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DIETARY TREATMENT OF DIABETIC NEPHROPATHY"

Medicine

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ABSTRACT

In recent years, several studies have reported that the prevalence of diabetes mellitus is increasing every year, and also the acute and chronic complications accompanying this disease are increasing. Diabetic nephropathy is one of chronic complications of diabetes mellitus, and food intake which is burden to kidney function should be limited. At the same time, diet restriction could deteriorate quality of life of patient with diabetic nephropathy. According to the results of previous studies, the aggressive management is important for delaying of the progression to diabetic nephropathy. Also, the implementation of a personalized diet customized to individuals is an effective tool for preservation of kidney function. This is a case report of a patient with diabetic nephropathy who was introduced to a proper diet through nutrition education to prevent malnutrition, uremia and to maintain blood glucose levels.

KEYWORDS

Diabetic nephropathy; Low-protein diet; Protein restriction.

INTRODUCTION

Diabetes mellitus is a clinical syndrome characterized by hyperglycemia due to absolute or relative deficiency of insulin, with or without glycosuria resulting from a diversity of aetiologies, environmental and genetic acting jointly.

It is the commonest endocrinological disorder encountered clinically, which involves kidney also as a part of its chronic complication.

The underlying cause of DM is the defective production or action of insulin, a hormone that controls the metabolism of carbohydrate, fat and protein, Chronic complication of DM includes cardiovascular, renal, neurological, ocular, g.i.t. genitourinary, dermatological systems etc.

Staging of Diabetic Nephropathy

1. Increased blood flow and glomerular hyperfiltration
2. Early glomerular lesions – thickening of glomerular basement membrane.
3. Incipient diabetic Nephropathy – the stage of microalbuminia.
4. Overt diabetic nephropathy
5. End stage renal disease in diabetes.

Kimmelsteil and Wilson first described diabetic intercapillary glomerulosclerosis in 1936 A.D. Most common lesion is diffuse glomerulosclerosis but nodular glomerulosclerosis **(Kimmelsteil Wilson nodule)** is the pathognomonic of diabetic nephropathy. Diabetic nephropathy manifests as a varying combination of Proteinuria, hypoproteinemia, hypertension, oedema & azotemia.

The principal clinical manifestation is proteinuria, which is followed by a decline in renal function after a variable period of time.

T1DM carries 30-40% chance of diabetic Nephropathy & T2DM a chance of 15-20% after 20 years.

The first & principal clinical sign of diabetic nephropathy is microalbuminuria defined as albumin excretion/24 hour in the range of 30-300 mg or overnight urinary albumin excretion rate 20-200 mg/min in at least 2 out of 3 collections over a time period not exceeding 3 months. Other cause of albumin excretion in urine is strenuous physical exercise, Pregnancy, CCF, HTN, UTI, fluid overload etc.

Once proteinuria is established, the renal function starts to decline steadily if appropriate treatment is not started immediately. The rate of progression of disease can be reduced by restriction of dietary protein (Low Protein diet), low carbohydrate diet, tight glycemic control and prompt treatment of hypertension & hyperlipidemia.

ADA guidelines suggest that dietary protein restriction reduces rate of decline of renal functions in patients with diabetic nephropathy.

Various studies have shown that protein restriction up to 0.6 g/kg/d retards the progression of nephropathy. The general consensus is to prescribe a protein intake of 0.8 g/kg/day (~10% of daily calories) in patients with overt nephropathy. However it has been suggested that once GFR begins to fall, further restriction to 0.6 g/kg/day may prove useful in retarding the progression of nephropathy to avoid malnutrition. The rate of progression of declining renal function can be reduced by dietary protein restriction, prompt glycemic control & management of hypertension.

The treatment of hypertension in patients of diabetic nephropathy is particularly very challenging as many of agents used to lower blood pressure can adversely affect glucose metabolism.

Though ACE inhibitors and/or ARBS are used to retard nephropathy they are not without risks. They can worsen azotemia by reducing GFR and can cause hyperkalemia. ACE inhibitors can precipitate ARF in patients with bilateral renal artery stenosis due to dilatation of efferent arterioles and fall in glomerular filtration pressure. In such patients, they are contraindicated.

Thus, in short, we can say that dietary protein restriction is quite effective non-pharmacological intervention to retard diabetic nephropathy. This is free from any risk and reduces proteinuria, reduces oedema by improving serum protein level and thus slows down the declining renal functions, when combined with prompt treatment of hyperglycemia and hypertension.

AIMS & OBJECTIVES OF THIS STUDY

a) To see whether dietary protein restriction reduces proteinuria in patients of Diabetic Nephropathy or not
b) To assess the effects of dietary protein restriction on creatinine clearance in patients of Diabetic Nephropathy.

MATERIALS & METHODS

Place of work:

This study was carried out in patients of diabetic nephropathy attending general MOPD and also in medical indoor wards, at All india institute of medical sciences , Patna.

Sample size: 63 patients of TIDM of mean age 29 years.

(out of which 15 patients were dropped out due to unknown reasons and the study was finally conducted on 48 patients)

PROTEIN RESTRICTED DIET-SHEET TO BE PRESCRIBED IN PATIENTS OF DIABETIC NEPHROPATHY.

(I) Proteins to be given @ 0.6g/kg/day for a 60 kg Person. (Low Protein Diet)

BREAK FAST	LUNCH	DINNER
Cow milk (100 ml) + Fruits (200 g) + 1 cup Tea (150 ml)	2 medium size chappatis + Pulses ½ cup cooked + 100g vegetables + 1 cup cooked rice	4 medium sized chappatis + 100g vegetables

(ii) Proteins to be given @ 1g/kg/day For a 60 kg Person (High Protein Diet)

BREAKFAST	LUNCH	DINNER
Cow milk (100 ml) + Fruits (200g) + 1 cup Tea (150ml)	2 medium size chappatis + Pulses (1 cup cooked) + 100 g vegetables + 1 cup cooked rice + 1 egg (60 gms)	4 medium size chappatis + 100g vegetables + Pulses (1 cup cooked)

Protein value of different foods :-

I) Cow milk (100 ml) = 3.2g
ii) Fruits (100g) = 1-2g
iii) Tea (150ml) = 0.9g
iv) Medium sized Chappati = 2g
v) 1 Cup cooked rice = 4g
vi) ½ Cup cooked pulses = 6g
vii) Vegetable (100g) =2-3g
viii) 1 Egg (60g) = 6g

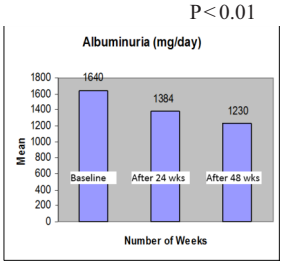
OBSERVATION

Table No. 1

Albuminuria (mg/day)

Group – A: Hypertensive / LPD (i.e., 0.6g/kg/day)

Sl. No.	At the start (Baseline)	After 24 weeks	After 48 weeks
01	1657	1412	1230
02	1447	1107	892
03	1860	1524	1387
04	1782	1385	1102
05	2205	1756	1500
06	1260	976	762
07	1185	1012	900
08	1980	1512	1270
09	1402	1165	997
10	2242	1824	1650
11	1838	1650	1512
12	1642	1532	1482
13	1523	1362	1256
14	1224	1122	1068
15	1586	1488	1412
16	1412	1322	1266
Mean	1640	1384	1230
S.D.	+337.52	+308.26	+288.30
S.E.	+106.53	+99.18	+90.52
		P<0.01	

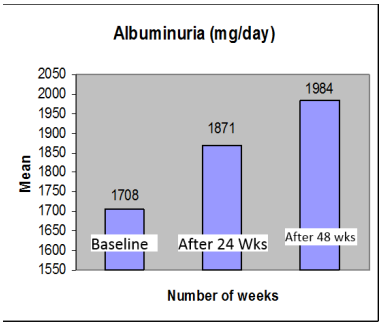


Graph -1
Showing the effect of low protein diet on urinary albumin excretion rate (mg/day) in hypertensive patients

Table No. 2 Albuminuria (mg/day) Group –B: Hypertensive / HPD (i.e.>1g/kg/day)

Sl. No.	At the start (Baseline)	After 24 weeks	After 48 weeks
17	1800	1970	2100
18	1650	1822	1958
19	1762	2112	2340
20	1314	1526	1644
21	1803	1995	2155
22	2137	2227	2301
23	1509	1795	1962
24	1560	1662	1704
25	1455	1512	1566
26	2070	2360	2500
27	1812	1924	2006
28	1924	2013	2086
29	1606	1712	1796
30	1513	1606	1686
31	1856	2017	2162
32	1552	1686	1776
Mean	1708	1871	1984
S.D.	+262.50	+293.12	+315.45
S.E.	+83.25	+93.63	+99.75

Graph -2
Showing the effect of high protein diet on urinary albumin excretion rate (mg/day) in hypertensive patients



ANALYSIS & DISCUSSION

- Diabetic Nephropathy is clinically defined by presence of persistent proteinuria of >500mg/day in a diabetic patient who has concomitant retinopathy & in the absence of clinical or laboratory evidence of other kidney or renal tract disease. The presence of retniopathy is an and important pre-requisite. (Jitendra singh Medicine Update, 2007).
- Diagnosis of diabetic nephropathy can only be confirmed by renal biopsy and as in this study, patients were selected on clinical grounds, a set of exclusion & inclusion criteria were adopted.
- The most important clinical manifestation of overt diabetic nephropathy is persistent proteinuria. The incidence of overt proteinuria peaks after 15 years, therefore one inclusion criterion was that patients must have had a definite history of DM for at least 15 years.
- TIDM carries a 30-40% chance of diabetic Nephropathy and T2DM carries a 15-20% chance of Nephropathy after 20 years. (Harrison's Principles of Internal Medicine 17th Edition).
- UTI is common in diabetics and may cause proteinuria. Therefore UTI was another exclusion criterion. In around 92% of cases of diabetic nephropathy, retinopathy is concomitantly found, so presence of retinopathy was another inclusion criterion.

Table No. 1 shows the effect of low protein diet on patient of diabetic nephropathy with hypertension. They were given a diet containing protein of high biological value to the level of 0.6 gm/kg/day. Albuminuria readuced from a mean of 1640 mg/day (S.D.± 337.52) to 1384 mg/day (S.D. ± 308.26) after a duration of 24 weeks and to 1230mg/day (S.D±288.30) after 48 weeks.

Table No. 1 shows effect of unrestricted protein diet (> 1 gm/kg/day) on hypertensive patients suffering from diabetic nephropathy. Albuminmia kept on rising from from a mean of 1708 mg/day (S.D.±262.50) to 1871 mg/day (S.D. ± 293.12)after 24 weeks and to 1984mg/day (S.D± 315.45) after 48 weeks.

Table No. 2 compares the effect of LPD & HPD on hypertensive group. At the start of the study, the difference in the baseline values of albuminuria in the two group was statistically insignificant. At the end of 24 weeks, albuminuria decreased in patients on low protein diet & increased in those taking high protein diet & the difference was highly significant ($p < 0.005$). This may be comparable to studies by Ciavarella et al. 1987 carried out on 16 patients of T1DMwith overt nephropathy. A significant reduction in albumin excretion rate (from 651 mg/day to 307 mg/day) was found in all LPD patients after dietary protein restriction.

Thus, the present study & the other comparable studies show that low protein diet has beneficial effect on patients with diabetic nephropathy (reduces albuminuria) independently of blood glucose and blood pressure changes.

CONCLUSION

- During study period, work were started over 63 patients but final observations were done on 48 patients because 15 patients were dropped out at different stages due to unknown reasons.
- It has been observed in this study that moderate dietic protein restriction (i.e. 0.6-0.8g/kg/day) in patients of diabetic nephropathy with proteinuria led to marked reduction of proteinuria. So, patients survival will be improved and long term benefit of protein restriction will delay End Stage Renal Disease (ESRD).
- If we cannot cure the disease by dietic protein restriction, we can definitely prolong the life of patients with diabetic nephropathy.
- The present study concludes and recommends dietic protein restriction in patients of diabetic nephropathy.
- However, constant trials over large number of patients are essential to give a final conclusion in this regard.

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