Accuracy and Quality of Routine Immunisation Data Monitoring System in two South-Eastern Districts of Nigeria

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ABSTRACT

BACKGROUND

To assess the accuracy and quality of immunisation data in Ogbaru (OGB) and Onitsha North (ONN) Local Government Areas (LGAs) of Anambra State, Nigeria.

METHODS

A validated methodology of immunisation Data Quality Audit was used. All the Health Facilities (HFs) conducting immunisation in OGB (28) and ONN (20) as well as the two LGAs' Immunisation Units (IUs) were visited. The records of the third dose of Diphtheria-pertussis-tetanus (DPT3) and measles immunisation at the HFs from January to December 2009 was recounted and compared with reported data at the LGA IUs for the same period. An Accuracy Ratio (AR), which expresses the ratio of immunisation recounted at the HFs to that reported to the LGAs IUs was obtained. AR of 0.95 to 1.05 indicates data accuracy. Immunisation Focal Persons (IFPs) in each HF were interviewed using a validated tool that contained a 70-point knowledge scale and a 120-item quality score (QS) on the data monitoring system.

RESULTS

The proportions of HFs with accurate data for DPT3 were 32.1% and 45.0% (p=0.39) in OGB and ONN respectively. The overall AR was 0.89 in OGB and 0.96 in ONN. The mean knowledge score among IFPs in the LGAs was 44.1±8.0 and 46.2±6.9 (p<0.05), while the mean QS for HFs was 74.5±18.0 and 73.6±13.2 in OGB and ONN respectively (p<0.05). There was a fair correlation between the overall QS and the overall knowledge score in the two LGAs, r=0.3 (p<0.05).

CONCLUSION

Auditing showed inaccurate and low quality of data reporting in the LGAs.

KEYWORDS

Routine immunisation; Immunisation monitoring system; Data quality audit.

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INTRODUCTION

Routine immunisation (RI) is a cost-effective public health intervention to reduce child mortality [1]. Most countries, including Nigeria, monitor the performance of RI through a hierarchical administrative data monitoring system. In a typical system, Immunisation Focal Persons (IFPs) at health facilities compile vaccination data from daily or session immunisation tally sheets and report these data to the district or to a Local Government Immunisation Officer (LIO). The officer collates these data and forwards them on a monthly basis to the provincial or state level and, finally, to the national level [2]. Globally, RI administrative data tend to be the primary source used by health information systems to estimate immunisation coverage [3]. Immunisation programme managers at all levels depend on this coverage to guide planning, review progress and determine the areas that require intervention to improve low coverage and high drop-out rates [2]. The RI administrative data are also the primary source of the data used by national authorities

to complete the WHO/Unicef joint reporting forms on vaccine-preventable diseases, a major source of information on immunisation system performance [4]. Furthermore, financial support provided by the Global Alliance for Vaccines and Immunisation (GAVI) to improve childhood immunisation services in participating countries is based on an independent verification of the number of children younger than 12 months of age who have been vaccinated with the third dose of the diphtheria-tetanus-pertussis vaccine (DTP-3)[2, 5].

Despite the importance of the RI data monitoring system, community-based surveys have reported coverage levels that are not consistent with coverage levels from the administrative data over the years [2, 3, 6-10]. In addition, evaluations of RI administrative information systems have revealed problems with data quality and consistency [2, 7, 10]. In Nigeria, limited studies have been conducted to verify the accuracy or determine the quality of the RI information system in Health Facilities (HFs) and Local Government Areas (LGAs), which are the sources of data for the state and national levels. An RI administrative data quality audit, conducted in 24 randomly selected health facilities across 4 of the 37 states in Nigeria by independent international auditors, expressed satisfaction with the existing system but identified gaps in the quality and accuracy of the reported data[8]. A report from the audit suggested that this assessment, serving as a diagnostic tool, could provide practical recommendations for improving the system in other LGAs not covered by the audit. Therefore, the current study was designed to compare the quality and accuracy of RI data monitoring systems in the Ogbaru (OGB) and Onitsha North (ONN) LGAs of Anambra State, located in south-eastern Nigeria.

METHODOLOGY

Anambra State, with 21 LGAs, is one of the 36 states of the Federal Republic of Nigeria. The 2 LGAs included in this study, OGB (rural) and ONN (urban), were randomly selected from the list of LGAs that were not part of any previous audit after stratification to urban and rural LGAs. At the time of the study, there were 28 HFs (public and private) in OGB and 20 HFs (public and private) in ONN providing RI services to estimated target populations (<1 year) of 9,899 and 5,581 in OGB and ONN, respectively. The routine immunisation information system in Nigeria requires that all clients be registered into an immunisation register. The vaccines received during an immunisation session are then tallied into a tally sheet. The IFPs, who are the staff responsible for immunisation at the health facilities, compile vaccination data from daily or session immunisation tally sheets and report these data to the district or to a Local Government Immunisation Officer (LIO) at the LGA Immunisation Units (IUs) using specified forms [8]. The LGA IU is responsible for planning, implementation and evaluation of immunisation activities at the LGA level. The LIO collates these data and forwards them on a monthly basis to the state level, from where collated data from all LGAs in the State are finally, forwarded to the national level.

The World Health Organization's validated standard methodology for an immunisation Data Quality Audit (DQA) was used to compare the data from the HFs' immunisation records with reports of immunisations at the LGAs [4]. All HFs conducting RI as well as the two LGAs' Immunisation Units (IUs) were visited. Records of the third dose of diphtheria-pertussis-tetanus (DPT-3) immunisation and the only dose of measles immunisation at the HFs from January to December 2009 were counted from the health facilities' immunisation tally sheets and compared with reported data on the LGA immunisation summary forms at the LGA IUs for the same period. An Accuracy Ratio (AR), which expresses the ratio of the number of immunisation identified at the HFs to the number reported to the LGAs' IUs (number of immunisation recounted at the HFs divided by the number of immunisation reported to the LGAs' IUs), was obtained for each HF. An AR

of ≥ 0.95 to ≤ 1.05 indicated data consistency, whereas an AR < 0.95 or >1.05 indicated the over- or under-reporting of data, respectively [2]. Immunisation Focal Persons (IFPs) in each HF (total of 48 in the two LGAs) were interviewed by one of the authors (NCA) using a standardized tool that contained 70 point knowledge scale and a 120 item quality score (QS) on the data monitoring system[2,4]. We had earlier contacted the IFPs on the phone (through the phone numbers we obtained from the LIOs at the LGA IUs) to book an appointment for a suitable date that each IFP will be available at the HF. The QS covered topics grouped into six components: recording, archiving, reporting, demographic information, core output or analyses and evidence of the use of data for action. Each correctly answered item (question) was assigned one point. An average value for each component was obtained by normalising the values of each index to a scale from 0 to 10 and presenting the values as radar graphs. The summaries of the QS mean scores and the standard deviations in the two LGAs were compared using the student t test. The Spearman rho correlation coefficient was used to determine the relationship between the knowledge score and the QS. In addition, factors that may influence data consistencies were examined in bivariate and multivariate logistic regression models. Ethical approval was obtained from the Ethics Committee of the Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria.

RESULTS

The proportion of HFs with accurate DPT-3 data were 32.1% and 45.0% in OGB and ONN, respectively (p=0.39), whereas 21.4% and 45.0%, respectively (p=0.09), had accurate data on measles, as shown in Figure 1. The overall AR for all HFs was 0.89 in OGB and 0.96 in ONN. All the 48 IFPs (28 in OGB and 20 in ONN) approached, responded. The mean age of IFPs was 39.1±9.1 years in OGB and 40.0±6.9 years in ONN (p=0.71). The proportions of female IFPs in the two LGAs were 96.6% and 95.0% in OGB and ONN, respectively (p=0.81). The proportions of IFPs with at least a diploma certificate were 53.6% and 30.0% (p=0.11) for OGB and ONN, respectively (Table 1). The mean knowledge scores among IFPs in the LGAs were 44.1±8.0 and 46.2±6.9 (p=0.33) in OGB and ONN, respectively.

The radar charts (Figure 2) show that HFs scored very low in core output analysis, use of data and the demographic components of the quality assessment in the two LGAs. The summary of the questions/observations from each of the components of the quality assessment and the proportion of facilities in each LGA with positive observations is shown in Table 2. None of the HFs in the two LGAs monitored performance using coverage divided into fixed and outreach strategies. Only one HF in Ogbaru monitored the DPT1-DPT3 drop-out rate and the vaccine wastage rate. The mean QSs for HFs were 74.5±18.0 and 73.6±13.2 in OGB and ONN, respectively (p=0.84). There was a fair correlation between the overall QS and the overall knowledge score in the two LGAs, r=0.3, (p=0.03). Consistencies in DPT-3 and measles data, however, were not associated with the total knowledge score, the overall QS, the age of IFPs, ever receiving training on the data monitoring system, having at least a diploma certificate, or years of experience.

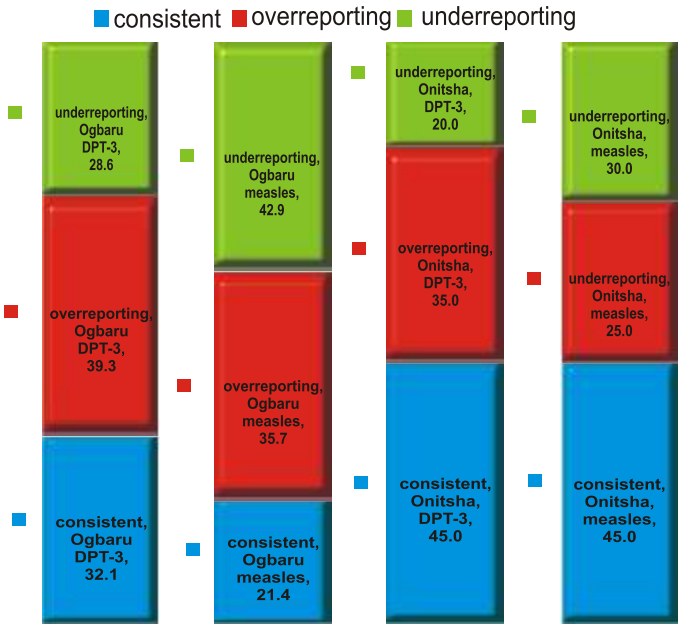

Figure 1: Chart showing the proportion (%) of Health facility with consistent, over and under reported third dose DPT and measles data in Ogbaru and Onitsha North LGAs

Table 1: Socio demographic characteristics and knowledge of Immunization Focal Persons in Health Facilities in Ogbaruand Onitsha North LGAs

Characteristics	Ogbaru IFPs N=28 (%)	Onitsha North IFPs N=20 (%)
Sex Male	1(3.5)	1 (5.0)
Female	27(96.6)	19 (95.0)
Mean age (SD)	39.1(9.1)	40.0(6.9)
Marital Status Married	23(82.1)	19(95.0)
Single	5(17.9)	1(5.0)
Qualification OND	15(53.6)	6(30.0)
HND	8(28.6)	10(50)
University Degree	5(17.9)	4(20)
Years of experience		
<4	5(17.9)	5(25.0)
4-<10	15(53.6)	13(65)
≥10	8(28.6)	2((10.0)
Ever received training		
Yes	26(92.9)	15(75.0)
No	2(7.1)	5(25.0)
Mean knowledge score (SD) on Recording	15.2 (2.6)	4.0(1.0)
Reporting	3.7(1.0)	15.3(1.9)
Archiving	2.8(0.7)	3.1(0.8)
Demography	7.2(1.6)	7.5(2.8)
information	8.0(2.6)	9.0(2.0)
Core output analysis	6.8(2.8)	7.3(1.3)
Use of data	44.1(8.0)	46.2(6.9)
Overall		

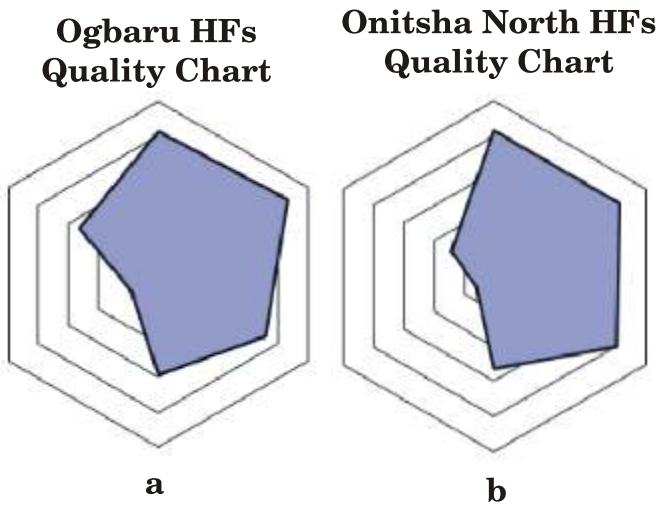

Figure 2: Radar charts of the quality scores of the information system components in Ogbaru (a) and Onitsha North Health facilities (b)

Table 2: Proportions of Health facilities with positive responses to Quality assessment criteria by components of immunization information system assessed in Ogbaru and Onitsha North LGAs

Criteria	Ogbaru N=28 (%)	Onitsha N=20 (%)
Recording component		
Availability of tally sheet with entries of last immunization	25(89.3)	21(100)
Use of register for recording	28(100)	18(90)
Availability of up to date immunization card	15(53.6)	11(55)
Recording of vaccine receipt in ledger book	18(53.6)	11(55)
Up to date Vaccine management tool (VM1)	14(50.0)	11(55)
Receipt of vaccine in the VM1 tool complete for the period	12(42.9)	10(50)
Availability of recording forms for the previous 12 months	24(83.7)	18(90)
Reporting component		
All previous 12 months report signed by authorized officer	21(75)	14(70)
Health Facility reports correctly filled in	21(75)	14(70)
Health staff are aware of standard operating procedure	7(25	2(10)
Archiving component		
Copies of all previous reports found in Health facilities	21(75)	16(80)
Location for storage of reports and records available	28(100)	20(100)
Health Facility reports available for the entire period	22(78.6)	16(80)
Child registers available for all periods of the previous year	27(96.4)	18(90)
All tally sheets covering the previous year were found	23(82.1)	17(85)
Latest feedback on data from LGA easily available	1(3.6)	18(90)
Demographic information component		
Data on the number of infants born in the catchments area	28(100)	20(100)
System for collection of data on new births in the area	1(3.6)	0(0)
Available target on the number of children to be vaccinated	28(100)	20(100)
Available target by type of strategy with a map of the area	26(92.9)	17(85)
Core outputs analysis component		
Coverage split by strategy	0(0)	0(0)
Up to date chart/table display for the current year	5(17.9)	0(0)
Monitoring of the DPT1/DPT3 drop out rate	1(3.6)	0(0)
Vaccine wastage rate monitored	1(3.6)	0(0)
Evidence of data use for action.		
Areas of low access identified and evidence of action	0(0)	0(0)
Evidence of actions taken on the last feedback	1(3.6)	5(25)
Interaction with the community regarding immunization	1(3.6)	5(25)

DISCUSSION

Valid immunisation data are a prerequisite for appropriate decision making. In this audit, we found inaccurate data and a low-quality data reporting system in the majority of HFs in the LGAs. This finding invalidates previously reported immunisation coverage data in these LGAs and jeopardises the credibility of decisions and the appropriateness of guidance that these data might provide [9]. Differences in data between health facilities and LGA reports, suggesting over-reporting errors at the LGA level, have been reported by other authors [2, 6-13]. The data accuracy was

higher in ONN, an urban LGA, than in OGB, a rural LGA. Mavimbe et al. (2005) reported a similar finding for their assessment on the quality of immunisation data from routine reports in a district in Mozambique [11]. In their report, data consistency was found in a health facility that performs most immunisations in an urban area of the district, whereas other facilities in rural areas over-reported immunisations. Survey-based methods to validate administrative data from health facilities have also demonstrated inconsistencies [3, 14]. Our finding differs from the result of a similar study in Uruguay, where numerator accuracy was 100% throughout the data flow [9]. The usefulness of data quality assessment was also demonstrated in a study based on DQA, in which the quality of both reporting and immunisation systems improved following GAVI Immunisation Service Support intervention [13]. Although the auditing methodology may not completely indicate the reasons for the data deviations, it has been observed that the notion of vaccination targets and the crucial need to achieve them, which constitutes the basis for good performance, may be responsible for over-reporting[11, 12]. These deviations can also be explained by defects in the quality of the information system, which were captured by the findings in the QS and knowledge questions.

In this study, the patterns of the quality scores in the two LGAs are similar. The LGAs scored relatively high on the recording, archiving and reporting components but very low for demographic information and core output analysis. These findings are similar to findings from other reports[2, 9, 12]. In Uruguay, for instance, the overall system performance was described as excellent, with proper archiving and recording of data forms, a sufficient supply of forms, the timely flow of information and adequate default tracing practices and computer system security. The primary weaknesses, as in this study, were in the degree of data analysis and feedback or data use. Previous studies have shown that immunisation staffs at provincial and local levels have weak skills in the use of quantitative immunisation data [2]. Our results show that important challenges in all components must be addressed to improve immunisation monitoring systems. The need to improve the skills and practices of those involved in the analysis and use of data to guide strategies for increasing coverage, managing vaccine supplies and monitoring vaccine safety cannot be over-emphasised. It has been argued that efforts to improve data analysis and use at the local level could stimulate improvements in the accuracy of the data collected because staff may take an interest in their own data and value the opportunity to demonstrate local achievements and guide local planning [2, 12]. Although previous reports did not specifically assess health workers' knowledge of the routine immunisation system, this study found health workers' knowledge to be inadequate. A fair correlation was also found between overall knowledge and the QS. This finding suggests the need to improve the knowledge of immunisation staff to ensure high quality and the accuracy of data.

In our audit, data accuracy was not associated with the age of IFPs, LGA location, having a diploma certificate, knowledge or years of experience. Limited studies have assessed the characteristics of the individuals who generate immunisation data and the quality of the data. A study in Tanzania assessing the quality of data collected through the health management information system found an association between knowledge of basic concepts of health information and improved data quality, but training in health information systems did not correspond with improved data quality [15]. It has been argued that training is not the problem; instead, the problem may be unwillingness to complete forms and a lack of commitment and accountability among poorly supervised health workers. In some instances, deliberate over-reporting has been found due to the concept of vaccination targets and the absolute need to achieve them, because meeting these targets constitutes the basis of good

performance [11]. Other factors that have been implicated in inaccurate data include unavailable or limited data tools and poor record keeping, archiving and use of data. Various approaches aimed at improving data quality, such as increasing the quality of supportive supervision and providing an adequate feedback mechanism for the data producers, have been suggested [11]. Some interventions (for example, in Kyrgyzstan and South Africa) have improved data quality by giving health workers the basic skills to monitor their own work, leading to a sense of ownership of the information [16, 17].

In conclusion, this audit indicates that the immunisation data generated in the two districts were not remarkably accurate. The quality of the system, as measured by the quality scores, suggests gaps in the system, especially in the analysis and use of data for problem identification and decision making at the health facility level. Although a fair correlation was found between the knowledge of IFPs and the quality scores, no particular demographic variable was found to be associated with data accuracy. Certain limitations of this audit should be considered. First, the findings may not be entirely applicable to other districts in the state or country. Second, the size of the health units investigated is too small to provide sufficient power to identify differences. However, despite these limitations, we believe that the audit provides insight into the reliability of the data from the LGAs. A high quality of generated data and overall improvements in the quality of immunisation information systems are desirable. These goals could be achieved by motivating immunisation staff through supportive supervision.

Authors' contributions

AAF conceived and designed the study. NCA collected the data. AAF and NCA were involved in analysis and interpretation of the data. AAF did initial draft and revision of the manuscript. All authors read and approved the final draft.

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