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Weight Gain as Tuberculosis Treatment Regimen Progresses in Patients Receiving Antituberculosis Therapy

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Authors' contributions

This work was carried out in collaboration between both authors. Author ANU designed the study, wrote the protocol and interpreted the data. Author NOU did the literature searches and produced the initial draft. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Tuberculosis (TB) has been known to be one of the most frequent underlying causes of wasting worldwide and this has however remained poorly studied and understood.
Methods: Pattern of weight gain during tuberculosis treatment in Ekpene Obom, Nigeria was assessed between January 2012 and December 2014. The 389 patients, who attended the TB clinic within this period, made up of 171(44%) males and 218(56%) females were used in this study.
Results: Patients had an average weight of 44.5kg at the time their infection was diagnosed. The percentage weight increment within this period was 12.1%. Yearly sex-specific percentage weight increment in 2012, 2013 and 2014 respectively for the males were 12.4%, 11.4% and 11.9% while it was 12.5%, 11.6% and 12.7% for the females within the same period. Similarly, within specific

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age groups, it also revealed an increment of 11.8%, 16.0%, 14.7%, 13.4%, 10.8% and 10.6% for 11-20 years, 21-30 years, 31-40 years, 41-50 years, 51-60 years and 61-70 years respectively. The females were seen to have higher body weights than the males.

Conclusion: This study has shown that clinical recovery does not guarantee immediate restoration of body weight and also confirms weight gain to be an unreliable indicator of overall treatment response in anti-tuberculosis therapy.

Keywords: Weight gain; tuberculosis; treatment; Nigeria.

1. INTRODUCTION

Tuberculosis (TB) remains a major cause of morbidity and mortality worldwide. The World Health Organization (WHO) estimates that one-third of the population of the world is infected with *Mycobacterium tuberculosis* and that more than 8 million new cases of active TB occur annually [1-3]. The estimated global annual mortality from TB is close to 2 million people [3]. Although management of TB has faced many challenges in the past, today there are 2 monumental threats to global TB control: The HIV epidemic and the increasing prevalence of drug resistance [4].

Tuberculosis is also the most frequent underlying cause of wasting worldwide and the pathophysiology of wasting however remains poorly studied and understood [1]. Weight loss and nutritional depletion therefore, are often seen in cases of tuberculosis at the time of diagnosis [5-7].

Weight gain and other improvements in nutritional indicators after effective chemotherapy for tuberculosis have been variously reported [6,7]. However, the relationship between changes in weight at diagnosis, while receiving treatment and when released from treatment has not been well studied. Since weight at diagnosis and changes in weight after the 2 months of intensive phase of treatment can help in identifying persons at high risk of relapse [7], and since the multidrug therapy for tuberculosis is prescribed according to the patients' body weight [8], this study therefore aims at determining the weight gained alongside effective chemotherapy in newly diagnosed TB infection.

2. PATIENTS AND METHODS

This study was conducted at the Qua Iboe Church (QIC) Leprosy Hospital, Ekpene Obom, Etinan, Akwa Ibom State in Nigeria.

Patients used in this study were those that attended the hospital TB clinic between January 2012 and December 2014. They were aged between 15 and 68 years. Each patient submitted 3 sputum samples. A direct smear of each specimen was made on a clean, dry, grease-free slide. The three smears were air-dried and stained by Ziehl Neelsen staining technique. Stained smears were examined at x100 magnification using oil immersion objective. Smear positive patients were prescribed treatment according to WHO multidrug treatment regimen [8]. Sputum smears and body weights in kilogram of each patient were assessed at the time of diagnosis and at the end of 2, 5, 7 and 8 months of treatment. The average weight for all the patients at the above stated months was calculated and recorded.

Similarly, the average weight in kilogram of 30 healthy adults made up of 16 males and 14 females, who were randomly selected among patients' relatives, was also assessed and their ages noted. These served as control subjects.

3. RESULTS

A total of 389 patients, 171(44%) males and 218(56%) females were involved in this study. They were aged between 15 and 68 years. At the end of the 8 months treatment regimen, 12(3.30%) patients had variously tested AFB positive either at 2, 7 or 8 months (result not shown). Twenty six patients had defaulted and as such their data were not included in the final assessment. The result has shown that the average weight of all the patients at the time the infection was diagnosed and treatment commenced was 44.5 kg, and that the percentage weight increment was 12.1%. This is shown in Table 1.

Year by year sex-specific assessment of the percentage weight increment shows 12.4%, 11.4%, and 11.9% for males and 12.5%, 11.6% and 12.7% for females in 2012, 2013, and 2014 respectively (Table 2).

Similarly, the percentage weight increment within age groups shows 11.8%, 16.0%, 14.8%, 13.4% 10.8% and 10.6% for 11-20 years, 21 -30 years, 31-40 tears, 41 -50 years, 51-60 years and 61-70 years, respectively. The average weight for the control healthy adult was 62.8 kg for females and 56.5% for males.

4. DISCUSSION

Today, tuberculosis has been confirmed in many parts of Nigeria and it features among the first six causes of mortality among many other diseases. One of the complications of this infection is weight loss whose recovery may depend on the distribution of lost and gained nutrients during active chemotherapy.

In this study, one of the notable findings was that the average weight at diagnosis and at the completion of treatment of TB patients was 44.5 kg and 49.9 kg respectively. The average weight at completion of treatment is still considered to be far below the average weight of 62.8 kg and 56.5 kg for female and male healthy control subjects in the same community. Dosumu [9] reported an average weight of 46.0 kg at diagnosis in Iwo town, Nigeria and this increased to 48.6 kg, 50.7 kg and 50.8 kg at the 2nd, 5th and 8th month of treatment respectively. These were also seen to be far less than that for age and sex matched controls in the healthy adults. This study has therefore shown that clinical recovery does not guarantee the restoration of body weight. Becker et al. [10] had earlier reported that clinical and functional recovery often lags behind microbiological cure.

The results of this study have also revealed a percentage weight increment of 12.1% from the initial weight of 44.5% at diagnosis to 49.9 kg at the 8th months of treatment. Dosumu had earlier recorded 10.4% in Iwo [9]. Even though weight gain is frequently used as a measure of treatment response in tuberculosis [11], results of many other studies have shown that although anti-mycobacterial treatment of tuberculosis is highly effective [12,13], many patients still remain underweight even after 6 months of treatment [6], probably as a result of the fact that it is only fat mass that is predominantly gained during recovery from wasting than protein mass, as documented for AIDS related opportunistic infections [14] and bacterial sepsis [15]. This could also be explained from the fact that body compartments differ in their contribution to weight gain and its clinical benefits and so microbiological cure of tuberculosis does not restore protein mass within 6 months despite strong anabolic response [16]. This study therefore confirms earlier report by Kennedy et al. [17] that weight gain during therapy appears to be an unreliable indicator of overall treatment response [17]. Similarly, according to Onwubalili [6], most patients undergoing anti-tuberculosis treatment normally have difficulties regaining their usual body weight within 6 months of treatment.

Higher body weights and higher percentage increments were recorded in patients within the age groups of 21-30 and 31-40 years as shown in Table 3. These age groups have been severally described by some researchers as the nutritionally active age group [18,19]. In the sex-specific analysis (Table 2), the females were seen to record higher body weights during treatment than the males. This agrees with previous studies in 2 London hospitals where female TB patients undergoing treatment had significant higher body weights than the males at all the periods [16]. However in this study, patients placed on treatment actually show some level of gain in body weight. Therefore, weight gain could be considered a potentially useful biomarker of response to TB treatment and the results of our study have added to knowledge of this in this direction in addition to response to TB treatment. This is because identification of surrogate markers of treatment response and risk for poor outcome obviously is of benefit to tuberculosis treatment programs especially as tools for individual patient management.

More so, now that treatment of MDR-TB is being rolled out to resource-poor countries where access to sputum culture is limited, the need for simple measures of treatment response like weight gain cannot be over emphasized.

Table 1. General pattern of weight Increase among tuberculosis patients newly diagnosed from 2012 to 2014

Months of treatment	Average weight (kg)
0	44.5
2	46.0
5	48.2
7	48.9
8	49.9

Table 2. 3 year sex-specific pattern of weight increment of newly diagnosed TB patients undergoing treatment

Months of treatment	Average weight (kg)					
	2012 (n=137)		2013 (n=114)		2014 (n=112)	
	Male	Female	Male	Female	Male	Female
0	43.5	44.8	42.0	46.4	43.8	45.8
2	43.8	46.7	42.9	47.0	44.0	48.3
5	45.5	48.0	44.3	48.2	45.1	48.9
7	46.1	49.3	45.6	50.0	48.3	51.0
8	48.9	50.4	46.8	51.8	49.0	51.6

Table 3. Weight Increment pattern among various age groups of TB patients undergoing treatment

Age group (years)	Months of treatment				
	0	2	5	7	8
	Average weight (kg)				
11-20	44.0	44.9	46.6	48.1	49.2
21-30	45.5	48.2	48.8	50.1	52.0
31-40	44.9	46.6	50.6	51.0	51.5
41-50	41.0	42.7	44.7	45.6	46.5
51-60	39.9	40.8	41.2	41.9	44.2
61-70	39.3	40.3	41.9	42.3	43.5

5. CONCLUSION

In conclusion therefore, patients undergoing treatment for tuberculosis achieved a strong positive recovery but do not regain an immediate usual body weight within the 8 months of treatment. Additional studies are however warranted to better define the underlying association between weight change after the intensive phase treatment and increased risk of relapse.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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