ORIGINAL ARTICLE

TUBERCULOSIS DATA MANAGEMENT, KNOWLEDGE AND ASSOCIATED FACTORS IN PUBLIC-PRIVATE MIX DOTS IMPLEMENTING HEALTH FACILITIES IN BAHIRDAR CITY, NORTH WEST ETHIOPIA

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ABSTRACT

***Background**: Tuberculosis is a major cause of morbidity and mortality in Ethiopia. Despite massive investments in health management information system, poor data coverage of these systems has led to gross under-use as an evidence base for decision-making at the national level. It is also true across all program areas; community program and health care delivery personnel often face competing demands that make the collection and recording of daily service delivery data a challenge.*
***Objectives:** The main objective of this study was to assess the data quality of recording, reporting, and associated factors of knowledge in public-private mix directly observed short course treatment implementing health institutions.*
***Methods:** Facility based cross-sectional study was used to assess the data quality in 4 public and 7 private health institutions in Bahir Dar city from February to August, 2015. A total of 195 health workers were included in the study. Information such as, age, sex, occupation, types of health institution were collected using pre-tested self-administered structured questionnaire and prepared formats. Data were entered in EP Info version 3.5.1, and analyzed using statistical package SPSS version 16.0. Different proportions were computed and logistic regression methods were used to see the association. P-value less than or equal to 0.05 at 95% confidence interval was considered as statistically significant, and corresponding adjusted Odds ratio were used for interpretation of the association variables.*
***Results**: Working in Hospital (p-value < 0.001) and Training on TB (p-value < 0.001) do have a positive effect in improving the knowledge status of data quality of recording and reporting. Out of the study subjects, 72.7% were filled completely and 45.5% were filled accurately according to essential data elements on TB. Private health institutions were better in recording and accounted 62.5% and 80% completeness and accuracy, respectively. Additionally, this particular research also found that 88.6% of the reports were brought to the city health department. Among these, only 47.8%, 22.7% and 6.8% were completely, timely and accurately compiled.*
***Conclusion:** The TB data quality on recording and reporting in Bahir Dar City Administration was seriously deprived. Its quality lacks completeness, accuracy, and timeliness. Therefore, training should be a priority action to alleviate this issue.*

***Key words:** TB, Data quality, Public-Private Mix DOTS.*

INTRODUCTION

Tuberculosis (TB) is an infection caused by bacteria (Mycobacterium Tuberculosis), which mainly affects the lungs, but can affect other parts of the body such as the spine or brain. *(1, 2),* It is spreading at the rate of one person per second and kills more people than any other infectious disease. Every year, 8 million to 10 million people contract tuberculosis, while 2 million die from it. And about one-third of the world population is estimated to be infected. Over half of all TB cases are concentrated in Asia and Africa, *(3).*

Tuberculosis is also a major cause of morbidity and mortality in Ethiopia with incidence estimated at 100 new smear-positive cases per 100,000 populations, *(4).*TB was declared a global public health emer-

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gency by the World Health Organization (WHO) in 1993 *(3*), by establishing strategies where a recording and reporting as one important component of the strategy. But many resource-constrained countries lack robust health management information systems, and the related information and communications technology infrastructure needed to access and report high-quality data and lack evidence-based for timely and effective health system decision-making, and this is exemplified by the scarcity of reliable data on health service use, *(5).*

Despite massive investments in HMIS across Africa, the poor data coverage of these systems has led to their gross under-use as an evidence base for decision-making at the national level, *(5).* It is also true in our context and across all program areas; community program and health care delivery personnel often face competing demands that make the collection and recording of daily service delivery data a challenge.
Women aged 15 to 24 years make up a great proportion of TB cases in countries with higher rates of HIV infection. However, in many African countries, there is low detection rate and considerable underreporting of TB cases*(8)*. HIV/AIDS is dramatically fuelling the TB epidemic in sub-Saharan Africa; up to 70 % of TB patients in some countries are co-infected with HIV. The estimated TB incidence rate is much higher in several countries of sub-Saharan Africa*(8).*

The national TB control program has put in place a recording and reporting system to systematically evaluate the patient's progress and treatment outcome, as well as overall program performance *(9).*Despite state and local laws requiring medical providers to report notifiable infectious diseases to public health authorities, reporting is believed to be incomplete (11). Every patient whose sputum is found to be positive for acid fast bacilli (AFB) is placed in the TB register, and the outcome in every patient is recorded. So an effective system of registering patients ensures accountability*(12).*

The recording and reporting system ensures that the patient's progress can be followed throughout treatment. It also allows assessment of the proportion of patients who are successfully treated, giving an indication of the quality of the program*(12).*

The DOTS information system allows supervisors and managers to determine key program indicators such as treatment success and case detection rates. Therefore, the recording and reporting system data provide the basis for action by program supervisors and managers to solve problems and improve program outcomes and effectiveness. Ensuring that the recording and reporting system provides reliable and timely data for the analysis of patient outcomes (through a standardized cohort analysis) is one of the most important program functions. Initially, training in the use of a recording system that is in accordance with WHO guidelines is necessary for all health care workers responsible for documenting TB patient data *(13).*

Center for disease control and prevention (CDC) recommends the need of revision of the TB recording and reporting in order to ensure quality patient care, to ensure information-sharing with patients and transfer of information between health facilities, to aid staff in providing adequate services to individual patients, to allow managers at different levels in the National Tuberculosis Control program NTP monitor program performance in a standardized and internationally comparable way, to provide the basis for

programmatic and policy development and to provide epidemiologic surveillance, (14).Therefore the present study was designed to assess the data quality of recording, reporting and associated factors in public-private mix directly observed short course treatment implementing health institutions.

METHODS

Study design and area: A cros-sectional quantitative study with analytic component was conducted from February to August, 2015, to assess the data quality (completeness, accuracy and timeliness) and to identify the possible factors affecting tuberculosis data quality on recording and reporting in Bahir Dar City Administration Northwest Ethiopia. One hundred ninety five health care providers in 11 health institutions health centers, hospitals and private clinics which provide the diagnosis and treatment service of tuberculosis were the participants of the study. All health workers who were directly or indirectly performing tuberculosis recording and reporting in public -private mix-DOTS implementing facilities were included conveniently in the study.

Study units, sample size and sampling procedure: For the knowledge study, the study units were health-care providers with profession of nurses, laboratory and pharmacy technicians by profession.

Variables and measurement: The outcome variable is knowledge about quality data recording and reporting. It was assessed with twenty questions. Few of the questions were: do you know the key indicators of tuberculosis case detection? How about the treatment outcome indicators? Do you know the time by which tuberculosis report is submitted and many others were asked? Therefore, a respondent would be classified as having "poor knowledge" when he or she answered less than half of the questions correctly, "good knowledge" when he or she answered ten to fifteen of the questions correctly, and "very good" when he or she answered more than fifteen of the questions correctly; for the binary logistic regression analysis, it was dichotomized by merging the last two categories as "good knowledge".

Data collection: Data were retrieved from unit TB register and quarterly reports for completeness, accuracy and timeliness at different levels, and a record review format with a checklist that fits the purpose was used to gather information. The collected consisted of both electronic and paper formats (matching data, checking for completeness, accuracy and timeliness was done). At the same time factors that influence data quality with regard to HWs working in both public and private HIs were assessed.

Data Management and Statistical Analysis: Quantitative data was entered in statistical package EP Info version 3.5.1, and data cleaned and analyzed using the statistical package SPSS version 16.0.Frequency distribution, percentages and summary statistics were used to describe the study population. Odds Ratio (OR) was computed to assess statistical association, and significance of statistical association was assured using 95% confidence interval (CI) and P-value< 0.5.

RESULTS

Socio-Demographic characteristics: A total of 195 health care providers were participated in this study. Of these 93(47.7%) were females. Among them 150 (76.9%) of respondents were from public and only 45 (23.1%) were from private HIs. The age ranges of participants were between 22 and 57 with mean age of

32.9 and standard deviation of 7.6 years and their service year ranges between 1 and 35 years with mean 8.56 and standard deviation of 7 years. Moreover, 85(91.5%) of females and 65 (63.7%) of males were employed at the public institutions. The overall response rate of participants was 92.9 %. One hundred eighty (60.5%) were diploma in their qualification, among them 86 (72.9%) were nurses, twenty four (20.3%) of them were laboratory and 8 (6.8%) were pharmacy technicians by profession. And 77 (39.5%) were degree and above in qualification, among them 30 (39%) (10 specialists and 20 GPs) of study participants were medical doctors, 35 (45.6%) were Bachelor of Science (17 nurses and 18 health officers), ten (13%) were laboratory technologists and 2 (2.6%) of them were pharmacists by profession. From total respondents 103 (52.8%) nurses, thirty (15.4%) medical doctors, 18 (9.2%) health officers, 34 (17.5%) laboratory and 10 (5.1%) pharmacy were included in this study (Table1).

Table1: The Socio-demographic Characteristics of Study Participants in PPM-DOTS Implementing HFs in Bahir Dar City Administration, Northwest Ethiopia 2015.

Variable	Frequency	%
Sex		
Male	102	52.3
Female	93	47.7
Age		
≤ 30 Years	84	43.1
>30 Years	111	56.9
Service year		
≤ 5 Years	87	44.6
> 5 Years	108	55.4
Educational Status		
Degree and above	77	39.5
Diploma	118	60.5

Training status of study participants: Of the total study participants, 103 (52.8%) were from the hospital, 47 (24.1%) from the public health centers, 34 (17.4%) from higher and 11 (5.6%) from private medium clinics. More than 60 % of the higher private clinic health workers have got training, while majority of the public HWs especially at the hospital did not take training on DOTS. Among 89 trained HWs,75.6% were from the private and the rest were from public (Figure 1).

Recording Status: From the total of 11 study institutions, 8 (72.7%) have completely filled in based on the essential data set elements of the unit TB registration book. Among them 5 (62.5%) were from the private health institutions. Similarly, from 11 His, only 5 (45.5%) filled accurately based on the essential data set elements of the unit TB registration book; out of them, 4 (80%) were from private health institutions. Private institution health workers were better in both completeness and accuracy of recording on the unit TB registration book which is the base for reporting specifically and showing the prevalence and incidence of the disease in a given City at large, so it indicates and warns to give an attention towards the public institution to fill the gap with regard to this study on recording. (Figure 3)

Reporting Status: The study was conducted in 4 public (1 hospital and 3 health centers) and 7 private (5 higher and 2 medium clinics), a total of 11, HFs. There are 11 focal persons for facilitating the DOTS service in each of the institutions, and all are diploma nurses; only one of them (9.1%) was not given training on DOTS program at large, all service provision including anti TB drugs provision, recording and reporting was his or her responsibility. Recording and reporting formats were available in 9 HFs

(81.8%), but only the reporting format was not available in two (18.2%) of the higher clinics for short time. Reports are supposed to be submitted quarterly to Bahir Dar City Health Department. Hence, the total numbers of expected reports for one budget year from all the study institutions were 44.

However, the numbers of reports found at the HFs were 39 (88.6%). Among these, compiled timely were only 10 (22.7%), complete 18 (40.9%) and that were found accurate were only 3 (6.8%). In addition to absence of 5 quarter reports at the HFs, those reports that were sent, reached and observed during this study at the CHD were only 33 (75%).

Among those reached timely to the CHD were only 8 (18.2%). Therefore, completeness, timeliness and accuracy of tuberculosis data in reporting were poor in the study area. But accuracy and timeliness of reporting was relatively better at the private institutions as compared to the public. (Table 2)

Table2: Status of TB reporting among PPM- DOTS implementing HIs inBahir Dar City Administration, Northwest Ethiopia 2015.

			Observed Reports					
			Number of Reports			Copy available at the HF		
Type of HF		**Number of HF**	**Expected**	**Available**	**%**	**Timeliness**	**Completeness**	**Accuracy**
Ownership		**Number**	**Number**	**Number**	**Percentage**	**No. (%)**	**No. (%)**	**No. (%)**
Public	Hospital	1	4	3	75	1 (25)	3 (75)	0 (0)
	Health Center	3	12	12	100	5 (41.7)	9 (75)	0 (0)
	Sub total	4	16	15	93.7	6 (37.5)	12 (75)	0 (0)
Private	Higher Clinic	5	20	18	90	3 (15)	1 (5)	9 (45)
	Medium Clinic	2	8	6	75	1 (12.5)	5 (62.5)	4 (50)
	Sub total	7	28	24	85.7	4 (14.3)	6 (21.4)	3 (10.7)
	Total	**11**	**44**	39	88.6	**10 (**22.7)	**18 (**40.9)	**3 (**6.8)

The report obtained from the City Health Department shows that 33(75%) reports were arrived annually; among them 24 (54.5%) were from the private and the rest from the public institutions so that the private HIs have 72.7% share of the reports to be submitted to the City Health Department is higher than the public institutions. Even though the numbers of reports arrived to the City were 75%, timely reports were only 9(20.4%); completeness 21(47.7%) and accuracy of the report were 13(29.5%). Relatively quality in terms of completeness and accuracy were better at private health institutions as compared to the public institutions, but, only timeliness in reporting was better at the public institutions. (Figure4)

Tuberculosis diagnosis and treatment, at selected 7 (5 Higher and 2 Medium Clinics) private health institutions, were begun in Bahir Dar City Administration, with MOU between the ANRS-HB and the PSP-E.It increases the number of DOTS providing Public-Private Mix (PPM- DOTS) institutions into 11. All of them are expected to send the reports quarterly to the City Health Department with a fixed schedule. This study shows a discrepancy or mismatch and a mathe-

matical error of cases seen in both the facility and zonal level as compared to the checked from the unit TB registration book. For instance, the total registered cases of pulmonary TB positive (PTB+) seen annually were 298 (checked) but there were 449 cases reported from the copy of all health facilities, and this also differs from 264 zonal report sent to the RHB. Similarly, the same discrepancy was seen in all forms of tuberculosis in the report: Pulmonary TB negative (PTB-) from the register checked was 409, but from the facilities copy report was 410 and city final report was 416; checked from the registry Extra Pulmonary TB (EPTB) cases were 679, but 691 from facilities copy reported and 527 from the city reported to the RHB. And the total cases annually seen from the checked registry was 1386 but was 1550 and 1207 from the HFs and City Health Department reports respectively. (Figure5)

Knowledge status of respondents: Knowledge status showed that 100 (51.8%) of respondents were accounted as having good knowledge on tuberculosis. Among them 63 (62.4%) were from the public institution. The knowledge of respondents on TB in higher, medium clinics, health centers and hospital do have good knowledge of 85.3%, 81.8%, 68.1% and 30.1%respectively.Out of the degree holders 58.4% have good knowledge on tuberculosis. 91.7% of HWs working at DOTS clinic do have good knowledge on tuberculosis, but only 74.2% do have knowledge on the recording and reporting of TB.

Factors associated with knowledge of data quality in public-private mix DOTS health institutions: The impacts of selected socio demographic characteristics and other independent variables on the status of knowledge of respondents were assessed using multiple logistic regressions. Type of institution especially hospital working respondents were found to have statistically significant with their knowledge status (OR- 0.185 with 95% CI of 0.082-0.421). Also training of the respondents showed statistically significant association with their status of knowledge (OR=3.564 with 95% CI of 1.717- 7.398)**.** (Table 3)

Table 3: Knowledge status of the Study Participants in PPM-DOTS Implementing HFs in Bahir Dar City Administration, Northwest Ethiopia 2015.

VARIABLE	KNOWLEDGE		OR AT 95% CI	
	POOR	GOOD	CRUDE	ADJUSTED
SEX				
Male	336[35.3]	66[64.7]	*3.038[1.694-5.447]	1.649[0.770-3.531]
Female	58[62.4]	35[37.6]		
EDUCATION				
Degree and Above	32[41.6]	45[58.4]	1.557[0.872-2.780]	1.882[0.886-3.997]
Diploma	62[52.5]	56[47.5]		
OWNERSHIP OFINSTITUTE				
Private	7[15.6]	38[84.4]	*3.301[2.177-5.005]	1.743[0.298-10.206]
Public	87[58]	63[42]		
TYPE OF HEALTH INSTITUTE				
Hospital	72[69.9]	31[30.1]	*3.301[2.177-5.005]	*0.185[0.082-0.421]
Health center	15[31.9]	32[68.1]		
Higher Clinic	5[14.7]	29[85.3]		
Medium Clinic	2[18.2]	9[81.8]		
TRAINING				
Yes	23[25.8]	66[74.2]	*5.821[3.120-10.862]	*3.564[1.717-7.398]
No	71[67]	35[33]		

DISCUSSION

Accurate, complete and timely information improves the quality of surveillance data and supports public health decision-making. Prompt notification to the public health system is an important component of the surveillance process to achieve the public health objectives: It provides data to measure disease burden monitor epidemiological trends, detect outbreaks, and plan and target preventative and treatment services(16). The present study showed that only 101 (51.8 %) have good knowledge on tuberculosis. This showed that there was knowledge gap and this may be a reason for not reporting with completeness, accuracy and timeliness.

This study also showed that 94.7% of health workers working at DOTS clinic and 74.2% of general health workers trained on TB have good knowledge on tuberculosis in related to the recording and reporting. Therefore, those trained and working in hospital were OR= 3.564 with 95% CI of 1.717-7.398 and 0.185 with 95% CI of 0.082- 0.421, respectively. Completeness, accuracy and timeliness in recording on a unit TB registration book was found worse in public than private HIs (16).Completeness was 75% in the public institutions than the private, but accuracy was 57.1% in private health institution and none of them had both completeness and accuracy above 75%, (16).

The impacts of selected socio demographic characteristics and other independent variables on the status of the awareness of time/frequency of reporting of respondents were tested using multiple Logistic Regressions. Training, Type of Health Institution/ working in hospital and Sex (OR= 3.213 with 95% CI of 1.608-6.419, 0.348 with 95% CI of 0.160-0.759 and 2.639 with 95% CI of 1.277-5.455) of the respondents were statistically significant with their awareness of time/frequency of reporting, respectively. Independent variables do have power to alter the performance of care provision towards DOTS implementation.

Awareness for time/frequency of reporting and the knowledge status of all respondents were considered as dependent variable and have a statistical association as it was tested with the explanatory variables (type of health institution/hospital, Sex and training on tuberculosis). Completeness, timeliness and accuracy of tuberculosis data in reporting were poor enough in the study area, while accuracy and timeliness of reporting was relatively better at the private institutions as compared to the public. This was supported by the following study(20-22).

CONCLUSION

This study identifies that, the recoding and reporting as well as the quality of data is seriously deprived. This implies that the quality of data lacks not only completeness, accuracy, and timeliness but also the compiled data available at hand were not reported to the City Health Department. Recording and reporting were largely influenced by training of the health care providers. Those who had previous training on DOTs showed better knowledge on recording and reporting as well as frequency of reports and destination of reports.

Training, working in Hospital and Sex are an important factor that influences the state of awareness of frequency of reporting and knowledge status of health workers for recording and reporting. The con-

tribution of private health institutions in raising the City TB case detection rate was 12.8%, and it is an encouraging achievement.

Therefore, planning is mainly based on the quality of data/information that has been recorded and reported, which is important in decision making for resource allocation, distribution of drugs and medical supplies as well as program intervention.

Declarations

Abbreviations:

ANRS HB: Amhara National Regional State Health Bureau, **BCHD:** Bahir Dar City Health Department, **CDC:** Communicable Disease Control, **DOTS:** Directly Observed Treatment Short course, **EPTB:** Extra Pulmonary Tuberculosis, **FMOH:** Federal Ministry of Health, HC:Health Center, **HFs:** Health Facilities, **HIs**: Health Institutions, **HMIS**: Health Management Information System, Hosp: Hospital, **HSA**: Health Service Area, **HWs:** Health Workers, **MOU:** Memorandum of Understanding, **NTBL:** National Tuberculosis and Leprosy, **NTP**: National Tuberculosis Program, **PP:** Private Partnership, **PPM**: Public- Private Mix, **PSP-E:**Private Sector Program- Ethiopia, **PTB+:**Smear Positive Pulmonary Tuberculosis, **PTB:** Smear Negative Pulmonary Tuberculosis, **TB:** Tuberculosis, **WHO:** World Health Organization.

Ethical approval and consent to participate: Ethical clearance was obtained from University of Gondar ethical review committee. Written permission was obtained from Amhara RHB and Bahirdar City Administration Health Department. Verbal consent was obtained from each study participant.

The objectives of the study were explained to the heads of the health facilities and health care providers who worked at His and clarification was given before starting data collection. Name or specific address of the study participants were coded and remain anonymous, and confidentiality was assured.

Consent for publication: Consent for publication was taken from facilities. Privacy and confidentiality of information given by each Health facility was kept properly; personal and facility identifiers were removed.

Availability of data and materials

All data generated or analyzed during this study are included in this article. Data that support the findings of this study are also available from the corresponding author upon reasonable request.

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Authors' contributions:

FM: conception of research idea, study design, data collection, analysis and interpretation, Manuscript writes up and Review.

TA: Research idea, data collection, analysis and interpretation.

SE: Data collection, analysis, interpretation, Manuscript writes up and Review.

SD: data collection, Quantitative data analysis and manuscript preparation.

All authors read and approved the final manuscript

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