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Prevalence of suicidal behaviour & associated factors among tuberculosis patients in public primary care in South Africa

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***Background & objectives*: In spite of the high prevalence of tuberculosis worldwide, there are only a few studies on its psychiatric complications such as suicidal behaviour. We undertook this study to assess the prevalence of suicidal behaviour and its associated factors among tuberculosis patients in public primary care in South Africa.**

***Methods*: In a cross-sectional survey conducted in three provinces of South Africa new TB and new re-treatment patients were assessed within one month of anti-tuberculosis treatment. The sample included 4900 (54.5% men and women 45.5%) consecutively selected tuberculosis patients from 42 public primary care clinics in three districts in South Africa.**

***Results*: A total of 322 patients (9.0%) reported suicidal ideation and 131 (3.1%) had a history of a suicide attempt. In multivariate analysis female gender [Odds Ratio (OR)= 0.56, Confidence Interval (CI)= 0.43-0.74], psychological distress (OR=2.36, CI=1.04-2.29), post-traumatic stress disorders (PTSD) (OR=4.98, CI=3.76-6.59), harmful alcohol use (OR=1.97, CI=1.25-3.09) and being a TB re-treatment patient (OR=1.76, CI=1.32-2.34) were associated with suicidal ideation, and psychological distress (OR=3.27, CI=1.51-7.10), PTSD symptoms (OR=4.48, CI=3.04-6.61) and harmful alcohol use (OR=3.01, CI=1.83-4.95) were associated with a suicide attempt.**

***Interpretation & conclusions*: Our findings suggest that co-morbid illnesses of psychological distress, PTSD and harmful alcohol use and HIV infection should be assessed in TB patients under TB control programmes to prevent suicidal behaviour. Clinicians should be aware about suicidality in tuberculosis patients to reduce mortality.**

Key words Public primary care - South Africa - suicide attempt - suicidal ideation - tuberculosis

South Africa has 0.7 per cent of the world's population and 28 per cent of the world's population of HIV and tuberculosis (TB) co-infected individuals[1]. It has been estimated that there are approximately 60 per cent of people with TB who are co-infected with HIV[1]. Co-infected patients have almost double the chances of getting multi-drug resistant (MDR)-TB as well as extremely drug resistant (XDR)-TB. These patients also have a high mortality rate due to co-infection with HIV[2].

A few studies from India have studied suicidal behaviour in tuberculosis patients[3], reporting different rates, *e.g.* suicidal thoughts (9%),[4] and a positive correlation between national suicide rates and rates of mortality due to tuberculosis has been reported[5]. In South Africa tuberculosis patients are often co-infected with HIV (60%)[1]. Suicidality has been reported to be common in persons living with HIV/AIDS (PLWHA), *e.g.* in Nigeria over a third (34.7%) of PLWHAs expressed suicidal ideation in the preceding month, with 9.3 per cent attempting suicide in the six months prior to the study[6]. Badiee *et al*[7] found that 26 per cent (405/1560) of HIV positive individuals reported lifetime suicidal ideation and 13 per cent (204/1560) reported lifetime suicide attempt. In a systematic review[8], the autopsy studies revealed 9.4 per cent of deceased HIV positive individuals had committed suicide; 2.4 per cent HIV positive study participants commited suicide; about 20 per cent of HIV positive persons studied had deliberately harmed themselves; 26.9 per cent reported suicidal ideation and 22.2 per cent had a suicide plan.

Various factors from studies among HIV patients (none on TB patients) have been identified to be associated with suicidal behaviour: female gender[6], unemployment[6], co-morbid illness[6], presence of pain[9], concurrent alcohol abuse[9], current major depressive disorder[7], lifetime substance abuse[7], poor family relations[9], presence of AIDS in the spouse[6,9], and living alone [6]. In the general population, studies found a relationship between traumatic events and suicidal behaviour across developed and developing countries[10,11], and post-traumatic stress disorders (PTSD) were predictive of suicide attempts in developing countries[12]. In recent reviews[13,14] a clear relationship between PTSD and suicidal thoughts and behaviours was found. In a study in Uganda, in bivariate analysis PTSD was associated with suicidality in HIV patients[15]. No study was found on the relationship between PTSD and suicidal behaviour in TB patients. The aim of this study was to assess the prevalence of suicidal behaviour and its associated factors among tuberculosis patients in public primary care in South Africa.

Material & Methods

Study design: This is a cross-sectional survey with tuberculosis patients in primary care clinics in South Africa. Three provinces, in South Africa, with the highest TB caseload[16] were selected for inclusion in the study. One district in each province (N=3) with the highest TB caseloads were ultimately included[16]. These districts were Siyanda in Northern Cape Province, Nelson Mandela Metro in the Eastern Cape Province, and eThekwini in KwaZulu-Natal Province. Within each of these three study districts, 14 primary health care facilities were selected on the basis of the highest TB caseloads per clinic (N=42). The type of health facilities was a primary health care clinic or community health centre. All new TB cases and new re-treatment patients were consecutively interviewed within one month of anti-tuberculosis treatment. The interviews were conducted by trained external research assistants for a period of 6 months in all 42 clinics from May to October in 2011. A health care provider who identified a new TB treatment or re-treatment patient (within one month of treatment) and 18 years and above informed the patient about the study and referred the patient for participation if interested. Written permission/ consent from patients attending the primary care facility to participate in the interview was obtained. Ethical approval for the study protocol was received from the Human Sciences Research Council Research Ethics Committee (Protocol REC No.1/16/02/11). The Department of Health in South Africa has also provided approval for this study.

Measures: Suicidal behaviour was assessed with three questions, two questions for suicidal ideation (ever seriously thought about committing suicide and ever made a plan for committing suicide) and one question on ever attempted suicide. Response options were "yes" or "no".

The four items on Primary Care PTSD Screen (PC-PTSD)[17] correspond to the four factors (*i.e.*, re-experiencing, avoidance, hyperarousal and numbing) found to be specific to the PTSD construct. A cut-off of 2 was used for PTSD-positive screening[18,19]. Cronbach alpha for the PC-PTSD in this study was 0.89.

The Kessler Psychological Distress Scale (K10) was used to measure global psychological distress, including significant pathology which does not meet formal criteria for a psychiatric illness[20,21]. The K10 has been shown to capture variability related to non-specific depression, anxiety and substance abuse, but does not measure suicidality or psychoses[22]. This scale serves to identify individuals who are likely to meet formal definitions for anxiety and/or depressive disorders, as well as to identify individuals with sub-clinical illness who may not meet formal definitions for a specific disorder[20]. The K10 demonstrated moderate discriminating ability in detecting depression and anxiety disorders in the general population in South Africa. This was evidenced by the area under the

receiver operating curves (ROCs) of 0.73 and 0.72, respectively, with a cut-off of 16[23]. The K10 scale was used in this study as a binary variable comparing scores of 10-15 versus 16 or more. The internal reliability coefficient for the K10 in this study was alpha = 0.92.

Alcohol consumption: The 10-item Alcohol Use Disorder Identification Test (AUDIT)[24] assesses the alcohol consumption level (3 items), symptoms of alcohol dependence (3 items), and problems associated with alcohol use (4 items). Responses to items in the AUDIT are rated on a 4-point Likert scale from 0 to 4, for a maximum score of 40 points. Higher AUDIT scores indicate more severe levels of risk; scores 8-19 indicate hazardous and scores 20-40 harmful drinking. The AUDIT has been validated in HIV patients in South Africa showing excellent sensitivity and specificity in detecting MINI (Mini International Neuropsychiatric Interview)-defined dependence/abuse (area under the receiver-operating characteristic curve, 0.96)[25] and among TB and HIV patients in primary care in Zambia demonstrating good discriminatory ability in detecting MINI-defined current AUDs (AUDIT = 0.98 for women and 0.75 for men)[26]. Cronbach alpha for the AUDIT in this sample was 0.92, indicating excellent reliability.

Tobacco use was assessed with the question, ''In the past month, how often have you used one or more of the following tobacco products (cigarettes, snuff, chewing tobacco, cigars, *etc*.)?'' Response options were once or twice, weekly, almost daily and daily[27].

Socio-economic characteristics: A specifically-designed questionnaire was used to record information on participants' age, gender, educational level, marital status, income, employment status, dwelling characteristics and residential status. Using a previously used measure[28], poverty or deprivation was assessed with 5 items on the availability or non-availability of shelter, fuel or electricity, clean water, food and cash income in the past week. Response options ranged from 1="Not one day" to 4="Every day of the week". Poverty was defined as higher scores on non-availability of essential items. The total score ranged from 5 to 20, 5=being low, 6-12= medium and 13-20=high poverty. Cronbach alpha for this poverty index was 0.89 in this sample.

TB treatment status, HIV status and antiretroviral treatment were assessed by self-report and from medical information. Sexually transmitted infection (STI) was assessed by self-report. Patients were also asked about a list of 10 chronic illness conditions they had been diagnosed with including hypertension, diabetes, depression, stomach ulcer, migraine headache, cancer, arthritis, asthma, diabetes, high cholesterol.

Data analysis: Data were analyzed using Statistical Package for the Social Sciences (SPSS) for Windows software application programme version 19.0 (Chicago, IL, USA). Frequencies, means, standard deviations, were calculated to describe the sample. Data were checked for normality distribution and outliers. For non-normal distribution non-parametric tests were used. Logistic regression was conducted in bivariate analyses and multivariate logistic regression analysis using the backward variable selection method[29] to estimate associations between relevant predictor variables and suicidal ideation and suicide attempt. Unadjusted odds ratios (OR) are reported together with their 95% confidence intervals (CI) for selected predictor variables while considering suicidal ideation and suicide attempt as dependent variables. Adjusted odds ratios (AOR) and their CI are reported from a multivariate analysis considering factors that were significantly associated with the outcome in bivariate analyses at $P<0.05$ level. Cases of suicide attempt are included in the suicidal ideation model and cases of suicidal ideation are included in the suicide attempt model. For each model, the R^2 is presented to describe the amount of variance explained by the multivariate model. Probability below 0.05 was regarded as statistically significant.

Results

Sample characteristics and suicidal behaviour: Of the total sample (N=4935) included in the study, 35 (0.7%) refused to participate, so the final sample included 4900 (54.5% men and 45.5% women) adults with a mean age of 36.2 ± 11.5 yr (range 18 to 93 yr). Almost two-thirds of the participants (n=3154, 65.2%) were between 25 to 44 yr age, the majority (72.7%) was never married, 27.7 per cent had completed secondary education, and 17 per cent scored high on the poverty index. Of the total sample, 76.6 per cent were new TB patients and 23.4 per cent were re-treatment TB patients. For those who had tested for HIV, 59.9 per cent were HIV positive, 9.6 per cent had never tested for HIV and 7.3 per cent indicated that they had ever been diagnosed with a STI. More than one in four patients (27.6%) were current (past month) tobacco users and 23.3 per cent were hazardous or harmful alcohol users (AUDIT ≥8). A large proportion (81%) reported psychological distress, 29.4 per cent screened positive for post-traumatic stress disorder (PTSD), 9.1 per cent (n=326) suicidal ideation and 3.1 per cent (n=131) had a history of a suicide attempt (Table I).

Table I. Sample characteristics and suicidal behaviour

	Total N (%)	Suicidal ideation N	Suicide attempt N
All	(n=4825)	326/3578 (9.1%)	131/4225 (3.1%)
Male	2631 (54.5)	142	64
Female	2194 (45.5)	180	65
Age (yr)	(n=4837)		
18-24	643 (13.3)	48	23
25-34	1841 (38.1)	138	54
35-44	1313 (27.1)	83	30
45 or more	1040 (21.6)	53	22
Marital status	(n=4570)		
Not married	3323 (72.7)	227	90
Married/cohabitating	982 (21.5)	62	25
Separated/divorced/widowed	265 (5.8)	24	10
Education	(n=4818)		
Grade 7 or less	1269 (26.3)	81	36
Grade 8-11	2213 (45.9)	155	64
Grade 12 or more	1336 (27.7)	87	29
Poverty	(n=4555)		
Low	1592 (35.0)	110	30
Medium	2195 (48.2)	150	59
Poverty high	768 (16.9)	42	27
Residence	(n=4848)		
Urban	3151 (66.2)	228	88
Rural	877 (18.4)	46	24
Informal settlement	730 (15.3)	49	18
	(n=4772)		
TB re-treatment patient	1113 (23.4)	106	42
New TB patient	3659 (76.6)	217	88
	(n=4900)		
Decided to stop TB treatment before	126 (2.6)	13	8
	(n=4900)		
Psychological distress (K 10 >15)	3970 (81.0)	277	121
	(n=4900)		
PTSD	1441 (29.4)	223	82
AUDIT	(n=4737)		
Low risk (0-7)	3637 (76.8)	229	78
Hazardous (8-19)	785 (16.6)	58	24
Harmful alcohol use (20-40)	315 (6.6)	35	24
	(n=4900)		
Current tobacco use	1290 (27.6)	94	40
Chronic conditions	(n=4246)		
Zero	3087 (72.7)	180	75
One	689 (16.2)	68	30
Two	298 (7.0)	27	14
Three or more	172 (4.1)	9	3
	(n=4506)		
Ever diagnosed with a STI	329 (7.3)	42	16
HIV positive and TB	(n=4315)	220	83
	2585 (59.9)		

TB, tuberculosis; PTSD, post-traumatic stress disorder; AUDIT, alcohol use disorder identification test; STI, sexually transmitted infection. Number is variable for different parameters

Predictors of suicidal ideation and suicide attempt: In bivariate analyses being female, being a TB re-treatment patient, psychological distress, PTSD symptoms, harmful alcohol use, having one other chronic illness, being HIV positive and having ever been diagnosed with a sexually transmitted infection were associated with suicidal ideation, while in multivariate analysis female gender, psychological distress, PTSD symptoms, harmful alcohol use and being a TB re-treatment patient were associated with suicidal ideation. Further, in bivariate analysis, being a TB re-treatment patient, had decided to stop TB treatment before, psychological distress, PTSD symptoms, harmful alcohol use, having one or two other chronic illnesses and having ever been diagnosed with an STI were associated with a suicide attempt, while in multivariate analysis psychological distress, PTSD symptoms and harmful alcohol use were associated with a suicide attempt (Table II).

Discussion

We found in a large sample of tuberculosis public health care patients low to moderate rates of suicidal ideation (9.0%) and a history of a suicide attempt (3.1%). These prevalence rates of suicidality seem to be similar to some other studies, *e.g.*, among TB patients in India 9 per cent had suicidal thoughts[4] and among HIV patients in Uganda 7.8 per cent had moderate to high risk for suicidality and 3.9 per cent had a life-time attempted suicide[15]. However, other studies among HIV patients, seem to show higher rates of suicidality, *e.g.* in Nigeria (34.7% suicidal ideation and 9.3 per cent attempting suicide)[6], and in the US 26 per cent reported lifetime suicidal ideation and 13 per cent lifetime suicide attempt[7]. It is possible that because of TB not being a terminal illness unlike HIV, suicidality may be lower in TB patients than HIV patients.

In multivariate analysis it was found that psychological distress, PTSD symptoms and harmful alcohol use were associated with suicidal ideation and suicide attempt. Female gender was associated with suicidal ideation and not suicide attempt, as found in some other studies[6]. Co-morbid illness (psychological distress, PTSD and harmful alcohol use) was found to be associated with suicidal behaviour as shown by others also[6,7,9]. Regarding PTSD, community and clinical data have suggested an association between trauma exposure and suicidal behaviour (*i.e.*, suicide ideation, plans and attempts)[10]. This finding seems to confirm that in TB patients, just like in AIDS patients, several potential risk factors (neuropsychiatric morbidity, alcohol and drug abuse, behavioural disorders, *etc.*) increase the suicide risk[30]. It has been confirmed that post-traumatic stress disorders were predictive of suicide attempts and suicidal thoughts and behaviours[13,14] and the crucial role of comorbid major depression in the aetiology of suicidality in PTSD has also been supported[14]. There are significant clinical implications of the reported relationship between PTSD, alcohol abuse, psychological distress (depression) and suicidality for suicide risk assessment and therapy[31]. It is suggested that the identified co-morbid conditions of PTSD, alcohol abuse, psychological distress (depression) be included in any comprehensive risk factor battery for suicidal behaviour and management[32].

Unlike earlier study[6], we did not find any association between socio-economic status (education, poverty) and suicidal behaviour. Being a TB re-treatment patient was found to be significantly associated with suicidal ideation in this study. In bivariate but not in multivariate analysis, it was found that co-infection with HIV and suffering from additional chronic illnesses were associated with suicidal behaviour. Therefore, in addition to co-morbid illnesses of psychological distress, PTSD and harmful alcohol use, TB re-treatment, HIV infection, and other chronic illness conditions should be considered in the prevention of suicide.

Caution should be taken when interpreting the results of this study because of certain limitations. As this was a cross-sectional study, causality between the compared variables cannot be concluded. A further limitation was that most variables were assessed by self-report and desirable responses may have been given. The population surveyed was predominantly from urban areas, and may not be representative of other settings in South Africa.

In conclusion, low to moderate rates of suicidal behaviour were observed in tuberculosis public primary care patients. Co-morbid illnesses of psychological distress, PTSD and harmful alcohol use, HIV infection, TB re-treatment and other chronic illness conditions should be assessed in tuberculosis control programmes in order to prevent suicidal behaviour and suicide.

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Table II. Predictors of suicidal ideation and suicide attempt

	Suicidal ideation			Suicide attempt		
	Cr OR (95% CI) [a]	Wald	Adj OR (95% CI) [a,b]	Cr OR (95% CI) [a]	Wald	Adj OR (95% CI) [a,c]
Age (yr)						
18-24	1.00		---	1.00		---
25-34	1.00 (0.71-1.41)			0.82 (0.50-1.35)		
35-44	0.83 (0.57-1.21)			0.64 (0.37-1.10)		
45 or more	0.68 (0.45-1.02)			0.58 (0.32-1.06)		
Gender						
Male	1.00	16.59	0.56 (0.43-0.74)***	0.84 (0.59-1.19)		---
Female	0.67 (0.59-0.84)***					
Marital status						
Not married	1.00		---	1.00		
Married/cohabitating	0.84 (0.63-1.12)			0.90 (0.57-1.41)		---
Separated/divorced/widowed	1.32 (0.85-2.07)			1.34 (0.69-2.61)		
Education						
Grade 7 or less	1.00		---	1.00		
Grade 8-11	1.06 (0.80-1.40)			1.01 (0.67-1.53)		---
Grade 12 or more	0.94 (0.69-1.29)			0.76 (0.46-1.25)		
Poverty						
Low	1.00		---	1.00		---
Medium	0.91 (0.70-1.17)			1.35 (0.86-2.10)		
High	1.07 (0.73-1.33)			2.25 (1.32-3.00)		
Residence						
Urban	1.00		---	1.00		
Rural	0.75 (0.54-1.04)			1.13 (0.71-1.79)		---
Informal settlement	0.81 (0.58-1.11)			0.88 (0.53-1.17)		
TB re-treatment vs. new TB patient	1.58 (1.24-2.03)***	15.00	1.76 (1.32-2.34)***	1.49 (1.03-2.17)*	3.22	1.44 (0.97-2.16)
Decided to stop TB treatment before	1.73 (0.95-3.15)		---	2.51 (1.19-5.20)*		---
Psychological distress (K 10 >15)	1.65 (1.20-2.26)**	4.59	2.36 (1.04-2.29)*	3.20 (1.67-6.12)***	9.01	3.27 (1.51-7.10)**
PTSD	5.26 (4.12-6.72)***	126.01	4.98 (3.76-6.59)***	4.27 (2.98-6.12)***	57.16	4.48 (3.04-6.61)***
AUDIT						
Low risk (0-7)	1.00	8.60	1.97 (1.25-3.09)**	1.00	18.87	3.01 (1.83-4.95)***
Hazardous (8-19)	1.26 (0.93-1.71)			1.43 (0.90-2.27)		
Harmful alcohol use (20-40)	1.84 (1.25-2.70)**			3.50 (2.18-5.62)***		
Current tobacco use	1.19 (0.93-1.54)		---	1.34 (0.91-1.97)		---
Chronic conditions						
Zero	1.00		---	1.00		---
One	1.57 (1.17-2.12)**			1.77 (1.15-2.73)**		
Two	1.42 (0.93-2.18)			2.01 (1.12-3.60)*		
Three or more	0.74 (0.37-1.48)			0.69 (0.21-2.21)		
Ever STI	2.01 (1.41-2.86)***	2.90	1.43 (0.95-2.14)	1.94 (1.13-3.32)*		---
HIV positive and TB	1.57 (1.20-2.05)***		---	1.41 (0.95-2.08)		---

TB, tuberculosis; PTSD, post-traumatic stress disorder; AUDIT, alcohol use disorder identification test; STI, sexually transmitted infection.

[a]Using backward variable selection of variables adjusted for age, education, marital status, geolocality and poverty index; [b]Hosmer and Lemeshow Chi-square 9.33, df 8, 0.315; Cox and Snell R^2 0.08; Nagelkerke R^2 0.16; [c]Hosmer and Lemeshow Chi-square 7.06, df 5, 0.216; Cox and Snell R^2 0.03; Nagelkerke R^2 0.12

P *<0.05; **<0.01; ***<0.001

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