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Adherence Parameters to Direct Observation Treatment Short-course (DOTS) Identified at Tuberculosis Treatment Centres of the South West Region, Cameroon

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Abstract

The implementation of Directly Observed Treatment Short-Course (DOTS) has been recommended by international tuberculosis authorities and has been shown to be effective in achieving a high successful treatment rate. Adherence to the strategy depends on education,

socio-demographic characteristics and many other socio-cultural factors. The aim of this study was to identify factors that enhance adherence to DOTS for use by all treatment centres where applicable. Specifically, to link all socio-demographic parameters to adherence and sought deviant groups for better health education on adherence. A cross-sectional study was conducted in Diagnostic and Treatment Centers (DTCs) with default rate, deaths and transfer rates of more than 10% in 2012 treatment outcome at the study site. Tuberculosis (TB) patients diagnosed of Sputum Positive Pulmonary Tuberculosis (SPPTB) participated in the study. Out of a total of 310 participants that took part in the study, a mean age of 39 years (± 10.8) registered. Majority of the participants 161(51.9%) were female. There was no statistical significance between adherence and socio-demographic factors but for age that showed a weak positive correlation. This means that persons at certain ages respond better to DOTS than other ages. The adherent age group could be used as educators to other age groups if health worker education needs to be complimented for better DOTS adherence.

Keywords: Directly Observed Treatment Short-course (DOTS), socio-demographic/ other factors, adherence

Introduction

Tuberculosis is an ancient disease yet it is so prevalent in our societies. In 1882 the microbiologist Robert Koch discovered the *Mycobacterium tuberculosis* at a time when one of every seven deaths in Europe was caused by TB [1]. The first genuine success against TB was in immunizing against tuberculosis. Developed from attenuated bovine strain of tuberculosis by Albert Calmette and Camille Guerin in 1906 was BCG (bacillus of Calmette and Guerin)[1]. Streptomycin the first antibiotic effective against *Mycobacterium tuberculosis* was discovered in the early 1940s and the use of this drug brought the infection under control[1].

Tuberculosis disease is treated with a standard six-month course of four antimicrobial drugs that are provided with information, supervision and support to the patient by a health worker or trained volunteer. Without such supervision and support, treatment adherence can be difficult and the disease can spread. The vast majority of TB cases can be cured when medicines are provided and taken properly. Without proper treatment up to two thirds of people

suffering from TB will die of the disease [2].

The World Health Organization (WHO) declared TB as a global emergency and devised the Directly Observed Treatment Short-course (DOTS) strategy and recommended that all countries adopt this strategy [1]. The essential features of DOTS strategy include government commitment to the TB control program, a secured supply of drugs, diagnosis based on sputum smear examination by microscopy in symptomatic patients, a reporting system and supervision of short course therapy using isoniazid, pyrazinamide and ethambutol including rifampicin in at least the intensive phase of treatment [3]. In 1994, based on the reported success of DOT in increasing treatment completion rates and preventing drug resistance, the World Health Organization (WHO) adopted DOT as a principal component of its global TB control strategy [4]. DOTS approach is the internationally recommended approach to TB control, which forms the core of the Stop TB Strategy [5]. This DOTS has been found to be an effective means of administering anti-TB drugs, significantly reducing the rates of relapse and drug resistance as well as improving the treatment compliance rate [4,6]. Recent global data show that the incidence rate of TB has been falling since 2004, the case detection rate reached 63% in 2007 and the treatment success rate 85% in 2006. Meanwhile the prevalence rate and the death rate shall be reduced to half, when compared with those of 1990 in at least three of the six WHO regions by the year 2015. But these targets will not be achieved for the world as a whole [7].

Some of the weaknesses in implementing the current TB programme and its strategy is that, the DOT strategy is only partially implemented in Cameroon because of financial constraints of patients to attend daily centers and because of lack of personnel and the fact that

Tuberculosis awareness is still too low among the health personnel and in the general population leading to diagnostic delays [8].

Directly Observed Treatment Short-Course (DOTS) is the internationally recommended control strategy for TB [10,11]. Countries with high rates of TB/HIV co-infection are the main focus of intensified efforts in DOTS expansion. [12].

To be classified as DOTS a country must have accepted and adopted the strategy by 2004 and must have implemented the four technical components of DOTS in at least part of the country [13]. The WHO advises that all TB patients should have at least the first two months of their therapy observed (and preferably the whole of it observed): this means an independent observer watching patients swallow their anti-TB therapy. The independent observer is often not a healthcare worker and may be a shopkeeper or a tribal elder or similar senior person within that society [14].

Irregular adherence to tuberculosis treatment causes therapeutic failure, leads to prolonged periods of infectiousness, provokes relapses, favors the emergence of drug resistance, and requires prolonged and expensive treatment schemes, which do not guarantee effectiveness, and finally, increases morbidity and mortality [8]. DOTS strategy is often not well applied because its implementation, especially in developing countries, is complex, has numerous barriers and needs enormous resources. This is why there are many adaptations (Partially Observed) depending on the context.

Non-adherence to TB medications decreases the chances of cure, increases the risk of relapse after treatment, and selects for drug-resistant TB strains. Any practitioner treating a patient for tuberculosis is assuming an important public health responsibility [15]. The practitioner must not only prescribe an appropriate regimen but also be capable of assessing the adherence of the patient to the regimen and addressing poor adherence when it occurs. By so doing, the provider will be able to ensure adherence to the regimen until treatment is completed [15].

Despite the establishment the lack of a strategy to search for defaulting patients, and limited supervision of the treatment affects adherence[16]. In many countries, because of incomplete application of effective care and control measures, tuberculosis case rates are either stagnant or decreasing more slowly than should be expected. This is especially true in high-risk groups such as persons with HIV infection among other socio-demographic parameters [17].

The proportion of patients with successful treatment decreased with age, while the proportion of deaths increased [18]. Being female patient, age 15–24 years, smear positive pulmonary tuberculosis, treatment with short course chemotherapy, and treatment at peripheral centers were associated with higher treatment success and lower defaulter rates [19]. Specifically, while some investigators have found older patients to have better adherence, others have shown younger patients to be more successful adherers [20].

Problem Statement

Since the adoption of DOTS strategy in Cameroon, The country and specifically the SWR has not been able to achieve the required annual cure rate of 85% [9]. The low cure rate might lead to an increase in the spread of TB in the community thereby frustrating the efforts of the National Tuberculosis Control Programme (NTBCP) and the Stop TB strategy.

Directly Observed Treatment Short-Course emphasis on early diagnosis of TB and also that patient take their complete treatment with education and under supervision and support from health care providers/family members to ensure that they are cured. Despite this, there have been variations among sufferers who adhere and those who do not

The relationship between patient adherence to TB treatment and patient socio-demographic /other factors which affects treatment outcome is not also known since most studies in Cameroon are focused on HIV/TB co-infection.

Research Question

- .What is the relationship between patient adherence to TB treatment and patient socio-demographic characteristics/ other parameters in the SWR?
- What is the nature of the Bivariate Analysis of adherence to DOTs among TB sufferers in the SWR

Objectives

1. To investigate the association between patient adherence to TB treatment following DOTs and patient socio-demographic characteristics/ other parameters.
2. To demonstrate bivariate analysis of parameters affecting adherence to DOTS in the SWR.

Method and materials

A cross-sectional study of TB patients at treatment sites within the study area was carried out. The common feature being that the study site is cosmopolitan, thickly populated, very mobile population and poor town planning. This can be the reasons why defaulting and transfer rates are high and also a high incident rate if compared to other Districts. BUT the socio-demographic and employer factors needed to be addressed. The target populations comprised of Sputum Positive Pulmonary TB Patients (SPPTB) diagnosed from September 2013 to June 2014 and were on treatment or had been on treatment from the study site.

The estimated sample size was 385 respondents who were registered in the Tuberculosis register and had completed treatment ,were admitted in the wards and those who have been on treatment for three months and above in the study area were willing to take part in the study. Sample size was calculated using a formula for estimating a single population proportion for a cross-sectional study of an infinite population, the maximum sample size at 95% confidence level and with a margin of error of 5%. A convenient sampling method was then used to select

the first 385 within the study period but 310 were accessed at the end of the period (all patients in the TB registers). Data collection was from case note study and a questionnaire to be sure of the socio-demographic data and the employer nature.

Results and Discussion

The characteristics of participants included in this analysis are presented in table 3 below. A total of 310 (including twelve (3.9%) participants who were found admitted in the wards during the period of data collection) participants were successfully enrolled and investigated in this study with a response rate of 80.5%. The mean age of participants was 39.1 years (SD: 10.8). Majority of participants 161 (51.93%) were females (Figure 4.2 below). More than half of the participants 122 (39.35%) and 109 (35.2%) had attained primary and secondary school levels of education and 175 (56.45%) and 102 (32.9%) were married and single respectively (figure - and - below).

Two hundred and ninety seven (95.8%) participants were gainfully employed but majority of them 247 (83.2%) work with the private sector (figure --). Two hundred and ninety seven (95.8%) were non-smokers and 175 (56.5%) were non-alcoholics.

Age and Adherence

The mean age of those who adhered to treatment was 39.8 ± 11.15 , while that for those who did not adhere was 37.4 ± 9.75 ($p=0.09$). Linear Regression gave a slope coefficient of 0.004 which means that, for every one year increase in age the percentage of those who adhere to treatment increases by 0.4% ($p=0.09$). Pearson correlation gave a correlation coefficient of 0.1 indicating that there is a weak positive correlation between age and adherence. Multiple logistic Regression gave an adjusted slope coefficient of 0.002 which was not statistically significant ($p=0.52$). This means that after adjusting for gender, levels of education, marital, employment, smoking and alcohol status for every one year increase in age percentage of adherence increases by 0.2. Pearson correlation gave an adjusted coefficient correlation of 0.2 still indicating a weak positive correlation between age and adherence.

Table 1: Socio-demographic characteristics of the study participants

Socio demographic characteristics	No	%
Gender		
Male	149	48.06
Female	161	51.93
Age: MEAN±SD (39.11 (10.82))		
Educational level		
None	3	1.0
Primary	122	39.4
Secondary	109	35.2
High school	57	18.4
Higher institute	19	6.2
Marital status		
Single	102	32.9
Married	175	56.5
Divorced	20	6.5
Widow	13	4.2
Occupation		
government	50	16.1
private	247	79.7
student	13	4.2

*No level of education means has not completed seven years in the primary education; Primary education involves at most seven years ;secondary level at most five years; high school level at most two years and higher institute involves attaining either a professional school or University education; frequency; frequency in percentage and SD means standard deviation.

The relationship between adherence and socio-demographic characteristic

Gender and Adherence

Of 216(72.5%) study participants who adhered to treatment, 118(54.6%) were females

And 98(45.7%) were males. Of the 82(27.5%) study participants who did not adhere to treatment, females were 38(46.3%) and males 44(53.7%) .The two groups showed statistical difference in their gender distribution ($p=0.20$). Logistic Regression gave an odds ratio of 1.39 which was statistically significant ($p=0.20$) meaning that females were 1.39 times (95%CI: 0.84-2.32) as likely as males to adhere to treatment. Multiple logistic regressions gave an adjusted odds ratio of 1.34 which was not statistically significant ($p=0.30$) meaning that after adjusting for other demographic variables in this study, females were 1.34 times (95% CI: 0.78-2.30) as likely to adhere as males.

Marital Status and Adherence

Of the 216 respondents who adhered to treatment, 66(30.6%) were single, 121(56.0.2%) were married, 10(4, 6%) were widow/widowers and 19(8.8%) were separated .Of 82 respondents who did not adhere to treatment, 31(37.8%) were single, 49(59.8%) were married, 1(1.2%) was a widow/widower and 11.2%) was separated. There was a significant difference in teams of marital status ($p=0.04\%$).

Logistic regression gave an odds ratio of 1.16 comparing married to singles meaning that married participants were 1.16 time (95% CI: 67-1.99) as likely to adhere to treatment compared to single subjects though it was not statistically significant ($p=0.59$). Multivariate analysis gave an adjusted odds ratio of 1.04 meaning married participants were 1.04 times (95% CI:0.53-2.02) as likely as singles to adhere to treatment after adjusting for confounding factors and it was not still significant ($p=0.92$).

Comparing widows/widowers to single subjects, logistic regression gave an odds ratio of 4.70 meaning that widows /widowers were 4.70 times (95%CI: 0.57-38.33) as likely to adhere to treatment as single participants and this was statistically significant ($p=0.15$). Multivariate analysis gave an adjusted odds ratio of 2.81 meaning widows/widowers participants were 2.81 times(95%CI:0.31-24.90) as likely as singles to adhere to treatment after adjusting for other socio-demographic factors in this study ($p=0.35$).

Comparing divorced participants to single participants, logistic regression gave an odds ratio of 8.92 meaning that participants who were divorced were 8.89 times (95%CI:1.14-61.70) as likely as singles to adhere to treatment and this was statistically significant ($p=0.04$). Multivariate analysis gave an adjusted odds ratio of 7.03 meaning divorce participants were 7.03 times(95% CI:0.83-59.53) as likely as singles to adhere to treatment after adjusting for other socio- demographic factors in this study and it was not significant ($p=0.07$).

Educational levels and Adherence

Educational levels were coded as primary, secondary and tertiary. Of the 216(72.5%) participants who adhered to TB treatment, 88(40.7%) attained primary level of education, 113(52.3%) attained secondary level of education and 15(6.9%) attained tertiary level of education. Of the 82(27.5%) participants who did not adhere to treatment, 27(32.9%) attained primary level of education, 51(62.2%) attained secondary level and 4(4.9%) attained tertiary level education. There was no significant difference in educational levels ($p=0.30$). Logistic regression gave unadjusted odds ratio of 0.68 comparing secondary education to primary/no level of education meaning that those with secondary level of education were 0.68 times (95%CI:0.39-1.17) as likely to adhere to treatment as those with primary /no level of education and this was statistically significant ($p=0.16$). Multivariate analysis gave an adjusted odds ratio of 0.73 meaning that those with secondary level of education were 0.73 (95%CI: 0.40-1.31) as likely as those with primary or no level to adhere to treatment after adjusting for age, sex, marital, alcohol, smoking and employment status and it was not statically significant ($p=0.29$). Comparing tertiary education to primary/no level of education, logistic regression gave an odds ratio of 1.15 meaning that those with tertiary education were 1.15 times(95% CI:0.35-3.76) as likely as those with primary /no level of education to adhere to treatment. There was no statistical significance ($p=0.82$). Multivariate analysis gave an adjusted odds ratio of 1.29 meaning that those with tertiary education were 1.29 times (95%CI: 0.37-4.43) as likely as those with primary/no level of education to adhere to treatment after controlling for age, sex, marital, alcohol, smoking and employment status with a ($p=0.69$) that was not statistically significance.

Type of Employer and Adherence

Of the 50(16.8%) who worked with the government, 15(30.0%) did not adhere to treatment and 35(70.0%) adhered to treatment. For those who were employed by the private sector 6 (26.8%) did not adhere to treatment and 172(73.2%) did adhere to treatment. As for students, 4(30.8%) did not adhere to treatment while, 9(69.2%) adhered to TB treatment. No significant difference in terms of where participants work ($p=0.87$). A logistic regression gave an odds ratio of 1.17 comparing those working with the private sector to those working with the government sector meaning that those working with the private sector were 1.17 times (95%CI:0.60-2.28) as likely as those working with the government to adhere to treatment, though there was no statistical significance ($p=0.65$). After adjusting for age, sex, marital status, alcohol status, smoking status and, level of education, multiple logistic regression gave an odds ratio of 1.02 meaning that those working with the private are 1.02 times (95%CI:0.45-2.29) as likely as those working with the government to adhere to treatment, this was not statistically significant ($p=0.97$). Comparing student participants to those working with the government with respect to adherence to treatment, a logistic regression gave an odds ratio of 0.96 meaning that student participants were 0.96 times (95%CI:0.26-3.62) as likely as those working with the government to adhere to treatment, there was no statistical significance ($p=0.96$). A multiple logistic regression gave an odds ratio 1.05 meaning that student participants were 1.05 times (95%CI:0.24-4.55) as likely as those working with the government to adhere to treatment after adjusting for age, sex, marital status, alcohol status, smoking status and region of origin, level of education. There was no statistical significance ($p=0.95$).

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Adherent parameters to DOTS are varied but socio-demographic data has demonstrated some variation. These socio-demographic parameters like age, gender, marital status, educational level, employment and type of employer, smoking and non smoking status each deter or enhance adherence in different settings. They have thus been discussed under associations between parameters and adherence as below.

A cut-off value of ≤ 0.25 [21] was used to select variables in the bivariate analyses for the multiple logistic Regression model. Comparing socio-demographic characteristics, a limited number of variables appeared to be associated to adherence in the bivariate analyses, these were being female when compared to males ($p=0.20$) [22], being widow/widower ($p=0.15$) or divorced ($p=0.04$) when compared to being single, attaining secondary level of education ($p=0.16$) when compared to primary level of education and age ($r=0.002$). However, when all socio-demographic characteristics were added to the multiple logistic regression model

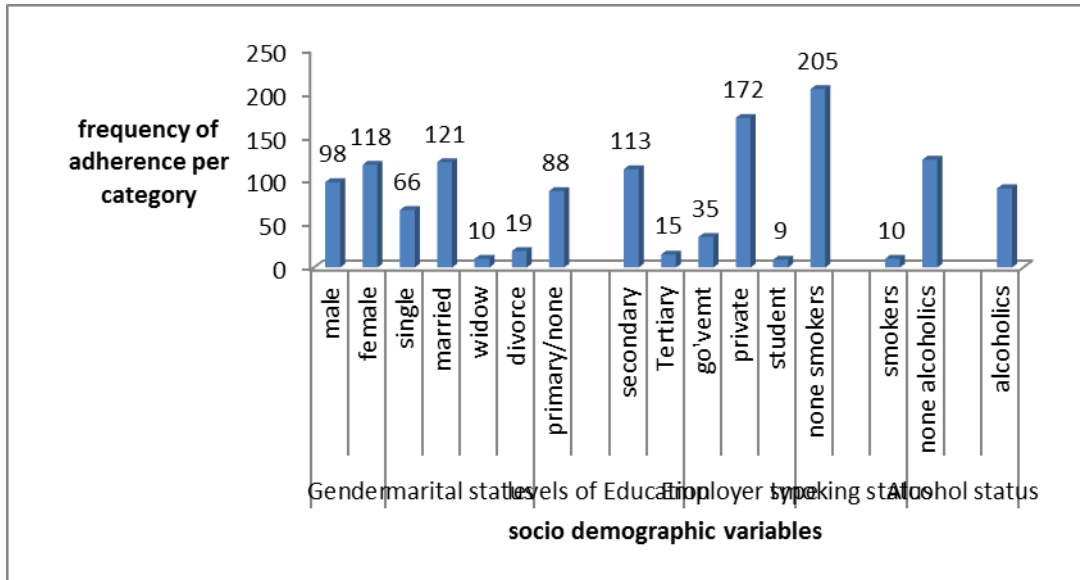


Figure 1: Frequency of adherence according to some socio demographic variable

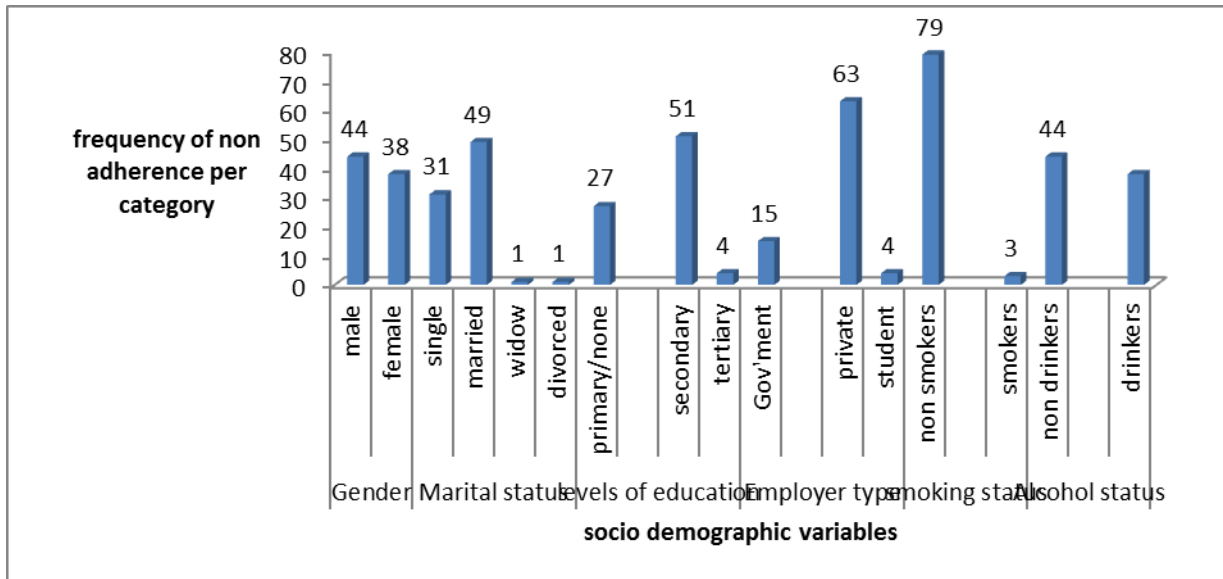


Figure 2: frequency of non-adherence according to other socio demographic variable

Table 2: Relationship between adherence and socio-demographic/other characteristics in a bivariate and multivariate analysis.

Socio-demographic characteristic	No (%)	bivariate analysis			multivariate analysis		
		OR	95%CI	p-value	aOR	95%CI	p-value
Gender							
Male	98(69.0)	ref					
Female	118(75.6)	1.39	0.84-2.32	0.20	1.24	0.78-2.30	0.25
Marital status							
Single	66(68.0)	ref					
Married	121(71.2)	1.16	0.68-2.00	0.59	1.04	0.53-2.02	0.92
widow/widower	10(90.9)	4.70	0.58-38.34	0.15	2.81	0.32-24.90	0.35
divorced	19(95.0)	8.92	1.14-69.70	0.04	7.03	0.83-59.53	0.07
Educational status							
primary/none	88(76.5)	ref					
secondary	113(68.9)	0.69	0.39-1.17	0.16	0.73	0.40-1.31	0.29
Tertiary	15(78.9)	1.15	0.35-3.76	0.82	1.29	0.38-4.44	0.69
Employer							
government	35(16.2)	ref					
Private	172(79.6)	1.17	0.60-2.29	0.65	1.02	0.45-2.29	0.97
Students	9(4.2)	0.96	0.26-3.62	0.96	1.05	0.24-4.55	0.95
Smoking Status							
non-smokers	205(72.2)	ref					
Smokers	10(76.9)	1.28	0.34-4.79	0.71	1.26	0.32-4.97	0.74
Alcohol Status							
non-drinker	124(73.8)	ref					
Drinker	91(70.5)	0.85	0.51-1.42	0.53	0.84	0.48-1.45	0.52
Mean age	39.8±11.15	0.004	r=0.1	0.09	0.002	r=0.2	0.52

N=frequency, %= frequency in percent, OR= unadjusted odds ratio, aOR=adjusted odds ratio, CI=confidence interval

unadjusted odd ratios gave p-values that were not statistically significant to adherence except age which showed a weak positive correlation to adherence (p=0.52) which was not statistically

significant. This may be so because it is a cross-sectional study. A longitudinal study found gender, age, marital and work status to be associated with adherence to medication treatment [6]. Other studies found time of working to be statistically associated with adherence ($\chi^2 = 6.2180$, $p = 0.013$) [29]. This implied that busy working schedules contributed to poor adherence to medications. It was also found that 87 (57.4%) of the females and 36 (61.0%) of the males who had secondary or post-secondary education failed to take drugs on time scheduled. This implied that patients with higher education were most likely busy with their professional activities. Due to their professional status in the society it could have been difficult for them to go for drug refills and to take medication in public

Even though there seems to be no statistically significant association between socio-demographic characteristics and adherence, in reality it is possible that students and those working with the private sector might not adhere to treatment because of their busy working schedule. Socio-demographic factors did not show any statistical significance to adherence except for age factor (older patients) that showed a weak positive correlation to adherence

Conclusion

The study has revealed that : -More females than males adhere to DOTS, -More coupled persons (living together, divorced or widowed) are more likely to adhere than singles, -More primary level education sufferers are more likely to adhere than those with secondary and tertiary certificates whose schedules for jobs and job seeking interfere with adherence to DOTS, -Older people were found to adhere to DOTS more than the younger ages. -Students and those found to working with private sector (as they always have tight schedules) did not adhere as much as those working with public sector (who can be granted permission any time a request is made).

Recommendations.

It is thus recommended that:

1. Longitudinal studies should be carried out for more certainty of the actual state of

adherence and campaigns carried out to sensitized the lacking socio-demographic groups.

2. Administrative permissions to be accepted for workers with very busy schedules who are sick to meet up with up DOTS requirements.
3. Public campaigns should be intensified to educate students, youths and tight schedules workers on tuberculosis, its prevention and the most effective treatment approach-DOTS.

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Authors Column



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