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Evaluation of Active Case Finding (ACF) of Tuberculosis in Slums Population in North of Iran

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Abstract

Background

At present of the limitation of the current case finding strategies and the global urgency to improve tuberculosis (TB) case finding, a renewed interest in active case finding (ACF) has risen. World Health Organization (WHO) calls for research on TB screening among low-income countries because of the limitation of the passive case finding strategies. We aimed to evaluated Active Case Finding strategy for TB among the slums population in North of Iran (Gorgan city) and comprise this procedure to Passive Case Finding.

Materials and Methods

We conducted a house-to-house survey from April 2016 to July 2016 by trained health volunteers for TB in ten urban slums of Gorgan. Individuals with TB symptoms were identified through targeted screening using a standardized questionnaire and investigated further for TB. Descriptive analyses were performed using Stata-12.

Results

During study period, of 22,741 individuals screened for TB, 112 (0.49%) were identified as TB suspects; 95 suspects were evaluated for TB. TB was diagnosed in four individuals, representing 4.2% of those evaluated for TB as suspected cases. The incidence rate of tuberculosis was 17.5 in 100.000 people in slums population of Gorgan. Of the four detected cases, three individuals had pulmonary TB that among them two cases had new smear-positive TB.

Conclusion

ACF could supplement current strategies to yield additional TB cases, lead to early diagnosis and better treatment.

Key Words: Active case finding, Diagnosis, Iran, Smear-positive, Tuberculosis.

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1- INTRODUCTION

Tuberculosis (TB), is an infectious and treatable disease. However TB patients should be early diagnosed and managed to achieve the main strategy in TB control (1, 2). TB is one of the most important causes of global premature mortality and disability – projected to remain as one of ten leading causes of disease burden by the year 2020 (3). TB continues to pose a major global health problem, causing an estimated 9 million new cases and 1.5 million deaths during 2013 (4). People with active TB can infect 10-15 other people through close contact over the course of a year (5). Since the 1990s there was a considerable progress in achieve to high-quality TB services (6). In 2013, the World Health Organization (WHO) issued recommendations for active TB screening defined as "the systematic identification of people with suspected active TB, in a predetermined target group, using tests, examinations or other procedures that can be applied rapidly"(7). The WHO recommends that active case finding focuses on certain at-risk populations.(8) WHO End TB strategy for 2016–2030 emphasis early diagnosis, including universal drug susceptibility testing and systematic screening of high-risk groups to reduce the case detection gap (9). National TB Control Program might have low impact on true incidence because patients are diagnosed and treated late (10). Moreover, the current TB control strategies cannot identified all of TB patients in developing countries (11).

Passive case finding (PCF), is the standard strategy that WHO recommended through Stop TB Strategy (12). In PCF strategy, patients with smear-positive TB as the main source of disease transmission are in focus (13). The PCF relies on the voluntary presentation of patients with TB related clinical manifestation on the health care system for diagnosis of TB and treatment (14). Although, this conventional approach has been evidenced as cost-effective strategy of TB screening, people who have limited access to TB services often fail to receive timely diagnosis and effective treatment (15). Delays in seeking care have been seen in TB high-risk and vulnerable populations, which have posed major challenges for improving case detection (15-18). Active case finding (ACF), could be effective in providing early diagnosis and is typically aimed at TB high-risk groups such as homeless, prisoners, and residents of impoverished areas (19). Although, ACF has been implemented for decades primarily in resource rich settings, there is inadequate evidence regarding the implementation of this approach for early case detection in developing countries (15). Findings of a review study indicated that ACF was effective in reducing TB prevalence, incidence, and mortality from disease complications (20).

Golestan province, North of Iran, has second highest TB incidence in Iran in 2014 (21). This province has adopted many case finding approaches to promote early diagnosis, including ACF of TB in patients of diabetes in rural population and ACF in people with close contact history in TB case families. This study aimed to identify suspect cases of TB for more investigation to detecting TB cases. We examine whether ACF contributes to detection of more TB cases, through comparing TB cases in slum population in the same time (three months) in two years. Also, we aimed to determine point prevalence rate of TB in subgroup population in slum areas.

2- MATERIALS AND METHODS

2-1. Data Collection

Using a standardized questionnaire that completed with national TB guideline. It involved in two sections that section one completed for all target population and section two completed for suspected

patients. The section one consist of demographic variables, signs and symptoms, TB history in individuals and her/his families. Section two was formed of direct smear examination test, chest-X ray, the purified protein derivative (PPD) skin test or tuberculin test, human immunodeficiency virus (HIV) rapid test and their results (11).

2-2. Study setting

Gorgan, center of Golestan province, in North of Iran, has an estimated TB incidence of 38 per 100,000 population; one of the highest rate in Iran. Gorgan has a 342,743 residents in 2015, with an estimated 30,601 people (8.9%) living on slum areas. A cross-sectional house to house screening for active TB conducted in poor urban settlement of Gorgan County from 2 April to 4 July 2016. The study area comprised ten communities – scattered geographically over the whole of Gorgan, with an estimated total population of 30,615. Health care workers, assisted by community health volunteers performed door-to-door visit to screen all available household members for symptoms suggestive of TB, such as cough, sputum, unintentional weight loss, fever, nocturnal sweat, etc. All consenting people with a positive TB symptom screen (any of the above), were interviewed using a standardized questionnaire. Detected cases during the survey that had already TB treatment were not considered as actively detected cases.

2-3. Sputum collection

The national TB program was used to evaluate all symptomatic people to be evaluated with three sputum specimens. Patients were instructed on how to produce a good quality sputum specimen following a standard operating procedure. The first specimen was collected in health center when the patients refer to TB worker. Second specimen collect early morning the next day and third was collected when the patient bring second specimen in health center. Specimens were transported daily to the TB laboratory after registered in Sputum Registry Notebook.

2-4. Laboratory procedure

Light emitting diode (LED)-based fluorescence microscopy (Motic-BA310, Spain), was introduced at referral TB laboratory. Direct examination for acid-fast bacilli was done with LED fluorescence microscopes using Auramine O staining counterstaining (22).

2-5. Patient management and follow-up

TB cases were defined as "a physician's diagnosis of TB in a person who has bacteriological evidence of active disease and/or signs and symptoms compatible with TB and has completed diagnostic evaluation, and a physician's decision to start treatment with a full course of anti-tuberculosis chemotherapy" (23). Laboratory technicians Issued positive results from smear microscopy to the respective TB workers who (ideally within 24-hour) contacted the patient directly. Smear positive TB patients were referred to the related health center for initiation of TB treatment at their earliest convenience. Written results were distributed to the TB worker at least once a week, including negative results. When smear microscopy was negative but TB symptoms persisted, individuals were advised to contact to health center TB workers. They would then be asked to submit three more sputum specimens (for repeat smear examination), and referred for further diagnostic work-up including chest radiography.

2-6. Statistical analysis

Baseline and clinical characteristics of patients were described in terms of frequencies and percentages. We calculated frequencies and proportions with 95% confidence intervals (95% CI). All analysis was performed using Stata

software version 11.2 SE (College Station, Texas, USA).

2-7. Ethical approval

Ethical approval was granted by ethic committee of Hamadan University of Medical Sciences, Hamadan- Iran.

3- RESULTS

Totally 22,741 individuals out of 25,217 were screened from during study period. Details on the timeline process of ACF are shown in **Figure.1**. About 49% of the participants were women. Almost 2.53% of target populations were Afghan refugees. The predominant tribe was Fars (79.5%), while about 7 different tribes made up the remaining 20.5% of the study population, reflecting the ethnic heterogeneity of the study population (**Table.1**).

As shown in **Table.2**, 112 people (0.44 %) reported any symptoms that suggest more investigations for TB. Moreover, 87 people (0.38%) of participants reported chronic cough and 86 people (0.37 %) had sputum at the time of household visits. Approximately 86 people (76.7%) of suspected participants submit sputum and remains do not for the following reasons: dry cough (n=7), receiving antibiotic and cured (n=12), or refused sputum test (n=7). Among 22,741 participants, six individuals (26.4 per 100.000), were identified as having TB disease, of whom four (66.6%) were through ACF, and two (34.4%) were found through PCF. The incidence rate of active TB was 23.7 per 100.000, including cases detected through active and passive case finding, but when we considered only those detected by ACF the incidence rate was 15.8 per 100,000. In comparison to six cases (0.02 %) that found in our study in three months, no TB case was found in slum population in the same period time in 2015. Forty four people (0.19 %) reported to were diagnosed TB and cured previously. Also, 169 people (0.74 %) declare that had close contact to TB cases in the past. For analysis we excluded 3 individuals who were on TB treatment at the time of screening.

We identified 112 individuals (0.44% of screened population) with TB symptom: 60.6% were male, the median age was 42 years. Smear examination were done on 86 (76.7%) presumptive TB cases who provided sputum; 70.9% (n=61) of whom gave at least two sputum specimens. Yield of TB screening (ACF) among individuals providing a sputum specimen (n=86), 2.3% had bacteriologically-positive TB. Besides the two bacteriologically-confirmed TB cases, we diagnosed two "clinical" TB cases (one pulmonary and one extra-pulmonary TB) totaling up to four, total population screened. All TB cases were examined by Rapid test for screening TB patients for human immunodeficiency virus infection that all cases had negative results.

Table-1: Demographic characteristics of participants in active case finding study in Golestan province, 2016

Variables	Categories of variable	Frequency	Percentage	P-value
Gender	Male	11,476	50.46	0.15
	Female	11,265	49.54	
	Total	22,741	100	
Age Group (Year)	1-15	5,965	26.23	0.001
	16-25	4,256	18.72	
	26-35	5,518	24.26	
	36-45	3,453	15.18	

	46-55	2,141	9.41	
	56-65	923	4.06	
	More than 65	485	2.13	
	Total	22,741	100	
Occupation of subjects	Agriculture	102	0.45	0.001
	Governmental	204	0.9	
	Worker	1,568	6.9	
	Housewife	7,254	31.9	
	Student	4,833	21.25	
	Jobless	902	3.96	
	Others	7,878	34.64	
	Total	22,741	100	
Nationality	Iranian	22,153	97.41	0.001
	Afghan	757	2.53	
	Others	13	0.06	
	Total	22,741	100	
Ethnic	Fars	18,084	79.53	0.001
	Sistani	3,358	14.77	
	Balooch	102	0.45	
	Torkman	77	0.34	
	Others	1,119	4.92	
	Total	22,741	100	

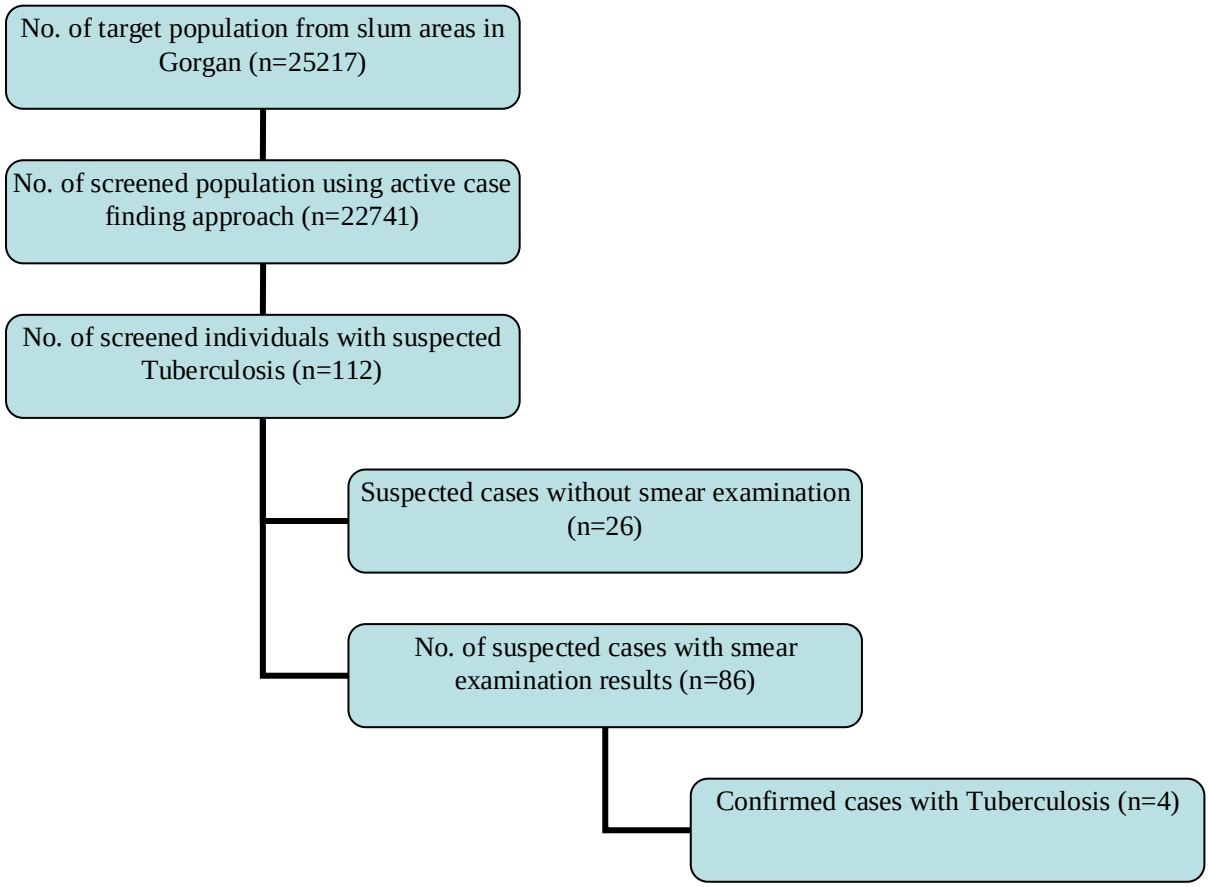

Fig.1: Flowchart of Active case finding approach

Table-2: Clinical characteristics of notified individuals in active case finding study in Golestan Province, 2016

Variables	Categories of variable	Positive N (%)	Negative N (%)	P-value
TB History	Male	30 (68.18%)	11,446 (50.43%)	0.019
	Female	14 (31.82%)	11,251 (49.57%)	
	Total	44 (100%)	22,697 (100%)	
TB History in Family	Male	98 (57.99%)	11,378 (50.41%)	0.05
	Female	71 (42.01%)	11,194 (49.59%)	
	Total	169 (100%)	22,572 (100%)	
Symptoms				
Cough	Male	54 (62.06%)	11,422 (50.40%)	0.007
	Female	33 (37.94%)	11,232 (49.60%)	
	Total	87 (100%)	22,741 (100%)	
Sputum	Male	51 (59.3%)	11,425 (50.23%)	0.033
	Female	35 (40.7%)	11,230 (49.77%)	
	Total	86 (100%)	22,741 (100%)	
Weakness	Male	38 (55.88%)	11,438 (50.45%)	0.371
	female	30 (44.12%)	11,235 (49.55%)	
	Total	68 (100%)	22,673 (100%)	
Chest Pain	Male	42 (64.62%)	11,434 (50.42%)	0.022
	Female	23 (35.38%)	11,242 (49.58%)	
	Total	65 (100%)	22,676 (100%)	
Dyspnea	Male	45 (70.31%)	11,431 (50.41%)	0.001
	Female	19 (29.69%)	11,246 (49.59%)	
	Total	64 (100%)	22,677 (100%)	
Fever	Male	16 (51.61%)	11,460 (50.46%)	0.898
	Female	15 (48.39%)	11,250 (49.54%)	
	Total	31 (100%)	22,710 (100%)	
Nocturnal Sweat	Male	28 (62.22%)	11,460 (50.46%)	0.114
	female	17 (37.78%)	11,250 (49.54%)	
	Total	45 (100%)	22,710 (100%)	
Lose Weight	Male	26 (63.41%)	11,450 (50.44%)	0.097
	Female	15 (36.59%)	11,250 (49.56%)	
	Total	41 (100%)	22,700 (100%)	
Lymphadenitis	Male	3 (63.41%)	11,473 (50.46%)	0.670
	Female	2 (40%)	11,263 (49.54%)	
	Total	5 (100%)	22,736 (100%)	
Any Symptoms	Male	68 (60.71%)	11,408 (50.40%)	0.012
	female	44 (39.28%)	11,221 (49.60%)	
	Total	112 (100%)	22,741 (100%)	

4- DISCUSSION

This is one of the first studies on the large-scale implementation of ACF of TB in Iran, and it has several important observations. First, the number of TB patients detected is within the ranges reported in similar epidemiological setting. Second, the study confirms that ACF can be implemented efficiently by community volunteers with adequate training and a supportive supervisory structure. From 2

April to 4 July 2016, we performed door-to-door active TB screening in slum population of Gorgan County, Golestan province, Iran, reaching a population of 22,741. We identified 112 individuals (0.49 %) with TB symptoms that among them four TB cases (0.89 %) identified of whom two were smear positive pulmonary TB, one case (25 %) was smear negative and one (25 %) had extra pulmonary TB (lymphadenitis TB). All identified cases begun TB treatment. The latest national prevalence survey in Iran was performed in Zahedan County, Sistan and Baluchestan province, where 55,845 people screened for TB, that 205 individuals (0.36 %) had symptoms suggestive TB. Among 205 individuals, 163 (66.3 %) had completed investigation and 15 TB cases (0.02 %) identified (24). In comparison to our study, in Zahedan more people screened and more suspects were found and therefore more TB cases have been diagnosed.

In another study that authored by Denise Rossato Silva et al., in a region with high prevalence of TB in Brazil using an active case finding strategy of tuberculosis, 31,267 patients were admitted in the emergency room, of whom 6,273 (20.1%) had respiratory symptoms. Among these 6,273 patients, 201 (3.2%) reported cough more than 2 weeks and were invited to participate in the study and finally 197 subjects (0.63 %) were enrolled in the study. Pulmonary TB was diagnosed in 30 (15% of enrolled) that among them 18 (60.0%) patients were with smear positive results, three patients were smear negative and culture positive and 9 people had extra-pulmonary TB (25). In our study, symptoms that considered as a criterion for more investigation were more than coughing and we apply diagnostic procedures for patient have had sputum, nocturnal sweat and fever. Shiravastava et al., in an urban population in India have screened 529,452 people using an active case finding approach; they found 278 TB suspects with sputum examination rate 79.5% (221/278) and 33 TB cases (26). The percentage of suspect rate among screened people in this work was less than our study 0.052% versus 0.44%. However, detected cases were different in comparison to our study, 11.8% versus 2.6%. Ogbudebe et al., in prospective study carried out an active tuberculosis case finding in urban slums in southeastern Nigeria. Over the one year period, 16,743 individuals were screened for TB; of these, 6361 (38.0%) were identified with symptoms suggestive of active TB and 5894 (92.7% of the individuals identified with TB symptoms), were evaluated for TB. According to the findings of this research, TB was diagnosed in 1,079 individuals include 6.4% of the screened population and 18.3% of those evaluated for TB. About 65% (697/1079) were new smear-positive TB cases (27).

Mean of incidence rate of TB in Iran was 12.9 per 100,000 in 2014. Golestan and Sistan-o-Baloochestan are two province that have highest incidence rate of tuberculosis in Iran. Sistan-o-Baloochestan province because of neighborhood to Pakistan is more vulnerable for TB infectious and Golestan province because of immigration of Sistan-o-Baloochistan has more risk of transmission infections from patients to healthy people. Morover, socio-economic status in both provinces are low. According to WHO recommendation for active case finding of tuberculosis in high risk groups, applying ACF in slums population is required to achieve WHO goals.

4-1. Limitations of the study

Although, our study had several strengths such as large-scale implementation of community-based ACF embedded in TB program, it also has limitations. Almost 5.8% of populations were absent when screening was run in target population.

This may had led to an underestimation of presumptive and real TB cases. Also, many suspicious do not compliance to give sputum specimen in spite of having symptoms such as cough and sputum. In the other hand health workers have many occupations that led to low cooperation in our study. However it seems we need to a non-governmental section to handle ACF in large scale such as slum population.

5- CONCLUSION

ACF should be considered as a potential supplementary approach to the existing DOTS strategy of passive case detection. In communities such as Eslamabad – one of the slum areas in Gorgan – ACF is more feasible strategy that may prove useful for TB control, but its cost-effectiveness needs to be evaluated.

6- CONFLICT OF INTEREST

The authors declare that they have no competing interests.

7- ACKNOWLEDGMENTS

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