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Clinical Research

DIETARY INTERVENTION TOOLS IN CHRONIC KIDNEY DISEASE

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ABSTRACT Chronic kidney disease (CKD) is a worldwide health problem. Its prevalence in Asian countries is increasing with subsequent socio economic and public health consequences. Since malnutrition is major contributing factor for disease progression and premature mortality, preventive measures are needed. Primarily, interventions should be planned to educate patients for maintaining nutritional status and improving dietary compliance. In the present study, dietary intervention tools are developed for non-dialysed Chronic Kidney Disease patients of age above 18 years. For this purpose, Behaviour Change Communication (BCC) goals are listed and risk factors are identified. Tools Renal Exchange List and Green Light Chart are developed. In combination with diet chart, these tools may add great value in bringing compliance and variety in the diets of CKD patients. In addition, these may aid patients adhere to the prescribed dietary amounts.

KEYWORDS : Chronic kidney disease, dietary compliance, nutrition intervention

Introduction

Changing demographics in developing countries like India, increasing affluence and sedentary lifestyles have led to the increase in prevalence of non-communicable lifestyle disease like Chronic Kidney Disease (CKD). CKD is a worldwide health problem.[1] It affects the global burden of death causing premature morbidity and mortality which is due to the disease interaction with other non-communicable illness and malnutrition which increases with disease progression.[2-4]The burden of chronic kidney disease is not restricted to its effect on demands for renal replacement therapy; the disease has other major effects on the overall population. High blood pressure, anemia, malnutrition, bone disease, neuropathy, dyslipidemia, hyperkalemia, hyperpar athyro idism, hyperphosphatemia, left ventricular hype rtrophy, metabolic acidosis and decreased overall functioning and wellbeing are few complications associated with CKD. As per Kidney Disease: Improving Global Outcomes (KDIGO), CKD is defined as abnor malities of kidney structure or function, present for >3 months, with implications for health.[5] Factors such as uncontrolled diabetes, hypertension, old age and maternal malnutrition increase the risk of CKD.[6] Other causative factors such as environmental toxins including residual pesticides, fluoride, aluminum, cadmium and cyanobacteria in drinking water could also lead to kidney disease.

Global facts

Worldwide projection showed that at the end of 2004, among 1,783,000 end stage renal disease (ESRD) patients, 77% were on dialysis, 23% had a functioning renal transplant (RT), and this number is increasing at a rate of 7% every year.[7] In 1990, CKD ranked 27th in the causes of deaths, which increased to 18th in 2010. [8]Prevalence of CKD estimated to be 10.2% in Europe, [9] 13.1% in the USA, [10] and 13.7% in Korea [11] among volunteers aged ≥ 20 years. Prevalence of CKD is very high even in developing countries [1,12] where Asians are on the higher risk.13 With increase in diabetics worldwide, with the projected figure of 57.2 million cases in 2025 especially in Asian countries like India,[14] and with the expected increase in hypertension to double from 2000 to 2025,[15] CKD prevalence in India is likely to increase and there is likely to be serious socioeconomic and public health consequences.

Malnutrition

Poor nutritional status plays a significant role in morbidity, accelerated progression and premature mortality among CKD patient population. [2-4] Malnutrition is highly prevalent and sets in much before the end stage renal disease (ESRD).[16] It was noted that nutritional status gets deteriorated even when glomerular filteration rate (GFR) is ≥ 28 to 35 mL/min/1.73 m^2.[17-19] In the support, other studies also assured decline in dietary calorie and protein intake when GFR is equal to or less than 50 mL/min.[17,18,20] Hence it becomes vital to assess nutritional status of CKD patients at early stages, which is quite challenging due to lack of single norm. Therefore, alternate measurements should be done to increase the sensitivity and accuracy of the evaluation. Due to various diagnostic tools used in separate studies, prevalence of malnutrition among CKD patients ranges from 20-50% at different stages.[21] In another study the prevalence of malnutrition in hemodialysis patients as per different methods ranged from 12.1% to 94.8%. [22] Therefore, there is a need to identify a single measure which correctly identifies malnutrition among non-dialyzed CKD patients with high sensitivity and specificity.[23] Various factors responsible for malnutrition in CKD are hormonal disturbances,[24-26] increased resting energy expenditure (REE),[27] inflammation,[28] gastrointestinal disorders, metabolic acidosis,[29] polypharmacy,[30] psychosocial and socioeconomic factors, treatment modalities,[31] alcoholism and poor in utero conditions.[32] However, the major factor considered is malnutrition because of "poor food intake"[33] due to poor appetite[34] and non-compliance with recommended diet. Once malnutrition appears, it progresses and results in increased sensitivity to infection, altered wound healing, low energy, poor quality of life and hence poor outcome of the disease. Research indicates that when patients receive intensive nutrition therapy and monitoring while the GFR is declining, nutrition status can be maintained.

Dietary compliance

Dietary compliance is the most important and integral part of well-established health care regimen. In renal disease, kidneys cannot excrete phosphorus and potassium which results in their accumulation and hence leads to metabolic disturbances.[35,36] Restricted diets therefore, play a major role.[37,38] Other than nutritional restriction, fluid has to be taken in limitation to compensate for the kidney's inability to excrete fluids.[36]If compliance to the dietary prescription is poor then it may lead to the development of renal osteodystrophy, metastatic calcifications, cardiac arrhythmia, fluid overload, heart failure and protein-energy malnutrition.[39] In studies, compliance with dietary and fluid restrictions has been described to turn down the risk of symptoms and medical complications, improve patients' quality of life[40] and increase life expectancy by 20 years or more.[41,42] Thus, manipulation of diet is vital along with the improved dietary compliance to slow down the loss of kidney function.[43,44]

Intervention

Early intervention is considered to control the progression of renal failure and improve survival.[45] As per Thomas (2007), structured educational programme for non-dialysed patients is an important part of disease management strategy [46] which helps patients to understand their disease and treatment, to slow the progression of kidney disease, to improve patient satisfaction and compliance with treatment and to improve quality of life indices.[47] Any educational program should incorporate components to improve knowledge and to change behaviour.[48] Literature confirms that knowledge, control over habits and consistent motivation are prerequisite for any change.[49] Other studies also emphasise that patient education is a necessary part of treatment where lifestyle modifications play a major role in disease control.[50] However, there are comparatively very few studies on early educational programmes on non-dialysed CKD patients and effect of these programs on the progression of kidney disease.[46]

Purpose and Planning of tools: Present Study is undertaken with the aim of development of dietary intervention tools for non-dialysed chronic kidney disease patients. Factors important while planning tools are that patients should be from stage II, IIIa, IIIb and IV, age above 18 years and on oral diet. Intervention was planned to change the behaviour of the patient. For this purpose, behaviour change communication (BCC) goal and problems are prioritised.

1. Goal of Behavior Change Communication (BCC) is to strategize interventional trial to improve knowledge, dietary intake and dietary compliance of CKD patients.
2. BCC problem is that patients with CKD are malnourished due to poor food intake
3. Reason for the BCC problem are anorexia, poor appetite, hormonal disturbances, increased resting energy expenditure, inflammation, polypharmacy, noncompliance with the diet.
4. Reason selected to study is noncompliance with the diet
5. Risk factors identified are protein intake of patients which does not match with the recommendation, patient's inadequate knowledge about disease and diet and wrong approach of choosing fruits and vegetables. Table 1, 2 and 3 explains the risk factors, goal, contributing factors, objectives and tools of the present study.

Table 1: Difference between dietary recommendation and protein intake as risk factor I

Risk factor I	**Protein intake does not match with the recommendation**			
Explanation	Patient's total protein intake does not match with the dietary recommendations. Either patients take very low protein or very high protein in their diets.			
Goal	To improve protein intake in pre-dialysis patients through education of renal exchanges			
Contributing factors	Patients are unaware about the amount of protein required as per their stage	Patients' protein intake is not planned according to stage of disease	Patients following same diet chart for long time irrespective of the change in their disease stage	Patients are not educated about the renal exchanges which may help them to bring variety in diet while remaining in the recommended exchanges
Objectives	To guide patients for the amount of protein required as per their disease condition.	To calculate patient's protein intake according to GFR	To follow up patients to check changes in GFR and diet	To explain and educate patients about renal exchanges
Tool	Dietary counselling	eGFR calculator for CKD-EPI equation, 2009	• eGFR calculator • 24-hour diet recall	**Renal food exchange list**

Table 2: Patient's inadequate knowledge about disease and diet as risk factor II

Risk factor II	**Patient's inadequate knowledge about disease and diet**		
Explanation	Lack of knowledge about disease and diet decreases dietary compliance		
Goal	To improve knowledge about kidney disease among non-dialysis patients		
Contributing factors	Patients are unaware about kidneys and their functions	Patients are unaware about kidney diseases, symptoms and causative factors	Patients are unaware about the importance of diet and nutrition in kidney disease
Objective	To provide and explain booklet to the patients which focuses on kidney disease and diet		
Tool	Booklet (information taken as such from the online source "National Kidney Foundation") 51		

Table 3: Wrong approach of choosing fruits and vegetables as risk factor III

Risk factor III	Wrong approach of choosing fruits and vegetables	
Explanation	• Patients are not aware of fruits and vegetables containing high potassium and phosphorus • Even if they are aware, their choice of fruits and vegetables is limited, which could make their diets monotonous leading to dietary non-compliance	
Goal	To increase knowledge of fruits and vegetables high in potassium using green light chart	
Contributing factors	Incorrect choice of fruits and vegetables	Limiting diet by choosing only a few fruits and vegetables
Objective	To explain patients about fruits and vegetables which could be taken liberally, moderately and rarely on the basis of potassium and phosphorus content	
Tool	**Green light chart**	

Intervention tools:
Renal Exchange List and Green Light Chart are formulated for the dietary intervention of Chronic Kidney Disease patients. In addition, a 6-page Booklet on kidney disease and diet was prepared. It comprised in general about kidneys, kidney diseases, risk factors and causes, role of proper nutrition and exercise in kidney disease. The content is taken from National Kidney Foundation (NKF), a leading organisation in United States which is constantly working for awareness, prevention and treatment of kidney diseases.[51]

Renal food exchange list: Renal food exchange list is the list of food items like milk, meat, dhal and cereal, which can be exchanged with other food items within the same food group in the specified amounts. Exchanges add variety to the day's diet and it helps patient to stay within prescribed amounts whether he/she is eating at home or at a friend's place. For the present renal exchange tool, the nutritive values are taken from "Nutritive value of Indian Foods by National Institute of Nutrition (NIN)".[52] Since, the nutritive values are subject to change with new researches and likely to vary in other countries, here basics of making the tool is explained. For renal exchanges, keeping 2.5 gm protein constant for food groups of milk, cereal and dhal and 5.5 gm protein as a constant factor for meat exchanges are developed. Standardization of all the foods in exchange list is done and is reported as household measures.

Green light chart: Green light chart is a visual aid to provide information on fruits and vegetables taken liberally, moderately and frequently. Nutritive values referred from "Nutritive value of Indian Foods by National Institute of Nutrition(NIN)".[52] In case of missing values from NIN source, are filled from USDA nutrient database.[53] Green light chart has three zones. Green part covers vegetables and fruits which can be consumed frequently. Orange part shows vegetables and fruits which should be taken in less amounts and occasionally, whereas red zone vegetables and fruits should be avoided or taken rarely in limited quantities. Both potassium and phosphorus content need to be considered to fulfil the criteria for considering it as green, orange or red zone fruits and vegetables. For example, if potassium of any fruit is less but phosphorus is high, then the higher zone i.e. orange or red is given to that fruit or vegetable. This chart will guide patients to choose vegetables and fruits correctly within the amounts recommended. In addition, this may help patients in bringing variety in their diets. These tools, can be translated in any local language to cover wider range of chronic kidney disease patient population. These tools will help dieticians as well as physicians to make quick counseling of their patients. In addition, this can also be used by para medical staff at any hospital in the absence of renal expert. Handouts can be made and given to the patients along with diet chart for their future reference. This will help patients remain in their dietary prescription and also guide care providers in improving dietary compliance of their patients.

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