EFFECT OF DIETARY COUNSELLING ON THE NUTRITIONAL STATUS OF TUBERCULOSIS PATIENTS

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ABSTRACT

This study was conducted from August to November, 2008 to investigate the impact of dietary counselling on the nutritional status of tuberculosis patients. A total of 20 patients of both sexes were selected for the study at the Emergency Satellites Hospital, Nahaqi, Peshawar, Pakistan. Energy and nutrient intake of patients before and after dietary counselling were determined by the 24-hour dietary recall method. The weight and height of patients were measured for the determination of BMI. Serum protein concentrations of the patients before and after two months of counselling were determined by the biuret method. Before counselling the patients were consuming energy (75%), protein (55%), fat (78%) and carbohydrate (75%) of the recommended dietary intake and after counselling, the intakes of these nutrients increased to 88%, 78%, 90% and 86%, respectively. Before counselling 30% of patients were normally nourished but 40% were mildly, 25% moderately, and 5% severely malnourished, as compared to 45%, 45%, 10% and 0%, respectively after counselling. At the start of the study, 55% of patients had normal and 45% of patients had below normal serum protein levels compared to 85% normal and 15% below normal serum protein concentrations at the end of the study. The results of the study indicated that dietary counselling is a simple and effective mean of stabilizing nutritional status in tuberculosis patients.

Key Words: Tuberculosis, Dietary Counselling, Nutritional Status of TB Patients.

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INTRODUCTION

Tuberculosis is an infectious disease caused by mycobacterium tuberculosis. It can infect various vital organs of human body i.e. lung (pulmonary tuberculosis), central nervous, the lymphatic, circulatory, genitourinary systems, bones, joints and skin (Kumar et al., 2007). The typical symptoms of tuberculosis are chronic cough with blood tinged sputum, fever, night sweating, weight loss and chest pain (Hopewell, 1994) Mortality and morbidity data on tuberculosis indicated 14.6 million chronically active cases, 8.9 million new cases and 1.6 million deaths occurred mostly in developing countries. Among the developing countries twenty-two are considered as high burden countries. Pakistan ranks sixth among the twenty-two high burden tuberculosis countries worldwide (WHO, 2006).

The energy and protein needs of tuberculosis patients are increased during the disease and an energy intake of 35–40 kcal kg\(^{-1}\) of ideal body weight is recommended. The protein intake of the diet is important to prevent the wasting of body stores (for example muscle tissues) and an intake of 1.2–1.5 g protein kg\(^{-1}\) of body weight or approximately 75–100 g protein/day is considered sufficient.

The nutritional status of tuberculosis patients (macro- and micro-nutrient levels) decreases during the disease which severely affects their muscle and immune response (Onwubalili, 1988; Dallman 1987). They need urgent dietary support in the hospital along with the recommended treatment. Dietary counselling is one of the effective tools to control malnutrition/wasting associated with tuberculosis. In Pakistan there are no proper dietary protocols for tuberculosis patients and they often have poor nutritional status. Therefore this study was designed to assess whether dietary counselling would increase nutrient intake and improve nutritional status in patients with tuberculosis.

MATERIALS AND METHODS

Study Location

The study was conducted in the Emergency Satellite Hospital, Nahaqi, Peshawar, Pakistan which provides treatment to tuberculosis and diarrhoeal patients.

Respondents

Twenty patients (both sexes) clinically diagnosed with tuberculosis, age range 15–45 years were randomly selected. Patients who were not interested or not cooperative with the researcher, of low socio
economic status, not registered with the TB center, suffering from gastrointestinal diseases or could not afford the recommended diet were excluded from the study. A preformed questionnaire was given to each patient and a detailed face-to-face interview was held.

**Data Collection and Dietary Counselling**

The data collection included height and weight measurements of the patients which were measured according to standard methods (WHO 1995) with the help of a non-stretchable measuring tape. The weight of the patients was taken using bathroom scales. The bathroom scales were checked for accuracy to the nearest 0.1kg before using. Dietary intake of the patients was determined by a 24-hour dietary recall method (Weiner and Lourie, 1969.) Biochemical assessment of the patients included serum protein which was determined by the biuret method (Johnson et al. 1999), the detail of which is given below. Dietary counselling was done by nutritionist working as an intern at the health care centre and involved the prescription of energy and nutrient rich diets using regular foods. The prescription identified the type, amount and frequency of feeding, specified the caloric and protein level to attain and included any restrictions and limited or increased individual dietary components.

**Determination of BMI**

Anthropometric data measured, included weight and height measurements which were used to calculate the body mass index (BMI) of the patients before and after counselling by the following formula

\[ BMI = \frac{\text{weight (kg)}}{\text{height (m}^2\text{)}} \]

**Determination of Energy and Nutrients Intake**

The recommended energy and nutrient intake of patients were calculated using ideal body weight (IBW) which was determined by measuring the body frame size of the patients with the help of the following formula:

\[ \text{Body frame size} = \frac{\text{Height (cm)}}{\text{wrist circumference (cm)}} \]

The values calculated using IBW were used for comparison purposes.

The dietary intake of patients before and after counselling was calculated by the 24-hour dietary recall method. After counselling dietary intakes were calculated for 3 consecutive days per week for two months. The time period of 24 hours began at 8:00 am and ended the following day at 8:00 am. Energy and nutrient intake of the patients before and after counselling were calculated from the dietary intake using Nutrition Survey for Windows (Erhardt, 2007). The energy and nutrient intake per day after counselling were calculated by taking the means of energy and nutrient taken over a two month period.

**Serum Protein Determination**

Before and after two months of counselling, a blood sample was taken from the cephalic vein of each respondent by the laboratory technician using disposable 5mL plastic syringes Beckton, Dickinson, Karachi). Blood samples were transferred to sterilized centrifuge tubes and allowed to clot at room temperature for 20 minutes. The blood samples were centrifuged for 10 minutes in a centrifuge (Hermle Z 200A, Hermle-Labortecnik, Goshe Merster, 56, Type H6 CHSTIUL, Germany) at 4000 rpm. The serum was separated off and stored at -20°C for analysis. The serum total protein level was determined by the biuret method (Johnson et al. 1999) using Spectrophotometer (GENESYS 10, Rochester NY USA) and Diasys kit (Diagnostic system GmbH, Germany).

**Procedure**

The wavelength of the spectrophotometer was adjusted to 540 nm and 1cm light path cuvette was used. Twenty (20) µl of sample and 1000 µl of reagent were pipetted into test tubes and mixed. After 5 minutes of incubation at 37°C in a water bath, the absorbance against the reagent blank was recorded.

**Calculation**

\[ \text{Serum total protein (g /dl)} = \frac{A \text{ sample}}{A \text{ standard}} \times 100 \]

\( A = \text{absorbance} \)
Statistical Analysis

Microsoft Excel version 2003 was used to calculate the mean nutrient intake and standard deviation (SD) for each nutrient before and after counselling. BMI and serum protein level before and after counselling were compared through graphs using Excel (Lena et al., 2002).

RESULTS AND DISCUSSION

Energy and Nutrients Intake of Tuberculosis Patients

Table I shows the energy and nutrient intake of the tuberculosis patients. The recommended intakes calculated using IBW were used for comparative purposes in this study.

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Rec. Before</th>
<th>Mean ± SD</th>
<th>% of the Rec. intake</th>
<th>After</th>
<th>Mean ± SD</th>
<th>% of the Rec. intake</th>
<th>Net Increase %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>1827 ± 362</td>
<td>1379 ± 287</td>
<td>75.49</td>
<td>1608 ± 272</td>
<td>88.04</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Protein (g)</td>
<td>81 ± 18</td>
<td>45 ± 11</td>
<td>55.8</td>
<td>63 ± 16</td>
<td>78.03</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Fat (g)</td>
<td>60 ± 14</td>
<td>47 ± 15</td>
<td>78.29</td>
<td>54 ± 14</td>
<td>90.03</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>CHO (g)</td>
<td>242 ± 49</td>
<td>182 ± 34</td>
<td>75.24</td>
<td>210 ± 35</td>
<td>86.76</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

* Values in the columns 2, 3 and 5 are the means of 20 patients.

** Recommended

The mean recommended intake for energy was calculated on the basis of IBW was 1827 kcal/day for all 20 patients. Before counselling the mean energy intake was 1379 kcal/day which was 75.5% of the recommended intake. After dietary counselling, the mean energy intake calculated was 1608 kcal/person/day for two months, which was 88% of the recommended intake, an increase of approximately 13%. For all 20 patients, the mean recommended intake of protein was 81 g/person/day (Table I) but the actual intake was 45 g/person/day, which increased to 63 g/day after counselling. The mean recommended intake of fat was 60 g/day and at the start of the study each person was consuming only 47 g/day, which increased to 54 g/day for the two month period. Based on IBW, the mean recommended intake of carbohydrate was calculated to be 242 g/person/day. However, before counselling the patients were only consuming 182 g/day, which increased to 210 g/person/day subsequent to counselling, a 12% increase.

Effect of Dietary Counselling on BMI of Tuberculosis Patients

Figure 1 shows the BMI of tuberculosis patients two months after dietary counselling compared with their BMI at the start of the project. There was an increase in the percent of normally (30 to 45%) and mildly malnourished (40 to 45%) nourished patients after two months of counselling. In contrast, there was a reduction in the percent of moderately malnourished patients from 25% to 10% and there were no severely malnourished patients after counselling.

Fig. 1. Body mass indices of tuberculosis patients before and after counselling

Effect of Dietary Counselling on the Serum Protein level of Tuberculosis Patients
Figure 2 shows a significant increase in the serum protein concentrations of tuberculosis patients after two months of counselling. There were 55% patients with normal serum protein levels before counselling compared with 85% patients after two months of counselling.

Fig. 2. Serum protein level of tuberculosis patients before and after dietary counselling

Low BMI is a known risk factor for mortality in tuberculosis patients (Van et al., 2003). The results of the study show that 70% of the tuberculosis patients were malnourished with a low BMI before dietary counselling, a large proportion having mild to moderate malnutrition. The observed malnutrition among tuberculosis patients at the time of registration has been reported in other studies in both developing and developed countries (Zachariah et al., 2002; Onwuahili, 1988; Harries et al., 1988; Metcalfe, 2004). The low BMI among patients with tuberculosis may be due to poor energy and nutrient intake, anorexia, impaired absorption of nutrients or increased catabolism (Hopewell, 1994). The present observations are in concurrence with studies done in India by Ramakrishnan et al. (2007) and in Malawi by Van et al. (2004). In this study, after dietary counselling a considerable increase was observed in energy and nutrient intake of the tuberculosis patients, which in turn produced a significant increase in BMI. The increase in BMI, confirming the findings that patients with tuberculosis can mount a protein anabolic response to increased energy and nutrient intake (Paton et al., 2003; Macallan et al., 1998).

One of the finding of the present study was that, tuberculosis patients were taking less than the recommended amount of protein before counselling. As a result more than half of the patients had serum protein levels below normal. In a previous study of Karyadi et al. (2000) and Taneja, (1990), the possible causes for the low serum protein in tuberculosis patients were considered to be nutritional intake, enteropathy and raised acute phase proteins. The hepatic synthesis of acute phase proteins is induced by cytokines such as interleukin-6 and tumour necrosis factor-α, which inhibit the production of serum albumin and cause dramatic shifts in the plasma concentration of protein (Xing et al., 1998; Gabay and Kushner, 1999).

An increase in nutrient intake was observed after counselling, which in turn significantly increased serum protein level in tuberculosis patients. Paton et al. (2004) in a previous study found that dietary counselling significantly increased nutrient intake in tuberculosis patients, which resulted in increase serum protein level.

CONCLUSION AND RECOMMENDATIONS

It is concluded that dietary counselling can have a substantial role in providing the recommended intake of nutrients and improving the nutritional status of tuberculosis patients. The addition of oral nutritional supplements to the diet did not appear to be as effective as dietary counselling.

REFERENCES


