

Influence of Family System Characteristics on Adherence to Directly Observed Treatment, Short-Course (Dots) in Pulmonary Tuberculosis-A Cohort Study

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Abstract

Objective: To evaluate the association of the characteristics of the family system in adherence observed treatment short in patients with pulmonary tuberculosis in three cities of the south-southeast of Mexico.

Material and methods: Cases of pulmonary tuberculosis were studied, who started treatment at first-level units. The follow-up was 6 months or until the patient lost his grip, emigrated to another city, died, or decided not to continue the study. Intrafamilial relationships were assessed, family functioning (FACES III) and social network (DUKE UNC-11); adherence was assessed with test-Greene Morinsky. We calculated incidence of non-adherence and relative risk factors studied. Variables with significant differences in the bivariate analysis were subjected to the proportional hazards model of Cox.

Results: Two hundred and thirty four patients were included; the total track joined 36,937 days, with a median of 175 days. Patients with dysfunctional family have RR=8.95 (95% CI=4.51-17.76, p<0.001) compared with those with functional family, and patients with non-functional network showed RR=2.22 (95% CI=1.13-4.35, p 0.002) compared with those with functional social network. In the Cox regression model adjusted for education, statistical significance was maintained for family functionality. Family functioning influences the cohorts studied in treatment adherence

Keywords: Pulmonary tuberculosis; Family functioning; Adherence; Directly observed treatment short-course (DOTS)

Introduction

Tuberculosis (Tb) is the leading cause of death worldwide and the number of new cases is increasing at an annual rate of 2%. The Tb is associated with poverty, 95% of cases and 98% of deaths occur in developing countries, most of these deaths occur in young people [1,2]. It is estimated that in 2008 there were 9.4 million new cases of TB, which killed 1.8 million people [3]. The magnitude of this problem is so great that in 1993 the World Health Organization (WHO) declared it as a global emergency [4].

In Mexico in 2008, 15,035 pulmonary TB cases were confirmed, the states with the highest incidence rate per 100,000 population were Baja California (40.5), Guerrero (33.1), Tamaulipas (31.9), Sinaloa (27.8) and Nayarit were presented (27.6) [5].

The scheme is currently recommended to treat new cases of pulmonary TB includes four drugs (isoniazid (H), rifampicin (R), pyrazinamide (Z) and ethambutol (E)) for the first 2 months, followed by HR during the 4 following months [6,7] this scheme, known in Mexico as observed treatment short course (DOTS), has shown promising results in the fight against this disease [8,9].

Adherence to treatment is defined as the match between the patient's behavior and the physician order [10,11]. Non-adherence is recognized as the most important obstacle to the control of Tb [10,12-15] and that the abandonment DOTS entails: reduction in cure rates, increased relapses, [16] relapses, increased the patient's susceptibility to other infections [17] the possibility of stimulating the mechanisms of bacterial resistance and the continued spread of infection [18-20] lists the above strategies to improve adherence as a necessity [21].

Non-adherence is present worldwide and is distributed in all social, ethnic and raciales [22]. Adherence to treatment for tuberculosis worldwide is between 18% to 80% [11,23-26] rates in Mexico adhesion provided by research studies ranging from 94% in Veracruz and 72.5% in Chiapas [27-30].

WHO in 2003 stated: "adherence is influenced by multiple factors simultaneously." [31]. The individual characteristics of each patient are only one factor that impacts on adherence; Other important factors include the socio-economic structure and the nature of health services, the quality of reporting of health workers and the nature of social support the patient receives [10,32].

Munro and contributors [33] considered the perspectives of patients, caregivers and health workers regarding adherence to treatment; however even with the qualitative approach mentioned having found no studies on the structure of the family, domestic relations and family functioning and its relationship to adherence to treatment. From 2005

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to date there have been quantitative studies have explored the factors involved in adherence to treatment for tuberculosis. Those who have consistently found as risk factors for non-adherence are poor access to health services (odds ratio (OR): 2.64, confidence interval 95% (95% CI):1.39-5.29 [34] Risk on (RR): 2.97, illicit drug use (OR: 5.25, 95% CI:2.43-12.94, OR: 7.15, 95% CI :1.69-30.23) [34] having low education (OR: 6.27, 95% CI: 2.88-13.64, [35] OR: 1.47, 95% CI :1.19-1.83) [36] male gender (OR: 2.51, 95% CI :1.63-3.94). Finally being female is associated with excellent adherence (OR: 1.87, 95% CI: 1.17-2.99) [37].

The occurrence of acute chronic or terminal illness, or any of the family members can be a serious problem, which to adjust to this new situation, the family launched self-regulatory mechanisms, such that changes occur in family interactions that have a specific purpose, conscious or inconscient [38].

Even with this knowledge, the characteristics of the family system and its association with adherence to the DOTS have not been studied. As an analogy of what could be extrapolated to patients with pulmonary TB who follow the DOTS the leading research in Mexico in which the association of adherence to treatment or control of disease with some features of the family system is studied were reviewed. Three studies were made, in order to found the association between family characteristics and treatment for diabetes mellitus [39-41] Those studies assessed family functioning by APGAR that despite it is reported that its sensitivity was low [42].

According to previously described adherence has been associated with multiple factors, including personal characteristics, socio-demographic, characteristics of health services and support social. Some studies indicate that direct observation by a family has as consequences in best rates of curation [43,44]. The studies which included family structure and its association with a disease control have revealed that those who have more uncontrolled from families has been studied as family functioning has found that those with dysfunctional families have decontrol risk or lack adherence to treatment

In the south and southeast of the country (Guerrero, Oaxaca, Chiapas, Campeche, Quintana Roo and Yucatan) the problem of adherence to DOTS has been explored only in the state of Chiapas, which relates adherence 72.5%, [30] below recommended by WHO. So evaluate the influence of the characteristics of the family system (family structure, domestic relations and family functioning) on adherence to DOTS in pulmonary TB patients treated at the Mexican Institute of Social Security (IMSS) in three cities south-southeast of Mexico.

Material and Methods

Prospective cohort study, multicenter, which had the working universe of pulmonary TB patients assigned and users of Family Medicine Units (FMU) of the IMSS in the cities of Acapulco, Guerrero was performed; Merida, Yucatan and Chiapas. The target population was those who presented pulmonary Tb between May 1, 2008 to February 28, 2009, these were followed by six months or until the loss of adhesion.

The units of observation patients were considered confirmed cases of pulmonary tuberculosis according to Mexican Official Standard the NOM-006-SSA-1993 for the prevention and control of tuberculosis in primary health care, which diagnosis of tuberculosis has been tested by smear, culture or histopathologyinitiating DOTS during the recruitment period. The diagnosis of the cases was through with sputum smear according to Mexican Official Standard. Patients aged 18 years and over who were incident cases were included; assigned to

patients were excluded either cities chosen, as their usual residence was outside of the city and its patients experiencing inability to attend the FMU physical disability; those with mental disabilities that prevent them from answering the questionnaire and those who decided not to continue with the interviews along the DOTS or who emigrated from the city where the treatment received were eliminated. Adherence to DOTS was considered if the patient presented in the relevant assistance to the supervision of a nurse, recorded on the sheet for the control of drug outlets also noted achiever in testing Morinsky-Greene takes days; present absence for 5 consecutive days or observed defaulting on t test Morinsky-Green was considered non-adherence.

The minimum sample size was calculated using EpiInfo v.3.4.1, two unpaired groups (patients from families with alterations and patients from families without disorders family system) with assumptions confidence index of 95% (95% IC); Test power 80%; families extreme ratio of 16%, [42] to consider that for each patient are dysfunctional family functional family 6 (6:1). The minimum detectable relative risk was 2.25 for the test, so the minimum to be considered were 231 patients, with an approximate range of 198 to 33 with family and functional dysfunctional family.

The instruments used were the test Morinsky-Greene [45]. Evaluating the Domestic Relations (EDR), [46] the Family Adaptability and Cohesion Evaluation Scales (FACES III) [47,48] and the questionnaire DUKE-UNC-11 functional social network [49].

For admission and registration of cases, medical epidemiologist developed epidemiological case study and classified and the nurse was responsible for overseeing the DOTS. The researcher asked the informed consent; if you agree to participate an epidemiological study and a questionnaire were applied including: personal data sheet, EDR, FACES III, DUKE and UNC-11. In a second patient visit, a month of starting the control sheet DOTS nursing was verified, and the questionnaire was applied again with proof of Morinsky-Greene-Levine. Two visits were made: one, at the end of the intensive phase of treatment (10 weeks) and again at the end of the support phase (approximately 6 months after initiating DOTS).

Adherence was considered as the dependent variable and the characteristics of the family system (family structure, domestic relations and family functioning) as independent; also were considered as intervening variables age, sex, marital status, education, socioeconomic status, body mass index (BMI), smoking related diseases, illicit drug use and social network.

The data were analyzed using Stata v.11.0 with univariate analysis intercuartilares median and ranges of age and follow-up time was calculated, and simple frequencies and proportions were obtained. Incidence rate was calculated non-adherence. The homogeneity of the cohort was assessed in relation to family functioning by Xi square test or Fisher exact test. To assess the association between risk factors and the incidence rate of non-adherence incidence rate (IR) of each of them with 95% and $\alpha=0.05$ value was calculated and equal the assessed survival function using the log-rank test. The variables that were statistically significant differences were tested for correlation and those not presented together, the relative risk (RR) was calculated for the above are also excluded the variables that were different between the cohorts regarding family functioning. Those that maintained statistical significance were introduced to a proportional hazards model of Cox, in order to calculate the adjusted risk ratio (ARR) with 95%, adjusted for sex.

Results

Were included in the study 234 pulmonary TB cases, of which 34 (14.5%) showed poor adherence to DOTS. According to residence the largest proportion of patients was Acapulco, Guerrero (121 patients, 51.7%). The age range was 18 to 91 years, with a median of 48.0 years and 32.0 years, interquartile range, males occurred more frequently (female 45.7% vs male 54.3%). The 62.4% reported being married and 21.4% single remaining reported being widowed or divorced. According to the school, it was found that 35.0% had primary or less and 26.1% high school. Regarding socioeconomic status was found that over 90% of the study population is in the low or in the middle. As for smoking, 62.0% refused this background. In relation to other diseases, 65% reported not make another disease. Regarding family system variables, it was found that 53.4% belonged to nuclear families; in terms of family relationships 42.7% had no problem; in relation to family functioning from dysfunctional families 17.5% was found. The social network is functional in 65.0% of patients.

The homogeneity of the formed cohort was assessed in relation to family functioning. The median age found in those with functional family was 46 years and those with dysfunctional family were 53 years. The 25th percentile, 75 and interquartile range were 29.5, 62 and 33 years for those with functional family and 35, 62 and 27 years in dysfunctional families, respectively. No difference was found in age between cohorts (p Mann Whitney U=0.20, p<0.001) in the distribution by source entity in the population of Chiapas found the proportion of dysfunctional families is higher than in the other two populations (31.6% Chiapas, 10.7% Acapulco and 10.8% Merida), also differences were found with regard to comorbidity (p<0.01), in other sociodemographic variables studied two cohorts were very similar. In regards to the characteristics of the family system were different in the distribution of family relationships among dysfunctional families greater proportion of them with problems (p<0.001), no other significant differences were found.

36,937 days tracking were performed with a minimum follow-up of 7 days and a maximum of 192 days, with a median of 175 days, 34 patients lost adherence to treatment, of which 13 were abandoned to DOTS (5.5% attrition rate). Patients who completed treatment totaling 35,110 days with a median of 175, while those who lost grip added 1,827 days with a median of 49.5 days, 25th percentile 32 days 76 days 75 percentile and interquartile range 44 days. The IR of non-adherence was 0.92 per thousand days/patient (95% CI=0.66-1.29).

IR thousand days/patient, which were calculated with stratification by each of the variables that were statistically significant; by sex found that IR in women was 0.51 (95% CI=0.26 to 0.98) and in men was 1.30 (95% CI=0.87-1.92); according to comorbidity, patients with IR showed no disease of 0.68 (95% CI=0.43-1.11), with diabetes mellitus of 1.24 (95% CI=0.64-2.38), and HIV/AIDS 7.73 (95% CI=2.49-24.0); in terms of family relationships, found in families without problems, IR 0.48 (95% CI=0.24 to 0.96) and those with problems, 1.28 (95% CI=0.87-1.88); in relation to family functioning in those with functional family was 0.43 (95% CI=0.26 to 0.73) and those with dysfunctional family was 4.29 (95% CI=2.77-6.65) and IR according to the social network, was 0.65 (95% CI=0.40-1.06) for those with functional network, and 1.47 (95% CI=0.93-2.33) for those with no functional network (Tables 1 and 2).

The RR of non-adherence to DOTS which was calculated for sex, comorbidity, family relationships, family functioning and social network (Table 3), where the male had more than 2 times the risk (RR=2.45, 95% CI=1.14-5.24) compared with the female gender; those

Variable	IR	IC _{95%}		p*	
Hometown					
Chiapas	1.11	0.65	-	1.92	
Acapulco	0.88	0.54	-	1.41	
Merida	0.68	0.25	-	1.81	0.64
Sex					
Femenine	0.51	0.26	-	0.98	
Masculin	1.30	0.87	-	1.92	0.02**
Marital status					
Married	0.96	0.63	-	1.45	
Other	0.86	0.49	-	1.51	0.77
Schooling					
University or more	0.51	0.19	-	1.36	
High school	0.94	0.49	-	1.80	
Junior high	1.42	0.74	-	2.72	
Primary or less	0.91	0.52	-	1.61	0.37
Socioeconomic status					
High	1.57	0.59	-	4.19	
Middle	0.79	0.47	-	1.34	
Low	0.95	0.58	-	1.55	0.45
Obesity					
Normal	0.96	0.65	-	1.43	
Overweight	0.77	0.37	-	1.62	
Obesity	1.01	0.25	-	4.04	0.87
Smoking					
Negative	0.78	0.49	-	1.23	
Positive	1.16	0.71	-	1.89	0.27
Comorbilities					
No one	0.68	0.43	-	1.11	
Diabetes mellitus	1.24	0.64	-	2.38	
Desnutrition	1.07	0.15	-	7.58	
Cirrhosis	0.42	0.06	-	3.00	
HIV/AIDS	7.73	2.49	-	24.0	
Others	1.31	0.73	-	7.07	0.001**

IR: incidence rate.

*p-value of the log-rank test for equality of survival function.

**statistically significant differences.

Table 1: Incidence of non-adherence to DOTS for each of the sociodemographic characteristics studied with confidence interval of 95%.

Variable	IR	IC _{95%}		p*	
Family structure					
Nuclear	0.75	0.45	-	1.24	
Seminuclear	1.33	0.43	-	4.11	
Extense	1.34	0.70	-	2.57	
Composed	0.88	0.42	-	1.85	0.52
Domestic Relations					
No problem	0.48	0.24	-	0.96	
With problematic	1.28	0.87	-	1.88	0.01**
Family functioning					
Functional family	0.43	0.26	-	0.73	
Dysfunctional family	4.29	2.77	-	6.65	<0.001**
Social network					
Functional network	0.65	0.40	-	1.06	
Unfunctional network	1.47	0.92	-	2.33	0.02**

IR: incidence rate.

*p-value of the log-rank test for equality of survival function.

**statistically significant differences.

Table 2: Incidence of non-adherence to DOTS for each family characteristics and social system with a confidence interval of 95%.

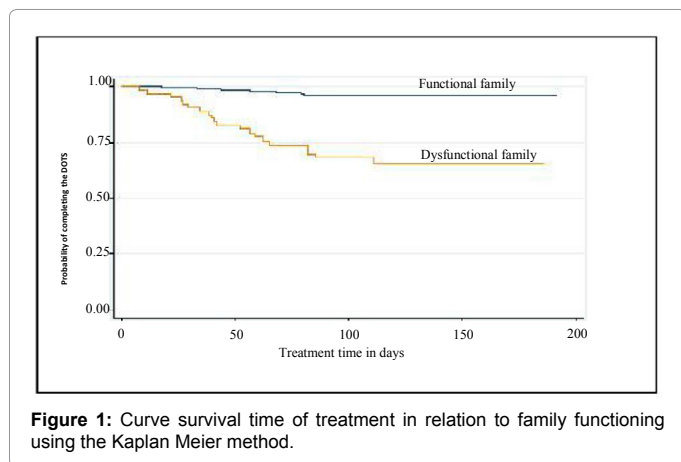
Variable	RR		IC _{95%}		p*
Sex					
Femenine	-	-	-	-	-
Masculine	2.45	1.14	-	5.24	0.02**
Comorbidity					
No one	-	-	-	-	-
Diabetes mellitus	1.77	0.79	-	3.97	0.17
Desnutrition	1.52	0.20	-	11.43	0.68
Cirrhosis	0.61	0.08	-	4.60	0.63
HIV/AIDS	8.65	2.53	-	29.55	0.001**
Others	3.29	0.96	-	11.24	0.06
Domestic Relations					
No problem	-	-	-	-	-
With problematic	2.61	1.18	-	5.77	0.02**
Family functioning					
Functional family	-	-	-	-	-
Dysfunctional family	8.95	4.51	-	17.76	<0.001**
Social network					
Functional network	-	-	-	-	-
Unfunctional network	2.22	1.13	-	4.35	0.02**

RR: Risk ratio.

*p-value of the test Z.

**statistically significant differences.

Table 3: Relative risk of non-adherence to DOTS confidence interval 95%, in relation to each of the variables with statistical differences between their IR.



with diabetes mellitus presented RR=1.77 (95% CI=0.79-3.97) and HIV/AIDS was 8.65 (95% CI=2.53-29.55), and those with any other RR=3.29 (95% CI=0.96-11.24) compared with those who reported no added disease; relating to domestic relations RR=2.61 (95% CI=1.18-5.77) was found in the family with problematic families bought those with no problem and according to family functioning, patients with dysfunctional family have almost 9 times more risk of non-adherence (RR=8.95, 95% CI=4.51-17.76) compared with those with functional family (Figure 1). Patients with non-functional social network showed RR=2.22 (95% CI=1.13-4.35) compared with those with functional social network.

Then the correlation of each of the variables from each family was assessed and found to intra-family relationships and family functioning are highly associated ($p < 0.01$), plus intra-family relationships and comorbidity were statistically different in the cohorts in relation to family functioning, so it is excluded to obtain RR adjusted. RR adjusted

for sex was obtained for both familiar functionality to the network, with a statistical significance of family functioning is maintained ($p < 0.01$), but not the social network ($p = 0.13$). The adjusted RR for patients with familiar dysfunction was 8.74 (95% CI=4.38-17.44) and in patients with non-functional social network was 1.73 (95% CI=0.85-3.53). Therefore, a model of family functioning adjusted for sex, in which the RR was obtained for patients with dysfunction was 9.23 (95% CI=4.64-18.37), where the model goodness of fit=141.27; survival curve adjusted by means of the Cox model shows these differences (Figure 2).

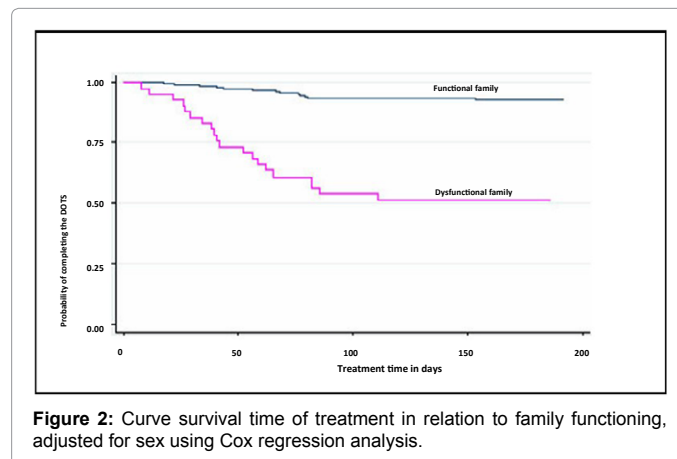
Discussion

The proportion of non-adherence recorded (14.5%) was similar to that found in studies conducted in Mexico, however was higher than that found in Chile (11.4%), and lower than in New York (48%), South Africa (17%) and Ethiopia (20%) family dysfunction increased the risk of non-adherence to treatment with a RR=9.18, which is higher than that reported in another study in diabetic patients by Marin F-Reyes and colleagues (OR=6.9, 95% CI=2.3-21.1).

Valadez and colleagues [40] conducted a cross-sectional study in 121 type 2 diabetic families, which found that belonging to a nuclear family was associated with the uncontrolled diabetic patients (OR=4.61, 95% CI=1.52-14.41), 40 this association in this research it was not possible to corroborate because the nuclear family category had the lowest IR.

Méndez-López DM et al. [24] reported that 56% of patients with familiar dysfunction showed improved glycemic control compared to 80% in functional families, in our study 51.2% of those with dysfunctional family had adequate adhesion, while 92.7% of patients with functional families successfully conclude the DOTS, so that the proportions were similar in dysfunctional families, but in our study the adhesion was observed above that expected in functional families. In this research, smoking, had an IR for those who refused this habit of 0.78 (95% CI=0.49-1.23) and those with smoking 1.16 (95% CI=0.71-1.89), no difference was found between groups ($p = 0.27$), compared with the study. However, Soza-Pineda et al. [17] reported that the number of individuals who smoked (OR=4.83, 95% CI=0.71-1.89) showed five times higher risk of leaving the treatment.

Although the present study revealed that there is a high risk for anti-tuberculosis cessation treatment in patients with dysfunctional family, is also a risk that the patient does not have a nuclear family or social support network; in Mexico there is a risk scale abandonment of treatment of patients with tuberculosis, which considers risk



points: history of drug cessation, perceived quality of health services, accessibility, absence of a nuclear family, drug addiction, absence of social security, migration and illiteracy; so it is fundamentally a multidisciplinary and multidimensional approach involving counseling and social situation of the patient and family, in order to obtain therapeutic success. Also, although it has affordability of first-line drugs in the Institute is transcendental promote self-care and patient health education.

The literature supports the premise that men tend to leave more than women. Cáceres [11] reported an OR of 1.84 for dropouts among men compared with women in the age group 15 to 44, and also Lertmaharit S et al. [37] indicate that being female is associated with excellent adherence (OR=1.87, 95% CI=1.17-2.99). In this research corroborated this association.

As for school, having primary or less had an IR of 0.91 (95% CI=0.52-1.61), which, when compared with those who completed professional studies (TI=0.51), an RR=1.76 was observed situation contrasts with studies Bam T [35] and the Gopi, et al. [36] RM=6.27 was found (95% CI=2.88-13.64) and OR=1.47 (95% CI=1.19-1.83), when these groups were compared.

With regard to socioeconomic status, no significant differences ($p=0.09$), contrary to the findings of Bam TS et al, in which 79% of patients who discontinued treatment were from low statuses. Lertmaharit S et al. [37] found reported that those living in rural and suburban area have abandoned twice more than those living in urban areas (RR=2.3, 95% CI=1.5-3.7).

The studies mentioned families as a determining factor in the control of diseases were many and our research can see that at least in our population, the family had a very important role for the DOTS a satisfying conclusion.

During follow dropouts were thirteen treatment and these were it considered no adherent. All possible recommendations for patients to continue treatment were followed; however it was not possible to conclude in all patients.

The results of this study indicated that factors related to sex, comorbidity, social network and the characteristics of the family system, contributed to the abandonment of drug anti-tuberculosis therapy and family clearly shows its importance in adherence to DOTS. Patients with dysfunctional families are at greater risk of not adhering to treatment than those with functional families and this is an independent risk factor for sociodemographic variables, so that patients with identified risk factors should be closely monitored and motivation to continue treatment. Physicians, whatever their specialty and general health worker who is faced with a patient should consider the importance of family and society. The commitment to the patient and family must always be present to provide better integrated care.

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