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Referral of presumptive TB among operators of community medicine outlets, Eastern Region, Ghana

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Running head: Presumptive TB referral, Ghana

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SUMMARY

BACKGROUND: Case detection is an important part of TB control programmes. In 2007, the TB programme in Ghana join the WHO's public-private partnership with community medicine outlet operators to increase referral of persons with presumptive TB for laboratory investigation. Information on factors likely to influence referral is scarce in Ghana. We assessed these factors among pharmacists and over-the-counter (OTC) medicine sellers.

METHODS: In 2019–2020, we conducted computer-assisted telephone interviews among community pharmacists and OTC medicine sellers in the Eastern Region of Ghana. We used a structured questionnaire and collected data on respondents' sociodemographics and professional characteristics. We used logistic regression to investigate characteristics associated with self-reported referral of presumptive TB cases.

RESULTS: Of all respondents who completed the interviews, 68.7% (321/467) reported having ever referred a presumptive TB case and 72.1% (336/466) had received specific training. Associated factors of presumptive TB referral were having received specific training (OR 2.7, 95% CI 1.5–4.9); performing both dispensing and managerial functions (OR 2.8, 95% CI 1.4–5.5); operating from OTC shop (OR 6.2, 95% CI 1.6–23.4) and the availability of a TB laboratory within walking distance (OR 3.3, 95% CI 1.2–9.5).

CONCLUSION: Interviewees largely support TB referral. However, a significant proportion does not follow the strategy closely. We recommend more specific TB training courses.

KEY WORDS: presumptive tuberculosis referral; computer-assisted telephone interviews; Ghana; pharmacists; public-private partnership

TB is the leading cause of infectious disease mortality worldwide.[1] In 2016, of an estimated 10.4 million people who developed TB, 1.8 million died. One of the health targets of the UN Sustainable Development Goals is to end the TB pandemic by 2030.[1,2] However, current case-finding efforts to increase early TB case detection and notification and stop the spread of the disease have consistently failed to yield a positive result.[3] In Ghana, TB case notification rates in the last 5 years have stagnated at around 60/100,000 population less than the global notification rate.[4,5] This has been attributed to limited laboratory capacity, weak active case-finding and reduced public education on TB.[6]

As part of interventions to increase TB case detection, the WHO has recommended partnerships between national TB control programmes (NTPs) and private health practitioners.[7] The private health practitioners include community pharmacists and over-the-counter (OTC) medicine sellers (herein referred to as community medicine outlet operators). Many countries have scaled up these public-private mix (PPM) initiatives, including the community-based TB care (CTBC) strategy adopted and implemented in Ghana in the last decade.[6,7] Private providers (PPs) such as those working in community pharmacies provide health care services to a significant proportion of populations in many low- and middle-income countries.[8] About 40% of sick persons presenting with cough use the PPs as their first point of call because they are easily accessible on demand without the need for appointments.[9]

Countries with PPM initiatives involving pharmacies have recorded some gains in the fight against TB, Cambodia being an example, with a 2% increase in their national TB case detection.[9] Also, PPMs in TB control that involve pharmacies and other community medicine outlets have helped India in saving 1.4 million lives through early reporting and TB case detection.[10]

Ghana adopted the CTBC strategy in 2007 to foster partnership between the Ghana Health Service TB control programme and civil society.[4] The active involvement of community pharmacists and OTC medicine sellers was a key component of Ghana's CTBC strategy, which aims to increase TB case detection through early referral of persons with presumptive TB for laboratory diagnosis.[4] The TB control programme provides TB-specific training free of charge to the community medicine outlet operators on TB case detection and on how to refer presumptive cases to designated health facility

laboratories for testing. As this collaboration has been implemented for over 10 years now, the experience of the operators should be investigable.

In the Eastern Region of Ghana, TB training schedules for pharmacies and OTCs are incorporated into the district-level professional meetings of the pharmacy association and this has the potential of improving uptake of the CTBC.[11] However, the factors that determine compliance among operators of community medicine outlets with the agreed strategy of early detection of TB through referrals are not known.

We conducted computer-assisted telephone interviews (CATI) in the Eastern Region of Ghana to assess the factors associated with presumptive TB referral by pharmacists and OTC medicine sellers.

METHODS

Study area

We conducted the study in the Eastern Region of Ghana (population: approximately 3 million), where 54% of households live in a single room, increasing the risk of the spread of TB.[12]

Data collection procedure

From March 2019 to January 2020, we invited 850 pharmacists and OTC medicine sellers to participate in a cross-sectional survey on their practices regarding presumptive TB referrals for laboratory testing. We used the CATI approach in our study, i.e., we conducted telephone interviews and recorded the responses on a computer via an application called LimeSurvey (https://community.limesurvey.org/downloads/).

Study sample and sampling process

All operators of pharmacies and OTC medicine outlets in the Eastern Region with correct phone contacts were eligible for the study. We obtained a list of all pharmacies and OTC medicine shops in the region from the TB control programme containing information on phone contacts for 83.4% of all shops (850/1,019) from 24 districts (Figure 1). Of these, 271 were called up to four times without response, 78 had wrong phone contacts, 21 had stopped operating and 12 refused to participate. One person was

excluded as there was no information on the outcome of interest available; the study sample thus consisted of 467 persons.

Study variables and data collection tools

We used a structured interviewer-administered questionnaire to collect data on participants' sociodemographic characteristics; their professional backgrounds and job responsibilities; their knowledge, attitudes and practices on presumptive TB referrals; and the services the pharmacists and OTC medicine sellers provide to their communities. The outcome variable was the self-reported referral of a presumptive TB case to a testing laboratory by a community medicine outlet operator.

Data collection process

We pretested the questionnaire among 15 operators in the Hohoe Municipality, a neighbouring region (Volta Region). We used cognitive testing techniques to assess consistency of understanding among the test group of respondents and revised the questionnaire accordingly. Potential interviewees were called in random order, and the responses were recorded in LimeSurvey.

Ethical considerations

The Ethics Review Committee of the Ghana Health Service, Accra, Ghana (reference number GHS-ERC005/04/18) and the Ethics Committee of the Hannover Medical School in Hannover, Germany (Nr. 7902_BO_K_2018) granted ethical approval for this study. The data protection officer of the Helmholtz Centre for Infection Research approved the data protection concept. Prior to the start of the interviews, we distributed information sheets on study objectives to all potential interviewees at their professional meetings in Ghana with the help of the district TB coordinators. In addition, information was available online via the research institute's website. We obtained verbal informed consent before the start of the interviews.

Statistical analysis

For bivariate analysis, we checked for normality of the distribution using a Q-Q plot; we used the Shapiro-Wilk test to decide whether to apply the *t*-test or Wilcoxon rank-sum

for all continuous variables; χ^2 test was used for categorical variables or the Fisher's exact test for variables that had a frequency of less than five in any cell of the contingency table (Table 1). For correlation analysis, we applied Spearman's coefficient because of inhomogeneity in the data. To build the multivariable logistic model, we applied the stepwise backward elimination method with a stopping rule at a *P* value of 0.05[13] to identify the set of variables associated with the practice of presumptive TB referral by community medicine outlet operators to designated health facilities for laboratory diagnosis, and to obtain the adjusted associations with referring presumptive TB cases. All exposure variables with a *P* value of ≤0.25 in the bivariate analysis were included in the full logistic model. We used Stata/IC v14.2 (Stata, College Station, TX, USA) to perform all the analyses.

RESULTS

Sociodemographic characteristics of community medicine outlet operators

The median age of the 467 interviewees was 53 years (min-max: 20–86); 73.0% (341/467) were males (Table 1). Of all participants, 89.5% worked as shop owners rather than shop assistants.

Service characteristics of community medicine outlet operators

Of the 467 interviewees, 321 (68.7%) reported having ever referred a presumptive TB case for laboratory diagnostic. Of 465 interviewees who disclosed their professional backgrounds, OTC medicine sellers were in the majority, at 87.7% (408/465), compared to pharmacists (Table 3); 95.9% of participants operated OTC shops; 81.5% (380/466) performed functions as both managers and dispensers. Participants with knowledge of the location of TB laboratories reported a higher proportion of presumptive TB referrals than those who did not know the location (275/375, 73.3% vs. 100/375, 26.7%). The Spearman correlation coefficient of district TB incidence (5-year averages) per 100,000 population and proportion referred was –0.1 (P = 0.5), indicating no monotonic correlation between TB incidence and referral probability (Table 2, Figure 2)

The reported means of going to the TB laboratories were taxi/bus (292/374, 78.1%), walking (75/374, 20.1%) and bicycle/motorbike (7/374, 1.9%). The median travel time was 20 min (min–max: 2–180 min). Of all participants who received

training, 76.8% (258/336) reported to have referred, while of the participants who received no training, 49.2% (63/128) reported to have referred; 82.7% (278/336) participated in TB training sessions offered by the regional TB control programme, and the remaining by courses offered by non-governmental organisations (NGOs). The median number of training sessions participated in was 1 and ranged from 1 to 10 and 1 to 32 for those with referral history and those without, respectively, with 70.4% of the training sessions having occurred between 2017 and 2019; 97.8% of participants were of the opinion that pharmacies and OTC operators should be engaged in presumptive TB referral.

Of the 174 participants who provided estimated records of the number of referrals made in the last 12 months, 161 (92.5%) did not document these. The median monthly estimated number of referrals for the 12 months preceding the study was 3 (min-max: 1-60).

Factors associated with presumptive TB referrals among community medicine outlet operators

Five predictor variables were significantly associated with referral (Table 4). Participants performing both dispensing and managerial functions had higher adjusted odds (aOR 2.8, 95% CI 1.4–5.5) of making presumptive TB referrals than those performing managerial functions only; working in a dispensing function only did not raise the odds of referral significantly. Also, compared to pharmacists, OTC medicine sellers had higher adjusted odds of referral (aOR 6.2, 95% CI 1.6–23.4).

Receiving some form of TB training was associated with a 2.7 times higher odds of referring presumptive TB cases (aOR 2.7, 95% CI 1.5–4.9) compared to having had no training. The adjusted odds of presumptive TB referral was higher when the means of transport from the pharmacy or OTC location to the TB laboratory was walking, i.e., the laboratory was within walking distance (reference: location of laboratory unknown, aOR 3.3, 95% CI 1.2–9.5) than when the means of transport required the use of a taxi/bus (aOR 2.0, 95% CI 1.0–4.5) or bicycle/motorbike (aOR 0.9, 95% CI 0.1–7.5). Likewise, participants in favour of OTC and pharmacy involvement in TB referral had a higher adjusted odds of referral compared to those not in favour (aOR 25.3, 95% CI 2.6–245.8).

DISCUSSION

Since the implementation of the CTBC strategy in Ghana over a decade ago, TB-related training courses are offered to community pharmacists and OTC medicine sellers to help them refer presumptive TB cases for laboratory diagnosis. However, not all pharmacists and OTC medicine sellers have had the opportunity to receive training, partly because such training courses were mostly targeted at shop owners.[14] The public-private partnerships have contributed to increased TB case detection in Cambodia[9] and India.[10] We investigated the factors associated with presumptive TB referral among pharmacists and OTC medicine sellers in a region in Ghana where the CTBC partnership is in operation.

We found that pharmacies and OTCs were predominantly operated by people in their retiring age, the majority of whom had had secondary education – the minimum requirement of engagement in Ghana.[15] Most participants were shop owners (89.5%); with 81.5% performing both dispensing and managerial functions. Persons performing dispensing functions were more likely to encounter presumptive TB cases compared to those with managerial functions. Understandably, participants who performed both functions had higher adjusted odds of making a referral than those performing either managerial or dispensing functions. This could be partly because over 80% of participants performed both functions and were more likely to have been trained and understood the rationale for presumptive TB referral. On the contrary, in the Philippines, all community pharmacy operators were viewed as dispensers without distinction.[16]

About 68.7% of our participants referred at least one presumptive TB case for laboratory investigation. Similar studies reported a higher proportions of referrals: 80% in Pakistan[17] and 77% in Peru.[18] Differences in study designs and qualification of participants partly account for these variations. In particular, none of the other studies used a telephone survey to collect data. The Pakistani study included all pharmacies (n = 82) in the study area, 38% of whom were qualified pharmacists, while the study from Peru sampled 51 of the 109 pharmacies in the study area, 11% of whom were trained pharmacists. Only 0.9% of participants in our study were trained pharmacists.

OTCs are normally located within residential communities; as these have fewer customers,[19,20] OTC medicine sellers may have a closer bond with their clients, making it more likely for them to refer those suspected of having TB for further diagnosis compared to pharmacies, which are normally located in the cities, where pharmacies are more crowded.[21] This could partly explain our finding that dispensers at OTC shops had higher odds of making presumptive TB referrals compared to pharmacies. Whereas pharmacies are supervised by licensed pharmacists, OTCs are operated by people from a wide range of backgrounds in nursing, medicine, and students on internships.[22] Therefore, the unavailability, lack of knowledge or reluctance to prescribe efficacious and often more expensive medications for persistent coughs among OTC medicine sellers may have influenced their decision to refer presumptive TB cases compared to pharmacies, which might have a wider range of expertise, dispensing options and patients with ability to pay.

Over 70% of participants in our study had received some form of TB-related training. A higher proportion (74.6%) of shop owners benefited from the training than shop assistants (51.0%). About 90.9% of all referrals were made by shop owners, suggesting that those who were trained were more likely to refer presumptive TB cases. Given this observation, training shop assistants could potentially increase presumptive TB referrals. In our study, about one in five untrained participant referred a presumptive TB case. This finding is similar to that from a study in Pakistan, where dispensers trained by the NTP were usually not present in the shops and did not transfer the knowledge gained to other dispensing staff of their shops.[23]

Operators in our study had higher odds of referring presumptive TB cases if they knew the location of the laboratory and if it was within walking distance. This suggests that operators have higher odds of referring if they consider the journey to the TB laboratory as less stressful. This practice of the operators is consistent with findings from a NTP preview of the difficulties in accessing a health facility, which reported that bad road networks and long travel distances compelled shop operators to attempt to manage the presumptive TB cases rather than referring them.[24] Similarly, in a study in Indonesia, participants were more likely to refer a presumptive TB case if the travel distance to a TB laboratory was ≤5 km.[25]

Nearly all (97.8%) of our participants believed their involvement in presumptive TB referral would contribute to TB case detection, a finding comparable to 83% of pharmacy staff in a Pakistani study willing to be trained and be involved in TB control efforts.[17] However, the non-availability of referral forms to operators in our study meant that referrals had to be verbal and without records, thereby limiting our ability to quantify their contribution to presumptive TB referrals. Therefore, the motivation for referral could invariably be largely influenced by the personal concern the operator might have for the client. In a pilot study in Cambodia among PPM network pharmacies, the pharmacy operators signed a PPM agreement to participate in TB referral services, they had access to the TB referral forms and had records of all referrals made in the past 2 years. The difference in results may thus be due to the fact that the pharmacy staff were provided with all the necessary tools to work with in addition to a clear definition of task to perform,[26] contrary to our study where there were no contractual agreements and formal role specifications. A more formal partnership with PPs in TB case detection could improve performance.[27]

Strengths

The telephone survey design made it feasible for us to achieve a wider geographical coverage and a large sample size. The study covered more than 80% of pharmacies and OTCs in 24 out of 26 districts in an entire region (sample size: 850 community medicine outlet operators). To our knowledge, this is the first telephone survey on TB referral among operators of pharmacies and OTCs in Africa.

Limitations

Participants reported on their own performance on compliance with presumptive TB referral strategy; measurement of referral was based on what was said without the opportunity to verify. This is prone to social desirability bias once interviewees know what is expected of them. Recall bias is also possible since participants had to recollect in answering some of the questions. As the study was conducted in only one region in Ghana, caution should be used when extrapolating our findings to all of Ghana.

CONCLUSION

Community medicine outlet operators largely support TB referral; nevertheless, a significant proportion did not practice the strategy of presumptive TB referral to designated health facilities. Factors associated with self-reported presumptive TB referral were having received TB-specific training, shop operator performing both dispensing and managerial functions, being an OTC medicine seller and having a TB laboratory within a walking distance from the referral shop. The NTP should consider including not just OTC shop owners, but also shop assistants and community pharmacists in TB case detection training.

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Conflicts of interest: None declared.

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Table 1 Sociodemographic characteristics of pharmacists and over-the-counter medicine sellers stratified by referral status, Eastern Region, Ghana

Variable	Total *n* (%)	Ever referred *n* (%)	Never referred *n* (%)	*P* value
Age, *n*	466	321	145	0.26*
Age, years, median [IQR]	53 [40–63]	52 [40–61]	55 [39–65]	
Sex (*n* = 466)				0.39†
Male	340 (73.0)	238 (74.1)	102 (70.3)	
Female	126 (27.0)	83 (25.9)	43 (29.7)	
Religion (*n* = 465)				0.77†
Christian	449 (96.6)	310 (96.6)	139 (96.5)	
Moslem	11 (2.4)	7 (2.2)	4 (2.8)	
Traditional	2 (0.4)	1 (0.3)	1 (0.7)	
Other	2 (0.4)	2 (0.6)	0 (0.0)	
No response	1(0.2)	1 (0.3)	0 (0.0)	
Educational level (*n* = 465)				0.23†
Secondary	349 (75.1)	245 (76.3)	104 (72.2)	
Tertiary	115 (24.7)	76 (23.7)	39 (27.1)	
None	1 (0.2)	0 (0.0)	1 (0.7)	
Occupation (*n* = 466)				0.12†
Shop owner	417 (89.5)	292 (91.0)	125 (86.2)	
Assistant	49 (10.5)	29 (9.0)	20 (13.8)	
District (*n* = 466)				0.60†
Urban	356 (76.4)	243 (75.7)	113 (77.9)	
Rural	110 (23.6)	78 (24.3)	32 (22.1)	
District laboratory status (*n* = 466)				0.55†
With laboratory	446 (95.7)	306 (95.3)	140 (96.5)	
Without laboratory	20 (4.3)	15 (4.7)	5 (3.5)	

*Wilcoxon rank-sum test.

†χ^2 test.

IQR = interquartile range.

Table 2 Distribution of pharmacists and over-the-counter medicine sellers by district TB incidence and referral status, Eastern Region, Ghana

District	Participants *n*	Ever referred *n* (%)	Never referred *n* (%)	5-year average TB incidence/100,000 pop (2013–2017) %
Akuapim South	12	8 (66.7)	4 (33.3)	51.5
Akuapim North	8	8 (100.0)	0 (0.0)	48.1
Akyemansa*	13	11 (84.6)	2 (15.4)	25.7
Asuogyaman	13	9 (69.2)	4 (30.8)	34.0
Atiwa	25	16 (64.0)	9 (36.0)	44.1
Ayensuano*	13	11 (84.6)	2 (15.4)	42.4
Birim Central Municipal	34	23 (67.6)	11 (32.4)	32.8
Birim North	22	17 (72.3)	5 (27.7)	76.9
Birim South*	24	15 (62.5)	9 (37.5)	34.3
Denkyembour	23	17 (73.9)	6 (26.1)	131.6
East Akim Municipal	32	18 (56.3)	14 (43.7)	57.7
Fanteakwa*	32	27 (84.4)	5 (15.6)	40.6
Kwaebibirem	28	22 (78.6)	6 (21.4)	34.3
Kwahu East*	23	13 (56.5)	10 (43.5)	22.1
Kwahu South	5	4 (80.0)	1 (20.0)	36.7
Kwahu West Municipal	21	14 (66.7)	7 (33.3)	60.2
Lower Manya Krobo	31	21 (67.7)	10 (32.3)	212.7
New-Juaben Municipal	22	12 (54.5)	10 (45.5)	62.5
Nsawam Adoagyire Municipal	15	10 (66.7)	5 (33.3)	100.8
Suhum Municipal	19	13 (68.4)	6 (31.6)	97.0
Upper Manya Krobo	5	1 (20.0)	4 (80.0)	55.9
Upper West Akim*	8	7 (87.5)	1 (12.5)	52.8
West Akim Municipal	26	14 (53.8)	12 (46.2)	53.5
Yilo Krobo	12	10 (83.3)	2 (16.7)	93.1
Total	466	321	145	—

*Rural districts.

Table 3 Service characteristics of pharmacies and OTC medicine shop operators stratified by referral status, Eastern Region, Ghana

Variable	Total *n* (%)	Ever referred *n* (%)	Never referred *n* (%)	*P* value
Qualification in field (*n* = 465)				0.41†
OTC medicine seller	408 (87.7)	286 (89.1)	122 (84.7)	
Medicine counter assistant	40 (8.6)	25 (7.8)	15 (10.4)	
Pharmacist	4 (0.9)	3 (0.9)	1 (0.7)	
Dispensary technician	1 (0.2)	0 (0.0)	1 (0.7)	
No specific training	12 (2.6)	7 (2.1)	5 (3.5)	
Type of dispensing unit (*n* = 466)				0.12†
OTC shop	447 (95.9)	311 (96.9)	136 (93.8)	
Pharmacy	19 (4.1)	10 (3.1)	9 (6.2)	
Function of shop operator (*n* = 466)				0.06†
Managing	28 (6.0)	16 (5.0)	12 (8.3)	
Dispensing	58 (12.5)	34 (10.6)	24 (16.6)	
Both functions	380 (81.5)	271 (84.4)	109 (75.2)	
Hours shop opens/week, *n*	463,	321,	142,	0.12‡
Hours shop opens/week, median [IQR]	87 [78–95]	87 [78–95]	85 [75–94]	
Time in operation, years	461	319	142	<0.01‡
Time in operation, median [IQR]	15 [9–23]	16 [10–25]	11 [7–20]	
Means of reaching TB laboratory (*n* = 462)				<0.01†
Taxi/bus	292 (63.2)	208 (65.2)	84 (58.7)	
Walking	75 (16.2)	62 (19.4)	13 (9.1)	
Bicycle/motorbike	7 (1.5)	5 (1.6)	2 (1.4)	
Location of TB laboratory unknown	88 (19.0)	44 (13.8)	44 (30.8)	
Time of travel to laboratory, min	339	249	89	0.69‡
Time of travel to laboratory, median [IQR]	20 [10–30]	20 [10–30]	20 [10–30]	
Received TB training (*n* = 466)				<0.01†
Yes	336 (72.1)	258 (80.4)	78 (53.8)	
No	128 (27.5)	63 (19.6)	65 (44.8)	
Don’t know	2 (0.4)	0 (0.0)	2 (1.4)	
Training given by (*n* = 336)				0.86†
TB control programme	278 (82.7)	214 (83.0)	64 (82.1)	
Other institutions	58 (17.3)	44 (17.1)	14 (18.0)	
Training sessions received, *n*	325	249	76	<0.01‡
Training sessions received, median [IQR]	1 [1–2]	2 [1–2]	1 [1–2]	
Time since last training received, years	290	223	67	0.75‡
Time since last training received, median [IQR]	2 [1–3]	2 [1–3]	2 [1–3]	
Cough syrup sold, *n*	272	188	84	0.34‡
Cough syrup sold, median [IQR]	5 [3–10]	5 [3–9]	5 [3–10]	
Opinions in favour of referral (*n* = 465)				<0.01§
Yes	454 (97.6)	317 (99.1)	137 (94.5)	
No	10 (2.2)	3 (0.9)	7 (4.8)	
Don’t know	1 (0.2)	0 (0.0)	1 (0.7)	
Referral in last 12 months (*n* = 321)				—
Yes		174 (54.2)	NA	

No		147 (45.8)	NA	
Records of referral in last 12 months (n = 174)*				—
Yes		161 (92.5)	NA	
No		13 (7.5)	NA	
Referrals made in last 12 months, n	159	159	0 (0.0)	—
Referrals made in last 12 months, median [IQR]	3 [1–4]	3 [1–4]		

*Of those who reported having ever referred.

[†]χ^2 test.

[‡]Wilcoxon rank-sum test.

[§]Fisher's exact test.

OTC = over-the-counter; IQR = interquartile range.

Table 4 Factors associated with presumptive TB referrals among pharmacies and OTC medicine shop operators in Eastern Region, Ghana (n = 466)

Predictor	cOR	95% CI	aOR	95% CI	*P* value
Responsibility of shop operator					
Managerial	1		1		
Dispensing	1.06	0.43–2.65	2.26	0.53–9.67	0.27
Both functions	1.86	0.85–4.07	2.77	1.39–5.53	0.004
Dispensing unit					
Pharmacy	1				
OTC shop	2.06	0.82–5.18	6.15	1.62–23.37	0.008
Received TB training					
No	1		1		
Yes	3.41	2.22–5.24	2.67	1.47–4.88	0.001
Means of reaching TB laboratory					
Location of TB laboratory unknown	1		1		
Walking	4.77	2.30–9.90	3.32	1.16–9.51	0.026
Taxi/bus	2.48	1.52–4.04	2.01	1.00–4.51	0.063
Bicycle/motorbike	2.5	0.47–13.58	0.92	0.11–7.53	0.936
Opinion in favour of TB referral as task for pharmacies and OTC operators					
No	1		1		
Yes	5.34	1.38–21.19	25.26	2.60–245.77	0.005

OTC = over-the-counter; cOR = crude odds ratio; aOR = adjusted OR; CI = confidence interval

FIGURE LEGENDS

Figure 1 Flow chart of telephone interview participants, Eastern Region, Ghana. OTC = over-the-counter.

Figure 2 Correlation of district TB incidence per 100,000 population and proportion of community medicine outlet operators with history of presumptive referral.