Smear Positive Versus Smear Negative Tuberculosis: An Audit of Some Aspect Related to Management Practices in Mahalla Al-Kobra Chest Hospital, Gharbia Governorate, Egypt.

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Abstract

The aim was to determine the difference in distribution of biomedical factors between smear positive and smear negative TB and to audit some aspects of management practices in Mahalla Chest Hospital, Egypt. A retrospective analysis for tuberculous records admitted during 2013. Smear positive and smear negative TB cases were similar regarding biomedical profile. Time needed to reach diagnosis among smear negative TB patients was significantly prolonged than positive one. TB screen is not asked directly in 88.9% once the patients suffered from chest symptoms for $\geq$ two weeks. 16.4% of diagnosed TB cases were done without making x ray in the hospital. In spite of 25.7% and of smear negative was not subjected to antibiotic therapy and 37.8% of them were not perform sputum smear or perform only one smear sample; the TB committee decided to treat these cases as TB. Ongoing audit to find service gaps and a medical training program as well as regular supervision of all processes of TB management were recommended.

Introduction

Tuberculosis is creating a new crisis globally. [(1)] It remains the leading cause of death attributed to infectious diseases. A lot of statistics have reawakened awareness on the magnitude of the problem caused by the disease.[(2)]According to World Health Organization (WHO), there are approximately 20 million active cases in the world infecting 50-100 million people annually. Mortality due to the disease is approximately 3 million annually, of which at least 80% are in the developing countries. [(2)]

WHO (2011) revealed that 3 year average incidence rate of tuberculosis in Egypt 2008, 2009 and 2010 was found to be 19/100,000 population. [(3)] It is estimated that 55.2% case detection rate of tuberculosis and a 65.6% case notification rate was found in Egypt in 1996. The data suggest that only two-thirds of actual cases are being identified and treated by the national program. The figures for expected versus reported deaths from tuberculosis in Egypt suggest underreporting to be almost 80%. [(4)]

Sputum smear negative cases are less infectious but are still capable of transmitting the disease. Therefore, sputum smear negative cases present a

challenge to tuberculosis management. [5-7] The smear positivity for acid fast bacillus (AFB) is a variable. Positive smears indicate large bacterial load in the lung lesions compared with negative cases which show less bacterial load. [5]

Diagnosing and managing sputum smear negative pulmonary tuberculosis cases have become increasingly challenging for clinicians. It requires a high clinical suspicion, good quality of sputum sample and meticulous radiological interpretation. This is because the clinical and radiological manifestations of pulmonary tuberculosis (PTB) may be atypical as in the case of sputum smear negative PTB. [8]

The basic principle of TB control is that the health system, not the patient, is responsible and accountable for ensuring proper quality of care. [9] One study at Alexandria (2007) found that Egypt Quality of care was graded as poor for 79.2% of cases at Bacos, compared to 24.3% of cases at El-Mamora. In total, 49.8% of cases received poor quality of care. The study revealed that in developing countries, health care delivery systems have been criticized for not being able to produce tangible results and the credibility of such systems would increase substantially if concrete results in terms of health service outputs could be demonstrated. [10]

Clinical audit may drive improvements in the quality of clinical care in resource-poor settings. It is likely to be more effective if integrated within and supported by the local TB programs. [11] Little is known regarding health team practice related to tuberculosis. So, the aim of the current study was to determine the difference in distribution of biomedical factors, underlying co-morbidities and outcome between smear positive and smear negative TB and to audit some aspects of the hospital management practices in Mahalla Al-Kobra Chest Hospital, Gharbia Governorate, Egypt.

Methods

This was a retrospective case review analysis. The study was conducted at the record office of Mahalla Al-Kobra Chest Hospital, Gharbia governorate, Egypt. All tuberculous case records admitted to hospital year of 2013 (125 cases with 140 admissions). The records review were included patients file, administrative hospital records and TB laboratory records. The case records review and data analysis were conducted over a period of three months (from the first of February to the end of April 2014). All cases of sputum smear positive and negative pulmonary tuberculosis (PTB) with or without extra-pulmonary involvement were included. Sputum smear positive PTB were compared with smear negative pulmonary tuberculosis regarding biomedical profile.

DIAGNOSIS OF SMEAR NEGATIVE TB

Assessment of each patient was carried out whether the clinical diagnosis of smear-negative PTB was when patient suffered from cough more than 2 weeks, no response to full course of antibiotics,

three negative sputum smears and a chest radiograph compatible with PTB. On the other hand smear positive TB when patient suffered from cough >2 weeks, a chest radiograph compatible with PTB and at least one positive smear. Also, the assessment included reporting to local health authorities. [12] The international standard for diagnosis and treatment of tuberculosis and WHO Treatment of tuberculosis Guidelines, Fourth edition of WHO standards for TB management were used as a standard for audit some aspect of TB management practices (including diagnosis, treatment, discharge and notification). [13&14]

TB cases were classified at the time of admission based on the history of previous TB treatment into:
A-New patients have never been treated for TB or have taken anti-TB drugs for less than 1 month.
B-Previously treated patients have received 1 month or more of anti-TB drugs in the past and further classified into:
1. Relapse patients have previously been treated for TB, were declared cured or treatment completed at the end of their most recent course of treatment, and are now diagnosed with a recurrent episode of TB (either a true relapse or a new episode of TB caused by reinfection).
2. Treatment after failure patients are those who have previously been treated for TB and whose treatment failed at the end of their most recent course of treatment.

3. Treatment after loss to follow-up patients have previously been treated for TB and were declared lost to follow-up at the end of their most recent course of treatment. (These were previously known as a treatment after default patients). [15]

Data was collected, presented and statistically analyzed using SPSS computer program version 20. The statistical tests used were number, percent, mean and standard deviation, student t test, chi square and likelihood ratio.

Ethical consideration

Approval of hospital ethical committee was taken before conduction of the current research and confidentiality regarding the data of the patient was maintained.

Results

This was a retrospective case review analysis for 125 TB cases (104 of them admitted one time, 18 for two times and 3 for four times with overall 152 total number of admissions. One hundred and forty of admissions were diagnosed as TB (80.7% of admissions were sputum positive and 19.3% smear negative (5.0% were pulmonary, 13.6% pleural effusion and 0.7% were extra-pulmonary TB) and 12 admissions were diagnosed as none tuberculous cases ±(same patients admitted due to other causes rather than TB during years 2013 with overall case fatality rate of 2.4% (3 out of 125 cases). Their age ranged between 13 and 75 years with mean of 43.82 $\pm$ 16.17 years with high frequency for age group from over 40 years to 60 years (40.7%) and also for age group between >15 and 30 years. 82.9% of them were males and 17.1% were females. 67.4% of study group were married while 27.1% were single. 80.7% of them came

from rural area while 18.6% came from semi-urban or semi-rural areas. 85% came from Gharbia governorate while the remaining percentage came from the surrounded other governorates. 36.4% of them were smokers and 3.6% were alcohol and drug addict. 25.7%, 12.9%, 2.9% and 11.4% had past history of TB, diabetes, hypertension and hepatitis respectively. 5.7% of them had positive family history of TB. 72.9%, 2.1% and 5% of all cases were discharged due to improvement, died or referred to other place respectively while 20% of them were escaped or patients asked to discharge. There were statistically significant in-differences between smear positive and smear negative TB patient regarding all items of biomedical data (table 1).

Table (2) revealed that the mean time to diagnosis among smear negative TB patients (11.4 ± 11.5 days) was statistically significantly prolonged than smear positive TB patients (2.8 ± 2.7 days). However, the mean time from diagnosis until notification was significantly longer among smear positive cases (2.5± 4.4 days) than smear negatives cases (1.3 ± 1.4 days).

Table (3) shows relationship between duration of symptoms and time to ask for TB screening and diagnostic tests. It revealed that only 18.8% of patients suffered from chest symptoms for $\geq$ two weeks were subjected to TB screening and diagnostic tests at once while 71.9%, 7.3% and 2.1% of them were subjected to TB screening and diagnostic tests within 2 weeks, more than two weeks and up to one month and more than one month respectively. There were no statistically significant relationship between duration of symptom and time for physician to ask for TB diagnosis.

Our result revealed that 77.9% of sputum positive and 92.6% of sputum negative TB patients were diagnosed as new cases at time of admission while 22.1% and 7.4% of them were previously treated respectively. More than four fifths (82.3% and 88.9%) of smear positive and negative patients respectively with overall percent of 83.6%were diagnosed based on X-ray film before admission made at hospital while 17.7% and 11.1% respectively of them did not perform X-ray in hospital but they did outside before. All smear negative cases were revised by TB committee to take decision to start anti-tuberculous treatment. 96.5.1% of smear positive were diagnosed depend upon clinical presentation, X-ray film suspected for TB and at least one smear positive while only one case (0.9%) of them were diagnosed depending upon smear and culture. Regarding smear negative cases, 18.5% of them did not made any smear analysis and 40.7% did one sample only while only 25.9% did three smears and more. 35.4% of smear positive cases were diagnosed by other medical organization than Mahalla Al Kobra chest Hospital lab throughout smear positive. The diagnosis of smear negative cases was depending upon clinical picture, X-ray, positive adenosine test and treatment with antibiotics subjected to TB committee. However 25.7% of smear negative were not subjected to antibiotic therapy. 25.7% of smear negative cases were adenosine test positive while the other smear negative cases (74.3%) did not make adenosine test (table 4). Also table four revealed that 94.6% and 85.2% of smear positive and negative pulmonary tuberculosis respectively stayed at hospital for a period less than 2 months without significant difference between

them. Our study revealed that medical staff used first line of international protocol of management of tuberculosis for new cases by using a regimen containing 6 months of rifampicin: 2HRZE/4HR. they used fixed dose combination according to patients body weight (30–39 kg, 40–54 kg, 55–70 kg and over 70 kg). However physician prescribed anti-tuberculous drugs without registration of the body weight in 27.1% of patients while physician use previous reading of the body weight during previous admission in 7.1% of patient. Body weight was not assessed during management of patient except at the start of treatment.

One case of smear positive was diagnosed based upon smear and culture while one case of smear negative was diagnosed based upon biopsy (TB lymphadenitis). 3.7%% of patients gave two sputum sample on the same day during a period less than 8 hours.

Health staff and tuberculous laboratory staff advised patients on how to provide good quality sputum sample in order to obtain a better yield of AFB. However, all results of smear negative sputum reports were neither included sputum sample size nor any natural constituent of the sample (mucous, muco-salivary or salivary)

About ten percent (9.7%) of sputum positive and 14.8% of sputum negative patients were wrongly classified as new cases though they were previously admitted and treated from the same conditions at hospital since more than one month before. 1.8% of smear positive cases were diagnosed as new case while they were transferred from other organization.

The calculated doses of anti-tuberculous treatment were wrong for 3.6 % of TB cases.

Our study revealed that reactivated cases were not subjected to TB drug culture and drug sensitivity testing in Mahalla Al Kobra chest hospital. All cases starting anti-tuberculous drugs were not assessed again for body weight to change doses if required. On the other hand, all patients had a health record for all medications, bacteriological response and adverse reaction.

Only 1.4% and 2.8% of admitted case were notified to local health authorities within 24 hours and 48 hours period respectively. 93.6% were notified within first week increased to 95.9% within 2 weeks and to 98.6% within one month. However, 1.4% of study cases were not notified.

Discussion

Biomedical criteria of studied group

This was a retrospective case review analysis for 125 TB cases (104 of them admitted one time, 18 for two times and 3 for four times) from an overall 152 total number of admissions. One hundred and forty of admissions were diagnosed as TB; 80.7% of admissions were sputum positive and 19.3% smear negative (5.0% were pulmonary, 13.6% tuberculous pleural effusion and 0.7% were extra-pulmonary TB) and 12 of them were diagnosed as non-tuberculous cases (same patients admitted for other causes rather than TB during years 2013). Subashini et al., (2012) found that 44.4% were sputum smear positive, 32.6% were sputum smear negative and 23.0% were extra-pulmonary

tuberculosis. They revealed that the diagnosis of smear negative TB requires a high clinical suspicion, good quality of sputum sample and meticulous radiological interpretation [16]

The overall case fatality rate was 2.4% (3 out of 125 cases) (1.8% and 3.7% for smear positive and negative TB cases respectively (table 3). Harries et al., (1999) found significant higher mortality rates in patients with smear-negative PTB more than those with smear positive pulmonary TB which is probably attributable to the lack of attention paid by TB program staff to this group of patients. [17] The risk of death from a case of tuberculosis is about 4% as of 2008, down from 8% in 1995. [18]

Our results revealed that age of the study group ranged between 13 and 75 years with mean of 43.8 $\pm$ 16.2 years with high frequency for age group from over 40 years to 60 years (40.7%) and also for age group between 15 and 30 years. Harries et al., 1999 found that the mean age of TB patients in their study was 35 years. [17] Tavanaei et al., (2008) found that TB patients' age range was 16 - 90 years old with a mean of 56.4 $\pm$ 18.8. [19]

In concordance with our results; Asha and Sashidhar (2014) in their study found that 78.21% of the enrolled patients were in the age group of 15-54 years, 8.23% were above 65 year age group and 1.45% of them were below 14 year age group. [20]

More than four fifths of study group were males and 17.1% were females. In consistency with our results, Asha and Sashidhar (2014) found that 81.36% of TB cases were males and 18.64% were females. The ratio of males to females was 4.4:1. The mean age was 40.7 years. [20]

More than four fifths of study TB cases came from rural areas. In agreement, Itogo et al., (2014) found in their study that 33% of TB cases were from urban areas and 67% of them were from rural areas. [21] Most of studied TB cases (85%) came from Gharbia governorate while the remaining percentage came from another 4 surrounding governorates with presentation ranging between 0.7% and 10.7%. Mahalla Al kobra chest hospital is present in Mahalla Al kobra city, Gharbia governorate serving this governorate and the surrounded ones.

The overall smoking frequency among TB cases was 36.4% while only 3.6% of TB cases were alcoholic and drug addict. Restrepo (2007) found that cigarettes smokers had nearly twice the risk of TB than nonsmokers. [22] Other disease states can also increase the risk of developing tuberculosis. These include alcoholism and corticosteroid therapy. [18]

Our results revealed that 5.7% of TB cases had positive family history of TB. [23] A history of TB in another member of the household was found to be associated with TB disease. 24% of West African TB cases had a family history of TB. [24]

More than one-eighth of study group had past history of diabetes. The risk of tuberculosis has three fold increases among diabetic patients. [25] On the other hand, our result revealed that 2.9% of study cases had hypertension. Subashini

et al., (2012) found that 17.2% of TB cases had hypertension. [16]

More than ten percent of our study cases had past history of hepatitis. Abideen (2013) and Jump et al., (2006) revealed that the single biggest problem with TB treatment is drug induced hepatitis which has a mortality rate of around 5%.[22&25] Also, during standard anti-tuberculosis treatment with normal baseline liver biochemical tests, 8.5% developed hepatitis and had a significantly higher mortality rate. [26]

There was no statistical significant difference between sputum positive and sputum negative smear patients regarding all socio-demographic profile. Harries et al., (1999) found in their study that the differences between patients with smear-negative and smear-positive PTB were similar when analyzed by sex and by most age-groups. [17] Gulbanu et al., (2014) found that there were no significant differences between smear negative and smear positive TB cases regarding socio-demographic characteristics, smoking, comorbid condition, presenting history and family history of TB. These results are in line with our results. [27]

Screening of suspected cases of TB:

Less than two fifths of patients suffering from chest symptoms for more than two weeks were subjected to TB screening and diagnostic tests at once (table 3). According to standard 1 of International Standards for Tuberculosis Care; all persons with otherwise unexplained productive cough lasting two–three weeks or more should be evaluated for tuberculosis. [14]

More than four fifths of TB patients were diagnosed depending on X-ray film before admission to hospital while 16.4% of them did not perform X-ay in hospital (table 4). The first step in the TB surveillance process is to identify suspected or confirmed TB cases. A suspected case has a diagnosis that is pending due to an incomplete medical evaluation. TB disease should be considered when a patient presents with a persistent cough lasting for 3 or more weeks or other signs or symptoms compatible with TB disease (for example, bloody sputum, night sweats, weight loss, or fever). The presence of a positive acid fast bacillus (AFB) smear, a positive tuberculin skin-test result and an abnormal, unstable chest radiograph will increase the suspicion of TB disease. A TB case is usually confirmed by a positive culture for M. tuberculosis. [28]

According to standard two of the International Standards for Tuberculosis Care; all patients (adults, adolescents, and children who are capable of producing sputum) suspected of having pulmonary tuberculosis should have at least two, and preferably three, sputum specimens obtained for microscopic examination. When possible, at least one early morning specimen should be obtained. [14]

Dealing with previously treated patients with tuberculosis

Our result revealed that 77.9% of sputum positive and 92.6% of sputum negative TB patients were diagnosed as new cases at time of admission while 22.1% and 7.4% of them were previously treated from TB (table 4). All previously treated including reactivated cases were not subjected to TB drug sensitivity testing

in Mahalla Al Kobra chest hospital. Lawn and Zumla (2011) stated that If tuberculosis recurs, testing to determine antibiotics sensitivity is important before determining treatment. If multiple drug-resistant TB (MDR-TB) is detected, treatment with at least four effective antibiotics for 18 to 24 months is recommended. [18]

According to standard 14 of Tuberculosis Coalition for Technical Assistance (2006); an assessment of the likelihood of drug resistance, based on history of prior treatment, exposure to a possible source case having drug-resistant organisms, and the community prevalence of drug resistance, should be obtained for all patients. Patients who fail treatment and chronic cases should always be assessed for possible drug resistance. [14]

Diagnosis of smear positive and smear negative TB cases:

All smear negative cases were subjected to TB committee to take decision to start anti-tuberculous treatment. 97.3% of smear positive were diagnosed depending upon clinical presentation, X-ray film in line with TB and at least one smear positive while only one case of them was diagnosed depending upon smear and culture. However 2.7% of them did not perform smear analysis. Regarding smear negative cases, 18.5% of them did not perform any smear analysis and 40.7% did one sample only while only 25.9% did three smears and more. One case of smear negative was diagnosed based upon biopsy (TB lymphadenitis).

The current work revealed that 3.7% of patients gave two sputum samples on the same day during a period less than 8 hours. The technical guidelines of WHO International Union Against Tuberculosis and Lung Disease specify that pulmonary tuberculosis (PTB) suspects are required to submit three sputum samples - the first and third are spot specimens taken at the center, and the second should be an early morning sputum. [25] Sputum smear is not a very sensitive tool in the diagnosis of PTB. This has been shown by other studies where sensitivity has been described to be 51% to 53.3%. [30&31]

According to standards 4 and 5 of Tuberculosis Coalition for Technical Assistance (2006); All persons with chest radiographic findings suggestive of tuberculosis should have sputum specimens submitted for microbiological examination and the diagnosis of sputum smear-negative pulmonary tuberculosis should be based on the following criteria: at least three negative sputum smears (including at least one early morning specimen); chest radiography findings consistent with tuberculosis; and lack of response to a trial of broad spectrum antimicrobial agents. [14]

Hospital stay days,

Our study revealed that 94.6% and 85.2% of smear positive and negative pulmonary tuberculosis respectively stayed at hospital for a period less than 2 months without significant difference between them (table 4). **Bouti** et al., (2013) revealed that since viable bacilli continue to be expelled for up to two months, infection control measures should be maintained for such a time. Our results revealed that the mean time to diagnosis among smear negative TB patients was statistically significantly prolonged than smear positive TB patients. On the other hand, the mean time from diagnosis until notification

was significantly higher among smear positive cases than smear negatives cases. [32] Karasulu et al., (2014) found that the mean hospital stay was 25.4 ± 14.2 days. Smear-negative patients had longer hospital stay days than smear-positive patients. Only 12 (18.5%) smear-negative patients have started treatment within 15 days of the first doctor visit. [33]

Quality of sputum sample:

Our study revealed that the health staff and tuberculous laboratory staff advised patients on how to provide good quality sputum sample in order to obtain a better yield of AFB. However, all results of smear negative sputum reports were neither included sputum sample size nor nature constituent of the sample (mucous, muco-salivary or salivary). A study conducted in Chicago reported that a minimum of 5ml of sputum improves the sensitivity of acid fast smear for mycobacterium tuberculosis. [34]

According to standard 3 of International Standards for Tuberculosis Care (2006), For all patients (adults, adolescents, and children) suspected of having extrapulmonary tuberculosis, appropriate specimens from the suspected sites of involvement should be obtained for microscopy and, where facilities and resources are available, for culture and histopathological examination. [14]

Number of sputum sample and time of sample:

The current study revealed that only 25.93% of smear negative patient introduced three sputum smear samples or more while 14.81%, 40.74% and 18.52% of them introduced two, one and no samples respectively before the patient was subjected to TB committee to take decision to start treatment as sputum negative tuberculosis or not. On the other hand, 3.7%% of patients gave two sputum sample on the same day during a period less than 8 hours. In Saudi Arabia, Memish et al., (2014), revealed that about 2% of the TB patients during period between 2010 and 2011 did not have result of smear analysis. [35]

25.9% and 3.7% diagnosed as sputum negative depending up on adenosine and biopsy positive. Physician asked for adenosine after the first smear sample only and patients not subjected to complete smear samples in 71.4% of them. Patient diagnosed based upon biopsy positive physician asked for biopsy after three negative smears. All smear negative tuberculous cases neither asked for sputum culture nor culture and sensitivity.

According to standard 3 International Standards for Tuberculosis Care (2006), for all patients (adults, adolescents, and children) suspected of having extrapulmonary tuberculosis, appropriate specimens from the suspected sites of involvement should be obtained for microscopy and, where facilities and resources are available, for culture and histopathological examination. [14]

Treatment of TB cases in relation to body weight assessment to determine the dose of anti-tuberculous treatment:

Our study revealed that medical staff use of first line international protocol of management of tuberculosis for new cases by using a regimen containing 6 months of rifampicin: 2HRZE/4HR. they used fixed dose combination according to patients body weight (30–39 kg, 40–54 kg, 55–70 kg and over 70 kg).

However physician prescribed anti-tuberculous drugs without registration of the body weight in 27.1% of patients while physician use previous reading of the body weight during previous admission in 7.1% of patient. Body weight was not assessed during management of patient except at the start of treatment. The calculated doses of anti-tuberculous treatment were wrong for 3.6 % of TB cases without significant difference between smear positive and smear negative TB cases.

According to WHO tuberculosis treatment guideline (2010): patient weight should be monitored each month, and dosages should be adjusted if weight changes, as in pulmonary smear-negative disease, the weight of the patient is a useful indicator. [13]

Discharge

More than two thirds of TB cases discharged without doing X ray to determine the degree of improvement. 87.6% and 92.6% of smear positive and negative TB cases were discharged without re-testing for smear samples or smear and culture. Most of the discharged cases were depending upon clinical condition only. To discharge TB patient from the hospital, the patient must have three consecutive sputum smears negative for AFB collected at least eight hours apart. [36]

According to recommendation 5.2 of tuberculosis treatment guideline (2010), in new patients, if the specimen obtained at the end of the intensive phase (month 2) is smear-positive, sputum smear microscopy should be obtained at the end of the third month. [13] Also, recommendation 5.3 mention that in new patients, if the specimen obtained at the end of month 3 is smear-positive, sputum culture and drug susceptibility testing (DST) should be performed.

WHO (2010) recommended For smear negative TB cases that It is important to recheck a sputum specimen at the end of the intensive phase in case of disease progression (due to non-adherence or drug resistance) or an error at the time of initial diagnosis (i.e. a true smear-positive patient was misdiagnosed as smear-negative). Pulmonary TB patients whose sputum smear microscopy was negative (or not done) before treatment and whose sputum smears were negative at 2 months need no further sputum monitoring. They should be monitored clinically; body weight is a useful progress indicator. For previously treated TB cases, culture and drug sensitivity test should be performed at the start of treatment and, if smears are positive. [13]

Sputum conversion defined as 3 consecutive smear-negative sputum samples collected on different days is one of standard requirements for discontinuation of isolation for patients with smear-positive pulmonary tuberculosis. Sputum smear conversion is usually seen prior to culture conversion. However, in some patients, sputum smear tests are continuously positive for a long time. To discontinue isolation of the patients, culture conversion is required instead of smear conversion. Culture testing requires a long period, which results in longer patient stay and isolation. [37]

Notification:

Only 1.4% and 2.8% of admitted case were notified to local health authorities within 24 hours and 48 hours period

respectively. 93.6% were notified within first week increased to 95.9% within 2 weeks and to 98.6% within one month. However, 1.4% of study cases were not notified.

According to global Tuberculosis Report for the year of 2012, WHO (2013); non notified cases constituted 3.7% of sputum negative tuberculous cases while they constituted 0.9% among sputum positive case. According to WHO (2012), the notification of TB cases is improving across countries as two-thirds (66%) of the total 8.6 million new cases reported in 2012 were officially notified by the respective notification systems as new cases. [38] However, the TB notification rate in Europe in 2012 (74%) was considerably higher compared to the global average notification rates. [39]

Outcome of treatment.

Surveillance of TB should address the current challenges of the disease. In that sense, surveillance of drug resistance and treatment outcome monitoring are essential tools for the evaluation of TB control. [40&41]

Our study found that 72.9%, 2.1% and 5% of all cases were discharged due to improvement, dead or referral to other place respectively while 20% of them escaped or patients asked to discharge (table 1). However, there were no feedbacks from outpatient clinic regarding the terminal outcome of treatment for all TB cases (table 3). Harries et al., (1999) found that 35% completed treatment, 25% died, 9% defaulted and 7% were transferred to another district with no treatment outcome results available. These results were significantly inferior to those obtained with smear-positive PTB in whom 72% completed treatment, 20% died, 4% defaulted, 2% were transferred and 1% had positive smears at the end of treatment. [17]

About 10% of sputum positive and 14.8% of sputum negative patients were wrongly classified as new cases as they were previously admitted and treated from the same conditions at hospital since more than one month. Also, 1.8% of smear positive cases were diagnosed as new case while they were referred from other organization. According to WHO (2013); new patients have never been treated for TB or have taken anti-TB drugs for less than 1 month. [15] However, Abhijit et al., (2009) revealed less favorable outcome in new smear negative cases, compared to new smear positive. Death and default rates were more in new smear negative cases, compared to new smear positive. Failure of treatment and referral were non-significantly higher in new smear positive. [42]

Only 12.4% of smear positive case did smear analysis for only one smear before discharge and 87.6% of them did not perform smear analysis at the time of admission. In spite of 1.8% of smear positive cases were smear positive at discharge; the physician did not ask for reviewing the management procedure or drug sensitivity.

According to standard 10 of international standards of tuberculosis care by Tuberculosis Coalition for Technical Assistance (TBCTA) (2006); all patients should be monitored for response to therapy, best judged in-patients with pulmonary tuberculosis by follow-up sputum microscopy (two specimens) at least at the time of completion of the initial phase of treatment (two months),

at five months, and at the end of treatment. Patients who have positive smears during the fifth month of treatment should be considered as treatment failures and should have therapy modified appropriately. (14)

However 94.7% of smear positive cases were discharged before 2 months of intensive treatment. Most of smear positive cases (94.7%) were discharged before 2 months of intensive treatment. Sputum smear-positive pulmonary tuberculosis patients are the most significant source of infection for tuberculosis because, when they cough or sneeze, they expel droplet nuclei which carry infectious bacilli. (43) One untreated infectious tuberculosis patient is likely to infect 10 to 15 persons annually. (44) WHO (2009) revealed that for smear-positive pulmonary TB patients treated with first-line drugs, sputum smear microscopy may be performed at completion of the intensive phase of treatment. (13)

Patient record and documentation:

All patients had a health record for all medications, bacteriological response and adverse reaction in accordance with standard 11 of the International Standards for Tuberculosis Care (2006). (14)

Conclusions and Recommendations

The current study revealed that there was no statistically significant between smear positive and smear negative TB cases regarding biomedical profile including sociodemographic profile, premedical condition, past history of TB and outcome of treatment. Mean hospital stay days and mean time to diagnosis among smear negative TB patients were statistically significantly prolonged than smear positive TB patients. On the other hand, the study found that 88.9% of physicians did not ask for TB screening when the patients suffered from chest symptoms for more than two weeks. 17.7% and 11.1% of TB cases diagnosed as smear positive and smear negative respectively with overall 16.4% did not perform X-rays in the hospital. In spite of 25.7% of smear negative was not subjected to antibiotic therapy and also, 37.8% of them subjected only for no or one smear sample; the TB committee take the decision to treat as TB cases. 1.4% of TB cases were not notified to health authority. There was no feedback about treatment of all cases after discharge from the chest clinic. Physicians did not ask for drug sensitivity for previously treated or dropout cases in about 20% of cases.

The results let us to recommend ongoing auditing for the process of TB management to find the gap areas in TB management practice and to improve the processes of TB care. Also, the result revealed the need for training program related to standards elements related to TB screen, and management process. Policies of ministry of health related to TB management need regular supervision of all processes of TB management.

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Table (1):Biomedical profile of study group according to smear positive and smear negative

Biomedical data	Categories	sputum positive	sputum negative		statistics	p
		No=113 (%=100.0)	No=27 (%=100.0)			
Sex	Female	19 (16.8)	5 (18.5)	24 (17.1)	Fisher exact= 0.782	0.513
	Males	94 (83.2)	22 (81.5)	116 (82.9)		
Age group	5-15 years	2 (1.8)	1 (3.7)	3 (2.1)	Likelihood ratio= 7.02	0.134
	>15-30 years	27 (23.9)	11 (40.7)	38 (27.1)		
	>30-40 years	16 (14.2)	3 (11.1)	19 (13.6)		
	> 40-60 years	46 (40.7)	11 (40.7)	57 (40.7)		
	> 60 years	22 (19.5)	1 (3.7)	23 (16.4)		
Marietal status	Single	29 (25.7)	9 (33.3)	38 (27.1)	Likelihood ratio= 7.02	0.216
	Married	76 (67.3)	17 (63.0)	93 (66.4)		
	Divorced	1 (0.9)	1 (3.7)	2 (1.4)		
	Widow	7 (6.2)	0 (0.0)	7 (5.0)		
Residence	Rural	90 (79.6)	23 (85.2)	113 (80.7)	Likelihood ratio= 4.50	0.105
	Semi-rural or semi-urban	23 (20.4)	3 (11.1)	26 (18.6)		
	Prison	0 (0.0)	1 (3.7)	1 (0.7)		
Governorates	Gharbia	100 (88.5)	19 (70.4)	119 (85.0)	Likelihood ratio= 8.77	0.067
	Kafe Al Seikh	9 (8.0)	6 (22.2)	15 (10.7)		
	Monofia	1 (0.9)	0 (0.0)	1 (0.7)		
	Dakhlia	1 (0.9)	2 (7.4)	3 (2.1)		
	Beharah	2 (1.8)	0 (0.0)	2 (1.4)		
Smoking condition	Yes	44 (38.9)	7 (25.9)	51 (36.4)	X^2= 1.59	0.207
Alcohol and addiction	Yes	5 (4.4)	0 (0.0)	5 (3.6)	Likelihood ratio= 2.18	0.139
Past history of TB	Yes	33 (29.2)	3 (11.1)	36 (25.7)	X^2= 3.73	0.053
Past history of diabetes	Yes	17 (15.0)	1 (3.7)	18 (12.9)	Likelihood ratio= 3.16	0.075
Past history of hypertension	Yes	4 (3.5)	0 (0.0)	4 (2.9)	Likelihood ratio= 1.74	0.18
Past history of hepatitis	Yes	10 (8.8)	6 (22.2)	16 (11.4)	Likelihood ratio= 3.31	0.06
Family history of TB	Yes	8 (7.1)	0 (0.0)	8 (5.7)	Likelihood ratio= 3.54	0.06
Outcome of management	Improve	81 (71.7)	21 (77.8)	102 (72.9)	X^2 = 2.63	0.62
	died	2 (1.8)	1 (3.7)	3 (2.1)		
	Escaped	9(8.0)	1 (3.7)	10 (7.1)		
	referred	7 (6.2)	0 (0.0)	7 (5.0)		
	Patient asked to discharged	14 (12.3)	4 (14.8	18 (12.9)		

Table (2): Mean and standard deviation of the time from diagnosis until notification and time from admission until diagnosis among smear positive and smear negative cases.

Variables	classification	N	Mean (Std. Deviation) in days	t test	p
diagnosis till notification time	sputum positive	112	2.5 (4.4)	2.35	0.02
	sputum negative	26	1.3 (1.4)		
admission till diagnosis time	sputum positive	113	2.8 (2.7) With median of 2 days	3.88	0.001
	sputum negative	27	11.4 (11.5) With median of 8 days		

NB. Two cases were not notified.

Table (3): Relationship between duration of symptoms and period between chest complaints until diagnosis of TB.

Duration of chest symptom	chest complains to diagnosis period					**Likelihood ratio**	p
	At once	Within 2 weeks	>2 weeks-1 month	>1 month	Total		
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
< 2 weeks	8 (18.2)	34 (77.3)	2 (4.5)	0 (0.0)	44 (100.0)	**1.39**	0.707
≥2 weeks	18 (18.8)	69 (71.9)	7 (7.3)	2 (2.1)	96(100.0)		

Table (4): Distribution of classification and management processes among smear positive and smear negative tuberculous cases.

Classification, diagnostic and management process of TB cases	Categories	Smear positive TB	Smear negative TB	Total	Statistics	p
		No (%)	No (%)	No (%)		
Classification of patient at admission	New	88 (77.9)	25 (92.6)	113 (80.7)	Likelihood ratio=6.86	.14
	Treatment failure	5 (4.4)	0 (0.0)	5 (3.6)		
	Re-positive	8 (7.1)	0 (0.0)	8 (5.7)		
	Treatment for dropout	3 (2.7)	1 (3.7)	4 (2.9)		
	Relapse	9 (8.0)	1 (3.7)	10 (7.1)		
X ray at admission at hospital	Not done	20 (17.7)	3 (11.1)	23 (16.4)	Likelihood ratio= 0.74	0.38
	Done	93 (82.3)	24 (88.9)	117 (83.6)		
Number of smear	No	3 (2.7)	5 (18.5)	8 (5.7)	Likelihood ratio=14.04	0.007
	1	34 (30.1)	11 (40.7)	45 (32.1)		
	2	50 (44.2)	4 (14.8)	54 (38.6)		
	3	19 (16.8)	5 (18.5)	24 (17.1)		
	4	7 (6.2)	2 (7.4)	9 (6.4)		
Antibiotic before committee decision	No	36 (32.4)	7 (25.9)	43 (31.2)	X^2 =.42	0.51
	Yes	75 (67.6)	20 (74.1)	95 (68.8)		
Subjected to TB committee	No	113 (100.0)	0 (0.0)	113 (80.7)		
	Yes	0 (0.0)	27 (100.0)	27 (19.3)		
Body weight assessment before treatment	Not done	38 (33.6)	9 (33.3)	47 (33.6)	Likelihood ratio=3.43	0.17
	Done	75 (66.4)	18 (66.7)	93 (66.4)		
Wrong treatment dose calculation *	No	110 (97.3)	25 (92.6)	135 (96.4)	Likelihood ratio=1.19	0.27
	Yes	3 (2.7)	2 (7.4)	5 (3.6)		
Notification	No	1 (.9)	1 (3.7)	2 (1.4)	Likelihood ratio=0.96	0.32
	Yes	112 (99.1	26 (96.3)	138 (98.6)		
X ray before discharge	No	87 (77.0)	7 (25.9)	94 (67.1)	X^2 = 25.75	0.000
	Yes	26 (23.0)	20 (74.1)	46 (32.9)		
Feedback from chest clinic	No feedback	113 (100.)	27 (100.)	140 (100.)		
Sputum smear on discharge	Not done	99 (87.6)	25 (92.6)	124 (88.6)	Likelihood ration= 1.15	0.56
	Negative smear	12 (10.6)	2 (7.4)	14 (10.0)		
	Positive smear	2 (1.8)	0 (0.0)	2 (1.4)		
Hospital stay days	Up to 15 days	34 (30.1)	4 (14.8)	37 (26.6)	X^2 = 4.65	0.19
	>15-30 days	51 (45.1)	14 (51.9)	65 (46.8)		
	31-60	22 (19.5)	5 (18.5)	27 (19.3)		
	>2 months	6 (5.3)	4 (14.8)	10(7.2)		

*According to body weight