The Effect of Nutritional Intake on Weight Change in Tuberculosis Patients Undergoing Antituberculous Therapy

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Abstract

Objectives: To determine the effect of nutritional intake on weight change in tuberculosis patients undergoing anti tuberculosis treatment.

Methods: It was a cross sectional study conducted at Pulmonology Department, Gulab Devi Hospital Lahore. Both male and female patients "with" age 10 years and above suffering from tuberculosis were included in the study. The weight of the patient at the start of the treatment was obtained and followed for six month. Demographic information of patient (name, age, sex, address) was obtained and frequency of weight change was recorded. Nutritional intake of patients was monitored through food frequency questionnaire. All the data was entered on a predesigned questionnaire. Data was entered, cleaned and analyzed using SPSS version 24.0.

Results: In this study 224 patients were included with mean age of 35.06 ± 17.6 years (range 10 to 80 years). One hundred and thirty-two (58.9%) were males while 92 (41.1%) were females. One hundred and forty six (65.2%) were married while 78 (34.8%) were unmarried. Mean weight change in all 224 patients was 2.95 ± 3.11 kg. It was observed that patients taking legumes, rice, sugar and apple in diet had weight gain with statistically significant difference. It was further observed that greater mean intake of oranges, tomatoes, lemons and spinach was associated with no weight gain with statistically significant difference.

Conclusion: In conclusion, certain food types (legumes, rice, sugar and apple) when used in conjunction with chemotherapy for tuberculosis treatment helps gain weight and leads to better treatment outcome.

Keywords: Nutritional Intake, Weight gain, Weight loss

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Introduction

Tuberculosis remains the leading cause of death due to a single infectious agent and one of the top 10 causes of death worldwide. According to WHO statistics 10 million people contracted the disease and 1.5 million people died in 2018 due to this deadly disease.[1] Majority of this disease burden is concentrated in the South East Asia and Africa. These two regions are home to some of the world's most poor nations. Most of these countries are classified as low or lower-middle income economy group. Low socioeconomic status has direct association with disease incidence and mortality due to overcrowding, unhygienic living conditions, malnutrition and poor access to healthcare.[2] Nutritional support is an important adjuvant therapy during treatment of Tuberculosis with anti-tuberculous therapy.[3]

Adequate provision of nutrition with counseling helps overcome macro and micronutrient deficiency observed at the diagnosis of Tuberculosis.[4] With a balanced diet, reduced breakdown of protein into amino switch the catabolic state into net buildup of body protein.[5] High Cholesterol content food may lead to speedy clearance of Mycobacterium from body. Sputum culture turns negative faster in patients fed with cholesterol rich diet.[6] Vitamin and mineral deficiency during tuberculosis is better managed with combination of supplements and chemotherapy as compared to chemotherapy alone. Food containing these micronutrients assists in overcoming the secondary immunodeficiency due to

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lack of these essential diet components.[4]

Good diet significantly improves body composition and physical functioning in well fed patients. Appreciable increase in body weight, total lean mass, total body fat and significant improvement in grip strength is observed in well fed people.[7] Nutritional support and subsequent weight gain significantly reduce the risk of unsuccessful treatment outcomes as compared to population with poor nutritional support.[4] The useful impact of nutritional support is observed when started early in the disease process. Late intervention with god diet fails to show any beneficial outcomes.[7] Individual patient's response to nutritional support is unpredictable. Time required to normalize nutritional deficiency and to gain sizeable weight is undefined and may vary among different patients.

Good nutritional intake have a direct impact on weight change and thus treatment outcome of patients on anti tuberculosis therapy. According to Sameul B et al treatment failure was less in patients having better nutritional intake as compared to poor nutritional intake. Treatment failure was present in 84 (21%) patients who had poor nutritional intake as compared to 15 (09%) which received good nutritional intake.[8] Similarly according to Bernabe-Ortiz A et al successful treatment was seen in the patients who gained 1 Kg during the first month of treatment, while the patient who lost weight during the first month had treatment failure. By the end of the fourth month, the former group gained an additional 2kg and only 0.2 Kg weight gain was noted in the treatment failure group.[9]

Aim of our study was to identify effect of nutritional intake on weight change of patients undergoing anti tuberculosis treatment and also determine individual contribution of these food types on weight gain in local set up.

Methods

It was a cross sectional study conducted at Pulmonology Department, Gulab Devi Hospital Lahore from July, 2018 to June, 2020. After approval from institutional review board patients with diagnosis of tuberculosis (pulmonary and extra pulmonary) were followed up to the completion of treatment (6 months). Non-probability convenience sampling technique was used. Both male and female patients with age 10 years and above suffering from tuberculosis were included in the study. Patients having co morbidities like diabetes, chronic liver failure, chronic renal failure and those operated for abdominal surgery as a result of tuberculosis were excluded from the study as they can interfere in weight change of the patient. The weight of the patient at the start of the treatment was obtained and followed for six month. Demographic information of patient (name, age, sex, address) was obtained and frequency of weight change was recorded. Nutritional intake of one week of 224 patients included in this study was documented on food frequency questionnaire on every visit. Drug compliance was also monitored. Patients were followed fortnight for 2 months and then monthly for next four months. All the data was entered on a predesigned questionnaire. Data was entered, cleaned and analyzed using SPSS version 24.0. Frequency tables were generated for all possible variables. Means and other parameters of central tendency were calculated for continuous data. Chi Square was applied to find out association between categorical variables. Means were compared using student's t test or ANOVA where applicable. A sample size of 224 was calculated using confidence interval of 85%, margin of error of 5% and population proportion of 50%.

Results

In this study 224 patients were included with mean age of 35.06 ± 17.6 years (range 10 to 80 years). One hundred and thirty two (58.9%) were males while 92 (41.1%) were females. One hundred and forty six (65.2%) were married while 78 (34.8%) were unmarried. Shapiro-Wilk test was done to check the normality of the data. The test showed normal distribution of population.

Mean weight change in all 224 patients was 2.95 ± 3.11kg. Mean weight gain was recorded in 175 (78.1%) patients and 21 (9.37%) patients had no change in weight. Mean weight loss was seen in 28(12.5%) patients. Mean height of patients included in this study was 5.3 ± 0.44 feet (range 3.4 to 6.2 feet). One hundred and sixty nine (169) (75.4%) had pulmonary tuberculosis while extra pulmonary tuberculosis was found in 55 (24.6%). Out of these extra pulmonary tuberculosis, tuberculous lymphadenitis was most common, 21 (38.2%) followed by pleural 20 (36.32%). Two hundred and twenty (220) (98.2%) patients were cured from tuberculosis while 2(0.89%) had treatment failure and 2 (0.89%) were transferred to MDR program. Drug compliance was seen in 217 (96.8%) patients while 7 (3.12%) patients had no drug compliance.

It was observed that patients taking legumes, rice, sugar and apple in diet had weight gain which was statistically significant. (Table 1)

Discussion

Tuberculosis is a chronic inflammatory disease associated with weight loss and low BMI at the time of diagnosis despite intake of high calorie diet.[10] A well-proportioned high calorie diet in combination with ATT gradually improves the body weight during the course of treatment.[11,12,13] Our study showed the same trend with 175 (78.1%) patients showing body weight gain at 6 month of treatment follow up. Mean weight change recorded in all 224 was 2.95±3.11 Kg. Weight loss was recorded in 28(12.5%) patients with 21(9.37%) showing no changes in weight. A study conducted by Sanchez et.al in Los Angeles on 24 tuberculosis patients recorded an increase in 3.02 ± 0.81 kg (5.5%) of body weight by 4 weeks and by 8.59 ± 0.97 kg (15.6) at 24 weeks of follow up.[12]

Result showed recovery of 220 (98.2 %) from the tuberculosis at the end of the treatment. Higher weight gain was seen in patients who were diseases free as compared to at the 6 months of follow up. Antonio Bernabe-Ortiz et.al noted a positive correlation between

Table 1: *Association of Consumption of Various Food Types with Weight Gain Using Chi Square Test*

Variable	Weight Gained		Weight Not Gained		Total N (%)	p value	Remarks
	N	%	N	%			
Egg							Not
Yes	144	79.1	38	20.9	182(81.3)	0.453	Significant
No	31	73.8	11	26.2	62(27.7)		
Milk							Not
Yes	130	78.3	36	21.7	166(74.1)	0.90	Significant
No	45	77.6	13	22.4	58(25.9)		
Yogurt							Not
Yes	100	75.2	33	24.8	133(59.4)	0.199	Significant
No	75	82.4	16	17.6	91(40.6)		
Fish							
Yes	31	83.8	6	16.2	37(16.5)	0.362	Not Significant
No	144	77	43	23	187(83.5)		
Chicken							
Yes	130	77.8	37	22.2	167(74.5)	0.90	Not Significant
No	44	78.6	12	21.4	57(25.5)		
Mutton							
Yes	139	79.9	35	20.1	174(77.7)	0.207	Not Significant
No	35	71.4	14	28.6			
Beef							
Yes	140	80	35	20	175(78.1)	0.200	Not Significant
No	35	71.4	14	28.6	49(21.9)		
Legumes							Significant
Yes	162	80.6	39	19.4	201(89.7)	0.008	
No	13	56.5	10	43.5	23(10.3)		
Chapatti							
Yes	173	78.3	48	21.7	221(98.7)	0.525	Not Significant
No	2	66.7	1	33.3	3(1.3)		
Rice							Significant
Yes	169	79.7	43	20.3	212(98.7)	0.015	
No	6	50	6	50	12(5.4)		
Apple							
Yes	171	79.5	44	20.5	215(96)	0.026	Significant
No	4	44.4	5	55.6	9(4)		
Sugar							
Yes	164	80.8	39	19.2	203(90.6)	0.003	Significant
No	11	52.4	10	47.6	2.1(4.4)		

weight gain and disease outcome. Patients with good outcome gained 1 kg on average by the end of the first month of treatment and additional 2 kg gain was seen at the 4 months of follow up. Tuberculous patient with poor outcome lost 1 kg at the end of first month[11]. A systemic review and meta-analysis reported rapid negative conversion rate of sputum smear and culture in nutritional support group compared to control group.[14]

Our study is distinctive for showing significance of various food types in improving BMI during tuberculosis treatment. Contribution of individual food type, vegetables and fruit has been rarely studied in past. Nutritional assessment was done using food frequency questionnaire which is a standard procedure. In protein intake only legumes had statistically significant association with weight gain of the patient. Patients using legumes in their diet had more weight gain as compared to patients not using legumes. Consumption of other protein containing diet like eggs, milk, yogurt, chicken, mutton and beef had no statistically significant association with weight gain.

In carbohydrates, sugar and rice intake had association with weight gain of the patient. Other diets including chapatti, candy, chocolates and bread had no association with weight gain of the patient. We also found that no association was present between fat diet and weight gain of the patients. Among fruits apple had a positive association with weight gain of the patients. Other fruits like banana, orange, guava and lemon had no significant association with weight gain of the patient. Among vegetables no association was found.

A multicenter study with large sample size can be done to more accurately link affiliation of diet with weight gain and treatment outcome. Number of calories consumed daily was not determined during assessment of patients. This limitation restricted us to show any correlation between the amounts of calories consumed daily and weight gain. The type of mass acquired during the weight gain was not determined due to lack of resources and study limitations. Contribution by fat and protein mass towards weight gain is a separate topic and needs dedicated study.

Conclusion

In conclusion, diet when used in conjunction with chemotherapy for tuberculosis treatment helps gain weight and leads to better treatment outcome. Not every type of food consumed daily contributes towards weight gain. Certain type of food, vegetable and fruit have significant role in weight gain while other food don't contribute in gaining weight during tuberculosis treatment.

Conflict of Interest: None

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Authors Contribution

A.U: Conceptualization of Project,
B.S: Data Collection
I.Z: Literature Search
H.S: Statistical Analysis
B.M.S: Drafting, Revision
A.A.Q: Writing of Manuscript