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## **Data quality assessment for routine antenatal care services at the Ho Municipal Hospital in Volta region**

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## Abstract

High quality data on antenatal services provided by health facilities are necessary to make informed decisions regarding resource allocation and planning. However, this potentially rich source of data is often overlooked in low- and middle-income countries, because it is assumed to be of limited completeness, timeliness, representativeness, and accuracy. The main objective of the study is to examine the quality of data for 2016 routine antenatal data from January to December. A retrospective cross-sectional study involving review of routine antenatal care data collected during the period January 2016 to December 2016. Checklist was used to collect data from the antenatal registers, data from the District Health Information System (DHIMS2) database was between the stipulated periods. The accuracy and completeness of data from the three sources were calculated using a tool from the WHO routine data duality assessment tool. A total of 1,193 antenatal registrants were available the antenatal register and 1,160 each for facility report and DHIMS2 database. There were discrepancies among the three data sources. Aside Tetanol-diphtheria, age, parity, haemoglobin at registration and 36 weeks were of good quality with data discrepancies less than 10% each. The overall level of discrepancies of ANC data on total number of antenatal registrants among the three sources ranges from 0.0% to -2.8%. Mean data completeness for facility report was 83.9%. The Antenatal register and DHIMS2 database recorded 99.1% and 88.0% level of completeness respectively. It was revealed that routine antenatal data is of good data quality and can be reliable for decision making and planning of health programs. Since almost all the indicators had less than 10 percent data discrepancies. Data handlers should be adequately trained and supervised during data generation or collections to ensure accurate transfer of complete data from one data source to another.

## Introduction

According to the [1], Antenatal care (ANC) can be defined as the care provided by skilled health-care professionals to pregnant women and adolescent girls in order to ensure the best health conditions for both mother and baby during pregnancy [1]. Most countries have made significant efforts in implementing ANC services at all health facilities to avert the dangers of pregnancy related complications by early detection of these problems and caring for these pregnant mothers [1]. The WHO envisions a world where every pregnant woman and new-born receives quality care throughout the pregnancy, childbirth and the postnatal period [1].

The Sustainable Development Goal (SDG) 3 talks about good health and wellbeing. The first target to this goal is to reduce the global maternal mortality ratio to less than 70 per 100,000 by 2030. To achieve this goal, quality data on ANC is a needed for effective planning and decision making. However, the health information systems in developing countries are generally known as feeble and 'continue to be overwhelmed by data quality drawbacks [2]. Also, many of the publications on data quality in developing countries concentrate on the higher levels of health information systems, while less attention is given to the lower levels which are very vital, since the point of data entry has huge consequences for the data quality of the whole system. If quality of data is hampered from the start, it cannot be restored later on [2]. Little on data quality at facility level in low-income countries has been conducted and published to date [3]. A recent study, on new born Health Data Transfer in the Cape Coast Metropolis, Ghana revealed that, there were data inaccuracies across all ANC indicators ranging from 46.5% to 89.3% [4].

The Ghana Health Service (GHS) has introduced an annual district, regional and national performance hearing which serves as a peer review mechanism and are used to validate the

reported performance. Despite these significant efforts, significant data quality issues and their application remain poor at the regional and district levels and poorest at the sub-district and community levels [5]. Also, previous study in Greater Accra had shown that, overall, there are small variations in the completeness and accuracy of ANC data transfer of primary source data at the facility and district levels [6].

High quality data and effective data quality assessment are required for accurately evaluating the impact of public health interventions and measuring public health outcomes [7]. Quality data is very crucial in decision making. Hence, findings of this study will help inform data managers and stakeholders in areas needed for strengthening and improvement in data quality. It will also guide policy makers with respect to the kind of decisions they make regarding antenatal services.

There is little literature on quality data reporting in Ghana. It is based on this reason; this study seeks to assess the quality of routine ANC data generated in Ho Municipality.

This study examined the quality of data for January to December, 2016 routine antenatal care reports in the Ho Municipal Hospital in the Volta Region of Ghana.

## **Materials and methods**

A cross-sectional retrospective study involving review of records of ANC data collected during the period under review. Three levels of data sources were reviewed.

- Primary source data at health facility level (antenatal registers, hemoglobin notebooks where in use, delivery registers)
- Monthly Midwives returns
- DHIMS2 data (district level data).

Sample size determination was not done because it involved a retrospective study using existing routine data.

Purposive sampling was used to select the Ho Hospital because it is one of the municipal hospitals that serves as a referral centre in the municipality, this study does not involve direct individual response towards the use of retrospective routine data.

A data extraction tool was used to collect data from the antenatal register. Age, parity, number of registrants, number of attendants with haemoglobin done at registration and 36 weeks gestation for antenatal was tallied per corresponding month (January 2016-December, 2016) and used as reference.

The tallied data were aggregated per corresponding months. The same variables (age, parity, number of registrants, number of attendants with haemoglobin done at registration and 36 weeks gestation for antenatal.) were extracted from the DHIMS2 and recorded onto the check list. The data extraction tool assessed data accuracy and completeness between source data (Antenatal register, Monthly Midwives returns) and DHIMS2 data.

The accuracy and completeness of data transfer from the source documents to DHIMS2 was investigated using a tool customized from world Health Organization; the Routine Data Quality Assessment (DQA) tool (WHO, 2011). Analysis for the Data Quality Assessments was done by comparing data from registers with data in duplicate copy of summary reporting forms and in the DHIMS2. Verification Ratios for the indicators was calculated by dividing the recounted figures from the registers with the figures in the summary reporting forms. The same was calculated for the data in summary reporting forms compared to those in the DHIMS2. These quantitative data (counts, percentages) was entered in Routine Data Quality Assessment (DQA) tool to generate accuracy ratio (%) and discrepancy levels (%). The formula for generating the accuracy ratio and discrepancy rate is as follows;

$$accuracy\ ratio = lower \frac{level}{higher} level * 100$$

$$\text{discrepancy}(\%) = 100 - \text{accuracy ratio}$$

The higher the discrepancy rate (whether positive or negative), the less quality the data is. According to the DQS tool standard if the discrepancy recorded is more than 10% then the data is not reliable for decision making and planning of immunization program. Descriptive statistics was done in Excel. Tables and simple graphs were produced from the data based on the accuracy ratios, discrepancy levels and completeness.

Also 95% confidence interval of the completeness and percentage error using the formula was computed:

$$Y = p \pm Z\alpha\sqrt{\frac{p(1-p)}{D}}$$

Where y = 95% confidence interval of the estimate; p=% completeness or percentage error; z = 1,645 (1-sided alpha of 0.05) and D= total data inspected for the variable.

## Results

The section presents the findings of the study. Tables and graph were used to present results for this study.

### Accuracy of data

Table 1 shows comparison of Antenatal data extracted from the three data sources. Data on ANC registrants between tally book and DHIMS2 was not consistent as accuracy was 102.8% indication underreporting. Similarly, data inaccuracy of 102.8 percent was observed between tally book and facility report. However, facility data and DHIMS2 was consistent (100.0%). Data on number of ANC attendance observed an inaccuracy of 19.0 percent between the tally book and DHIMS2 indicating overreporting. Same inaccuracy of 19.0 percent was observed between

tally book and facility report. But data accuracy between facility report and DHIMS2 was 100.2% indicating underreporting.

Again, Data on Tetanol-diphtheria (TD2+) showed inaccuracy of overreporting 10.8 percent, 85.2 percent and 12.6 percent between tally book and DHIMS2, facility report and DHIMS2, and tally book and facility report respectively.

**Table 1 Comparison of ANC data extracted from the three Data sources in 2016**

Variables	Number of Registrants	Number of Attendance	TD2+
ANC register	1193	1193	83
Facility report	1160	6269	658
DHIMS2	1160	6256	772
Accuracy ratio 1 (%) (T/D)	102.8	19.0	10.8
Discrepancy level 1 (%)	-2.8	81.0	89.2
Accuracy ratio 2 (%) (FR/D)	100.0	100.2	85.2
Discrepancy level 2 (%)	0.0	-0.2	14.8
Accuracy ratio 3 (%) (T/FR)	102.8	19.0	12.6
Discrepancy level 3 (%)	-2.8	81.0	87.4

Accuracy ratio 1 is the measure of disparity between the data in the primary source (ANC register) and data in DHIMS2

Accuracy ratio 2 is the measure of disparity between the data in the facility report (facility aggregate data) and data in DHIMS2

Accuracy ratio 3 is the measure of disparity between the data primary source (ANC register) and in the facility report

Table 2 shows comparison accuracy of data on age group of antenatal mothers at registration from the three data sources. Data on ANC mothers aged 10-14 years was consistent between the facility report and DHIMS2 with accuracy ratio of (100.0%). However, it was inconsistent when compared between the ANC register and DHIMS2 and that of the facility report with accuracy ratio of 200% each indicating overreporting.

Also, data on mothers aged 30-34 years and 35 years and above both reported consistent data between the facility report and DHIMS2 with 100 percent accuracy ratio each. There were data inaccuracies between the ANC register and DHIMS2 and well as the ANC register and the facility report. The other age groups of the ANC mothers reported varied data inaccuracies.

**Table 2 Comparison of Age group of mothers at registration extracted from three sources in 2016**

Variable	Age group of mothers at registration					
	10-14	14-19	20-24	25-29	30-34	35+
Count/Tally book/ANC register	4	135	256	336	288	172
Facility report	2	120	264	321	278	165
DHIMS2	2	130	254	323	278	165
Accuracy ratio 1 (%)	200.0	103.8	100.8	104.0	103.6	104.2
Discrepancy level 1 (%)	-100.0	-3.8	-0.8	-4.0	-3.6	-4.2
Accuracy ratio 2 (%)	100.0	92.3	103.9	99.4	100.0	100.0
Discrepancy level 2 (%)	0.0	7.7	-3.9	0.6	0.0	0.0
Accuracy ratio 3 (%)	200.0	112.5	97.0	104.7	103.6	104.2
Discrepancy level 3 (%)	-100.0	-12.5	3.0	-4.7	-3.6	-4.2

Table 3 shows the level of accuracy of data on parity of mothers at registration from the three data sources for antenatal. None of the categories of parity recorded an accurate data. Mothers with para zero recoded an accuracy of 91.6% between the ANC register and DHIMS2 and 94.2% between the facility report and DHIMS2. Between the ANC register and facility report, an accuracy of 97.3% were observed. Data on mothers who had parity 5 and above reported an accuracy of 81.3% between the ANC register and DHIMS2 whereas, an accuracy of 131.3% was recorded between the facility report and DHIMS2.



**Table 3 Level of accuracy of parity of mothers at registration from the three sources of ANC data**

Variables	Parity			
	0	1-2	3-4	5+
Count/Tally book/ANC register	362	607	193	26
Facility report	372	547	196	42
DHIMS2	395	561	172	32
Accuracy ratio 1 (%)	91.6	108.2	112.2	81.3
Discrepancy level 1 (%)	8.4	-8.2	-12.2	18.8
Accuracy ratio 2 (%)	94.2	97.5	114.0	131.3
Discrepancy level 2 (%)	5.8	2.5	-14.0	-31.3
Accuracy ratio 3 (%)	97.3	111.0	98.5	61.9
Discrepancy level 3 (%)	2.7	-11.0	1.5	38.1

Table 4 shows the overall level of accuracy of ANC data on Registrants, Age, TD2+, parity haemoglobin at registration and haemoglobin at 36 weeks. Overall, the level of accuracy on total registrants between the three sources range from (0.0% -2.8%). There was no discrepancy between the facility report and DHIMS2. However, there was an inaccurate and underreporting of data on total registrants between the primary source and DHIMS2 and that of the primary source and facility report with -2.8% level of discrepancies each.

Also, with regard to age, the overall level accuracy between the three sources ranges from -3.6% to 0.2%. There was overreporting of data on age between the Facility report and DHIMS2 with 0.2% level of discrepancy. There was underreporting of ANC data on age between primary source and DHIMS2 and that of the primary source and the Facility report with discrepancy level of -3.4% and -3.6% respectively.

ANC data on number of women receiving TD2+ was inconsistent and overreported as discrepancy levels of 89.2%, 14.8% and 87.4% were observed between, the ANC register and DHIMS2, Facility report and DHIMS2 and ANC register and Facility report respectively.

With regards to parity, the level of accuracy ranges from -2.7% to 0.3%. There was underreporting of data on parity between ANC register and DHIMS2 and that of ANC register and the facility report with -2.4% and -2.7% level of discrepancy respectively.



**Table 4 Overall Level of Accuracy of ANC data on Registrants, Age, Tetanol-diphtheria, parity, hemoglobin at registration and haemoglobin at 36 weeks**

<b>Health Indicator</b>	<b>ANC Register</b>	<b>Facility Aggregate Data</b>	<b>DHIMS-II Data</b>	<b>Discrepancy level 1 (%)</b>	<b>Discrepancy level 2 (%)</b>	<b>Discrepancy level 3 (%)</b>
Total Registrants	1193	1160	1160	-2.8	0.0	-2.8
Age	1191	1150	1152	-3.4	0.2	-3.6
Total number of women receiving TD2+	83	658	772	89.2	14.8	87.4
Total number of women with haemoglobin checked at registration	1162	929	1000	-16.2	7.1	-25.1
Total number of women with haemoglobin checked at 36 weeks gestation	186	311	347	46.4	10.4	40.2
Parity	1188	1157	1160	-2.4	0.3	-2.7

## Completeness of data

A total of 1193 data counts were available in the primary source (ANC Register) from January 2016 to December 2016. Completeness of antenatal data from the primary data source was 99.6%, 97.4% and 99.8% respectively for age, parity and hemoglobin done at registration and women receiving TD2+. The mean percentage completeness for these three mandatory variables at registration was 99.1 percent. Data completeness was best for TD2+ data, followed by data on haemoglobin and the least were age and parity.

The facility report and DHIMS2 reported the same number of data available from January 2016 to December 2016. The most complete data variable for facility report was parity with 99.7 percent level of completeness and the least was TD2+ with 56.7 percent level completeness. Parity variable reported 100 percent level of completeness for DHIMS2 data, followed by age with 99.3 percent completeness [Table 5].

**Table 5 Comparison of level of completeness of ANC data on Age, Parity, hemoglobin and Tetanol-diphtheria among the Three Data Sources**

<b>Variables</b>	<b>Number of Registrants</b>	<b>Number of Registrant with recoded age</b>	<b>Percentage of Registrant with recoded age (%)</b>	<b>Number of Registrant with recoded parity</b>	<b>Percentage of Registrant with recoded parity (%)</b>	<b>Number of Registrant with recoded Hb</b>	<b>Percentage of Registrant with recoded Hb (%)</b>	<b>Number of Registrant with recoded TD2+</b>	<b>Percentage of Registrant with recoded TD2+ (%)</b>	<b>Overall (%)</b>
Count/Tally book	1193	1188	99.6	1188	99.6	1162	97.4	1191.0	99.8	99.1
Facility report	1160	1150	99.1	1157	99.7	929	80.1	658	56.7	83.9
DHIMS2	1160	1152	99.3	1160	100.0	1000	86.2	772	66.6	88.0

## **Level of completeness of ANC data on Age, Parity, haemoglobin and Tetanol-diphtheria from the Antenatal Register**

The overall level of data completeness for the antenatal register was 99.1 percent and the best performing variables for the antenatal register was TD2+ with 99.8 percent level of completeness followed by haemoglobin level.

## **Level of completeness of ANC data on Age, Parity, haemoglobin and Tetanol-diphtheria among the three sources of data**

Overall, the most complete data source was the antenatal register with 99.1 percent level of completeness followed by DHIMS2 (88.0%) and the least was the facility report with 83.9 percent level of completeness. Parity and age group were the most complete data variable among the three data sources with more than 90 percent level of completeness.

## **Discussion**

### **Data Accuracy**

This present study shows that, there were some indicators or variables on ANC data were consistent and accurate among the three data sources. The overall level of discrepancies of ANC data on total number of ANC registrants among the three sources ranges from 0.0% to -2.8%. There was no any data discrepancy on total number of ANC registrants between the facility report and DHIMS2. Which means the data on total number of ANC registrants

between the facilities reported was consistent and accurate. However, the findings also, show that, data on total number of ANC registrants among the other data sources there were inaccurate and underreported. The level of discrepancies of ANC data on total registrants between the primary source and DHIMS2 and that of the primary source and facility report was -2.8% each. These findings were similar with what was reported by [4]. Their study revealed that, there were data inaccuracies across all the indicators ranging from -46.5% to 89.3%. These discrepancies could have occurred as a result of wrong tabulation and additions of tallied as stated by [8]. Data quality is influenced by the rate of discrepancies. The higher the discrepancy rate (whether positive or negative), the less quality the data. According to the DQS tool standard if the discrepancy recorded is more than 10% then the data is not reliable for decision making and planning of program. Therefore, since the finding on the overall level of discrepancy was less than 10%. It means the ANC data on total number of registrants is of good quality and reliable.

This present study shows that, the overall level of discrepancy of ANC data on age between the three sources ranges from -3.6% to 0.2%. This implies that, data on age was of good quality and reliable for decision making and planning of ANC programs. However, the findings also, showed that, there were data inaccuracies on age among the three data sources. Data on age between the Facility report and DHIMS2 was over reported with 0.2% level of discrepancy. There was also underreporting of ANC data on age between primary source and DHIMS2 and that of the primary source and the Facility report with discrepancy level of -3.4% and -3.6% respectively. These findings could be due to transcription and addition errors during compilation of monthly reports. Also, the desire to receive additional resources to achieve high targets could make health workers deliberately underreport.

In this present study, ANC data on number of women receiving TD2+ was of the poorest quality. Data on TD2+ was inconsistent and over reported as discrepancy levels of 89.2%,

14.8% and 87.4% were observed between, the ANC register and DHIMS2, Facility report and DHIMS2 and ANC register and Facility report respectively. These findings were similar with what was reported by [8]. In their study, they found that, TT2+ was the lowest quality data with accuracy ratio and discrepancy level of 59% and 41% respectively. Reasons attributable to this finding may be due to arithmetic errors during monthly data compilation or deliberate over reporting to achieve high coverage to avoid query by higher levels staff. [8], suggested that, poor documentation on the part of health workers could be the reason for poor quality of data [8].

The present study shows that, there was data inconsistency among the three data sources regarding ANC data on to parity. The overall level of data discrepancies ranges from -2.7% to 0.3% indicating that data on parity is of good quality since, the overall level of discrepancies was less than 10 percent. Also, the findings showed that, ANC data on parity was underreported between ANC register and DHIMS2 and that of ANC register and the facility report with -2.4% and -2.7% level of discrepancy respectively. These findings were similar to was reported by [6] in similar study in Accra. Their study found that, percentage error comparing aggregate form data and DHIMS2 data respectively to the primary source data ranged from 0.0% to 4.9% respectively [6]. The underreporting of parity data between the ANC register and DHIMS2 in this present study, could be due to transcription and addition errors during compilation of monthly reports. Also, the desire to receive additional resources to achieve high targets could make health workers deliberately underreport.

## **Completeness of Antenatal data**

In this present study, a total of one thousand, one hundred and ninety-three data counts were available in the primary source (ANC Register) from January 2016 to December 2016. Data completeness for the ANC register were 99.6 percent, 99.6 percent, 97.4 percent and 99.8



percent respectively for age, parity and hemoglobin at registration and women receiving TD2+. The findings of this study were higher with what was reported by [9] in Mozambique. Their study found that, the completeness of manual data was between 37.5 percent and 52.1percent [9]. Another study in Mali and Senegal also found that, the mean data completeness of maternal and perinatal care services was from 94.0 percent to 97.0 percent.

Also, in this present study, the mean percentage -completeness for the mandatory variables at registration was 99.1 percent. The best performing variables for the antenatal register was TD2+ with 99.8 percent level of completeness followed by hemoglobin level and the least were age and parity. These findings were similar with [6]. Their study also found 94.3 percent data completeness for the selected antenatal variables [6]. Even though the level of completeness of these variables were more than 90 percent, it can be further improved, especially with regards to data on parity and age.

This present study also found that, the most complete data variable for the facility report was parity with 99.7 percent level of completeness and the least was TD2+ with 56.7 percent level completeness. However, DHIMS2 data reported 100 percent level of completeness for parity, followed by age with 99.3 percent completeness. These findings mean that, there were some data errors during the transfer of data on TD2+ from the ANC register to the facility summary reports. This could have occurred probably due to addition errors during compilation of monthly reports. Or deliberately underreporting by health professional. The DHIMS2 data recorded 100 percent level of completeness for parity may be due to the fact that, health workers properly documented data on parity during registration and as well did proper data transfer, since parity was the most complete data variable for the antenatal register too.

The study also found that, the most complete data source when comparing the three data sources, was the antenatal register with 99.1 percent level of completeness followed by

DHIMS2 (88.0%) and the least was the facility report with 83.9 percent level of completeness. Parity and age group were the most complete data variable among the three data sources with more than 90 percent level of completeness. These finding indicates that, data on District Health Information System (DHIMS2) are not entirely complete. These findings were similar to previous studies that demonstrated inaccuracies in the reported values with discrepancies between facilities register data, summary form figures and the figures in DHIMS2 [4]. [6] suggested that, DHIMS2 data is relatively accurate and reliable for use [6]. Hence, health manages need to care look at data when making decision and planning of health programs. Also, data handlers need more training and education on how to work with health information systems.

## **Conclusion**

In conclusion, the Antenatal data from January, 2016 to December, 2016 has some variations among the three data sources. However, it is of good quality and can be reliable for decision making and planning of health programs. Since almost all the indicators had less than 10 percent data discrepancies. The data element or indicator on antenatal data with the poorest quality was the Tetanol-diphtheria (TD2+). Data completeness of the antenatal register, facility reports and the DHIMS2 data was good. However, the performance can be improved especially data on facility reports and the DHIMS2 data.

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