

## Factors that Contribute to Tuberculosis Control in Primary Health Care Services at Mutale Primary Health Care Sub-District of the Limpopo Province, South Africa

Takalani G. Tshitangano\*, Supa Pengpid\*\* and Karl Peltzer\*\*\*

\**Department of Public Health, University of Venda for Science and Technology, South Africa*

\*\**National School of Public Health, University of Limpopo (Medunsa Campus), South Africa*

\*\*\**Human Sciences Research Council and University of the Free State, South Africa*

**KEYWORDS** Tuberculosis Cure Rate. Patient Factors. Health System Factors. DOT Supporter Characteristics

**ABSTRACT** The aim of the present study was to analyze factors associated with TB control at Mutale health sub-district in the Limpopo Province of South Africa. Using a cross-sectional descriptive study design health care providers (n=72 professional nurses), DOT supporters (n=78) and TB patient's (n=66) from 22 Primary Health Care (PHC) clinics were interviewed with a semi-structured questionnaire. The results are divided into three parts: (1) TB patient's characteristics, (2) the DOT supporter's characteristics, and (3) health-care provider characteristics. Comparing best (cure rate of e" 85%= 9 clinics) with poor TB controlling clinics (cure rate of <85%=13 clinics), lack of TB compliance was associated with poor TB knowledge among patients, perceived inaccessibility of health workers, lower experience and poor TB knowledge of DOT supporters, poor TB knowledge of health-care providers, poor TB management and lack of TB resources. Based on the multiple factors found contributing to tuberculosis control in this study recommendations made included improvement of human resources, training of health-care workers, substance use counselling of patients, special and legislative support.

### INTRODUCTION

South Africa is a high tuberculosis (TB) burden country and has one of the worst TB epidemics in the world; in 2007 the incidence of all forms of TB (including people with HIV) was 848 per 100,000 population per year and the TB prevalence was 692 per 100,000 population per year (WHO 2009). Although TB is a notifiable disease in South Africa, the quality of notification and reporting varies. The case detection rate of smear-positive cases in 2007 for Directly Observed Treatment Short course (DOTS) programmes was 78% in South Africa (WHO 2009). Current treatment adherence and cure rates are poor by World Health Organization (WHO) standards. Out of the 53 districts nationally, 25 have cure rates of less than 50%: way below the WHO target of 85% of new smear positive cure rate (Barron et al. 2007). The TB cure rate in Limpopo Province was 60.8% in 2006 (Department of Health 2007).

According to the World Health Organization (WHO 1994), the poor TB programme was seen as the main reason for the increasing global TB burden. The National Tuberculosis Control Programme (NTCP) (Department of Health 2000) indicates that poor patients' compliance is a contributing factor to low cure rate in South Africa. Barhoorn and Adriaanse (1989) in their study of factors responsible for non-compliance among tuberculosis patients in Wardha District, India, identified the several factors as barriers to patients' compliance with TB treatments, including leaving home travelling, fare of transport, inadequately informed patients, ill-informed helpers, unclear instructions about drug regimen and absence of a supportive person. According to Rabahi et al. (2002) factors associated with poor compliance with TB treatment included its complexity and duration, adverse side effects, difficult access to health-care services, alcohol consumption, lack of preventive treatment and unemployment.

Since 1996, the South African National Department of Health has adopted the DOTS strategy of WHO. This strategy is trusted all around the world because of its ability to produce a cure rate of upto 96% (Department of Health 2000). With this strategy South Africa aimed to

---

*Address correspondence to:*  
Prof. Karl Peltzer  
Social Aspects of HIV/AIDS and Health (SAHA)  
Human Sciences Research Council (HSRC), Private Bag  
X41, PRETORIA 0001, South Africa  
*E-mail:* kpeltzer@hsrc.ac.za

increase the case finding to 70% and the cure rate to 85% by 2005 (Dick et al. 2005). Despite availability of an effective TB control strategy, South Africa is still failing to achieve the aimed targets.

The aim of the present study was to analyze factors associated with TB control (health-care provider characteristics, DOT supporter characteristics and TB patients characteristics such as TB knowledge, implementation of the TB control policy, availability of necessary TB control resources, TB drug adherence) in Primary Health-care (PHC) services at Mutale health sub-district in the Limpopo Province of South Africa.

## METHODS

### Sample and Procedure

This quantitative, cross-sectional descriptive study was carried out in 22 Primary Health-care (PHC) clinics of Mutale health sub-district, Limpopo province of South Africa. These clinics were grouped and categorized as best and poor TB controlling clinics, based on their 2004 cure rate statistics. Clinics that achieved the cure rate of <85% (13 in number) were regarded as poor TB controlling clinic, whereas clinics that achieved a cure rate of e" 85% (9) were regarded as best TB controlling clinic. 13 poor TB controlling clinics as well as 9 best TB controlling clinics from the sub-district participated in the study.

All 72 professional nurses (36 from the best TB controlling clinics and 36 from poor TB controlling clinics) participated in the study. Only 33 TB patients from poor TB controlling clinics and 33 TB patients from best TB controlling clinics could be recruited for participation in the study. Furthermore only 39 DOT supporters from poor TB controlling clinics and 39 from best TB controlling clinics could be recruited for participation in the study.

Nurses, DOT supporters and TB patients were interviewed by the first author face-to-face in a private place in the clinic area with a semi-structured questionnaire after informed consent had been obtained. Responses from interviewees were written by hand on the semi-structured questionnaire by the interviewer. In order to protect the confidentiality and anonymity of the interviewees, the questionnaire used did not indicate any identifying information of the interviewee. Interviews with DOT supporters and

patients were done on specific days after they had been invited to the clinic. Professional nurses were for the sake of the interviews divided into two groups, i.e. those who are on -duty and those who are off -duty. All instruments were translated into Tshivenda (mother tongue of the participants) and translated back to English according to scientific standard procedures. An expert in the field of TB management was consulted for comments on the used TB terminology, relevance of the content and whether the instrument was covering all of the important aspects of TB control. All instruments were pre-tested and adjusted before using for data collection. The ethical clearance certificates were obtained from Faculty of Health Sciences and the Health, Safety and Research Ethics Committee of the University of Venda and the Research Committee of the Department of Health and Social Development, Limpopo Province.

### Measure

The measure was developed on the basis of a literature review; it consisted of three sections:

(a) *For Health-care Providers:* A 12-item measure to assess the level of health workers' TB control knowledge, e.g. How many sputum specimens should be taken for PTB investigation? How is the progress of PTB monitored? What is the recommended practice if TB bacilli are susceptible to drugs at three months of intensive phase? And 8 items to evaluate the implementation of TB control policy, e.g. Awareness of the TB control policy? Received training on TB control policy? Management of irregular TB attendance? Tracing of TB contacts, and a 32 item TB resources availability checklist, e.g. large poster of TB symptoms, empty sputum of specimen bottles, TB drugs for intensive/continuation phase, Pyridoxine for side effects, DOT supporters.

(b) A questionnaire for *DOT supporters and patients* aimed to measured level of TB knowledge services provided and drug adherence with 18 close-ended items, e.g. TB is transmitted through sexual intercourse; shortness of breath and chest pain are common symptoms of TB. A person co-infected with HIV and TB, his TB cannot be cured. With 24hrs treatment regimen a person will no longer be infectious to others.

### Data Analysis

The computer statistical software for social

sciences research (SPSS) was used to analyze the data. Data were first organized by means of frequency distributions and percentages. The Mann-Whitney U, Fisher's Exact Tests and the Student T-test were used to compare the findings between the best TB controlling and poor TB controlling clinics at an alpha value of  $< .05$ . The level of TB knowledge and the extent of policy implementation among the nurses were categorized into four categories; 1) poor and low = 49% and less, 2) satisfactory = 50-64%, 3) and 4) good = 65-74%, excellent = 75% and above.

## RESULTS

The results are divided into three parts: (1) TB patient's characteristics, (2) the DOT supporter's characteristics, and (3) health-care provider characteristics.

### (1) TB Patients' Characteristics

*Demographic and Health Characteristics of TB Patients:* Sixty-six TB patients participated in this study, 53% were female, 95.4% black African, 44% were single, a minority (19%) was employed, and one in three (35%) had completed secondary school.

TB patients were also suffering from various chronic conditions e.g. diabetes mellitus, cancer,

hypertension, and interestingly 5(8.6%) of them could disclose their HIV/AIDS status. The majority (67.7% from best TB controlling clinic as compared to 96.6% from poor TB controlling clinics) was taking other medication with TB treatment. 65.7% of respondents from the best TB controlling clinics and 90.3% of the respondents from poor TB controlling clinics drink alcohol. Out of this number 82% have been drinking alcohol for more than 5 years and two third (75%) drinks alcohol more often in a week. The majority (70.6% from best TB controlling as compared to 96.7% from poor TB controlling clinics) of the respondents smoke cigarettes. The majority of the patients (96.4% from best TB controlling clinics as compared to 65.5% from Poor TB controlling clinics) smoke more than one pack of cigarette in a day (see Table 1).

### *Patient's TB Knowledge*

There was a significant difference in the level of TB knowledge between patient from best and poor TB controlling clinics at a p value  $< .000$ .

### *A Comparison of Patient's Adherence Indicators by Clinics*

Table 2 reports the comparison of the proportion of patient's adherence indicators

**Table 1: TB Patients' health history and behaviour**

<i>Patients' TB health and risk related history</i>		<i>Patients from 2 categories of clinic</i>			
		<i>Best controlling clinic</i>		<i>Poor controlling clinic</i>	
		<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
Which of these diseases are you suffered from?	Diabetes Mellitus	7	23.3	1	3.6
	Cancer	3	10.0	0	0
	Stress	2	6.7	10	35.7
	HIV/AIDS	0	0	5	17.9
	Hypertension	11	36.7	0	0
	Asthma	3	10.0	0	0
	Mental condition	3	10.0	12	42.9
Currently taking any other medication	Heart	1	3.3	0	0
	Yes	21	67.7	28	96.6
Do you drink alcohol?	No	10	32.3	1	3.4
	Yes	23	65.7	28	90.3
For how long have you been drinking alcohol?	No	12	34.3	3	9.7
	<5 Years	20	87.0	21	77.8
How often do you drink?	>5 Years	3	13.0	6	22.2
	Only on Weekends	5	19.2	9	30.0
Do you smoke?	More Often	21	80.8	21	70.0
	Yes	24	70.6	29	96.7
How many cigarettes do you smoke daily?	No	10	29.4	1	3.3
	More than 1 packet	27	96.4	19	65.5
	Less than 1 packet	1	3.6	10	34.5

between best and poor TB controlling clinic using Fishers Exact –test. There is no significant difference in the number of times patients had been on TB treatment when the two clinic groups were compared. A significantly higher percentage of respondents from best TB controlling clinics had defaulted treatment before when compared to poor TB controlling clinics at p-value < .05. There is no significant difference in the manner in which respondents feel about the expenses of getting TB treatments. Significantly higher percentages (80.6%) of respondents from poor TB controlling clinics found health workers inaccessible as compared to (5.9%) of respondents from best TB controlling clinics at p-value < .05. There is no significant difference in the respondents' value belief about TB treatments in both clinic groups (see Table 2).

## (2) DOT Supporter Characteristics

The DOT supporters from both types of

clinics have similar demographic characteristics. Two in three DOT supporters were between 18 to 35 years old, most (95%) were female, two in three (63%) were married, and 53% had completed secondary school.

## DOT Supporters' TB Related Experience

Table 3 shows three quarters (78.7% from best TB controlling clinics as compared to 67.9% from poor TB controlling clinics) of the respondents had a DOT supporting experience of more than 3 years. Almost all (95.8% best TB controlling as compared to 100% poor TB controlling) of the respondents have never suffered from TB in the last 5 years. Only two DOT supporters from best TB controlling clinics have suffered from TB in the past 5 years. Only few DOT supporters (29.2% from best TB controlling clinics as compared to 8.3% from poor TB controlling clinics) indicated that they live with someone that have suffered from TB. Almost all (96% best TB controlling as

**Table 2: A comparison of patients' compliance indicators by clinics using the Fishers' Exact Test**

Variable		Clinic group				P-value
		Best control clinic		Poor control clinic		
		N	%	N	%	
Times have been on TB treatment before	Two times	25	86.2	29	100.0	.056
	Three times	4	13.8	0	.0	
Previous TB treatment	Completed	5	17.2	17	54.8	.003 *
	Defaulted	24	82.8	14	45.2	
Expenses of TB treatment	Affordable	3	8.6	2	6.5	.558
	I cannot afford it	32	91.4	29	93.5	
Health workers taking care of TB patients	All are fine	32	94.1	6	19.4	.000 *
	Inaccessible	2	5.9	25	80.6	
Perception of TB Treatment	Ineffective	5	15.6	8	27.6	.204
	Effective	27	84.4	21	72.4	

\*Significant at P-value < .05.

**Table 3: DOT supporters' TB related experience**

DOT supporters' TB related experience		Patients from 2 categories of clinic			
		Best controlling clinic		Poor controlling clinic	
		N	%	N	%
Start engaging in TB patients support	Before 2003	37	78.7	19	67.9
	After 2003	10	21.3	9	32.1
Ever suffered from TB in the past 5 years	Yes	2	4.2	nil	nil
	No	46	95.8	28	100.0
Ever lived with someone who suffered form TB	Yes	14	29.2	2	8.3
	No	34	70.8	22	91.7
Ever received TB training or DOT supporting	Yes	48	96.0	28	100.0
	No	2	4.0	nil	nil
Distance from your house to the patient's	Within walking distance	49	98.0	26	96.3
	One has to be transported	1	2.0	1	3.7
Relationship with patients	Relative/family member	16	32.0	4	13.8
	Community member	34	68.0	25	86.2

compared to 100% poor TB controlling) had TB and DOT supporting related training and was staying within a walking distance away from the patients. The majority of the respondents were supporting community members and not relatives (68% best TB controlling as compared to 86.2% poor TB controlling) while the rest of them (32% best TB controlling as compared to 13.8% poor TB controlling) supported close relatives and family members

#### ***A Comparison of the DOT Supporters' Follow-Up Methods by Clinics Using Fisher's Exact Test***

Table 4 reports the comparison of DOT supporters' follow-up methods in best and poor TB controlling clinics using Fishers Exact-test. The table shows no significant difference in the DOT supporters' follow-up methods when the two clinic groups were compared, apart from one item, which ensures that patients have enough medicine for the next day. Surprisingly, all DOT (100%) supporters in poor TB control clinics had monitored and reminded the patients to replenish, which was significantly higher than in best TB controlling clinics at  $p$ -value  $< .05$ .

#### ***DOT Supporters TB Knowledge***

Overall most participants scored correct TB knowledge but there were also weaknesses, e.g. 75% of DOT supporters in this group could not remember that there is a possibility of developing side effects to TB drugs; and that within 24 hours of TB treatment regimen, a TB sufferer is no longer infectious to others (65.9%).

#### ***Comparison of the Mean Scores of TB Knowledge DOT Supporters By Clinics Using Student T Test***

The mean scores of TB knowledge of DOT supporters from best TB controlling clinics (82.35) was significantly higher than the mean scores of TB knowledge of DOT supporters from poor TB controlling clinics (76.47) at  $p$ -value  $< .05$ . However the mean percentage scores of DOT supporters' TB knowledge from both clinic groups was found to be above 75%, which is regarded as very good knowledge level.

The Relationship between the DOT Supporters' Activities and Patients' Compliance to TB Treatments By Clinics Using Mann Whitney U Test

**Table 4: A comparison of DOT supporters' follow-up methods by clinics using the Fishers' Exact test:**

Variable	Options	Clinic group				P-value
		Best control clinic		Poor control clinic		
		N	%	N	%	
Where do your patients receive their treatment?	They come to my house daily	5	10.0	2	6.9	.490
	I go to their homes daily	45	90.0	27	93.1	
How do you ensure that your patients have taken their daily medication?	Observe the patients as they swallow	43	87.8	27	93.1	.703
	Trust them to tell me that they have swallowed	6	12.2	2	6.9	
How do you ensure that the patients have enough medicines for the next day?	Patient checks and goes to the clinic for replenishment	7	14.6	0	.0	.041 *
	I monitor and remind the patient to replenish	41	85.4	29	100.0	
What makes the patient remember clinic appointments?	The patient remembers himself	2	4.0	0	.0	.529
	I take it upon myself to remind them	48	96.0	29	100.0	
Who fills the patients' treatment card?	The patient fills the card	2	4.0	1	3.6	1.000
	I do the filling of the card	48	96.0	27	96.4	
What do you do when a patient does not come for treatment?	Inform the health worker the 2nd day	44	89.8	24	82.8	.487
	Give them some time to rethink himself	5	10.2	5	17.2	
Have you ever received training related to TB or DOT supporting?	Yes	48	96.0	28	100.0	.534
	No	2	4.0	0	.0	

\*Significant at P-value  $< .05$

DOT supporters from best TB controlling clinics have significantly supported greater number of patients (45.2) as compared to poor TB controlling clinics (30.0) at p-value < .05. Results also found that a significantly larger number of patients supported from best TB controlling clinics (45.87) completed treatments as compared to poor TB controlling clinics (26.98) at p-value < .05. There was no difference in the number of patients who defaulted treatments between the best and poor TB controlling clinics. There was also no significant difference in the number of patients supported by one DOT supporter at once in both clinic groups, according to the Mann-Whitney Test (see Table 5).

### (3) Health-care Provider Characteristics

#### *Demographic Characteristics of the Health-care Providers*

The health providers from both types of clinics have similar demographic characteristics, two-thirds were professional nurses. About half of them were older than 35 years and married. The majority were female (75%), African (95%), had been working in the study clinics for more than 5 years (85%) and had had TB management training (84%).

#### *TB Control Knowledge and Implementation of TB Control Policy of Health-care Providers*

The mean TB knowledge score of health-care providers in best TB control clinics (41.7, SD =16.0) was found to be significantly higher than in the poor TB controlling clinics (25.0, SD 15.1), at P-value <.000. For example, when asked about the number of sputum smear specimen to be

collected for TB laboratory investigations, only 25.7% of health-care providers from poor TB controlling clinics as compared to 41.9% of health-care providers from best TB controlling clinics collect at least two sputum specimen. The remaining 74.4% from poor as compared to 58.6% from the best clinics are still collecting three sputum specimens. When asked about the time the first sputum is collected from a TB suspect, more than half (59.0%) of health-care providers from poor TB controlling clinics as compared to only 48.3% from best TB controlling clinics collect the first sputum from a TB suspect early the next morning whereas, half (51.7%) from best TB controlling as well as only 42.0% from poor TB controlling collect first sputum specimen on the spot during the first interview with the TB suspect. In order to monitor the progress of an adult TB patient, the majority of participants (80%) from poor as compared to 66.7% from best TB controlling clinics collect sputum smear specimen at 2 and 5 months of TB treatment. The remaining 20% from poor as compared to 33.3% from best TB controlling only monitor the progress at eight months. Approximately 60% of participants from poor as compared to 63.3% from best TB controlling clinics start with the continuation phase of TB treatment when sputum smears are negative at two months. The remaining 40% from poor as compared to 36.7% from best TB controlling clinics continue with the intensive phase of TB treatment for the third month. When smears are negative at three months, 50% from best TB controlling start with the continuation phase whereas another 50% send the sputum for culture and sensitivity. Only a small percentage (41.7%) from poor TB controlling considers starting the continuation phase of treatment when smears are negative at three months whereas more

**Table 5: DOT supporters' activities and compliance of patients to TB treatments by clinics using Mann-Whitney U Test.**

<i>Variables</i>	<i>Clinics groups</i>	<i>n</i>	<i>Mean rank</i>	<i>Sum of ranks</i>	<i>Mann-Whitney U (P- value)</i>
How many patients have you supported?	Best controlling clinics	49	45.12	2211.00	435.00 (.003)*
	Poor controlling clinics	29	30.00	870.00	
How many of your patients have completed their treatment?	Best controlling clinics	49	45.87	2247.50	349.50 (.000)*
	Poor TB controlling clinics	28	26.98	755.50	
How many of your Patients have defaulted?	Best TB controlling clinics	18	15.47	278.50	72.50 (.354)
	Poor TB controlling clinics	10	12.75	127.50	
When you supported more than one patient at a time how many were you supporting?	Best TB controlling clinics	22	18.43	405.50	67.50 (.071)
	Poor TB controlling clinics	10	12.25	122.50	

\*Significant at P-value < .05

than half (58.3%) sends the sputum for culture and sensitivity. When sputum smears are positive at two months of TB treatment, half (50%) of the participants from best TB controlling as compared to 63.4% from poor decides to start continuation phase of treatment whereas the other half (50%) from best TB controlling as compared to only a small percentage (36.9%) from poor TB controlling decides to give the third month of intensive treatment. When sputum smears are positive at three month of intensive phase of TB treatment, 62.5% of participants from poor TB controlling and only 46.7% from best TB controlling clinics start the continuation phase of TB treatments, whereas, only a small percentage (37.5%) of respondents from poor TB controlling clinics as well as 53.3% from best TB controlling clinics send the sputum smear for culture and sensitivity. If at three months of intensive treatment, the sputum smear are positive, but the TB bacilli is still susceptible to TB treatments, half (50% of participants from poor as opposed to only small percentage (38.71%) from best TB controlling clinics continue with the intensive phase of TB treatments where as another half (50%) of participants from poor TB controlling clinics as opposed to an alarming 63.3% from best TB controlling clinics further refer patients.

If at three months of intensive phase, sputum smear are positive and the TB bacilli is resistant, only a small percentage (22.5%) of participants from poor and as compared to 48.38% from best further refer patients, whereas 77.5% of participants from poor TB controlling clinics as compared to 51.72% of participants from best TB controlling clinics continue with the TB treatments. About 75.6% from poor as opposed to 61.3% from best TB controlling clinics could not describe what a cured TB patient is. The same applied to treatment completion; about 42.5% from poor as opposed to 83.87% from best could not describe what it is.

#### ***Implementation of the TB Control Policy***

The majority of the staff at both the best and poor TB control clinics were aware or implementing the TB control policy, e.g. 95% had a copy of the latest National TB control policy, 85% had received training related to the National TB control policy, 82% stated that their objectives for TB control was to achieve a TB cure rate of 85%, 78% indicated that in order to deal with

treatment interruption/ irregular taking of TB treatment at their clinic, if in the intensive phase of treatment, more than 10 doses are missed, patients are started on re-treatment TB regimen. There were no significant differences between the best and poor TB control clinics regarding implementation of the TB control policy.

#### ***Assessment of Availability of TB Control Resources***

The facilities observation checklist was coded as: when available resource = 1 and unavailable resource = 0. Mann-Whitney U test shows that significantly higher percentages of TB control resources were readily available (29.2) in best TB controlling clinics as compared to poor TB controlling clinics (20.6) at a p-value=.03.

For the majority of the respondents from both clinic groups, TB services were always available at their clinics, e.g. large posters of TB symptoms; empty sputum specimen bottles; hand basin; refrigerator; cooler bag; disposable gloves; broad-spectrum antibiotics; nurses of all categories; medication for intensive as well as continuation phase; TB register; green cards; blue cards; and large posters for TB treatments, labeling stickers for specimen; plastic bags for carrying specimen; water; black, blue and red pens; sputum collection book; and referral letters; the DOT supporters and large posters for TB treatments. Most (76%) also reported lack of transport for home visit and one in three revealed a shortage of weight scales.

## **DISCUSSION**

### **TB Patients**

In this study the socio-economic status, i.e. unemployed, living below poverty line and sharing their two-roomed houses with five other people were found to be associated with TB treatments. These findings are similar to a study of non-compliance in Brazil, which reported non-compliance associated with the worsening socio-economic conditions (Diniz et al. 2001). Another study by Connolly et al. (1999) in South Africa also revealed an association between unemployment and poor compliance.

The study also revealed a high rate of TB treatment default history among patients from best (82.8%) TB controlling clinic as compared to

the poor (45.2%) TB controlling clinics. These results differed from the findings of the study by Ashry et al. (1997) about the compliance with TB treatment in Alexandria in Egypt where only one-third of the patients were non-compliant. According to Singleton et al. (1997), poor compliance hinders TB control in the sense that TB patients cannot be cured and therefore the chain of transmission of TB within the population is not interrupted. Ashry et al. (1997) further argues that non-compliance with TB treatments result in treatment failure.

The study also found that about 80% of patients from best TB controlling clinics as opposed to about 93.5% from poor TB controlling clinics had family history of TB. According to Ashry et al. (1997), family history of TB is associated with compliance to TB treatments. This also means that the higher the rate of TB family history, the higher the rate of patients' compliance to TB treatments. This information is in line with the findings in this study. Patients from the poor TB controlling clinics whose TB family history was high (93.5%) were also found to be having a low (45.2%) non-compliance rate as compared to patients from best TB controlling clinics whose non-compliance rate was found to be high (82.2%).

The study also revealed significant higher TB knowledge mean scores of patients in best compared to poor controlling clinics, which is conforms with other studies (Barhoorn and Adriaanse 1989; Ashry et al. 1997; Peltzer 2001).

The study also revealed that the majority (80.6%) of TB patients from poor TB controlling clinics were not happy about the attitudes of the health-care providers taking care of TB patients. Similarly, in a study on the attributions of causes of TB in Limpopo Province of South Africa, Promtusananon and Peltzer (2005) found that the cooperation of health-care providers and patients was very poor such that, patients delayed seeking help from these health-care providers. The importance of good cooperation between patients and health-care providers cannot be overemphasized because according to Sumartoyo (1993), poor communication between the patient and the health-care provider can be the reason for poor TB control and can also make the health service difficult to access.

### **The DOT Supporters**

Barnhoorn and Adriaanse (1994) identified the

presence of social support, in particular, a person who establishes routine in taking pills and making control visit, a positive factor that contributes to TB control. Peltzer (2001) also documented in their study titled 'Delivery of the directly observed TB therapy in Limpopo South Africa' that DOT supporters are important because they form part of the TB counselling team. The present study found that 100% of TB patients at Mutale PHC sub-district had DOT supporters.

However, the study revealed a significant difference of supporting experiences between DOT supporters from best and poor TB controlling clinics. About 78.7% of DOT supporters from best TB controlling clinics had a supporting experience of more than 3 years as compared to 67.9% of DOT supporters from poor TB controlling clinics. No evidence was found to support or disagree with the findings of this study.

The study also revealed that the mean scores of DOT supporters' TB knowledge were much higher in best than poor controlling clinics. Despite the excellent DOT supporter's TB knowledge level, the majority of DOT supporters in this study did not know that there is a possibility of developing side effects to TB medications and what to do should side-effects occur. The results are also supporting Barhoorn and Adriaanse's (1989) study, which identified ill - informed DOT supporter as a predisposing and a barrier to TB control in India.

The study also revealed the difference in the relationship between the DOT supporters and the patients. The majority (86.2%) of DOT supporters from the poor TB controlling clinics were supporting community members as compared to only 68% from best TB controlling clinics. Furthermore, higher percentages (32%) of DOT supporters from best TB controlling clinics were supporting close relatives or family members as compared to only 13.8% from poor TB controlling clinics. The national DOT programme recommends that patients are encouraged to choose their own DOT supporters, preferably a non-family member such as shopkeeper, chief, teacher or any prominent member of the community. Study findings seem to differ on the appropriateness of family DOT supervision (Peltzer 2001; Walley et al. 2001).

### **The Health-care Provider**

The study has found that almost all (97.6%

from best TB controlling clinics as compared to 96.8% from poor TB controlling clinics) health-care providers were Africans with a tertiary nursing qualification. Almost all (97.4%) from both clinic groups had received TB management training in accordance with the National Tuberculosis control program guideline (Department of Health 2000). However the study revealed a significant difference in the TB patients' management experience among health-care providers from best and poor TB controlling clinics at a  $p$ -value  $< .05$ . About 93.9% of health-care providers from best TB controlling clinics were having more than 3 years experience as compared to about 80% from poor TB controlling clinics. Furthermore, the study revealed a significant difference in the mean score of health-care providers' TB knowledge when the two clinic groups were compared; health-care providers from best TB controlling clinics had a significantly higher mean score as compared to poor TB controlling clinics, e.g., not being able to describe what a cured TB patient or treatment completion is. It is common knowledge to think that a health-care provider, whose knowledge is poor, cannot teach the patient well enough to enable the patient to have good knowledge that is associated with compliance. According to Rabahi et al. (2002) poor compliance was associated with lack of treatment by health-care providers knowledgeable enough to treat TB patients. According to this study, lack of knowledge on the part of the health-care service provider leads to irregularities in the delivery of TB services.

The study found that only 25.7% of health-care providers from poor TB controlling clinics as opposed to 41.4 % of health-care providers from best TB controlling clinics collected at least two sputum specimens from a TB suspect, the practice which is in line with the National Tuberculosis Control Programme guideline (Department of Health 2000).

The study also found that when sputum smears are positive at two months of TB treatment, half (50%) of the participants from best TB controlling as compared to 63.4% from poor decides to start continuation phase of treatment whereas the other half (50%) from best TB controlling as compared to only a small percentage (36.9%) from poor TB controlling gives the third month of intensive treatment. Starting the continuation phase of TB treatment when smears are positive at two month is a

dangerous practice, which is similar to stopping TB treatments completely. Treatments that are used in the continuation phase are weak as compared to those that are used in the initial intensive phase. Starting these treatments when the smears are still positive may result in treatment failure or the development of MDR-TB. It is also not in line with the TB guideline (Department of Health 2000), which indicates that when the smears are positive at two month, another (3<sup>rd</sup>) month of intensive phase of treatment should be allowed.

Furthermore the study revealed that when sputum smears are positive at three month of intensive phase of TB treatment, 62.5% of participants from poor TB controlling as compared to only 46.7% from best TB controlling clinics start the continuation phase of TB treatments, whereas, only a small percentage (37.5%) of respondents from poor TB controlling clinics as compared to 53.3% from best TB controlling clinics send the sputum smear for culture and sensitivity. Starting the continuation phase of treatment at this time is an irregular practice because at this time no one is sure yet whether the bacilli is susceptible or resistant to TB treatment. Furthermore it is contrary to TB control guideline of South Africa (Department of Health 2000).

The study also found that if at three months of intensive treatment, the sputum smear are positive, but the TB bacilli is still susceptible to TB treatments, half (50% of participants from poor as compared to only small percentage (38.71%) from best TB controlling clinics continue with the intensive phase of TB treatments, where as another half (50%) of participants from poor TB controlling clinics as compared to an alarming 63.3% from best TB controlling clinics further refer patients. Continuing with treatments during this time is safe since it is known that the bacilli can still be destroyed by ordinary TB treatments. Furthermore this practice is in line with the TB control guideline (Department of Health 2000). Referring a patient will appear like tossing the patient around and wasting doctor's times of examining the patient, misusing government vehicles and nurses who will accompany that patient because the referral clinics will simply send the patient back for him to continue with the ordinary TB treatments.

Furthermore, the study revealed that if at three months of intensive phase, sputum smear are positive and the TB bacilli is resistant, only a

small percentage (22.5%) of participants from poor as compared to 48.38% from best further refer patients for further management, whereas 77.5% of participants from poor TB controlling clinics as compared to 51.72% of participants from best TB controlling clinics continue with the TB treatments. Referring patients for further management at this time is a proper practice since there may be a need for a change of TB drugs from ordinary to those that can treat MDR-TB. Besides it is a practice, which is in line with the NTCP (Department of Health 2000). Continuing with ordinary TB treatments at this time is a waste of treatment since they are no longer doing what they were meant to do (the cure of TB).

### **Implementation of the TB Control Policy**

The study has found that almost all clinics had a copy of the latest National TB control policy, the majority of health-care providers had received training related to the National TB control policy, and the majority of clinics had received sub-district TB coordinator supervision visits on a monthly basis. The study also revealed that the majority (73.4% from best TB controlling as compared to 82.1% from poor TB controlling) of the clinics indicated that in order to deal with treatment interruption/ irregular taking of TB treatment, if in the intensive phase of treatment, more than 10 doses are missed, patients are started on re-treatment TB regimen. This practice is in line with the South African TB policy guideline (Department of Health 2000). The small percentages (26.6% from best as compared to 17.9% from poor TB controlling clinics) that are not practicing as such are causing confusion in TB control. Considering the findings of the measurement of health-care providers' level of TB knowledge, which was done on the basis of the TB control policy guideline, the results are indicating that the National Tuberculosis Control programme is not effectively implemented in this sub-district. The results are confirming the findings of the study in Free State Province of South Africa, which found that the National Tuberculosis Control Programme was not effectively implemented in the province to an extent that it guides the local decision making, health system organization, resource allocation, health and community worker practice and the role of the community (Van Rensberg et al. 2005).

### **Availability of TB Control Resources in PHC Services**

The study found that most of TB control resources were readily available at both clinic types. About 69.2% from best TB controlling clinics as compared to 85.7% from poor TB controlling clinics reported lack of large posters for side effects of TB treatments. Such posters do not exist in South Africa. Their absence according to common knowledge may contribute to lack of knowledge regarding side effects of TB treatments. The study also found that about 35.5% of the respondents from both clinic groups revealed a shortage of weight scales (for measuring patient's weight). Lack of this resource means that patients are either getting under-dose or over-dose of TB medication since TB treatments depend on patients' weight (Department of Health 2000). The study also revealed that there was lack of transport for home visit, which was also found in other studies (e.g., Peltzer 2001). The study also revealed a lack of treatments for side effects (e.g. aspirin and pyridoxine). This means that those who develop side-effects are in trouble because their side-effects are not going to be treated or else they will have to spend some more money going to the hospitals for treatment of such side-effects. The TB guideline of South Africa (Department of Health 2000) advises that minor side-effects of TB treatments should be treated at clinic level using such medications as aspirin and pyridoxine. The presence of side effects has been found to associated with non-compliance (Ashry et al. 1997).

### **Limitations of Study**

This was a small cross-sectional survey, so no causal inferences and generalisation for the whole study area can be made.

### **CONCLUSION**

The National Department of Health should consider priorities of the clinics are supplied with necessary resources for TB control. Training of health-care providers is essential, especially in poor TB control clinics. All TB patients who drink alcohol and smoke cigarette should be engaged in withdrawal regimes and intensive counselling regarding drinking and smoking should be increased. TB patients who are concurrently

taking TB treatments together with other treatments for chronic medical conditions should be assigned a DOT supporter who is staying within a walking distance, who can assist them on a daily basis to prevent confusion posed by the complexity of too many medicines for different conditions. Legislation should be passed, which hold the patient accountable for defaulting TB treatments. Patients at risk of defaulting treatment should be confined to supervised intermittent ambulatory centres or sites which are known to achieve 89% of treatment completion.

### REFERENCES

- Barhoorn F, Adriaanse H 1992. In search of factors responsible for non-compliance among tuberculosis patients in Wardha district, India. *Soc Sci Med*, 34: 291-306.
- Barron P, Day C, Monticelli F 2007. *The District Health Barometer 2006/07*. Durban: Health Systems Trust.
- Bennett F 1998. *Community Diagnosis and Health Action: A Manual for Tropical and Rural Areas*. London: Macmillan Publishers Ltd.
- Connolly C, Davies GR, Wilkinson D 1999. Who fails to complete tuberculosis treatment? *Int J Tuberc Lung Dis*, 3(12): 1081-1087.
- Department of Health 2000. *National Tuberculosis Control Programme Guideline: South Africa*. Pretoria: Government Printers.
- Department of Health 2007. *Tuberculosis Strategic Plan for South Africa, 2007-2011*. Pretoria: Department of Health.
- Dick J, Murray E, Botha E. 2005. *The Effectiveness of TB DOTS Supporters in South Africa. Operations Research Results*. Bethesda, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project (QAP).
- Diniz LS, Gerhardt G, Miranda JA, Manceau JN 2001. Prognostic factors for pulmonary tuberculosis outcome in Recife, Pernambuco, Brazil. *Rev Panam Salud Pública*, 9(6): 5-15.
- Gad A, Mandil AMA, Sherif AAR, Gad ZM, Sallam S 1997. Compliance with antituberculosis drugs among tuberculosis patients in Alexandria, Egypt. *EMHJ*, 3(2): 244-250.
- Peltzer K 2001. Factors at follow-up associated with adherence with directly observed therapy (DOT) for tuberculosis patients in South Africa. *J Psychol Afr*, 11(2): 165-185.
- Promptusananon S, Peltzer K 2005. Perceptions of tuberculosis: attributions of cause suggested means of risk reduction and preferred treatment in Limpopo province, South Africa. *J Health Popul Nutr*, 23(1): 74-81.
- Rabahi MF, Rodrigues AB, Queiroz De Mello F, De Almeida Netto JC, Kritski AL 2002. Noncompliance with tuberculosis treatment by patients at a tuberculosis and AIDS reference hospital in midwestern Brazil. *Braz J Infec Dis*, 6(2):63-73.
- Singleton L, Turner M, Haskal R 1997. Long-term hospitalization for tuberculosis control. *JAMA*, 278(10): 838-842.
- Sumartojo E 1993. When tuberculosis treatment fails: A social behavioral account of patient adherence. *Am J Respir Crit Care Med*, 147: 1311-1320.
- Van Rensberg D, Van Rensberg-Bonthuysen EJ, Heunis C, Meulemans H 2005. Tuberculosis control in South Africa: reasons for persistent failure. *Acta Academica (Suppl.)*, 1: 1-55.
- Walley JD, Khan MA, Newell JN, Khan MH 2001. Effectiveness of the direct observation component of DOTS for tuberculosis: a randomised controlled trial in Pakistan. *Lancet*, 357(9257): 664-669.
- World Health Organisation (WHO) 1994. *Paragonimiasis Tuberculosis Diagnosis Confusion: A Review of the Literature*. Geneva: WHO.
- World Health Organisation (WHO) 2009. *Global Tuberculosis Control 2009: Epidemiology, Strategy, Financing*. Geneva: WHO.