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The effect of phone communication on patients' compliance to the DOTS in Mosul

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Abstract
Background: Effective treatment of tuberculosis (TB) necessitates adherence to treatment regimen consisting of multiple drugs for a minimum of 6 months otherwise, advanced stages of TB such as multi-drug resistant (MDR) occur. The using of telecommunications particularly mobile communication has been initiated in many countries to support the healthcare sector as a form of prompt maintaining contact between the patient and the TB service provider over the entire course of treatment.
Aim of study: to prove that the counseling, health education and support through the telecommunication during the two stages of TB treatment will affect the patient adherence to DOTS in the way that meets the needs and ensures the rights of the patient.
Patients and Methods: Institutional-based prospective randomized controlled trial of a clinical interventional study design was adopted and conducted among TB patients from 1st of October 2018 to 30th of September 2019 at TBMU in the left health district in Mosul. The study conducted among 30 pulmonary TB newly diagnosed with the inclusion criteria that the patients who were classified as new sputum (+) and new sputum (-) in the catchment areas are enrolled, while the extra-pulmonary TB (EPTB) patients are excluded. The interview done by the researchers and the already design questionnaire was fulfilled. The patients followed up using a phone communications to check compliance to treatment and follow up visit. Ratios, percentages, Fisher exact test, correlation, p-value were calculated using SPSS version 18.
Results: Age intervals (45-55) and (55-65) is the most frequent, while in female gender the most frequent is age interval (15-25), 86.6% of study sample have their own mobile, 75% are ever married, total no. of calls done by patients regarding counseling were 19, medication 8, side effects of drugs 24 and food 13. A significant statistical difference (p=0.048) between the time of patients response by sending miss-call for TBMU and the compliance to treatment each visit was noted. Regarding the comparison between the patients who receiving reminder call and those who not in attending the TBMU at the exact follow-up time, a very highly significant difference with p-value =0.005 was clear. Moreover, correlation between the number of patients attending the TBMU at time of recommended follow-up dates and the frequency of calling by the TB coordinator and had a significant statistical correlation (r= -0.98, p= 0.045).
Conclusion: The patients treated with DOTS will become more adherences and comply with the treatment regimen by the use of mobile communication.

Keywords: TB, DOTS, phone communications, patient compliance

Introduction

Tuberculosis (TB) is caused by the bacteria called Mycobacterium tuberculosis (M. tuberculosis). M. tuberculosis and seven very closely related mycobacterial species (M. bovis, M. africanum, M. microti, M. caprae, M. mungi, M. canetti and M. pinnipedii) all known as the M. tuberculosis complex. Most of these species have been found to cause diseases in humans [1]. TB is spread from one individual to another through the air as droplets. When a human with TB disease coughs, sneezes, speaks, tiny particles containing M. tuberculosis may be expelled and spread into the air [2]. Worldwide, TB remains the second leading cause of death from infectious diseases and the leading preventable cause of death particularly among people living with HIV [3]. In Iraq [4.5], TB has a public health priority. The country occupies rank 108 globally and 7 in eastern Mediterranean region among countries with TB burden size. The estimated incidence of TB in Iraq is 45/100000 population, while the prevalence is 74/100000 and the mortality is 3/100000.The Iraqi Ministry of Health (MOH) has established the National Tuberculosis Control Program (NTP) in 1989 with World Health Organization (WHO) support, and introducing the strategy of directly observed treatment short course (DOTS) in 1998. This plan of action for effective TB control is implemented through different levels from the national specialized center for the chest and respiratory diseases in Baghdad to the chest and respiratory diseases consulting clinics in each governorates to TB coordinators unit in the general directorate of health and their primary health care centers (PHCC), including providing and observing the treatment of TB patient [6, 7] **.** DOTS program has been described by WHO as "the most important public health breakthrough of the decade in terms of lives saved" The 5 major components of DOTS are [8].

- Political will.
- High-quality microscopy.
- Uninterrupted supply of short-course chemotherapy drugs.
- Directly-observed chemotherapy regimen use.

It is the most effective strategy available for ensuring adherence to treatment (which defined as the extent to

which a person-taking medication adheres to a self-administered protocol specified by the healthcare provider with respect to timing, dosage, and frequency) [9, 10], that carried out entirely under the program supervision so that all of medications, in correct dosage and at correct interval are swallowed by the patient in the presence of a trained treatment observer. DOTS programs also provide monitoring for side effects, emotional support and education, triage and referral and incentives/enablers [11]. Effective treatment of TB necessitates adherence to treatment regimen consisting of multiple drugs for a minimum of 6 months otherwise, advanced stages of TB such as multi-drug resistant (MDR) occur [12, 13].

So, the treatment non-compliance or poor compliance was and still consider as a complex challenge that facing the health workers contributing to development of MDRTB and relapse [14]. The main reasons for non-adherence in anti-tuberculosis treatment are they begin to feel better, drug side effects, forgetting to take medication, long treatment duration, be out of home, missing date of appointment, lack of transportation cost, lack of social support, poor communication between patient and healthcare providers, and stock out of medicines [15, 16]. In Mosul, although DOTS was the best means of escalating compliance among TB patients and ensuring cure and completion of treatment [17], many financial and administrative factors restrict the distribution of anti-TB drugs from Nineveh Respiratory and Chest Disease Consulting Clinics (RCC) to the TB Management Unit (TBMU)/District TB Coordinator (DTC) and subsequently to the PHCC [18-20]. So the patients must reach the RCC from different catchment areas to receive their treatment every 10-14 days which causes financial burden, and potentially social stigma, this obstacle inspires and encourage this study since that the using of telecommunications particularly mobile communication has been initiated in many countries to support the healthcare sector as a form of prompt maintaining contact between the patient and the TB service provider over the entire course of treatment [21]. This technology has the potential of improving adherence to medication in outpatient setting by reminding patients of dosing schedules and attendance to scheduled appointments [22], since it involve the two key elements of medical adherence; the monitoring and intervention [23, 24]. Various studies with different methods have been conducted to evaluate the patient compliance with different diseases using mobile-patient monitoring systems [25, 30]. The aim of this work is to prove that the counseling, health education and support through the telecommunication during the two stages of TB treatment will affect the patient adherence to DOTS in the way that meets the needs and ensures the rights of the patient.

Patients and Methods

Institutional-based prospective randomized controlled trial of a clinical interventional study design was adopted and conducted among TB patients from 1st of October 2018 to 30th of September 2019 at TBMU in the left health district in Mosul. Each study participant was informed about the purpose, method, expected benefit, and risk of the study. Moreover, their full right not to participate or depart from the study at any time also informed to them, and their decision to withdraw will not impact their services. Written informed consent was obtained from study participants and the confidentiality maintained. The study conducted with the inclusion criteria that the patients who were classified as new sputum (+) and new sputum (-) in the catchment areas are enrolled, while the extra-pulmonary TB (EPTB) patients are excluded. The interview done by the researchers and the already design questionnaire was fulfilled. In this study, the phone calls are using in two ways; the first one to check the patient adherence to the drug regimen and for counseling patients regarding side effects of drugs and food. These calls done by the DTC at the morning of each day during the initial phase and at beginning of each week during the continuation phase, and because the cost of a one minute outgoing call on a mobile network in Mosul is variable among the deferent mobile networks, the TB patients are clearly instructed to run miscall to the DTC phone who call them back to overcomes this barrier. The second way is to run phone calls by the DTC for the half of the patients who selected by simple random technique, at a particular date; the end of 2nd month, the end of 5th month, and the end of treatment regimen to ensure the patient attendance for sputum examination. Whenever the patient visits the health facility, the need for regular and complete intake of treatment should be reinforced and any problems that may cause interruption should be identified. At registration, sufficient time should be set aside for meeting with the patient preferably with the patient's family members. This initial meeting provides an important prospect to inform the patient about the duration of treatment. During the meeting, it is important to record the patient's address and other relevant addresses. Recording mobile telephone numbers for the patient and family has proved valuable in many settings. Ratios, percentages, Fisher exact test, correlation, p-value were calculated using SPSS version 18.

Result

I-Descriptive data of the study sample

Figure (1) shows the distribution of study sample according to both age interval and gender and displays that male gender at the age intervals (45-55) and (55-65) is the most frequent, while in female gender the most frequent is age interval (15-25).

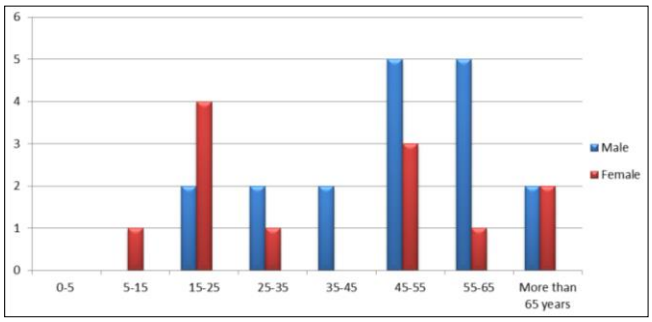

Fig 1: Distribution of study sample according to age interval and gender

Figure (2) shows the distribution of study sample according to their ownership of mobile and embodies that 86.6% of them have their own mobile, and 13.4% don't have and use the mobile of other family members.

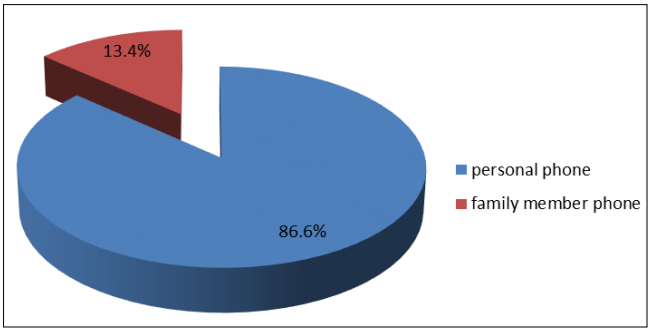

Fig 2: Distribution of study sample according to their ownership of mobile

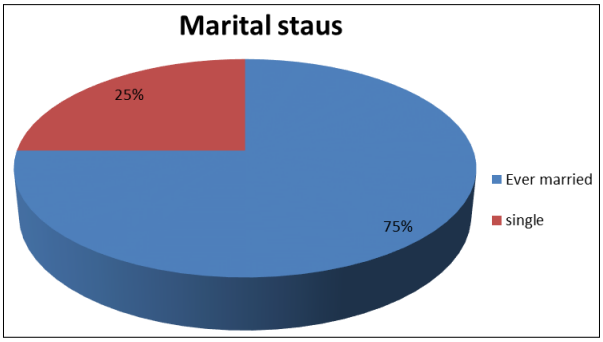

Fig 3: Distribution of study sample according marital status

Figure (3) shows the distribution of study sample according to marital status and finds that 25% of them are single while 75% are ever married.

Table (1) shows the distribution of study sample according to their PHCC and the classification of their sputum, and reveals that Al-Aqsa PHCC which is the deprived crowded and relatively far from the district is at the top regarding the no. of patients.

Table 1: Distribution of study sample according to their PHCC.

PHCC	TB (+ve sputum)		TB (-ve sputum)		Total
	Males	Females	Males	Females	
Al-Karama	2	0	0	1	3(10.00%)
Al-Sharqi	2	2	0	0	4 (13.33%)
Al-Jazaaer	1	0	0	0	1(3.33%)
Al-Sukar	0	0	0	1	1(3.33%)
Al-Noor	0	2	0	0	2(6.66%)
Al-Rashedia	2	1	0	0	3(10.00%)
Al- Zohour	1	0	0	0	1(3.33%)
Al-Wahda	1	0	0	0	1(3.33%)
Al-Qadisea	0	0	0	1	1(3.33%)
Al-Zahraa	0	0	0	0	0(0.00%)
Al-Aqsa	6	0	1	0	7(23.33%)
Al-Qahera	0	1	1	1	3(10.00%)
Al-Araby	0	0	0	0	0(0.00%)
Al-Qudes	0	0	1	0	1(3.33%)
Baasheqa	0	1	0	0	1(3.33%)
Al-Samaah	1	0	0	0	1(3.33%)
Al-Intisar	0	0	0	0	0(0.00%)
Al-Jameaa	0	0	0	0	0(0.00%)
Total	16	7	3	4	30(100.00%)

II- Main findings

Table (2) shows the distribution of study sample according to no. of calls done by patients regarding counseling, medication, side effects of drugs and food and portrays that the 24 calls done by the patients are about the side effects of drugs, 19 calls are about counseling, 13calls about food and 8 about medication.

Table (3) shows the distribution of study sample according to the time of response by sending miss-call for TBMU by patients and the compliance to treatment each visit whether patients complete or miss any dose, and finds out that there is significant statistical difference (p=0.048) between the patient response and the completion of treatment.

Table 2: Distribution of study sample according to no. of calls done by patients

Calling subjects	No. of calls done by patients			Total calls
	Once/week	2-3/week	>3/week	
Counseling	2(10.5%)	9(47.4%)	8(42.1%)	19(100.0%)
Medication	3(37.5%)	4(50.0%)	1(12.5%)	8(100.0%)
Side effects of drugs	6(25.0%)	13(54.2%)	5(20.8%)	24(100.0%)
Food	9(69.2%)	3(23.1%)	1(7.7%)	13(100.0%)

Table 3: distribution of study sample according to the time of patient response and the completion of treatment

Checking the doses	First 30 minutes	Second 30 minutes	Third 30 minutes	p-value*
Completed doses	5	9	12	0.048
Missing any dose	3	1	0	

*Fisher exact test (Freeman-Halton extension) used

Table (4) shows the comparison between the patients who receiving reminder call and those who not regarding the attending the TBMU at the exact follow-up time, it demonstrates very highly significant difference with p-value =0.005.

Table 4: Distribution of study sample according to follow-up time

Follow-up time	Receiving reminder call	Not receiving reminder call	p-value*
Follow-up at time	14	6	0.005
Beyond follow-up time	1	9	

*Fisher exact test used

Figure (4) demonstrate the correlation between the number of patients attending the TBMU at time of recommended follow-up dates and the frequency of calling by the TB coordinator and illustrates that 9 patients attend after one call, 4 after 2 calls, 1 after 3 calls; with a significant statistical correlation (r= -0.98, p= 0.045).

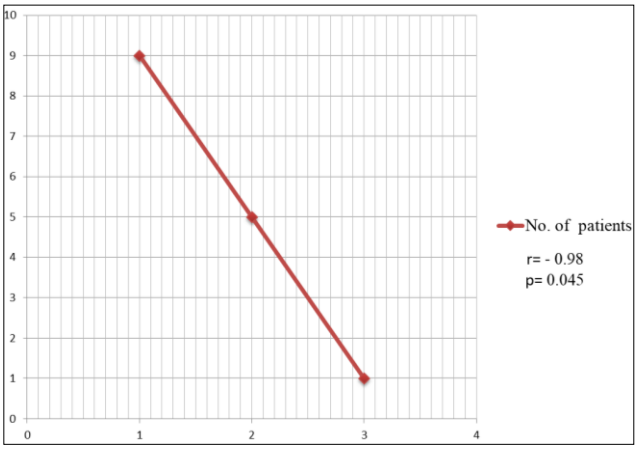

Fig 4: Demonstrates the correlation between the number of patient attend at time and the frequency of calling

Discussion

TB is an infectious disease requiring prolonged treatment, this obliges high compliance. The use of mobile in the health services can help improve the patient-physician relationship, improved the overall patient experience and keep patients' time.In figure (1) the study sample showed that male gender is the most frequent at all the age intervals apart from (15-25) age interval, this could be due to fact in our locality that females at this age group were the primary carers in the family and more prone to be infected, also this age was within the age of high school and beginning of the college years, women in this period of time by virtue of customs and traditions were committed to staying at home to do homework and help with housework. The impact of gender disparities appeared to be small in Victoria, Australia [31]. The ownership and the access to the mobile were very important; in the present work 86.6% of the study sample has their own mobile, and only13.4% have access to the mobile of other family members. The findings regarding the marital status were 75% of the patients were ever married. In table (1), it was clear that the PHCCs that distant from the TBMU have the most frequent TB cases; Al-Aqsa PHCC 7(23.33%) cases, Al-Karama, Al-Rashedia and Al-Qahera have 3(10.00%) cases, only the relatively close PHCC Al-Sharqi with highly crowded catchment area has 4 (13.33%) cases. Counseling Patients with TB and their family members should be done at every opportunity, so the information gaps will overcome and the decision-making achieved. Counseling includes issues such as healthcare, physical, financial, psycho-social and nutritional needs to conquer obstacles to successful treatment. During counseling, patients need to be informed about TB, how the disease spreads, signs and symptoms, consequences of not following treatment guidelines, why treatment is long and why completion of treatment is critical, likely adverse events during therapy, and cost involved in treatment and what free/public services are available to patients. Patients need to be told that TB is a fully curable and treatable disease. In table (2) found that regarding the no. of calls done by the patients more than 3 per week, the most frequent subject was counseling 8 calls/week followed by side effects of drugs 5 calls/week. It is argued that educating patients about their disease status and general comprehension of medications would increase their active participation in a treatment [32, 33]. Some research has suggested an "inverted U shape" relationship between medical knowledge and patient compliance in adolescents, indicating that patients who have an appropriate level of knowledge about their disease and drug regimens are more likely to comply [34]. However, there has also been research reporting that patients with detailed knowledge about a disease may not always be effective [35] Table (3) represents the comparison between the patients' response by sending a miss-call to the TBMU after the reminding call that done by TB coordinator and the completion of treatments' doses, in which the coordinator do a reminder calling at morning if no response, another one done after 30 minutes and if no response also, third call done. When the patients attend the TBMU to receive the next treatment package, they checked up about the completion of the previous package. The significant difference suggesting the relation between the patients' responses and taking complete doses. Also in table (4), the comparison between the patients receiving reminder call from the TB coordinator at the exact follow-up time and those who not, demonstrated very highly significant difference.

In figure (4), although the correlation between the number of patient attended to the TBMU at time and the frequency of calling had clear strong in inverse way (r= -0.98, p= 0.045), but good adherent, active communication, well education by TB coordinator about the importance of compliance to treatment and follow-up visits can explained this finding. Evidence has confirmed that patient experience can be improved by mobile health apps through which reminders and diagnostic information are delivered to patients [36]. In a study done for a sample of 300 outpatients was randomly selected from 3 comprehensive public hospitals (3 tertiary hospitals) in Hubei province, China [37]; found that the use of mobile health apps could improve patient experience, physician-patient communication and the overall health outcomes. Another study was conducted at Salem city in south India among the patients and Revised National TB Control Program (RNTCP) health workers

found that the use of mobile phone increasing the chances of better adherence to DOTS [38]. In 2010–2012, the Video Directly Observed Therapy (VDOT) monitoring system was pilot tested with 43 patients in San Diego and nine patients in Tijuana [39]. Researchers found that VDOT was feasible: more than 93% of expected doses were observed using VDOT. Remote Mobile Direct Observation of Treatment (MDOT) for TB patients using mobile phone video capture and transmission done among 13 patients and their treatment supporters were recruited from the Mbagathi District Hospital in Nairobi, Kenya [40] and showed that the MDOT is technically feasible. Many studies [41-43] have been carried out on appropriate mobile reminder systems using text messaging and telephone call interventions to support patients in following their treatments. Studies have shown how mobile reminder systems can be effective for improving patients keeping follow-up appointments [44, 45].

Conclusion

The patients treated with DOTS will become more adherences and comply with the treatment regimen by the use of mobile communication.

Recommendations

1. Finding government and institutional support to provide tuberculosis patients with a specific free SIM card that enables them to contact the tuberculosis coordinator unit by telephone as well as support the Internet service.
2. Allocation of payments in the form of payments given to patients as support during the treatment period and also at the end of treatment course upon gaining full recovery or completion as a reward.
3. The preparation of an application on the mobile through which all data is recorded for patients with the possibility of follow-up via text messages or video clips and the possibility of self-alert for the commitment to address the treatment and follow-up dates.

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