

Weight Gain Pattern in Children Below 14 Years Undergoing Antitubercular Therapy

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Abstract

In India, an estimated 3.33 lakh children in the 0–14 years' age group become ill with Tuberculosis (TB) each year. TB is one of the most pressing health problems nationally. Weight gain during treatment is the main indicator of good treatment outcome, but there is no adequate information on weight gain pattern and the factors that affect weight gain in pediatrics population.

Objective: To evaluate the weight gain in pediatric patients undergoing antitubercular therapy and to analyse the various factors associated with weight gain in pediatric patients undergoing antitubercular therapy.

Methods: This prospective observational study enrolled 117 patients of ≤ 14 years with newly diagnosed drug susceptible TB. Baseline demographic characteristics and other risk factors were identified. Weight was recorded at time of starting antitubercular treatment [ATT], then at the end of 2 months and 6 months. After completion of data collection change in weight was compared and statistical analysis was done using SPSS software.

Results: After comparing the baseline weight at the time of starting ATT and on follow ups it was found that 111 patients [94.8 %] showed gain in at the end of 2 months of treatment with average weight gain of 1.31 ± 0.93 KG. At the end of 6 months of treatment all patients showed an increment in weight with average weight gain of 2.45 ± 1.93 KG. Age, exposure to household smoke and TB contact came out be significant factors associated with weight gain in univariate analysis as well as multivariate linear regression analysis.

Keywords: Tuberculosis, TB, Pediatric Tuberculosis, Tuberculosis In Children, Weight Gain, Antitubercular Therapy.

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Introduction

In India, an estimated 3.33 lakh children in the 0–14 years' age group become ill with TB each year (28% of global childhood TB burden), with a slightly higher burden among males. Pulmonary TB is the most common form of TB in children but extra-

pulmonary TB forms a larger proportion of cases than in adults. It is also known that about 6% of the cases reported to national TB elimination programme (NTEP) are from children up to 14 years of age.¹

Tuberculosis cases are often malnourished, and malnourished people are at higher risk of developing tuberculosis. These patients often suffer from severe weight loss, which is considered to be immunosuppressive.² Wasting is recognized as a prominent feature of TB and also a major determinant of severity and disease outcome.³ Cases that have lost weight due to TB are expected to gain weight during successful treatment of the intensive phase.⁴ While studies in adults have shown associations between weight gain and good therapeutic response in adults with TB but there is paucity of studies which have documented weight trends in children on TB treatment.^{5,6}

Leptin is thought to be a mediator in the complex process between TB, nutrition status and host immune response. Leptin level increment in the body is correlated to increment energy, protein and fat intake which is increased after administration of oral anti-tuberculosis therapy either in intensive phase or maintenance phase.⁶ Thus, the more energy intake will increase body weight during and after tuberculosis therapy.

In this study, we evaluated the change in weight in pediatric patients undergoing antitubercular therapy and analysed the various factors associated with weight change.

Methodology

All children ≤ 14 years of age who had newly diagnosed tuberculosis as per NTEP guidelines during the study period were enrolled in the study. After taking informed consent the data on socio-economic and demographic characteristics were taken. Information about other factors like history of contact with TB patient, exposure to household or tobacco smoke, BCG vaccination status and presence of any comorbidity were asked using a pre-tested semi-structured questionnaire. Relevant investigations which confirmed the diagnosis of TB were analysed and cases were labelled accordingly into

bacteriologically confirmed TB or clinically diagnosed TB and standard treatment was initiated after diagnosis of drug susceptible or drug resistant tuberculosis as per NTEP guidelines.⁷ Only newly diagnosed drug susceptible pulmonary and/or extrapulmonary cases were enrolled in the study. Patients who were previously treated with ATT for more than 1 month and with drug resistant TB were excluded from the study. It was ensured that all the patients enrolled in the study were consuming adequate calories and nutritional support as per the recommended dietary allowance for age and sex. Weight was recorded at the time of starting ATT then on follow ups at monthly intervals till 6 month. At 6 month of taking ATT, cases were classified according to treatment outcome. After completion of data collection change in weight was compared and statistical analysis was done using SPSS software.

Results

Out of 117 patients, 57 were of age 0- 5 years and 60 patients belonged to the age group 6- 14 years. 81 patients were male and 36 were female. 33 patients belonged to rural and 84 belonged to urban area. Out of 117 patient history of TB contact could be identified only in 27 patients while exposure to household smoke and tobacco smoke was seen in 78 and 75 patients respectively. BCG vaccination was taken by all patients however, in 15 patients scar mark was absent. Out of 117 patients, 15 were microbiologically confirmed while rest were diagnosed with TB as per clinical diagnosis. Number of patients with pulmonary and extrapulmonary TB was 72 and 30 respectively. 15 patients were suffering from both pulmonary and extrapulmonary TB. Duration of illness before starting treatment was ≤ 30 days in 63 patients while > 30 days in the rest. [Table 1]

After comparing the baseline weight at the time of starting ATT and on follow up at 2 month it was found that 111(94.8%)

patients showed gain in weight while 3 patients (2.6%) showed no change and 3 showed (2.6%) a decrement from baseline weight. The average weight gain at the end of 2 months of treatment was 1.31 ± 0.93 KG. [Table 2] 42 (35.9%) patients showed more than 10 percent weight gain, 33(28.2%) patients showed weight gain between 5 to 10 percent while the rest showed a gain of less than 5 percent. At the end of 6 months of treatment all patients showed an increment in weight with average weight gain of 2.45 ± 1.93 KG. At the end of 6 months patients showing weight gain above 10 percent were 78(66.7 %) while 30 (25.6%) patients showed a gain between 5 to 10 percent and the rest below 5 percent. [Table 3] Average weight gain in males and females was 1.29 ± 0.80 kg and 1.36 ± 1.20 kg respectively

Average weight gain in patients in age group 6 to 14 years was more [1.66 ± 1.11 kg] than in the patients up to 5 years age [0.95 ± 0.51 kg], and it was found to be clinically significant [p value- < 0.001]. Also, patients with history of exposure to household smoke and TB contact, had significant less average weight gain than who did not have history of contact and exposure to smoke [Table 1]

After analysing all the factors in univariate analysis, it was found that age, TB contact and exposure to household smoke were having significant association with weight gain and on multivariate regression analysis they came out to be significantly independently associated with weight gain [Table 4].

Table 1: Demographic characteristics and other risk factors with association with weight gain

Factors	Total	Mean weight Gain	P value
Sex			
Male	81	1.29 ± 0.80	0.67
Female	36	1.36 ± 1.20	
Age			
0-5 Years	57	0.95 ± 0.51	<0.001
6-14 Years	60	1.66 ± 1.11	
Resident			
Rural	33	1.1 ± 0.62	0.24
Urban	84	1.40 ± 1.02	
TB Contact			
No	90	1.45 ± 0.98	<0.01
Yes	27	0.86 ± 0.59	
Exposure to Household Smoke			
No	78	1.48 ± 1.02	<0.01
Yes	39	0.96 ± 0.62	
Exposure to Bidi/Cigarette Smoke			
No	75	1.32 ± 0.92	0.64
Yes	42	1.30 ± 0.97	
BCG Vaccination SCAR			
No	15	1.48 ± 0.51	0.06
Yes	102	1.29 ± 0.98	
Diagnosis			
Pulmonary TB	72	1.34 ± 0.79	0.31
Extra pulmonary TB	30	1.34 ± 1.22	

Pumonary+ Extrapulmonary both	15	1.12±0.98	
Confirmation			
Microbiologically confirmed TB	15	1.44±1.06	0.79
Clinically diagnosed TB	102	1.29±0.92	
Duration of Illness Before Treatment			
≤ 30 Days	63	1.21±0.83	0.26
> 30 Days	54	1.42±1.04	

Table 2: Difference in weight and average weight gain with duration of treatment

	Difference in weight			Average weight gain(Kg)
	No. of patients with no change	No. of patients with weight loss	No. of patients with weight gain	
At the end of 2 months of ATT	3(2.6%)	3(2.6%)	111(94.8%)	1.31±0.93
At the end of 6 months of ATT	0	0	117(100%)	2.45±1.93

Table 3: Percentage weight gain with duration of treatment

Percentage weight gain	No. of patients showing weight gain at 2 months	No. of patients showing weight gain at 6 months
< 5%	42(35.9%)	9(7.7%)
5- 10%	33(28.2%)	30(25.6%)
>10%	42(35.9%)	78(66.7%)

Table 4: Multivariate linear regression analysis for factors affecting weight gain

	Unstandardized Coefficients (B)	p value	95% Confidence Interval for B	
			Lower Bound	Upper Bound
Female gender	-.077	.601	-.369	.215
Age	.116	.000	.083	.149
TB Contact	-.672	.000	-1.006	-.338
Household smoke	-.471	.003	-.777	-.165
BCG	-.040	.848	-.454	.374

Discussion

This study was aimed at evaluating the weight gain in pediatric patients undergoing antitubercular therapy and identifying the determinant factors of weight gain among pediatric TB patients. Although there have been various studies in adult population identifying this correlation but very few studies have analysed these factors on pediatric patients and to surprise Indian studies are rare on this important issue.

In our study we found 93 percent [111 patients] showed an increment in weight at the end of intensive phase with average

weight gain of 1.31±0.93.42 kg, ranging from -0.2 kg to +10.3kg. However, at the end of 6 months 100 percent patients showed gain in weight with the average of 2.45±1.93 kg ranging from +0.2 kg to +4.6 kg. it was similar to the observation in study by Chiang et al who also found weight gain in all patients with drug susceptible TB on ATT.⁸ In a study by Vasantha et al on adult TB patients it was found that among the category 1 patients, 91.1% of the total showed weight gain and the change in weight ranged from -4 to 20 kgs with an average of 3.34 kgs while study by Pany et al in Sumatra in patients less than 18 years

old it was found that only 75% of respondents got their body weight increment at the end of tuberculosis therapy.^{9,10} In a study at Houston in adult population in the intensive two-month initial phase of treatment, only 31.9% of patients had gained at least 5% of their body weight. By the end of treatment, 62.4% of patients had gained 5% or more of their body weight.¹¹

Present study did not observe any significant difference in weight gain among males and females, urban and rural population. Average weight gain in patients in age group 6 to 14 years was more [1.66±1.11 kg] than in the patients up to 5 years age [0.95±0.51 kg], and it was found to be clinically significant [p value- < 0.001]. Other factors which came out to be significant in present study were TB contact [p value- < 0.01] and exposure to household smoke [p value- < 0.01]. On applying multivariate regression analysis age, TB contact and exposure to smoke came out to have significant independent association with weight gain. No significant difference was found in weight gain in patients with pulmonary in comparison to extrapulmonary TB and in microbiologically confirmed TB vs clinically diagnosed cases. Also, no correlation was found between duration of illness before starting the treatment and weight gain. This was in contrast to study by Meselu et al who in the bivariable as well as multivariate analysis found that type of TB and duration of illness before treatment were significantly associated with weight gain. Although the sample population studied in their study was above 18 years unlike our study population.¹²

Conclusion

Tuberculosis is a major public health problem in India. Diagnosis and management of tuberculosis is challenging even for pediatrician due to varied presentation, paucibacillary nature of disease, comorbidities, associated poor nutrition of children and drug resistance.

Traditionally weight gain has been considered as surrogate marker for response to antitubercular therapy but surprisingly very few studies have been done to observe weight gain pattern in children on antitubercular therapy. There was felt need to study and quantify this important parameter in pediatric tuberculosis. So present study was conducted to fill the data gap on weight gain pattern in Indian children below 14 years taking antitubercular treatment and possible factors affecting it. Present study observed average weight gain of 1.31±0.93 KG at the end of intensive phase and 2.45±1.93 KG at the end of 6 month of antitubercular therapy in pediatric patients below 14 years. Age, contact with tuberculosis and exposure to household smoke were significantly associated with weight gain. There is further scope to compare the weight gain pattern in drug sensitive & drug resistant tuberculosis in pediatric patients.

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