

# Malnutrition in tuberculosis patients on admission and weight-gain in relation to HIV status in Thyolo district

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## Abstract

**A study was conducted in Thyolo district, southern Malawi in new patients registered with tuberculosis (TB) in order to 1) determine their nutritional status on admission, 2) to compare weight gain in relation to HIV status during the intensive phase of anti-TB therapy. There were 1181 TB patients with an overall HIV prevalence rate of 80%. Of these patients, 673 (57%) were malnourished on admission (BMI<18.5) while 414 (35%) of all patients had moderate to severe malnutrition (BMI<17.0). Mortality in the first four weeks of admission was higher in TB patients with moderate to severe malnutrition (10.9%), as compared to 6.5% in those with normal to mild malnutrition (OR 1.8, 95% CI; 1.1-2.7). All TB patients showed significant weight gain at 4 weeks after admission. HIV-negative TB patients however gained significantly higher amounts of weight than HIV infected individuals during the same period. This study highlights the high prevalence of malnutrition in TB patients and the need to consider adjunctive nutritional support as a rational step “a minima” in the efforts towards optimising current management of TB patients in our setting.**

## Introduction

An association between tuberculosis (TB) and body wasting has long been recognised.

Malnutrition impairs host immunity and predisposes to TB while TB itself can cause malnutrition.<sup>1</sup> In Malawi, human immunodeficiency virus (HIV) prevalence in TB patients that are registered country-wide is as high as 77%.<sup>2</sup> The baseline nutritional status of TB patients at the time of registration in such a setting is likely to be further exacerbated by the concomitant effects of HIV.<sup>3</sup> District hospitals cater for diagnosis and treatment of TB cases in Malawi. Most have limited financial resources and cannot afford to run nutritional support programs without donor support. TB patients who are malnourished meanwhile have to depend on family relatives for their basic meals and nutritional supplements while in hospital. In a resource-poor rural setting, this responsibility is often not sustained due to socio-economic constraints of family members.

Knowledge of the prevalence of malnutrition in TB patients at the time of registration would be useful in deciding on the relative importance of nutritional supplementation as an adjunctive intervention alongside chemotherapy for TB patients in Malawi. Regular measurements of the weight gained by TB patients during the course of anti-TB therapy is often used as part of the routine assessment of response to treatment, and poor weight gain is often considered as an ominous sign. HIV status of TB patients on admission is likely to influence overall response to treatment as well as weight gain although this has not been documented in our setting. This study was conducted in new patients registered with tuberculosis in order to 1) determine their nutritional status on admission, and 2) to compare weight gain in relation to HIV status during the intensive phase of anti-TB therapy.

## Materials and methods

### Study setting

The study was carried out in new TB patients registered between November 1999 and March 2001 in Thyolo district. All TB patients are registered and started on standardized anti-TB treatment according to National Guidelines.<sup>4</sup> Since 1999, all TB patients undergo voluntary counseling and HIV testing and are offered co-trimoxazole prophylaxis (800mg of sulfamethoxazole and 160 mg of trimethoprim) if they test HIV-seropositive, and if there are no contraindications to the medication. All hospitalised TB patients also receive a daily nutritional supplement of 1250 Kilo calories in the form of a premix of Likuni-Phala (a mixture of maize flour and soya, mixed with oil and sugar) in addition to a routine hospital ration of 1200 calories.

### Study population and data collection

A structured questionnaire and record form was used to gather information on basic demographic data, HIV status and length of symptoms before being diagnosed as a case of TB. All patients were weighed on admission and subsequently on a weekly basis for 4 weeks. Weighing was done without shoes, with minimum clothing, and between 9 and 10 am in the morning. The same weighing scale was used, and calibration was carefully controlled. Height was measured on admission with the patient standing straight and looking straight ahead. For patients who could not stand unassisted, height was estimated using knee height<sup>5</sup>. A normal BMI (weight in kg divided by height in m<sup>2</sup>) was defined as 18.5-24.9 kg/m<sup>2</sup>. Mild malnutrition was defined as BMI = 17.0 to 18.4 kg/m<sup>2</sup>; moderate: BMI = 16.0 to 16.9 kg/m<sup>2</sup>; and severe: BMI less than 16.0 kg/m<sup>2</sup>. Personnel involved in conducting these measurements were well trained and remained the same throughout the study. Elderly patients with obvious spinal deformity, patients with oedema and those for whom HIV status was not known were excluded from the study. All patients had given informed consent to participate in the study.

### Statistical analysis

Data analysis was done using the Epi-info software (Centers for Disease Control, Atlanta). Non-parametric tests (Kruskal-Wallis test for 2 groups) was used to verify differences in means between groups, and the students “t” test was used to measure differences in weight gain. The level of significance was set at  $p \leq 0.05$  and 95% confidence intervals were used.

## Results

### Characteristics of the study population

Of a total of 1319 new adult TB patients, data is available for 1181 patients; HIV status was unknown in 83 patients, in 12 patients there were spinal deformities affecting height, in 8 patients there was oedema, and 35 patients died before undergoing measurements.

Of the 1181 patients tested for HIV, HIV seroprevalence was 80%. 922 (78%) of these patients were given cotrimoxazole prophylaxis. There were 576 male and 605 (51%) female patients. Smear positive pulmonary tuberculosis (PTB) was present in 624 (53%) patients, 250 patients had smear negative PTB and 307 had extra-pulmonary TB.

HIV negative individuals had a mean age of 38 years when diagnosed with TB compared to 32 years for HIV positive

patients ( $p < 0.001$ ). Mortality in the first four weeks of admission was higher in TB patients with moderate to severe malnutrition (10.9%), as compared with 6.5% in those with normal to mild malnutrition (OR 1.8, 95% CI; 1.1-2.7). 87% of those that died in the first month ( $n=95$ ) were HIV-infected. Nutritional status on admission and mean weight gain in relation to HIV status and sex.

The mean BMI on admission was 18.2 kg/m<sup>2</sup> (males =18.4 ,females = 17.9  $p < 0.001$ ). 54 % of all male TB patients and 60% of female patients were malnourished on admission (BMI<18.5). Severe malnutrition (BMI<16.0) was present in 246 (21%) of all patients on admission (26% of females and 16% of males), while 14% of both males and females had moderate malnutrition. Although the BMI on admission of HIV infected individuals was lower than those who were non infected, the difference was not statistically significant.

Weight gain in HIV-negative patients was significantly higher than in those infected with HIV. Both male and female TB patients (irrespective of HIV status) showed weight gain ( $P < 0.001$ ) at 4 weeks when compared to weight on admission (see Table). There was no difference in weight gain with respect to TB type.

## Discussion

More than half of all TB patients in Thyolo district were malnourished on admission with over one third having moderate to severe malnutrition. Death rates were significantly higher in those with moderate or severe malnutrition. Significant weight gain occurred in all patients irrespective of HIV-status. The finding of a high prevalence of malnutrition in TB patients on admission confirms that, at least in this rural setting, marked nutritional impairment exists on registration for TB and prior to starting TB therapy.

In TB patients that have moderate to severe malnutrition, mortality was higher and the majority of those that died were HIV-infected. This might be due to more severe illness, atypical pathology, coincident opportunistic infections or life-threatening bacteraemia in HIV-infected patients.<sup>6-9</sup> In this group, nutritional rehabilitation as an adjunct to drug therapy is likely to improve the ability to cope with the illness, improve treatment response and so reduce mortality.

HIV-negative patients gained significantly more weight than HIV-positive patients with TB at the end of four weeks of treatment. This may be related to a number of factors including altered nutritional metabolism linked to the HIV status itself<sup>3</sup>, increased needs due to underlying opportunistic infections and an insufficient intake, for whatever reason. The total caloric intake provided to inpatients in the setting is only 2450 calories and family relatives are expected to supplement

the additional nutritional needs. This nutritional responsibility is often not sustained in the resource-poor setting and patients end up with a sub-optimal intake. This is likely to be particularly true in households affected by HIV/AIDS due to the socio-economic implications of the disease. This might be one reason for lower weight gain in HIV-positive patients.

The National TB control program in Malawi needs to consider adjunctive interventions to improve TB case management and reduce early mortality. Measuring Body Mass Index (BMI) on admission is a simple tool that can be used to assess the nutritional status of TB patients in district hospitals and target nutritional interventions.

This study highlights the need to consider integrating nutritional support, and rehabilitation programs as a rational step "a minima" in the efforts towards optimising current management of TB patients in our setting.

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Table: Mean weight gain in TB patients in relation to sex and HIV status (n=1181).

	Weight on admission	Weight after 4 weeks admission	Weight gain * of treatment	p-value #
<b>Male patients (n= 576)</b>	48.8 (0.30)	51.3 (0.33)	2.4 (0.13)	-
HIV negative	48.3 (0.64)	51.0 (0.74)	2.9(0.23)	0.05
HIV positive	48.9 (0.34)	51.4 (0.37)	2.3(0.16)	-
<b>Female patients (n=605)</b>	43.4 (0.30)	45.7 (0.34)	2.24 ( 0.12)	-
HIV negative	44.4 (0.71)	47.1 (0.73)	3.0 ( 0.29)	< 0.01
HIV positive	43.1 (0.34)	45.4 (0.38)	2.1(0.13)	-

\* p value is < 0.001 (in all groups) for weight gain at 4 weeks compared to admission weight

# p value for weight gain in HIV-negative compared to HIV-positive patients