

Original Research Article

A study in prevalence of diabetic nephropathy in recently detected cases of type 2 diabetes mellitus as evidenced by altered creatinine clearance, urinary albumin and serum creatinine, with special emphasis on hypertension, hypercholesterolemia and obesity

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ABSTRACT

Background: Diabetic nephropathy is one of the commonest and most dreaded complications of Diabetes. The Aim was to evaluate the significance of microalbuminuria and creatinine clearance for detecting incipient diabetic nephropathy, and to find out the prevalence of nephropathy among freshly detected Type 2 diabetic patients with vs. those without hypertension, hypercholesterolemia and/or obesity.

Methods: In this prospective study, 100 recently diagnosed diabetics were studied. Group A had 50 patients with at least one risk factor are hypertension, hypercholesterolemia and obesity. Group B had 50 patients without any of the aforementioned factors. Patients were investigated for presence of Diabetic nephropathy with abnormal serum Creatinine, creatinine clearance and urinary albumin levels.

Results: As many as 43 out of 100 patients were found to have Diabetic nephropathy. The number was significantly higher in group A compared to group B (34/50 vs. 9/50). Incidence of nephropathy was higher with higher number of associated risk factors. Urinary microalbuminuria was the commonest abnormality, Serum creatinine was found in only 30.23% of total positive cases.

Conclusions: Incidence of diabetic nephropathy is much larger than imagined in freshly diagnosed/new onset cases of DM type 2. Author also conclude that hypertension, obesity and hypercholesterolemia can contribute to development of nephropathy (68% vs. 18% in those who had the factors vs. those who didn't). Also, urinary microalbuminuria appears to be much more sensitive than serum creatinine as screening tool.

Keywords: Diabetic nephropathy, Diabetes, Hypertension, Hypercholesterolemia, Microalbuminuria, Obesity

INTRODUCTION

Diabetes Mellitus (DM) is one of the commonest diseases in the world, especially the industrialized world. But recently, the "Silent epidemic" of diabetes has been spreading like a wild fire through the developing world. India has earned the dubious distinction of being termed

the "Diabetes capital of the world" with number of patients expected to cross 79.4 million by year 2030.¹

The dangerous fact about diabetes is that it is a "Silent killer". By the time patient is diagnosed to have diabetes, he/she is already affected with complications like diabetic nephropathy, retinopathy and neuropathy. This is especially worse in India, where various factors delay the

diagnosis of Diabetes significantly compared to developed nations. Diabetic nephropathy and microalbuminuria are also strong predictors of cardiovascular and overall morbidity and mortality in patients of diabetes, and hence vital indicators in the patients.

While prevalence of nephropathy in diabetes has been extensively studied in past, very few studies have taken to determine how much prevalence is at the time of detection already. This becomes even more important when we take into account how delayed the diagnosis is in Indian patients. And presence of other complicating factors may worsen this. A study is indicated looking for how these factors impact the prevalence of diabetic nephropathy, and if targeting these factors may benefit the medical practice, especially in India.

Hence, this study aims at, and studying the occurrence of nephropathy in presence of Risk factors like Hypertension, Obesity and Hypercholesterolemia and gauging how they may impact the prevalence of nephropathy.

Objective of this study were to study the incidence of nephropathy in freshly detected Type 2 DM patients and to study how associated factors like Hypertension, Hypercholesterolemia and Obesity affects incidence of Nephropathy in a freshly detected Diabetic. To evaluated various investigations used for detection of Diabetic nephropathy.

METHODS

This was an analytical cross-sectional study carried out from April 2016 to November 2016 at SSG Hospital, Vadodara, Gujrat a tertiary care referral centre. The study was carried out among May 2011 to November 2012. A total 51 patients were male and 49 were female. The mean age was 49.24, with 28 being the youngest and 100 being the oldest. The study was approved by scientific review committee and institutional ethical committee of Baroda Medical College. Informed and written consent was obtained from patient or a responsible attendant before including the patient in the study.

The criteria for diagnosing DM was the same as given by WHO and ADA based on oral Glucose Tolerance Test is as follows.²

- FBS ≥ 126 mg/dl (Fasting = no caloric intake for at least 8 hours).
- PP2BS ≥ 200 mg/dl.

Author had divided the patients in 2 groups of 50 patients each.

- Group A: Diabetic patients with hypertension and/or obesity and/or hypercholesterolemia.

- Group B: Diabetic patients without any of the above-mentioned factors.

Subjects were selected after applying the inclusion and exclusion criteria and taking written informed consent for all participants or a responsible attendant in case of a minor.

Inclusion criteria

- Age more than 18 years.
- Detection of diabetes within 6 months at the time of enrolment in study.

Exclusion criteria

- Patients having type 1 diabetes.
- Known case of diabetes for more than 6 months.

Parameters recorded

Diabetic nephropathy is a progressive kidney disease involving damage to the capillaries in the kidneys' glomeruli because of longstanding DM, characterized by diffuse scarring of the glomeruli. While final diagnosis may need a biopsy, diagnosis is usually done with measurement of urinary albumin/GFR/creatinine clearance/serum creatinine levels.³

Microalbuminuria can be diagnosed from a 24-hour urine collection (between 30-299mg/24 hours) or, more commonly, from elevated concentrations in a spot sample (30 to 299mg/L) as done by us.

A complete history, clinical examination and investigative profile was carried out in each patient for nephropathy with particular emphasis on hypertension, hypercholesterolemia and obesity.

Patients were considered to have obesity⁴

- BMI >30 kg/m² of body surface area⁵
- The waist to hip ratio >0.85 for females and >0.90 for males

Hypertension when there was a history of Hypertension/drug therapy for the same/ blood pressure was recorded more than 140/90mmHg on 3 consecutive occasions.⁶ Complete lipid profile was done for hypercholesterolemia. Then author studied both the groups for prevalence of diabetic nephropathy and analyzed if there was a statistical difference in between these groups and inside the group A itself.

RESULTS

In this study, out of 100 total patients, 43 patients were detected to have Diabetic Nephropathy. In group A, out of 50 patients 34 (68%) patients had diabetic

nephropathy, while in group B, out of 50 patients 9 (18%) patients had diabetic nephropathy (Figure 1).

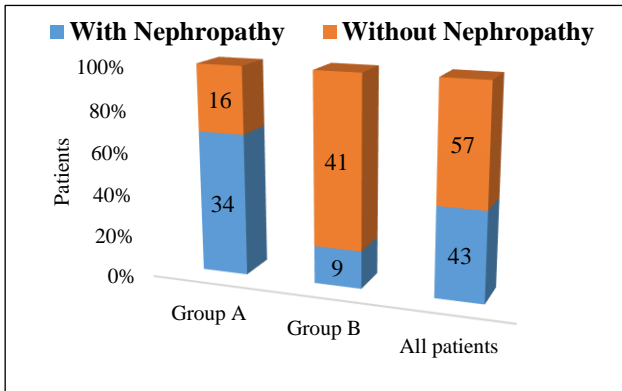


Figure 1: Patients detected with nephropathy in both groups.

A subgroup analysis was done within Group A with regards to multiple co-morbidities, showing increasing number of patients affected with increasing comorbidities (Figure 2).

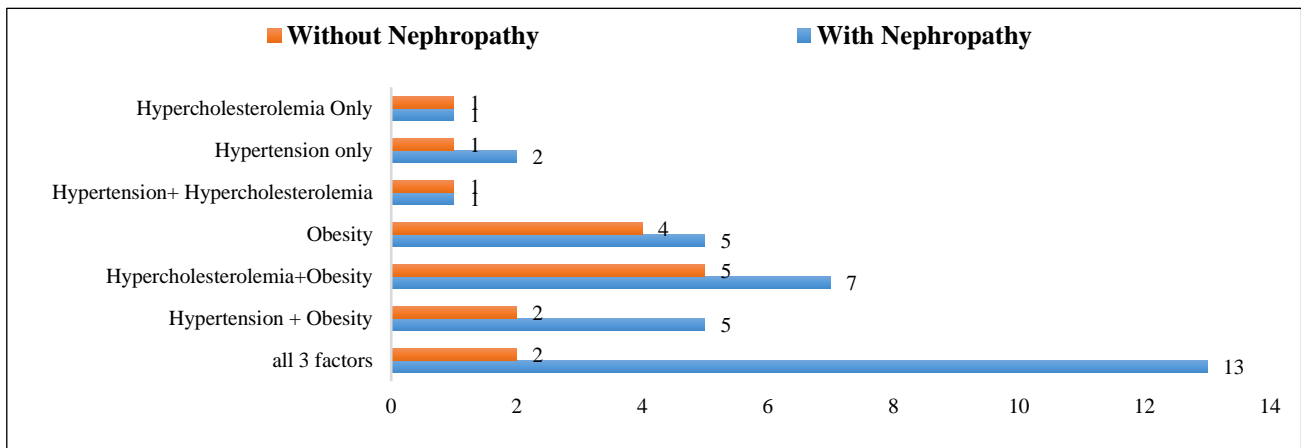


Figure 2: Patients detected to have nephropathy in subgroups of Group A.

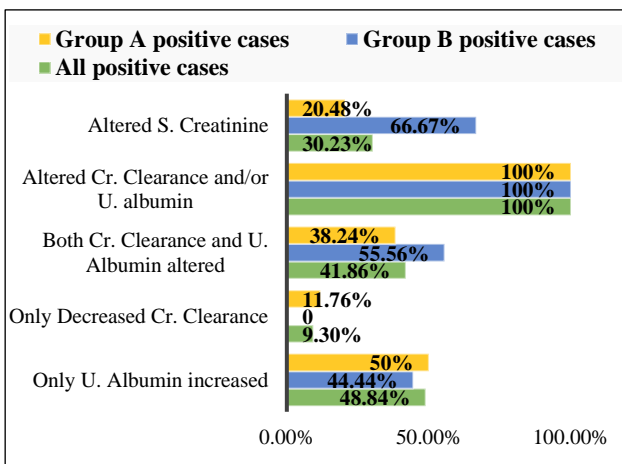


Figure 3: Biochemical abnormality detected in patients with nephropathy in percentage.

While analyzing the biochemical abnormality itself that led to diagnosis of nephropathy, author found that all positive patients had altered creatinine clearance and/or altered urine albumin levels. A significant number had only altered urine albumin levels. While only a small portion had altered S. creatinine levels (Figure 3).

DISCUSSION

Diabetic nephropathy is a dreaded complication of DM and early detection is of paramount importance. Earlier, it has been shown that Nephropathy is present in about 15-18% of patients with newly diagnosed type 2 Diabetes.⁷ In this study, out of 100 total patients, total 43 patients were detected to have Diabetic Nephropathy.

In group A, out of 50 patients 34 (68%) patients had Diabetic Nephropathy, while in group B, out of 50 patients 9 (18%) patients had diabetic nephropathy. This data is higher than data obtained by previous studies (Figure 1).

Study of development and progression of nephropathy in type 2 Diabetes by Amanda I.⁸ Adler, Stevens RJ in United Kingdom showed the prevalence of nephropathy in recently detected type 2 DM to be 7.3%. Study by Ghai et al on microalbuminuria showed the prevalence of Nephropathy in type 2 DM at onset to be 25%.⁹ Chowta NK and Pant's P study on relation of microalbuminuria in type 2 DM with relation to age, sex weight and creatinine clearance showed prevalence of nephropathy at onset to be 37%.¹⁰ Study by Agarwal N, Sengar NS has shown that there is 17.34% prevalence of diabetic nephropathy in recently detected type 2 DM, but with hypertension this prevalence was shown to be as high as 60%.¹¹ Other studies have shown similar results.^{12,13}

The higher prevalence of diabetic nephropathy found in this study could be attributed to a variety of factors.

- Low health awareness in the region in general public.
- The attitude of the general public to “bear through the problem” for as long as possible.
- Fear of Diabetes leading to refusal of accepting that one might have a problem and needs medical help.
- Ayurveda and other medicinal branches are still sought to relieve the earlier symptoms of Diabetes, thus delaying the actual diagnosis of Diabetes itself, as well as treatment sometimes.
- Unawareness in the medical community of the importance of screening for Diabetes/Diabetic nephropathy in high risk patients, leading to missed diagnosis.
- Relative lack of awareness in the medical fraternity of the best tools to diagnose Diabetic nephropathy as well as relative lack of awareness of the magnitude of the issue.

These factors would lead to a delayed diagnosis of DM, and patient would carry Diabetes, without treatment for years, which would explain the higher prevalence seen in this study. Which would mean that aggressive diagnosis by countering these issues would significantly reduce the nephropathy prevalence.

In this study, author detected 34 out of 50 patients in Group A (those having hypertension and/or hypercholesterolemia and/or obesity) to have diabetic nephropathy. While in Group B (without any of the 3 factors), only 9 out of 50 patients were detected to have diabetic nephropathy.

Author analyzed this data using Chi² method and found that association of nephropathy in group A was highly significant at P value < 0.0001.

Thus, Author conclude that diabetic patients with risk factors of hypertension and/or obesity and/or hypercholesterolemia are at a much higher risk of developing diabetic nephropathy, even at the onset. Although, even without the risk factors, the prevalence of nephropathy at onset of type 2 DM was 18%, which is NOT a number that can be ignored. While the 68% prevalence with any of these factors, is a danger that has to be dealt at the earliest for the public health. Much effort from the general public, medical community and government is required to address to this issue.

Unfortunately, the study was not powered to do a complete subgroup analysis for each separate risk factor and due to small size of the subgroups. However, it is clear from the data at hand that maximum prevalence of Diabetic Nephropathy was with all three factors present, as high as 87% (Figure 2). Further studies to determine significance of each factor on its own and especially with combination of factors are warranted here. Previous studies have shown their individual effects.¹⁴⁻¹⁸

ALL 43 patients had altered Creatinine Clearance and/or altered Urine Albumin levels. Eighteen (41.86%) had abnormality of both creatinine clearance and U. albumin, while as many as 21 (48.84%) had abnormal U. albumin levels only. But only 13 patients (30.23%) had altered S. Creatinine levels (Figure 3).

Which suggests that U. albumin maybe the most sensitive tool to diagnose incipient diabetic nephropathy. This also raises a red flag against the common medical practice of only using Serum Creatinine as a test to determine renal function.

CONCLUSION

Urinary Albumin is much more sensitive test to detect Nephropathy. And author recommend doing measurement for urine microalbuminuria on two separate occasions (especially in presence of another cause for albuminuria) or measuring the creatinine clearance for the earlier diagnosis of nephropathy. author also conclude that S. Creatinine is a VERY poor marker of Nephropathy (only 13/43 patients had altered S. Creatinine levels) and maybe medical fraternity needs to stop depending on it as screening tool for Diabetic Nephropathy.

Author conclude that the incidence of Diabetic nephropathy is much larger than imagined in freshly diagnosed/new onset cases of DM type 2, especially compared to more developed nations. Low awareness of the issues in both general public and medical fraternity, as well as heavy reliance of alternative medical practices has led to an increased prevalence in the population compared to more developed regions, an issue that must be dealt with. In addition to that, we conclude that factors like Hypertension, hypercholesterolemia and obesity can contribute to development of nephropathy (68% vs. 18% in those who had the factors vs. those who didn't). These factors might also have synergistic effect, something that needs to be explored via future studies.

These risk factors clearly add fuel to the fire, so it is very important to study their effects in more detail and mount a more aggressive and management against them when dealing with Diabetes/Diabetic nephropathy. It is also important to aggressively monitor a person who is not diagnosed as having Diabetes yet but possesses one or more of said risk factors.

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