Factors at first diagnosis of tuberculosis associated with compliance with the Directly Observed Therapy (DOT) in the Limpopo Province, South Africa

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Abstract

The aim of this study is to compare and contrast health beliefs, demographic and socio-economic variables, causative beliefs, knowledge, health-seeking behaviour and health provider-patient interaction of compliant and non-compliant tuberculosis patients. The sample included 219 consecutive new sputum-smear and/or culture positive pulmonary tuberculosis patients registered between October 1999 and March 2000 in three hospitals in the Limpopo Province of South Africa. The patients were 144 (65.8%) men and 75 (34.2%) women in the age range of 18 to 79 years (*M* age 35.9 yr., *SD*=12.6). The consultation at first diagnosis was observed and tape-recorded. Thereafter an interview was conducted and a questionnaire was face-to-face administered with the patient including knowledge, causative beliefs, health seeking, and Health Belief Model items. Discriminant analysis between compliant and non-compliant groups after six months follow-up showed that the quality of the health practitioner-patient interaction and causative belief were associated with compliance behaviour whereas knowledge, onset of TB, sociodemographic variables, health care seeking, and health beliefs were not associated.

Introduction

South Africa is burdened by one of the worst tuberculosis epidemics in the world, with disease rates more than double those observed in other developing countries and up to 60 times higher than those currently seen in the USA or Western Europe. The Medical Research Council estimated that the country had an estimated 180 507 cases (55% reported) in 1997, or 419 per 100 000 of the total population; of these, 32,8% (73 679 cases) were probably infected with HIV (Fourie, 2000: 4f.). Estimates by the MRC National Tuberculosis Programme indicate that current trends in the epidemic will continue unless effective control is achieved, resulting in 3,5 million new cases of tuberculosis over the next decade and at least 90 000 patients dying. On the other hand, significant reductions in transmission of HIV infection together with effective tuberculosis control would mean a turn-around in the tuberculosis epidemic by the year 2003 (Fourie, 2000: 5f.). In comparison with the MRC estimates based on epidemiological modelling as mentioned above, actual registration reports to the National Department of Health indicated smear positive rates per province (per 100 000 of the total population) of 285 for the Western Cape, 300 for the Eastern Cape and 328 for the Northern Cape. All other provinces had rates below 200. The overall rate for South Africa was 163 for smear positive and 310 for all pulmonary tuberculosis cases (Fourie, 2000: 7f.).

Tuberculosis was declared a top health priority by the Department of Health in November 1996 and National Health Minister Zuma committed her Department to implementing a new control programme based on the DOT strategy of the World Health Organisation. The pace and extent of implementation of the programme is, however, slow in most provinces. Since 1996, a system of case registration based on strict criteria for case definition was implemented in South Africa. These registrations, based on standardised criteria, are now beginning to present a clearer picture of disease rates in the country than what was available before. Some progress is being made in certain provinces in South Africa (Wilkinson & Davies, 1997: 700) Mpumalanga (despite relatively high HIV rates) and the Western Cape are already showing dramatic improvements in cure rates, because of disciplined implementation of the DOT strategy of the WHO in these provinces. Other provinces are at various stages of implementation of the process such as the Limpopo Province (Fourie, 2000: 10). Factors identified for the improvement of the DOT strategy from research are implementation of the DOT right from the beginning of diagnosis, culturally determined beliefs about and knowledge of tuberculosis, adherence of TB treatment (Rubel & Garro, 1992: 626), transportation time, the sex of the patient, patient information and the quality of communication between patients and health workers (Comolet,

Rakotomalala & Rajaoarioa, 1998: 891), substance abuse, emotional disturbance, homelessness, lack of transportation, behavioural problems, dissatisfaction with clinic scheduling, forgetfulness, mental retardation, lack of family or social support, migrant status, illiteracy, unemployment, and low income (Sumartojo, 1993: 1311). Glatthaar and Berends (1995: 179) have shown how DOT with a community approach reached a 90% adherence rate in an urban (Cape Town) area. Jaramillo (1999: 71) reviews that low levels of self-efficacy, poor information about TB and its means of control and the stigma attached to the disease (with the social discrimination it entails) contribute to some extent to poor adherence to treatment. Furthermore, he states that material support (food, money, fees for transport, etc.) and personal/family income has been reported as a predictor of the outcome of TB control programmes. Barnhoorn and Adriaanse (1992: 291) identified that the presence of social support (in particular the presence of a supportive person, who establishes routine in taking pills and in making control visits) and satisfaction with health-care providers contributed positively to compliance. Westaway and Wolmarans (1994: 447) found among black urban South African TB patients that case-holding (compliance for both patient and system) involves complex behaviours that depend upon symptom recognition and evaluation, cultural and social influences and enabling factors such as time, money, skills and appropriate/accessible health services. Rideout and Menzies (1994: 3) stated that tuberculosis control programmes must be tailored to take into account the importance of cultural factors in promoting compliance with therapy. In many cultures, the largely unremarked social stigma of tuberculosis contributes to abandonment of treatment and lengthy delays in seeking professional care (Rubel & Garro, 1992: 626).

Statement of the problem

The DOT strategy has been shown to be more cost effective than conventionally delivered treatment for the treatment of new cases of tuberculosis in adults in South Africa (Floyd, Wilkinson & Gilks, 1997: 1407f.; Westaway, Conradie, & Remmers, 1991: 447). However, the implementation of the DOT strategy in the Limpopo Province has been slow. Several studies have identified factors for the improvement of DOT strategy (Glatthaar & Barends, 1995: 179; Garner, 1998: 1326; Rubel & Garro, 1992: 626; Comolet et al., 1998: 892; Sumartojo, 1993: 1311ff.). Other studies have suggested additional factors to be considered (Jaramillo, 1999: 71; Barnhoorn & Adriaanse, 1994: 291f.). These studies were urban-based and did not focus on rural black South Africans. Westaway and Wolmarans (1994: 447) studied black South African TB patients but this study was also urban-based. There is paucity of information on DOT strategy in South Africa. This information has not resulted in significant improvement of the pace, extent of implementation and effectiveness of DOT programme in the Limpopo Province. This study aims to investigate the predisposing, reinforcing and enabling factors, which can improve the delivery of DOT programme in three predominantly rural black communities in the Limpopo Province of South Africa.

Theorectical models

Directly observed therapy is predicated on the belief that by directly observing the patient consume all required medications, a full treatment regimen will be ensured, thereby reducing the risk of treatment failure (Nazar-Stewart & Nolan, 1992: 58).

The health belief model (HBM) has proven to be a useful framework for examining sick role behaviours such as compliance. It assumes that people comply with regimes under a very specific set of conditions. Patients must possess some minimal level of health knowledge and motivation towards health. They must see themselves as vulnerable to the illness and believe that the illness is of a serious nature. Additionally, they must be convinced that the treatment can be efficacious, i.e. that it is actually possible to obtain control over the disease and that the cost of such control is not too high in view of the benefits. Another factor included in the model is the predisposition, or motivation, of people to engage in health-related practices (Barnhoorn & Adriaanse, 1992: 300).

Effective care for patients also requires understanding of one's ethnic identity and related conception of illness. Kleinman (1980: 80f.) referred to developing an openness to each patient's own 'explanatory model' of illness. Because of their primary contact with the patient, health care providers can strongly affect the patient's commitment to a correct regimen, particularly by means of clear communication about the regimen.

Aims and objectives

The aim of this study is to compare and contrast health beliefs, demographic and socio-economic variables, causative beliefs, knowledge, health-seeking behaviour, and health provider-patient interaction of compliant and non-compliant tuberculosis patients. If the model distinguishes well between both groups, it would be important to identify what dimensions have the greater impact on patient compliance and which ones are appropriate to serve as a basis for planning educational and health promotive interventions for the improvement of the DOT strategy in the three main cultural groups and three regions in the Limpopo Province of South Africa.

Methods

Design

The design of the study was a prospective case control study divided into (1) assessment of first diagnosed pulmonary tuberculosis patients, and (2) follow-up of the diagnosed tuberculosis patients. Here only the follow-up statistics are used in the analysis. The detailed results of the follow-up study are reported elsewhere (Peltzer, 2001: 191).

Sample

The sample included 219 consecutive new sputum-smear and/or culture positive pulmonary tuberculosis patients registered between October 1999 and March 2000 in three hospitals (74

in Tsilidzini, 80 in Letaba and 65 in Pietersburg-Mankweng-Groothoek hospitals). Criteria for inclusion in our study were: (a) formal informed consent, (b) age 18 years or older, and (c) no previous treatment history. All patients received super-

Table 1: Sociodemographic characteristics (N=219)

Sociodemographic characteristics		No	(%)
Place of residence	-Village	188	85.5
	-Urban	031	14.2
Family type	-Nuclear	139	63.5
	-Joint	080	36.5
Marital status	-Married/living with partner	104	47.5
	-Single	092	42.0
	-Divorced/widowed	023	10.5
Formal education	-None	28	12.8
	-Primary:	68	23.1
	-Secondary	103	47.0
	-Tertiary	20	09.1
Occupation of patient	-None	81	37.0
	-Housewife	08	03.7
	-Gardener, domestic worker	37	16.9
	-Security, driver, mechanic	75	34.2
	-Police officer, secretary	08	03.7
	-Teacher, nurse	05	02.3
	-Lecturer, businessman, manager	04	01.8
Type of house	-Brick house with tiles	10	04.6
	-Brick house with corrugated iron	126	57.5
	-Mud house with corrugated iron	25	11.4
	-Thatched mud house	41	18.7
	-Other	17	07.8
Type of fuel	-Firewood	110	50.2
	-Electricity	60	27.4
	-Paraffin	43	19.6
	-Other	06	02.7
Monthly income	- None	93	42.5
	-1-999 R	51	23.3
	-1000-2999 R	39	17.8
	-3000-6999 R	19	08.7
Relation with head of family	-Self	61	27.9
	-Son	64	29.2
	-Daughter	36	16.4
	-Wife	32	14.6
	-Brother/sister	11	05.0
	-Grandchild	08	03.7
Religion	-African/traditional	89	40.6
	-Zion	55	25.1
	-Apostolic	11	05.0
	-Christian Protestant	34	15.5
	-Christian Catholic	15	06.8
	-Other	17	07.8

vised therapy with RHZE (R=rifampicin, H=isoniazid, Z=pyrazinamide, E=ethambutol) 5 times weekly for 8 weeks, followed by RH 5 times weekly for 16 weeks. The patients were 144 (65.8%) men and 75 (34.2%) women in the age range of 18 to 79 years (*M* age 35.9 yr., *SD*=12.6). Distribution by ethnicity showed 101 (46.1%) Northern Sotho, 65 (29.7%) Venda, 48 (21.9%) Tsonga, and 5 (2.3%) others.

Research instrument

(1) A 46-item scoring key for the health carer patient consultation (Boesch, 1988: 253ff.). Items include for example: "How does the doctor start the consultation?", "Symptom question concerning cause", "Explaining of cause by doctor", "Personal question related to symptom or other health question", and "Explanation of treatment and medicine by doctor".

(2) A recall interview of the patient on the consultation (Boesch, 1988: 250)

(3) Fifteen items on demographic and socio-economic data.

(4) Four items on family and community history and attitudes of tuberculosis.

(5) Two items on drinking and tobacco use status.

(6) The Problem Portrait Technique on causative beliefs of tuberculosis (see Table 4) (MacLachlan, 1997: 84-9).

(7) Six items on transmission knowledge of tuberculosis (rated from 1=strongly agree to 6=strongly disagree) (Metcalf, Bradshaw & Stindt, 1990: 408) (.68, indicates the Cronbach alpha for this study sample).

(8) Nine items on when to stop tuberculosis treatment (rated from 1=strongly agree to 6=strongly disagree) (Metcalf et al., 1990: 410)(.67).

(9) Seven items on previous health-seeking behaviour (answered by yes or no) (.62). (cf. Steen & Mazonde, 1999: 163)

(10) Three items on the curability of health care agents (rated from 1=agree to 3=disagree). (cf. Steen & Mazonde, 1999: 164)

(11) A 21-item questionnaire based on the Health Belief Model developed by Barnhoorn & Adriaanse (1992: 302): (a) health motivation (5 items) (.64 indicates the Cronbach alpha for this study sample), (b) perceived susceptibility (4 items) (.61), perceived severity (4 items)(.62), perceived benefits (4 items)(.70), and perceived barriers or costs (4 items)(.66) (rated from 1=strongly agree to 6=strongly disagree). The overall alpha coefficient was .67 indicating the Cronbach alpha for this study sample.

(12) Assessment of compliance. The criterion for labelling a patient to be 'non-compliant' was the failure to take anti-tuberculosis medication for more than two weeks duration. This was assessed by a) number of pills taken (checked ticks on green card and number of pills prescribed checking the container), and b) number of appointments kept and scheduled. Patient's treatment outcome, coded 0 if patient had complied and 1 if patient had failed to comply, was used as dependent variable.

Table 2: Group means, standard deviations and significance tests of sociodemographic variables for the compliant and non-compliant groups

Variables	Compliant (n=81) M (SD)	Non-compliant (n=55) M (SD)	Univariate F-ratio
Sex	0.34 (0.48)	0.26 (0.44)	.592
Age	35.3 (13.8)	34.4 (13.0)	.091
Marital status	0.46 (0.50)	0.52 (0.51)	.236
Family type	0.72 (0.97)	0.58 (0.92)	.410
Family size	6.52 (3.26)	6.68 (2.53)	.053
Place of residence	1.08 (0.27)	1.03 (0.18)	.741
Education	2.32 (1.15)	2.26 (1.21	.053
Occupation	2.66 (1.36)	2.55 (1.59)	.113
Family's monthly income	1.06 (1.27)	1.03 (1.22)	.009
Type of house	4.00 (1.34)	4.13 (1.34)	.178
Type of fuel	1.70 (1.15)	2.19 (1.33)	3.138
Religion	0.90 (0.81)	0.68 (0.65)	1.654

Procedure

Permission was obtained from the University of the North Ethics Committee and the Provincial Health and Welfare Department.

Before consultation the tuberculosis patient was identified

from the files and asked for formal consent to participate in the study. Then the patient was accompanied by one of the researchers to the consultation. The consultation was observed by one of the researchers (P Seoka) and two trained research assistants and tape-recorded. Thereafter an interview was conducted and a questionnaire was face-to-face administered with the patient. This included a recall interview on the health provider- patient interaction.

The questionnaires were translated and back translated by bilingual experts in the major languages used in the study according to scientific standard procedures. The schedule was field tested before the survey and modified where necessary.

Data analysis

The health professional-patient consultation was analysed

Table 3: Onset of tuberculosis for the compliant and non-compliant groups

When did the illness start	Compliant (n=81) No (%)	Non-compliant (n=55) No (%)	X^2
Less than 4 weeks	29 (39.7)	14 (26.9)	4.727
1-2 months ago	11 (15.1)	14 (26.9)	
2-3 months ago	10 (13.7)	7 (13.5)	
3-4 months ago	12 (16.4)	6 (11.5)	
4 months and more	11 (15.1)	11 (21.2)	
	M (SD)	M (SD)	F-ratio
How many months ago did the sickness begin?	2.62 (1.87)	2.85 (1.93)	.446

Table 4: Group means, standard deviations and significance tests of tuberculosis causative beliefs from Problem Portrait Technique (PPT) rated from 0 to 10 indicating the importance of the behaviour (10 being most important) as well as frequency of agreed responses (in percent) for the compliant and non-compliant groups

Causative beliefs	Compliant (n=81)		Non-compliant (n=55)		Univariate F-ratio
	M (SD)	No (%)	M (SD)	No (%)	
Dust	2.31 (3.20)	31 (38.3)	1.81 (3.21)	15 (27.3)	.773
Smog/smoke	0.57 (1.70)	9 (11.1)	--	--	5.933*
Heredity	0.27 (1.41)	3 (3.7)	0.70 (2.33)	5 (9.1)	1.752
Infected by spouse (sex) partner	0.68 (2.24)	7 (8.6)	1.45 (2.93)	13 (23.6)	2.990
Hard work	0.67 (1.92)	9 (11.1)	0.79 (2.28)	6 (10.9)	.118
Tobacco smoking	2.28 (3.63)	26 (32.1)	3.85 (4.07)	27 (40.1)	5.403*
Ciment dust	0.31 (1.45)	4 (4.9)	0.87 (2.53)	6 (10.9)	2.638
Alcohol	1.51 (3.00)	18 (22.2)	1.45 (2.75)	13 (23.6)	.011
Germs	2.73 (3.47)	33 (40.7)	1.45 (2.66)	13 (23.6)	5.177*
Dirty environment	0.69 (1.96)	10 (12.3)	1.25 (2.81)	10 (8.2)	1.809
Witchcraft	0.48 (1.90)	5 (6.2)	0.45 (1.88)	4 (5.6)	.007
Makgoma#	0.32 (1.69)	3 (3.7)	0.58 (2.13)	4 (7.3)	.637
Poor eating habits	0.43 (1.74)	6 (7.4)	0.94 (2.48)	8 (14.5)	1.972

***$p<.001$, **$p<.01$,*$p<.05$

Assortment of ailments which follows the breach of particular taboos (Peltzer, 1998)

using a 46-item scoring key (Boesch, 1988: 253ff.). The tape-recorded patient-doctor consultation and recall interview of the patient on the consultation were transcribed from the vernacular language to English according to scientific standard procedures. The messages from the health professional (=messages given) and the messages recalled by the patient were content analysed using the following categories: diagnosis, treatment course, treatment duration, support available, prognosis, treatment adherence, results of non-compliance (see appendix II) (Boesch, 1988: 250). Causative beliefs of tuberculosis from the Problem Portrait Technique were content analysed, coded and also analysed statistically (see Table 4) (MacLachlan, 1997: 84-9). Further, descriptive, Chi-square and discriminant statistical analyses were applied using the SPSS (version 10.0).

Table 5: Help-seeking behaviour for tuberculosis other than biomedical prior to first diagnosis

Help-seeking for TB	Compliant (n=81) No (%)	Non-compliant (n=55) No (%)	X^2
1. Used home remedies for TB	22 (27.5)	17 (30.9)	.438
2. Use of herbs	22 (27.2)	15 (27.3)	.000
3. Used warm fluid/water	28 (35.0)	27 (49.1)	2.680
4. Over-the-counter drugs	35 (44.3)	23 (42.6)	.038
5. Visited traditional healer	20 (25.0)	16 (29.1)	1.816
6. Visited faith healer	13 (16.3)	13 (23.6)	2.750

***$p<.001$, **$p<.01$,*$p<.05$

Table 6: Knowledge about transmission of tuberculosis (rated from 1=strongly agree to 5=strongly disagree)

Variables	Compliant (n=81) M (SD)	Non-compliant (n=55) M (SD)	Univariate F-ratio
1. Sputum (including standing on sputum)	1.49 (1.04)	1.30 (0.77)	1.327
2. Air borne (breathing, cough and droplet spread)	1.31 (0.82)	1.13 (0.44)	2.249
3. Sharing toilet, bath, towels or clothes	1.96 (1.44)	1.98 (1.35)	.006
4. Sharing cigarettes, food or drink	1.59 (1.14)	1.46 (1.00)	.421
5. Sexually transmitted	3.29 (1.60)	3.09 (1.55)	.491
6. Contact with someone with TB	1.56 (1.16)	1.74 (1.31)	.690

Results

The sample included all (N=219) first diagnosed pulmonary tuberculosis patients. Most patients (85.5%) came from a village and a nuclear family type (63.5%). About half of the participants were married or living with a partner (47.5%) and 92 (42%) were single. Almost half (47%) had (some) secondary education and 28 (12.8%) were illiterate. Ninety-three (42.5%) did not have any monthly income and the majority were either having unskilled or semi-skilled occupations.

Table 1 indicates the sociodemographic characteristics of first diagnosed tuberculosis patients in all three research sites. Typically the tuberculosis patient is a middle-aged male, married or cohabits, lives in the rural area, comes from a nuclear family, has a semi-skilled occupation, has secondary education, lives in a brick house with corrugated iron, uses firewood as fuel, has no income or is unemployed, belongs to African traditional religion, and is either the son or the head himself of the family.

In order to identify demographic and socio-economic variables that discriminated between the compliant and non-compliant groups a discriminant analysis was performed for a

total of 136 patients (81 compliant and 55 non-compliant), which had been successfully followed-up.
From 219 tuberculosis patients assessed at first diagnosis 136 were successfully followed-up after 6 months, 81 (59.6%) had been compliant and 55 (40.4%) had been non-compliant. The compliance rate differed by hospital site from 70.8% to 41.9%. A large group of patients (82) could not be followed-up due to death, had moved out of the province, and could not been traced.

the Problem Portrait Technique.

The compliant group attributed more germs to tuberculosis than the non-compliant group did, whereas the non-compliant group saw smoking tobacco as more responsible for tuberculosis than the compliant group did. The most commonly mentioned causative agents for tuberculosis are believed to be: germs, tobacco smoking, dust, alcohol, dirty environment, and infected by spouse (sex) partner.

Table 7: Knowledge of patients on when to stop treatment (rated from 1=strongly agree to 5=strongly disagree)

Variables	Compliant (n=81) M (SD)	Non-compliant (n=55) M (SD)	Univariate F-ratio
1. When feeling well	4.72 (0.77)	4.60 (1.07)	.525
2. After a period less than six weeks	4.73 (0.73)	4.64 (1.06)	.327
3. When side effects are experienced	4.58 (0.88)	4.66 (0.87)	.275
4. Depends on how bad it is	4.55 (0.95)	4.72 (0.70)	1.170
5. On discharge by the doctor or from hospital	3.96 (1.57)	4.30 (1.40)	1.530
6. When treatment is finished	3.09 (1.88)	3.52 (1.89)	1.590
7. After a period of six months or more	1.88 (1.49)	2.26 (1.68)	1.759
8. Once radiograph is clear	3.28 (1.63)	3.54 (1.62)	.764
9. Once disease is cured	2.01 (1.58)	1.86 (1.41)	.308

Table 8: Past six months substance use and family and community history of TB

Variables	Compliant (n=81) No (%)	Non-compliant (n=55) No (%)	X^2
Past 6 months alcohol or other drug use	31 (39.2)	19 (34.5)	.306
Past 6 months tobacco use	24 (30.0%)	20 (36.4)	.601
Family member had TB	21 (25.9)	14 (25.5)	.004
Community member had TB	23 (28.4)	15 (27.3)	.020

Table 2 contains the group means of 12 predictor variables for patients (see details in Appendix I), who complied and for those who did not comply with tuberculosis treatment.
None of the variables had significant differences between compliant and non-compliant groups.
Table 3 indicates the onset of tuberculosis symptoms as experienced by the patients.

The non-compliant group had a slightly longer onset of tuberculosis symptoms than the compliant group, which was almost significantly different.

Table 4 indicates the causative beliefs of tuberculosis using

Table 5 indicates the use of alternative health care sources for the treatment of tuberculosis, both since first diagnosis and before first diagnosis of tuberculosis.

Prior to first diagnosis a number of participants from both compliant and non-compliant groups had used alternative healing systems.

Table 6 indicates the patients' knowledge about the transmission of tuberculosis.

Knowledge on transmission of tuberculosis can generally be considered high regarding sputum, airborne and contact with someone. Falsely sharing toilet, bath, towels or clothes, cigarettes, food or drink was seen by the majority as a route of transmission. There was no significant difference between the compliant and non-compliant group.
Table 7 indicates the awareness of patients on when to stop the treatment

Most patients disagreed with stopping the medication 'when feeling well' and most agreed with after a period of 6 months or more. There were no significant differences between compliant and non-compliant group.

fied properly, whereas 34.2% (out of 54 cases) of the non-compliant group was classified correctly.
The health practitioner-patient interaction score was significantly higher among compliant than among non-compliant patients.
Messages given at first diagnosis of TB were in both groups about 4.5 per session and messages recalled were between 3 to 3.5 messages. Examples for messages given and recalled are given in Appendix II.

Discussion

The study identified the following factors to be associated with compliance with the DOT strategy, which could serve as

Table 9: Group means, standard deviations and significance tests of health beliefs and other variables for the compliant and non-compliant groups (scored from 1=strongly agree to 5=strongly disagree)

Variables	Compliant (n=81) M (SD)	Non-compliant (n=55) M (SD)	Univariate F-ratio
Health Belief Model (subscales)			
1. Motivation (5 items)	14.37 (5.33)	13.67 (4.67)	.611
2. Perceived susceptibility (4 items)	8.84 (2.40)	8.91 (2.47)	.028
3. Perceived severity (4 items)	7.04 (2.49)	6.65 (2.27)	.846
4. Perceived benefits (4 items)	6.16 (2.33)	5.61 (1.65)	2.267
5. Perceived barriers/costs (4 items)	9.94 (2.79)	10.09 (2.62)	.195

Table 8 indicates substance use and family and community history of tuberculosis of the participants.
Both past 6 months alcohol and tobacco use seemed with more than 30% high in both compliant and non-compliant tuberculosis patients. Every fourth (about 25%) in both groups had a family member who had tuberculosis. There were no significant differences between compliant and non-compliant patients.
Table 9 indicates the components of the Health Belief Model regarding tuberculosis.

Both compliant and non-compliant patients rated tuberculosis as a severe disease, saw strong benefits in taking medication, felt somewhat susceptible towards tuberculosis, and appeared to have not much motivation for treatment. There were no significant differences between the compliant and non-compliant groups. Even the analysis of individual items of the 21-item Health Belief Model questionnaire did not show any significant difference on any item between the compliant and non-compliant group.

Table 10 indicates the analysis of the health practitioner-patient interaction at first diagnosis.

The overall percentage of cases classified correctly was 61.1%. cases out of 81 (57.9%) of the compliant cases were identi-

a basis for planning educational and health promotive interventions for the improvement of the DOT strategy in the Limpopo Province:

Case detection; Lesser use of herbs, warm fluid/water, and visiting of traditional and faith healer
In this sample diagnosis of TB was made about 2.7 months after the onset of symptoms. Among a rural sample in Botswana a median delay period of 12 weeks was found for the anti-TB treatment in modern medicine (Steen & Mazonde, 1999: 165).
In this sample more than 27% had used herbs, more than 25% had visited a traditional healer and 43% over-the-counter drugs prior to TB diagnosis. Steen and Mazonde (1999: 166) also found in Botswana that 52% of the subjects tried one or more alternative treatments during the delay period. After modern treatment had started in this sample the utilization of alternative treatment modalities dropped, whereas in Botswana 47% of the subjects visited or planned to visit a traditional or faith healer (Steen & Mazonde, 1999: 169). Brouwer, Boeree, Kager, Varkevisser and Harries (1998: 232) found that 37% of TB patients visited a traditional healer before seeking regular medical care in Malawi. In Ethiopia therapeutic preference hinges on the utilization of ethnobotanical remedies (Vechiato, 1997: 185f.). Liefooghe, Baliddawa, Kipruto, Vermeire and De Munynck (1997: 812) reported that the delay in diagnosis of TB, was partly, a result

of health-care-seeking practices held by PWT.

Demographic and socio-economic factors were not identified as discriminating factors between compliant and non-compliant groups

Liam, Lim, Wong and Tang (1999: 300) also found that compliance with treatment was not affected by age, sex, ethnic group, educational level, occupation, extent of knowledge, tuberculosis symptoms, hospitalisation for tuberculosis. Demographic factors such as age, sex, race, ethnicity, occupation, income, and education are often included in successful treatment of tuberculosis, however, such variables are inconsistent or unreliable predictors of patient adherence (Sumartojo, 1993: 1311). Nuwaha (1997: 690) found in TB patients in Uganda that gender and age was not associated with compliance. Werf, Dade and Van der Mark (1990: 249) found in TB patients in rural Ghana that lower educational level, female gender and younger age was associated with compliance.

Causative beliefs (germs, smog/smoke, and tobacco smoking)

Barnhoorn and Adriaanse (1992: 301) only found witchcraft associated with compliance. Steen and Mazonde (1999: 169) found similar causative beliefs in Botswana such as heavy work, dusty, smoking, from other TB patients, drinking, germs and witchcraft. However, in this sample heredity was also mentioned, likewise in a community sample in the Philippines (Nichter, 1994: 649). Heredity and hard work were often reported in Vietnam (Liam, Lim, Wong & Tang, 1999: 300). Nichter (1994: 650) found among Filipina TB patients that cigarette smoking was associated with TB not only through the perception that smoke was harmful for the lungs, but because it was observed that smoking sometimes reduced appetite. This study found other causative beliefs of lower importance such as hard work and witchcraft. Overwork and exposure to the elements (as well as excessive sexuality) were perceived to weaken the body among Filipinas. Overwork was a risk factor for pulmonya, an illness thought to weaken the lungs, predisposing people to TB (Nichter, 1994: 650). DeVilliers (1991: 70) felt that for Xhosa TB patients witchcraft was important. In a study in Honduras 57% of the TB patients studied believed that they would contract the disease by using the eating utensils of someone afflicted by TB (Mata, 1985: 57). Dalal and Singh (1992: 193) found among hospitalised male TB patients in India that similar causative beliefs as in this study, namely inadequate diet, strenuous work routine, unhygienic practices, and addiction. Scientifically founded beliefs are that TB is not transmitted by sharing meals or cutlery, by kisses, hugs, or sexual relationships.

Knowledge

In this study both compliant and non-compliant groups seemed to have basic knowledge about tuberculosis in terms of causes, transmission modes and treatment. However, knowledge did not discriminate between compliant and non-compliant group. Other studies have demonstrated that knowledge about an illness, its origins, its dangers, or its treatment in itself does not necessarily lead to improved compliance (Sbarbaro, 1990: 325f.).

Quality of practitioner-patient relationship: Health practitioner-patient interaction score; Quality of communication

Enarson, Grosset, Mwinga, Hershfield, O'Brien, Cole and Reichman. (1995: 809) feel that the quality of the patient and provider relationship has a strong influence on treatment adherence. Chaulet (1987: 21) suggests that for improving compliance in TB patients: a personal interview with the patient lasting at least 20 min, to identify his social, occupational, and family problems, as well as his perception of the disease and its treatment, and the development of personal contact between the patient, the physician, and the nurses throughout treatment. In this study the interview with the physician did not normally include the social history of the patient, occupational and family problems as well as the perception of the disease as it was rated from the health practitioner-patient interaction score. Health care providers do need training on the importance of health education to encourage treatment completion (see also Khan, Walley, Newell & Naghma,

Table 10: Analysis of health practitioner-patient interaction

Variables	Compliant (n=81) M (SD)	Non-compliant (n=55) M (SD)	Univariate F-ratio
1. Health practitioner-patient interaction score	9.82 (7.90)	6.95 (7.09)	3.275*
2. Messages given by health practitioners (doctor, nurses, DOT coordinator)	4.50 (2.48)	4.41 (2.55)	.022
3. Messages recalled by patient (doctor, nurses, DOT coordinator)	3.04 (2.20)	3.50 (1.80)	1.171

$^{***}p<.001$, $^{**}p<.01$,$^{*}p<.05$

2000: 247).
This study found that messages on the instructions by the physician recalled were not associated with compliance. However, the patient recalled more than half of the messages given soon after the consultation. Sbarbaro (1990: 325) reviews that roughly half the statements made to a patient will be forgotten within five minutes.

Patient characteristics

In this sample about 25% indicated that they had a family member and 28% a community member who had had TB. Westaway and Wolmarans (1994: 447-9) found among urban South Africans that 48% of tuberculosis patients had a family history of TB and 60% knew someone who had TB in the community.

Appendix I

Demographic and socio-economic predictors of non-compliance with treatment

Variable	Description
Sex	Patient's sex. Coded 0 for men, 1 for women
Age	Patient's age, measured in years
Marital status	Coded 0 for single or divorced or widowed, 1 if married or living with partner
Type of family	The type of the patient's family: either nuclear coded 0 or joint coded 1
Size of family	Number of persons of the patient's family
Education	Patient's formal schooling. Coded 0 if no formal schooling (illiterate), 1 if primary, 2 if secondary, and 3 tertiary
Occupation of patient	Coded 0 if none, 1 housewife, 2 gardener, 3 security officer, driver, mechanic, 4 if police officer, 5 if teacher and 6 if lecturer, businessman, manager
Place of residence	Place of habitat of the patient. Coded 1 if rural, 2 if urban
Income	Coded 0 if none, 1 if R 1-R999, 2 if R1000-R2999, 3 if R3000-R6999, 4 if R7000 above
Type of house	The type of house the patient lived in. Coded 1 for Mukhukhu/zozo, 2 for thatched mud house, 3 for thatched brick house, 4 mud house with corrugated iron, 5 brick house with corrugated iron, and 6 for brick house with tiles
Type for fuel	The type of fuel used in a household to cook, Coded 1 for firewood, 2 for paraffin, 3 for gas, and 4 for electricity
Religion	Coded 0 if African or traditional religion, 1 if healing church (Zion Christian Church, Apostolic), and 2 if Christian Protestant or Catholic

Limitations

In common with other researchers' findings was that the factors associated with compliance and non-compliance seem to differ, and in some areas no clear differences were found to different studies (Khan, Walley, Newell and Naghma, 2000: 247).

Conclusion

This study has proved useful in the determination of factors that must be taken into account while designing DOT interventions, which are acceptable and feasible, and therefore likely to be effective in South Africa. Most important of these factors are: quality of health provider – patient relationship and causative belief. They have shown that powerlessness can be thought of as a broad risk factor for improving the delivery of DOT programme; and empowerment or control over one's destiny, as an important strategy. These findings need to be characterized as preliminary until the concepts can be tested directly in the Limpopo Province of South Africa. If these findings hold, health promotion practitioners should begin adopting an empowerment education approach. Researchers need to measure more accurately the psychological, interpersonal, organizational and community changes that can occur as people participate in their communities to improve individual and social health. This should be reflected in a systematic planning process, which seeks to empower individuals with understanding, motivation and skills; and an active engagement in community affairs to improve their quality of life.

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Appendix II: Examples of transcripts and analysis of doctor-patient messages

X=No of messages given **Y=No of messages recalled**

Messages given	Type of message given	X	Messages recalled	Type of messages recalled	Y
[#25] - You have got TB. - It takes six months be cured when you take treatment correctly. - You have to come back after two so that we check how treatment works and when you are better we give further treatment which you take for four months and then we check you if you are cured. - We are going to look for someone in the community who will supervise you while taking treatment. - The TB officer will accompany home when you are discharged. - Every time when you take medication you must tick on the green card. - If you take your treatment regularly you will completely get cured.	Diagnosis (1), Treatment duration (1), Treatment course (3), Support available (1) Prognosis (1)	7	- They said TB takes six months to be cured. - They said I have take this pills for two months and then they will others pills. - They said the TB officer will explain to me treatment works.	Treatment duration (1), Treatment course (1), Support available (1)	3
[#27] - You have got TB. - TB is curable if you take medication properly. - You are going to take treatment for six months. - You have to come back after two so that we check how treatment works and when you are better we give further treatment which you take for four months and then we check you if you are cured. - If you don't take treatment you will be admitted here again and the disease will be worse.	Diagnosis (1), Prognosis (1), Treatment duration (1), Treatment course (1) Treatment adherence (1)	5	- They said I should not stop taking treatment. - They said I have to take treatment for six months.	Treatment duration (1), Treatment adherence (1)	2
[#39] - Sputum results show that you got TB. - You have to take treatment for six months. - You must be supervised while taking treatment, to be sure that you're taking it. - The TB officer will drive you home and explain. other things you have to know about TB treatment. - You have to come back after two so that we check how treatment works and when you are better we give further treatment which you take for four months and then we check you if you are cured. - Some patients do not finish their treatment, after two months or so they stop thinking they are cured, don't follow suit, because illness come back and you'll infect those around you.	Diagnosis (1) Treatment duration (1) Adherence to treatment (1) Results of non-compliance (1) Support available (1) Treatment course (1)	6	- He said when one is suffering from TB he should tell the doctor everything that he feels. - He said I should take treatment for six months. - I have to tick on the green card every time I take medication. - He said there would be a person to supervise me while taking treatment. - He said TB is infectious.	Treatment duration (1) Adherence to treatment (1) Treatment course (2)	4

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References

BARNHOORN, F & ADRIAANSE, H 1992: In search of factors responsible for non-compliance among tuberculosis patients in Wardha district, India. Social Science & Medicine. 34: 291-306.

BOESCH, EE 1988: Doctor patient interaction in Thailand. Saarbrücken: Institute for Social Psychological Development Planning.

BROUWER, JA; BOEREE, MJ; KAGER, P; VARKEVISSER, CM & HARRIES, AD 1998: Traditional healers and pulmonary tuberculosis in Malawi. International Journal of Tuberculosis & Lung Disease. 2: 231-234.

CHAULET, P 1987: Compliance with anti-tuberculosis chemotherapy in developing countries. Supplement to Tubercle. 68: 19-24.

DALAL, AK & SINGH, AK 1992: Role of causal and recovery beliefs in psychological adjustment to a chronic case. Psychology and Health. 6: 193-203.

COMOLET, TM; RAKOTOMALALA, R & RAJAONARIOA, H 1998: Factors determining compliance with tuberculosis treatment in an urban environment, Tamatave, Madagascar. International Journal of Tuberculosis & Lung Disease. 2: 891-897.

DE VILLIERS, S 1991: Tuberculosis in anthropological perspective. South African Journal of Ethnology. 14: 69-72.

ENARSON, DA; GROSSET, J; MWINGA, A; HERSHFIELD, K; O'BRIEN, R; COLE, S & REICHMAN, L 1995: The challenge of tuberculosis on global control and prevention. The Lancet. 346: 809-819.

FLOYD, K; WILKINSON, D & GILKS, C 1997: Comparison of cost effectiveness of directly observed treatment (DOT) and conventionally delivered treatment for tuberculosis: experience from rural South Africa. British Medical Journal. 315: 1407-1411.

FOURIE, PB 2000: TB in South Africa: the burden of tuberculosis in South Africa. *www.healthnet.org.za.*

GARNER, P 1998: What makes DOT work? The Lancet 352: 1326-1327.

GLATTHAAR, E & BERENDS, LJA 1995: The community and TB control: a success story. The Community and TB Control. 6: 179-186.

JARAMILLO, E 1999: Tuberculosis and stigma: predictors of prejudice against people with tuberculosis. Journal of Health Psychology. 4: 71-79.

KHAN, A; WALLEY, J; NEWELL, J & NAGHMA, I 2000: Tuberculosis in Pakistan: socio-cultural constraints and opportunities in treatment. Social Science & Medicine. 50: 247-254.

KLEINMAN, A 1980: Patients and healers in the context of culture. *Boston*: Harvard University Press.

LIEFOOGHE, R; BALIDDAWA, JB; KIPRUTO, H; VERMEIRE, C & DE MUNYNCK, AO 1997: From their own perspective: a Kenyan community's perception of tuberculosis. Tropical Medicine and International Health. 2: 809-821.

LIAM, CK; LIM, KH; WONG, CM & TANG, BG 1999: Attitudes and knowledge of newly diagnosed tuberculosis patients regarding the disease, and factors affecting treatment compliance. International Journal of Tuberculosis & Lung Disease. 3: 300-309.

MACLACHLAN, M 1997: Culture and health. Chichester: John Wiley.

MATA, JI 1985: Integrating the client's perspective in planning a tuberculosis education and treatment program in Honduras. Medical Anthropology. 9: 57-64

METCALF, CA; BRADSHAW, D & STINDT, WW 1990: Knowledge and beliefs about tuberculosis among non-working women in Ravensmead, Cape Town. South African Medical Journal. 77: 408-411.

NAZAR-STEWART, V & NOLAN, CM 1992: Results of a directly observed intermittent isoniazid preventive therapy program in a shelter for homeless men. American Review of Respiratory Disease. 146: 57-60.

NICHTER, M 1994: Illness semantics and international health: the weak lungs/TB complex in the Philippines. Social Science & Medicine. 38: 649-663.

NIVEN, N 1994: Health psychology. Edinburgh: Churchhill Livingstone.

NUWAHA, F 1997: Factors influencing completion of treatment among tuberculosis patients in Mbarara District, Uganda. East African Medical Journal. 74: 690-693.

O'LEARY, A 1985: Self-efficacy and health. Behaviour Research and Therapy. 23(4): 437-451.

PELTZER, K 1998: A community survey of traditional healers in South Africa (Northern Province). South African Journal of Ethnology. 21: 191-198.

PELTZER, K 2001: Factors at follow-up associated with adherence with directly observed therapy (DOT) for tuberculosis patients in South Africa. Journal of Psychology in Africa. 11(2): 165-185.

RIDEOUT, M & MENZIES, R 1994: Factors affecting compliance with preventive treatment for tuberculosis at Mistassini Lake, Quebec, Canada. Clinical & Investigative Medicine. 17: 31-36.

RUBEL, AJ & GARRO, LC 1992: Social and cultural fac-

tors in successful control of tuberculosis. Public Health Reports. 32: 626-635.

SBARBARO, JA 1990: The patient-physician relationship: compliance revisited. Annals of Allergy. 64: 325- 331.

STEEN, TW & MAZONDE, GN 1999: Ngaka ya setswana, ngaka ya sekgoa or both? Health seeking behaviour in Botswana with pulmonary tuberculosis. Social Science & Medicine. 48: 163-172.

SUMARTOJO, E 1993: When tuberculosis treatment fails: a social behavioral account of patient adherence. American Journal of Respiratory and Critical Care Medicine. 147: 1311-1320.

VECHIATO, NL 1997: Sociocultural aspects of tuberculosis control in Ethiopia. Medical Anthropology Quarterly. 11: 183-201.

WERF, VDTS; DADE, GK & VAN DER MAEK, F 1990: Patient compliance with tuberculosis treatment in Ghana: factors influencing adherence to therapy in a rural service programme. Tubercle. 71: 247-252.

WESTAWAY, M; CONRADIE, PW & REMMERS, L 1991: Supervised outpatient treatment of tuberculosis: evaluation of a South African rural programme. Tubercle. 72: 140-144.

WESTAWAY, M & WOLMARANS, L 1994: Cognitive and affective reactions of black urban South Africans towards tuberculosis. Tubercle and Lung Disease. 75: 447-453.

WILKINSON, D 1994: High-compliance tuberculosis treatment programme in a rural community. Public Health. 343: 647-648.

WILKINSON, D & DAVIES, GR 1997: Coping with Africa's increasing tuberculosis burden: are community supervisors an essential component of the DOT strategy? Tropical Medicine and International Health. 2: 700-704.