Key Factors In Predicting The Nutritional Status Of Patients With Three Renal Replacement Therapies Maintenance Hemodialysis, Continuous Ambulatory Peritoneal Dialysis And Post Renal Transplantation Using Subjective Global Assessment Scores And Diet Recall

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Abstract: To identify key factors that influences the nutritional status of patients in three renal replacement therapies Maintenance Hemodialysis (MHD), Continuous Ambulatory Peritoneal Dialysis (CAPD) and Post renal transplantation. Eight five patients participated in this study of which 45 (53%) from MHD, 29 (34%) from CAPD and 11 (13%), from renal transplantation group. The SGA scores in the end stage renal disease (ESRD) population were studied in order to know the various conditions influencing the food intake and the quantity of food consumed during the treatment. In the proposed study food intake was evaluated and included to compare the patient’s usual recommended intake to current intake. The number of subjects in CAPD with good SGA ratings was high compared to that of the MHD. In MHD group the SGA scores were limited to poor and average scores. The frequency of gastrointestinal (GI) disturbances was high in MHD compared to that of CAPD. Predictably the renal transplantation subjects were well nourished and the scores were observed in average and good SGA rating categories. In conclusion, the nutritional status should be monitored from the pre-ESRD state and patients must be guided in making correct food choices. The food frequency and diet recalls will help in knowing the type and quality of food consumed by these patients. It is evident that dietary counseling is extremely important and dietician plays a pivotal role in the nutritional care of dialysis patients.

Keywords: SGA scores, Food Intake, Diet monotony, CAPD, MHD and Post renal transplantation.

Introduction:

The SGA scores in the ESRD population were studied in order to know the various conditions influencing the food intake and the quantity of food consumed during the treatment. It is evident from previous studies of Kalantar et al (1) and Sharma et al (2,3) that the dietary intake is very poor in ESRD. The treatment associated gastrointestinal disorders the subjects face is one of the critical factors limiting the quantity of the food consumed leading to poor nutritional status. The SGA adaptability in Indian conditions to assess the nutritional status has been limited. This study brings to light the factors influencing the nutritional status in various renal replacement therapies using SGA scoring system in Indian context.

Objective:

To identify key factors that influences the nutritional status of patients in three renal replacement therapies Maintenance Hemodialysis(MHD), Continuous Ambulatory Peritoneal Dialysis (CAPD) and Post renal transplantation.

Materials and methods:

Design:

The research study was based on the SGA data of end stage renal disease (ESRD) patients under three renal replacement modalities. To assess the nutritional status and to check the frequency of different foods consumed by the study subjects using the standard SGA proforma and Dietary recall.
A total number of 85 patients participated in this study of which 45 from MHD, 29 from CAPD and 11, from Renal transplantation group.

The patients who participated in the study were outpatients from the department of Nephrology, Nizam's Institute of Medical Sciences University hospital, Hyderabad.

Inclusion Criteria:
- Outpatients, both male and female, over 18 years of age
- Patient undergoing one of the three renal replacement modality for more than 3 months.

Exclusion Criteria:
- Any serious comorbid conditions requiring hospitalization.
- Any other serious medical disorder incompatible with participation in the study.

Main Outcome Measure:

Nutritional assessment intake of ESRD patients in three renal replacement modalities using SGA scoring system, diet recall to assess food monotony.

Intervention:

Subjective global assessment was developed for use in assessing the nutritional status of patient. Subjective global assessment is recommended in US, UK and the European guidelines or the nutritional assessment of patients with end stage renal failure for malnutrition. This system identifies patient groups with abnormal nutritional parameters, but may fail to identify patients with malnutrition as identified by other techniques, such as total body nitrogen (4). The SGA scoring system to assess nutritional status, as it is commonly used in nephrology, is a semi-quantitative scoring system based on history and physical examination (5,6).

The score is based on the 7-point scale. The technique of subjective global assessment allows a rapid, equipment-free scoring of nutritional status in patients with renal failure. This has led to the widespread use of SGA in renal patients both in research studies and clinical practice. Hence in the present study a 7-point rating scale recommended by the DOQI guidelines was used over a period of 12 months.

In the proposed study food intake was evaluated and included to compare the patient's usual recommended intake to current intake. Dietary recall (24 hrs) was collected thrice a week from all MHD, CAPD and Renal transplantation subjects.

Food intake was closely monitored in hospital for 2 days every month in case of CAPD and Transplant subjects as majority were non local this was planned in order to ensure that the amount of food on observation and that expressed by the subjects in the diet recall was similar.

Mean average consumption of protein, energy and fat consumed was assessed from the dietary recall data. The nutritive values were calculated based on the Nutritive values of Indian foods recommended by National Institute of Nutrition (7).

A simple user friendly Excel sheet was prepared for calculation of nutritive values of foods by the investigator. This excel sheet also serves in knowing the frequency of consumption of different foods to track the most frequently consumed food stuff and variation in food consumptions throughout the study period.

Results:

The table-1 shows the dietary protein, energy and fat consumed among different groups.

<table>
<thead>
<tr>
<th>Food Intake</th>
<th>Poor (&lt;3)</th>
<th>Average (&lt;3&gt;5)</th>
<th>Good (&gt;5&lt;6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPD-SGA SCORES RANGE</strong></td>
<td>N=301</td>
<td>n=20</td>
<td>n=119</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>39.37</td>
<td>45.29</td>
<td>54.86</td>
</tr>
<tr>
<td>Energy (kcal)</td>
<td>1283.37</td>
<td>1506.60</td>
<td>1807.04</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>37.88</td>
<td>42.99</td>
<td>56.44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food Intake</th>
<th>Poor (&lt;3)</th>
<th>Average (&lt;3&gt;5)</th>
<th>Good (&gt;5&lt;6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MHD-SGA SCORES RANGE</strong></td>
<td>N=286</td>
<td>n=76</td>
<td>n=210</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>56.50</td>
<td>56.87</td>
<td>NA</td>
</tr>
<tr>
<td>Energy (kcal)</td>
<td>1768.52</td>
<td>1775.41</td>
<td>NA</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>39.16</td>
<td>39.95</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food Intake</th>
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<th>Good (&gt;5&lt;6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POST TRANSPLANTATION-SGA SCORES RANGE</strong></td>
<td>N=132</td>
<td>n=5</td>
<td>n=46</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>NA</td>
<td>69.53</td>
<td>62.44</td>
</tr>
<tr>
<td>Energy (kcal)</td>
<td>NA</td>
<td>1853.59</td>
<td>1911.27</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>NA</td>
<td>36.44</td>
<td>38.21</td>
</tr>
</tbody>
</table>
consumption levels across the three renal replacement modalities. The dietary consumption levels were further classified into three categories based on the SGA scores, as poor SGA scores if the scores are less than 3, while average scores if more than three and less than 5 and good scores if more than 5 and less than 6.

The number of subjects in CAPD with good SGA ratings was high compared to that of the MHD. In MHD group the SGA scores were limited to poor and average scores. The frequency of gastro intestinal (GI) disturbances was high in MHD compared to that of CAPD. The details of the GI disturbance scores in the SGA were discussed in the consequent paragraphs and tables. Predictably the Renal transplantation subjects were well nourished and the scores were observed in average and good SGA rating categories. None of the subjects were in the poor SGA ratings category. The protein and caloric intake was similar to that of the normal individuals.

As per the DOQI recommendations the protein consumption of 1.2 gm/kg body weight during dialysis, considering the average weight in CAPD and MHD, it was found that the average protein consumption was lowest in CAPD 39.37 gm, 45.29 gm, 54.86 gm in the three SGA rating categories followed by the MHD with 56.50 gm, 56.87 gm in MHD. In Renal transplantation group 69.53gm, 62.44 gm which was the highest as per the DOQI recommendations. Mean dietary protein intake was 65.52 gms (body weight 54.6 x 1.2 gm protein). The mean dietary protein intake was 54.6 gm in MHD subjects, and in CAPD the mean protein intake was 56.86 gm and the recommended was 73.15 gm (body weight 60.96 x 1.2 gm protein). The recommended was 55.49 x 1 gm protein among transplant subjects while the protein consumption was high in Renal transplantation group (69.53and62.44)

The fat consumption was highest in the CAPD subjects ranging from 37.88 gm, 42.99, and 56.44 under three SGA ratings. While the MHD group had 39.16gm and 39.95, Renal transplantation group had the lowest scores with 36.4 gm and 38.21 gm. The mean average body weight in CAPD 60.96 kgs, MHD 54.6 kgs and 54.3 kgs in renal transplant subjects.

Discussion:

From the table 1 results and the various reviews it is evident that dietary counseling is extremely important and dietician plays a pivotal role in the nutritional care of dialysis patients. Patients should be provided with dietary counseling from the start of substitutive treatment in order to meet the recommended nutritional intakes.

By and large the dietary intake in the MHD or CAPD was low compared to the actual recommendations. The qualitative results during the recalls showed that majority of the subjects come from middle and low middle income groups and are the key earning member in the families. Due to financial constraints, myths and beliefs on various foods and lack of awareness in bringing change in the diet resulted in monotony in the diet.

Jennifer et al(8) reported similar observations that patients with the most varied diets had the highest energy and protein intake while patients with the most monotonous diets had the lowest energy and protein intake. The study concluded that diet monotony correlates with nutritional intake. However despite of frequent counseling the access to prepare a better quality food and affordability have contributed to the poor dietary intake in the present study.

The dietary intake in the ESRD state is influenced from the pre-ESRD state. Majority of subjects diagnosed initially with proteinuria and or renal failure avoid protein rich food stuff and the non-vegetarians turn into compulsive vegetarians and those who are vegetarians completely go on a protein free diet. The diet of these subjects consisted of a repetitive menu of rice, butter milk (diluted curd with water), occasionally the Indian bread (roti), batter made of rice and pulse combination steamed (idly), pan cakes (dosa) of the same batter, very small quantities of cooked vegetables, a concoction made of tamarind and some herbs and spices (rasam) and small quantity with some pulse added to it (sambaar) were some occasional foods. The vegetable consumed was limited with the panic for raised electrolytes like sodium and potassium; same was the reason for low consumption of fruits. The subjects with history of diabetes were extremely apprehensive of consuming fruits owing to raised blood sugars and potassium thus the vitamin C, carotene rich food and dietary fiber in the foods consumed was negligible.

In a study on food intake and characteristics of hemodialysis patients as obtained by food frequency questionnaire concluded that patient receiving dialysis may consume significantly lower amounts of potassium, vitamin C and dietary fibers as well as carotenoids. The study also stated that lower vitamin C, dietary fiber, carotenoids and potassium
in MHD patients may be atherogenic. A hypothesis was proposed that prescribed restrictions in the above nutrients may lead to reduced fruit and vegetable intake, leaving meat and fats as the main source of calories(8). This may contribute to atherosclerosis and increased cardiovascular morbidity and mortality in these patients.

Nutritional inadequacy was attributed firstly to anorexia, accumulation of an anorectic factor, infection, medications, psychological factors, hemodialysis and peritoneal dialysis. Secondly to metabolic acidosis and malnutrition. In normal subjects a low protein diet activates the following adaptive mechanisms to promote neutral nitrogen balance: Suppression of amino acid oxidation, suppression of protein degradation and stimulation of protein synthesis. Metabolic acidosis impairs all these adaptive metabolic responses; it stimulates the degradation of essential, branched-chain amino acids, and muscle proteins and suppresses albumin synthesis (2). In short metabolic acidosis blocks the ability of ESRD patients to adapt to low protein diet leading to negative nitrogen balance. Few isolated reports suggest that malnutrition is the most common condition in ESRD patients in India. Despite of the various reasons interpreted it was stated that out of all factors enumerated inadequate nutrient intake probably remains the single most important factor.

The term malnutrition is a continuum, which starts when the patient fails to eat enough to meet needs and progresses through a series of functional changes which precede any changes in the body composition which are related to the duration of reduced intake and its severity. The base definition of malnutrition on any one of these changes is inappropriate. Only by recognizing the different facets of malnutrition can we define its various manifestations in relation to our clinical objectives. SGA combined with selected objective parameters at this moment provides the best clinical way of meeting these objectives. In the future muscle function may be useful in determining optimal nutrient intake early in the course of feeding. Techniques such as a BIS DEXA and MRI combined with spectroscopy may provide powerful tools in the future.

The CAPD group had scores ranging in all the three categories. It was observed that with higher scores, the consumption levels were high however the intakes were less on comparison with those of the DOQI recommendations. The basis for such difference could be that the CAPD subjects were having dialysis at home or work stations, were employed, long duration on CAPD and stability.

Though the subjects were in two categories based on the SGA ratings there was no substantial difference in the dietary intake of the groups and was in actual fact low compared to that of the DOQI recommendations.

Denis et al stated that because there is no protein storage in adults, every gram of protein absorbed above the daily requirement at the early stage of renal failure will increase urea generation and hence blood urea nitrogen. For this reason at least, protein should be limited to the optimal amount eg, 0.7 to 0.8g/kg ideal body weight(IBW)/day, a safety level obtained from the clinical research that includes two standard deviations above the individual mean, ensuring that 96% of the patients will stay in neutral protein balance (9). However all these trials have been performed with a sufficient energy provision, and these protein requirements are adequate only if patients eat at least 35 kcal/kg/day. Thus as the kidney disease progresses to the stage of chronic renal failure, patients may not see dietician before entering dialysis. During the initial dialysis there is a complete reversal of nutritional requirements. Indeed, due to enhanced protein losses through the dialysis membrane, excess catabolism secondary to HD session, or spontaneous peritoneal losses during peritoneal dialysis, patient’s protein intake has to increase robustly to 1.2 in MHD and 1.3 g protein/kg/day in PD patients. A qualitative change in food selection therefore needs to be judicious because energy intake must remain constant.

In addition, intake is specific for some patients a third episode may occur because they receive kidney transplantation. Indeed after diuresis restoration, subnormal urea clearance and electrolyte normalization, almost none of the diet precautions will apply as in pre ESRD, ESRD on MHD or CAPD. At this stage patients usually eat more, are more hypertensive as a consequence of cyclosporine treatment, and may have drug-induced diabetes and dyslipidemia. All these symptoms will become specific and subtle targets, particularly those of cardiovascular domain need focus. Hence the restrictions and access to providing a variety in food is important to maintain nutritional requirements especially with regards to protein and energy consumption.

A compulsive reduction in the fatty foods, saturated fats and unsaturated fats was observed amongst all the Renal transplantation subjects. On the qualitative assessment of the food intake among all the Renal transplantation subjects it was noticed that they had apprehensions of developing diabetes, cardiac problems and rejection. This was also encouraging report since post transplant most of the patients
had good knowledge on the food choices that they need to make in order to maintain good health. The dietary results regarding the fat consumption are encouraging and at the same time difficult to interpret since low consumption of fat in the Renal transplantation group as a precaution to prevent hyperlipidemia, associated CAPD etc, but this radical and strict dieting by the subjects could lead to undernutrition since complete restriction of the fatty foods might give space to conditions related to under nutrition. Consequently more evidence based information in this area is required. Since there are very limited studies related to the dietary consumptions and its impact after kidney transplantation. While the CAPD subjects require more counseling related to fat consumption as this group is more prone to hyperlipidemia and cardiac conditions.

**Conclusion:**

The pre ESRD stage and diet monotony in Indian conditions actually affect the nutritional status of the patients at a very early stage. Due to proteinuria and diabetes several non-vegetarians in India, turn vegetarian as a precaution. However this is the beginning of the malnutrition and with the progression of the condition the diet is extremely repetitive and thus the monotony in choice of foods sets in. SGA assessments must start at this stage in order to closely monitor the nutritional requirements of these patients and prevent malnutrition. The food frequency and diet recalls will help in knowing the type and quality of food consumed by these patients. Peer pressures, advices from various sources and financial constraints limit and also affect the food choices. The nutritional status should be monitored from the pre-ESRD state and patients must be guided in making correct food choices. New recipe demonstrations to the patient groups must be encouraged to break the monotony in cooking the same food. The dieticians must look out for new recipes with the limited foods items and products that are available to the patients group as per place, lifestyle and adoptability to new foods.

**References:**