Original Article

District Health Information System 2 Routine Immunisation Dashboard: A Tool for Improving Routine Immunisation Data Quality in Katsina State, Nigeria

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ABSTRACT

Background: District Health Information System (DHIS) is a web-based electronic data capturing platform built on a framework of Health Management Information System (HMIS). In 2014, Nigeria adopted DHIS as the only government-approved electronic reporting platform for all HMIS data. In Katsina State, poor data quality has been identified to be a measure setback despite the robust data quality monitoring tools contained in the DHIS package and this had adversely affected the use of data for informed decision-making.
Materials and Methods: Retrospective and prospective studies were conducted on routine immunisation (RI) data uploaded on the DHIS of Katsina State. These studies were carried out to determine the root causes of data quality issues in the state and to conduct field spot checks using predesigned Data Quality and Use Supportive Supervision (DQUSS) checklists. RI data uploaded on the DHIS2 for the period of January 2018 to December 2018 were downloaded and analysed for varying data quality issues. These data served as baseline data for prospective follow-up. The data quality issues were segregated by local government areas (LGAs) for purposive supervision visits. Data quality monitoring tools on the DHIS2 RI dashboard were used for monitoring these data quality issues. The LGAs were monitored overtime for the period of January 2019 to September 2019 through predefined indicators on the DHIS2 RI dashboard.
Results: Training gap (odds ratio of 0.85 at 95% confidence interval) was identified to be the modal cause of poor data quality in the study area. A continuum of improved data quality was observed over time post conduct of DQUSS.
Conclusion: It was concluded that persistence of RI data quality issues was attributed to inadequate quality supportive supervision in the state.

Key words: Data quality, District Health Information System, Katsina, routine immunisation, scorecard

INTRODUCTION

The District Health Information System version 2 (DHIS2) evolved from research conducted on Health Information System (HIS) programme at the University of Oslo in 1994. The purpose of its development was to aggregate routinely collected data across all of the public health facilities (HFs) of a particular country, to facilitate analysis of health services provided in that country at the national level, forecast required services for future planning purposes and to evaluate the performance of healthcare workers.[1] The primary goals of the system were to establish a centralised database with reporting capabilities at health centres, define and determine the standards for local and national health centre reports and connect service delivery and other health system input databases.[2] The basic version of DHIS2 was based on Microsoft Office Access. It was considered useful as a decentralised and independent database programme. DHIS2 has been used to collect and analyse data on a monthly basis at local, regional and provincial levels in several countries.[3]

DHIS is a web-based electronic data capturing platform built on a framework of Health Management Information

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System (HMIS). In 2014, Nigeria adopted DHIS as the only government-approved electronic reporting platform for all HMIS data. Poor data quality has been identified to be a measure setback despite the robust data quality monitoring tools contained in the DHIS package.[4] Nigeria's Expanded Programme on Immunisation (EPI) was first initiated in 1979 and has witnessed significant progress during the last two decades. The polio eradication efforts brought huge human, material, technical and financial investments into the immunisation space. The introduction of new life-saving vaccines such as pentavalent, pneumococcal conjugate and inactivated polio vaccines infused new funding and programme enhancements, while other targeted efforts such as the routine immunisation (RI) intensification interventions, cold chain expansion and direct delivery of vaccines, vaccine stock monitoring dashboards and EPI trainings served to improve the immunisation system.[5] Despite these programmatic enhancements, data sources on vaccine coverage show a mixed picture. Poor data quality, weak data management and lack of data use for action at the operational level are widely acknowledged problems in the RI system. Although there is progress, there is a long-standing wide disparity observed between the RI performances on the different reporting platforms (especially between administrative and survey coverage estimates, also large discrepancies between DVD_MT and DHIS2.0, which are both HF based). In particular, government and partners are concerned that despite increased programme efforts in the last 2 years, the coverage estimates from surveys remain low, while the national RI administrative coverage is on the rise, making the actual coverage uncertain. The DPT3 administrative coverage has increased from <50% about a decade ago to over 90% in the last 3 years.[6]

MATERIALS AND METHODS

The study was conducted in Katsina State, Nigeria. The state is made up of three geopolitical zones, namely Katsina North, Katsina Central and Katsina South. The state has 34 local government areas (LGAs). There are 1618 HFs offering RI in the state. Katsina State is located in the Sahel Savannah in Northwest Nigeria. It has a total population of nearly 6 million. Each ward has at least one functional primary HF.[7]

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Study design

Retrospective and prospective studies were carried out. Retrospectively, 12-month RI data of January 2018 to December 2018 were pulled from DHIS2 and analysed using an Excel spreadsheet scorecard. Based on the scorecard indicators, LGA performances were ranked as high, average and low. This served as based line data for prospective follow-up.

Target population

The target population for this study was RI service providers saddled with the responsibility of providing RI services as fix sessions and outreach sessions (OS) in all the PHCs.

Data collection

Secondary data were downloaded from DHIS2 at www. dhis2nigeria.org.ng using secured pass to login into the DHIS2 dashboard. Pivot table tool embedded in DHIS2 apps was used to select and download data in tables. Purposive sampling was used to select data with the most frequently reported discrepancies over the past 12 months (January 2018 to December 2018). These data served as baseline data. Post conduct of supportive supervision and on the job training for the RI providers, the same method was used to pull data from the DHIS2 to feed the scorecard for ranking.

Data Quality and Use Supportive Supervision

Katsina State developed and implemented supportive supervision plan at both state and LGA levels with technical and financial supports from partners to drive the process of improving the state data quality. The supportive supervision was guided and focused with the aid of a checklist developed by the National Primary Health Care Development Agency (NPHCDA).[5]

Inclusion criteria

The scorecard was used to select LGAs for the study. LGAs ranked as average and low were considered for the study.

Scorecard

The scorecard was developed using Microsoft Excel 2017 version. The following were used as core indicators for the evaluation of LGA RI performance:

Data reporting indicators

The following Key Performance Indicators (KPIs) were considered for the study:

a. % Completeness of reporting
b. % Timeliness of reporting
c. % Fixed sessions conducted
d. % Outreach Sessions conducted
e. % of Health Facilities Reporting outliers for any RI antigen
f. % of Health Facilities with >10% discrepancies between co-administered antigens
g. % of Health Facilities that Conducted RI review meeting
h. % of Health Facilities that Reviewed DHIS2 RI dashboard
i. % of Health Facilities that Reviewed DHIS2 RI dashboard with plan for follow-up.

Scoring and interpretation was based on the following: 0–49 (low), 50–69 (average) and >69 (high). Source of monitoring data used was from the DHIS2 RI dashboard. All indicators used for the analysis were embedded on the DHIS2 RI dashboard tool.

Data analysis

Data Quality and Use Supportive Supervision (DQUSS) checklist was transcribed into Excel spreadsheet for descriptive statistics and exported to the Statistical Package for the Social Sciences (SPSS) version 20® manufactured by International Business Machine Corporation (IBM) for descriptive and inferential data analysis. Fish bone analysis was used to map out and determine the modal root causes of poor data reporting. Odds ratio (OR) at 95% confidence interval (CI) was used to measure the degree of association and statistical significance between categorical responses (Yes and No) and variables.

Ethical approval for this study (MOH/ADM/SUB/1152/1/660) was provided by the Katsina State Health Research Ethical Review Committee (HREC), 15th April, 2021.

Table I: Ranked performance of local government areas prior to Data Quality and Use Supportive Supervision

LGAs	Total score (maximum score=36)	Percentage score	Rank
Bakori	21	58	Average
Batagarawa	20	55	Average
Batsari	21	58	Average
Baure	12	33	Low
Bindawa	16	44	Low
Charanchi	10	27	Low
Dan Musa	13	36	Average
Dandume	22	61	Average
Danja	19	52	Average
Daura	21	58	Average
Dutsi	10	27	Low
Dutsin-Ma	19	53	Average
Faskari	21	58	Average
Funtua	16	44	Low
Ingawa	16	44	Low
Jibia	14	39	Low
Kafur	10	28	Low
Kaita	19	53	Average
Kankara	13	36	Average
Kankia	11	31	Low
Katsina	14	39	Low
Kurfi	18	50	Average
Kusada	14	39	Low
Mai'Adua	13	36	Average
Malumfashi	11	31	Low
Mani	12	33	Low
Mashi	14	39	Low
Matazu	18	50	Average
Musawa	18	50	Average
Rimi	10	28	Low
Sabuwa	10	28	Low
Safana	10	28	Low
Sandamu	13	36	Low
Zango	16	44	Low
Katsina State	15	42	Low

LGAs: Local government areas

RESULTS

Retrospective desk review of secondary data pulled from DHIS2 RI (www.dhis2nigeria.org.ng) revealed suboptimal performance on RI data quality for the period from January 18 to December 18 using the scorecard tool. None of the 34 LGAs was ranked high in terms of data quality, as shown in Table I. Fifteen LGAs representing 44% were ranked 'average' while 19 LGAs representing 56% were ranked 'low'. This depicted huge suboptimal data quality status of Katsina State. The national guideline as provided by NPHCDA accepts less than or equal 10% LGAs with data discrepancy.[5]

Field spot checks conducted during the study period revealed high workload (73.53%). This was evident as 1217 HFs representing 75% out of the 1618 HFs were manned by only 1 staff providing all health services in the HF.[6] The study also showed that 40 (58.88%) out of 68 HFs sampled responded 'Yes' to RI data tool stock-outs, as shown in Table II. Fish bone analysis was used to map out and determine the modal root causes of poor data reporting. OR at 95% CI was used to measure the degree of association and statistical significance between categorical responses (Yes and No) and variables.

Post conduct of DQUSS, Figure 1 shows the performance of the LGAs across the state. The cluster bar chart depicts both baseline assessment and post DQUSS performances of the 34 LGAs in Katsina State.

DISCUSSION

The current study was not at variance with a similar study conducted in Kebbi State, Nigeria,[7] where it was identified that poor RI data management was responsible for the gross data quality issues in the state. DQUSS findings also revealed training gap (OR = 0.85, CI = 0.34–1.73) and heavy workload (OR = 1.8, CI = 0.52–6.39) on RI providers as the major contributing factors for untimely tallying and registration on the RI data tools. The high workload of a staff responsible for registration, tallying and vaccine administration could lead to inaccurate documentation in the phase of large clients. This finding corroborates the reports of NPHCDA on Nigeria RI Data Quality Improvement Plan report 2017–2025. Remarkable improvement was observed post conduct of DQUSS and field spot checks. All LGAs recorded significant improvement with the exception of Dutsi LGA that recorded a regression. The regression was attributed to staff attrition and training gap.

In addition, efforts from high-level supervision were mainly targeted at improving overall coverage rather than the consistency of data using different data tools and at different levels.[7] Paying more attention to data quality, de-emphasising on high coverage and use of multiple data sources to validate administrative coverage could be some of the proffered solutions towards addressing poor data quality. One of the most important challenges is the ownership of RI data.[5,7] It was observed that health workers (HWs) were not properly trained in the use of data tools, analysis of data and using data for action. High frequent

Table II: Root cause analysis associated with poor routine immunisation data quality

Variable	Response (yes/no)	HFs with data quality issues (*n*=68)	Prevalence (%)	OR	95% CI on OR
Received training in the past 1 year	Yes	30	44.12	0.85	0.34–1.73*
	No	38			
RI data tool stock-outs	Yes	40	58.88	0.59	0.24–1.46
	No	28			
Received supportive supervision in the past 1 month	Yes	24	35.29	0.3	0.08–0.99
	No	44			
High workload (health worker: client ratio)	Yes	50	73.53	0.43	0.16–1.20*
	No	38			
Participate in RI data validation	Yes	23	33.82	0.3	0.12–0.95
	No	45			

*Significant at 95% CI. RI: Routine immunisation, HFs: Health facilities, CI: Confidence interval, OR: Odds ratio
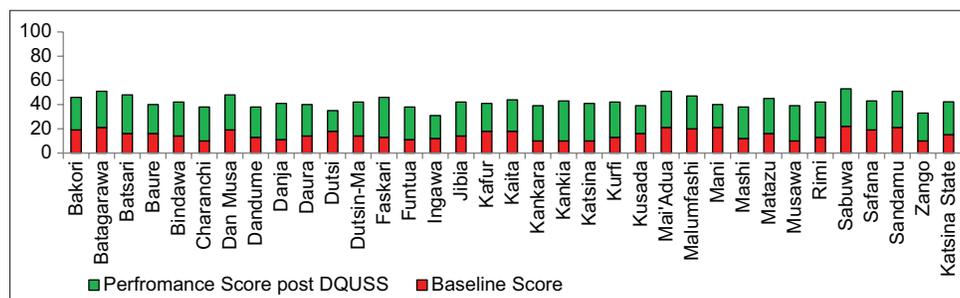
Figure 1: Post DQUSS performance assessment. DQUSS: Data Quality and Use Supportive Supervision

redeployment of HWs also contributed to this as trained HWs are frequently transferred to other sections where the skills acquired would not be useful.[7] The HFs frequently experience data tool stock-outs due to lack of financing and distribution gaps. In addition, there was also lack of regular feedback from the state to the LGA. Regular feedback on data from the LGA to HF level was also observed to be weak as similarly reported in a publication that drew the attention of stakeholders in immunisation space on the limitation of using administrative immunisation data for monitoring RI performance in Nigeria. Similarly, there was suboptimal use of data for action by the facility and LGA staff which was in concord with the findings of the Nigerian Federal Ministry of Health strategic plan document for improving RI in Nigeria (2013).[5]

CONCLUSION

A continuum of improved data quality was observed over time post conduct of DQUSS. It was concluded that persistence of RI data quality issues was attributed to high workload and data tool stock-outs, especially at HF levels.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Garrib A, Stoops N, McKenzie A, Dlamini L, Govender T, Rohde J, *et al.* An evaluation of the district health information system in rural South Africa. S Afr Med J 2008;98:549-52.
2. Manya A, Braa J, Øverland LH. National Roll Out of District Health Information Software (DHIS 2) in Kenya, 2011 – Central Server and Cloud Based Infrastructure. IST Africa 2012 Conference Proceedings; 2012. p. 1-9. Available from: http://www.ist-africa.org/Conference2012/. [Last accessed on 2019 Nov 26].
3. Krajca T. Components for the Health Information System DHIS2. Masarykova Univerzita, Fakulta Informatiky. Bachelor Thesis, Masaryk University, Faculty of Informatics; 2010. p. 1-54. Available from: https://is.muni.cz/th/ptonq/xkrajca_thesis.pdf. [Last accessed on 2019 Nov 24].
4. Global Framework for Immunization Monitoring and Surveillance. Geneva: World Health Organization; 2007. Available from: http://apps. who.int/iris/handle/10665/69685.
5. Agency NPHCD. Strategic Framework, in Nigerian National Routine Immunisation Strategic Plan (2013-2015): https://nphcda.gov.ng [Last accessed on 2019 Nov 23].
6. Federal Republic of Nigeria. Federal Republic of Nigeria 2006 Population and Housing Census. Priority Table Vol. III. Abuja: National Population Commission; 2012.
7. Omoleke SA, Tadesse MG. A pilot study of routine immunization data quality in Bunza Local Government area: Causes and possible remedies. Pan Afr Med J 2017;27:239.
8. Dunkle SE, Wallace AS, MacNeil A, Mustafa M, Gasasira A, Ali D, *et al.* Limitations of using administratively reported immunization data for monitoring routine immunization system performance in Nigeria. J Infect Dis 2014;210 Suppl 1:S523-30.