adhere to formal SOPs, whereas others adopt informal practices due to staff turnover, and lack of institutional memory, consistent with Oladipupo (2023), who highlighted the importance of formal workflows for data consistency. This is contrary to Anand (2024) who found more frequent adherence to SOPs in tertiary facilities. Likewise, capacity building for staff is limited with few health workers receiving structured, routine training in RHIS data quality management, consistent with Chekol et al. (2023) and Morris (2024) but not Ojo et al. (2022), who found better results in systems with ongoing mentorship. Leadership engagement also differs, with committed facility heads and supportive Local Government Authorities (LGAs) contributing to better data quality, as reported by Moloko and Ramukumba (2022), while ineffective leadership is linked with poor documentation, as reported by Salihu (2024). These differences reflect how differences in organisational capacity, leadership and training impact data quality across the RHIS.

Application of the Theoretical Framework to the Findings of this Study

In the light of Total Quality Management and Lean Six Sigma principles, the results suggest that while the quality of RHIS data in Osun State has good foundations, it is limited by deficiencies in continuous improvement and process optimisation. A high organisational mean score and high prevalence of supervision, RHIS standards and reporting structures are indicative of TQM principles of leadership,

stakeholder engagement and documented processes, which support good performance in terms of data completeness, timeliness and reliability. But the variability in data accuracy, lack of use of performance improvement tools, and sub-optimal internal feedback mechanisms indicate that a culture of continuous improvement as promoted by TQM is yet to be fully embedded. In terms of Lean Six Sigma, the recurring problems of inconsistency between registers and reports, data omissions and non-adherence to SOP highlight process inefficiencies and non-standardisation, suggesting the systematic approaches of DMAIC are not being systematically applied to establish the root causes and variation reduction. Moreover, the small but significant impact of organisational factors on data quality ($\beta = 0.203$, $p < 0.001$) underscores the need for structured management and process control, but also that current practices are not maximised for data quality. In summary, the results indicate that to evolve from compliance-based to quality-driven, continuously improving RHIS, there is a need to improve feedback mechanisms, institutionalise routine monitoring and use structured process improvement approaches to improve the accuracy and consistency of data across facilities.

CONCLUSION

The research shows that RHIS in Osun State has a robust organisational structure with well-defined hierarchies and supervisory structures; but the lack of continuous quality improvement processes, weak implementation of SOP, staff training and leadership commitment limits the potential for high quality data. RHIS remains compliance-based, rather than learning-based and this constrains its ability to improve.

RECOMMENDATIONS

1. Osun State Ministry of Health (SMOH) should implement continuous improvement systems like TQM and Lean Six Sigma in RHIS.
2. Regular data review meetings and internal benchmarking should be improved and institutionalised at all levels of facilities to support feedback and learning.
3. The Policy and Planning Directorate of SMOH should consider including a Data Quality Improvement (DQI) strategy in state RHIS policy, with specific budget lines for ICT support, supervision and training.
4. Ongoing capacity building should be conducted to enhance data management and validation skills among staff.
5. Policy and accountability mechanisms should be enhanced to promote leadership commitment to data quality at all levels of health facilities.

LIMITATION

The study faced challenges with delays in obtaining organisational and supervisory reports due to administrative burdens and organisational practices. Participants may have been affected by response bias responses to report higher compliance with SOPs or management. In addition, Incomplete documentation and inconsistent supervisory records also complicated the consistency and accuracy of organisational data analysis.

Other Information

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

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.

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.

Acknowledgement

The authors sincerely acknowledge the Research and Project Committee of the School of Health Information Management, Obafemi Awolowo University Teaching Hospitals Complex, for their constructive feedback and valuable contributions. Appreciation is also extended to the academic staff of the School, particularly Mr. Adeniregun, Mr. Lamidi, Mr. Kolawole, Mr. Jeje, and Mr. Akilo, for their guidance and support. The authors further thank the 2024/2025 final year students and all participants across the selected Local Government Areas in Osun State for their time and cooperation in this study.

Author Contribution Statements

OSA conceived the study, initiated the study design, participated in data analysis and coordination, and drafted the manuscript. OAD contributed to the study design and coordination and critically reviewed the manuscript for intellectual content. EKC also contributed to the study design and coordination and reviewed the manuscript. MOA 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.

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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