

A PROSPECTIVE OBSERVATIONAL STUDY ON PREVALENCE OF CHRONIC KIDNEY DISEASE IN DIABETES MELLITUS

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ABSTRACT

Background: Diabetes is a metabolic disorder that results from deficiency in insulin production and insulin resistance. Chronic Kidney Disease is defined as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m² for 3 months or more. In 2013, diabetes led to more than 51,000 new cases of kidney failure and over 247,000 people are currently living with kidney failure resulting from diabetes.^[1] **Methodology:** This study was conducted with the aim to assess the percentage of population at risk of Chronic Kidney Disease in Diabetes Mellitus, to determine the stages of Chronic Kidney Disease and to assess the quality of life of the patient that who are

diagnosed with Chronic Kidney Disease in Diabetes in Mallareddy Narayana Multispeciality Hospital, Suraram, Hyderabad. This study is prospective observational in nature and the subjects enrolled in this study were about 200. Informed consent was obtained from all the subjects. The stages of Chronic Kidney Disease were determined using eGFR value by CKD-EPI equation.^[9] The quality of life of subjects were assessed by using SF-36 HS scale.^[2]

Results: This study identifies the percentage of population at risk of chronic kidney disease in Diabetes, stages of Chronic Kidney Disease and quality of life of subjects. A total of 200 diabetes patients were observed among them 77 subjects (37.99%) were with Chronic Kidney Disease, of which stage-5 (End Stage Renal Disease) was prominent. 24.53% of subjects were under dialysis. Quality Of Life is categorized into 9 activities, out of which role limitations due to physical health is more effected with a percentage of 22.5%. **Conclusion:**

The percentage of population at risk of chronic kidney disease in diabetes was found to be 37.99%. Out of which, stage-5 Chronic Kidney Disease was more prominent and are under dialysis.

KEYWORDS: Diabetes mellitus, Chronic Kidney Disease, serum creatinine, Estimated Glomerular Filtration Rate, Quality Of Life, End Stage Renal Disease.

INTRODUCTION

Diabetes Mellitus is a metabolic disorder characterized by the prolonged increase of blood sugar levels which arises either due to impaired insulin secretion, impaired insulin action, or both.^[7] Diabetes is the leading cause of kidney failure, accounting for 44 percent of new cases.^[1] According to K/DOQI guidelines, CKD is defined as kidney damage or glomerular filtration rate (GFR) $<60 \text{ mL/min/1.73 m}^2$ for 3 months or more, irrespective of their cause.^[3]

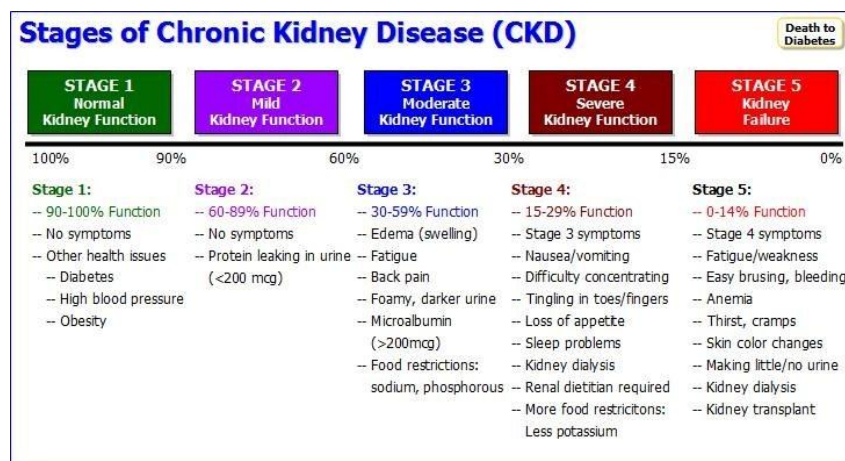


Figure 1: Stages of CKD.

PATHOPHYSIOLOGY OF CKD IN DIABETES MELLITUS

Diabetes is a disorder that affects the body's ability to produce or use insulin. When food is taken, it is converted to glucose in the body. In response to glucose, insulin is secreted to absorb blood glucose into the cells. If cells are resistant to insulin or pancreatic damage to produce insulin, the sugar remains in the bloodstream instead of going into the cells. Over time, high levels of sugar in the blood damage tiny blood vessels throughout the body including the filters of the kidneys. As more damage occurs to the kidneys, more fluid and waste remain in the bloodstream instead of being removed.^[1]

TREATMENT OF CKD IN DIABETES MELLITUS

The non pharmacologic therapies include - dietary modification, exercise, and weight reduction.

Dialysis - Haemodialysis, Peritoneal dialysis.

Kidney transplant: An alternative to dialysis for people with severely reduced kidney function is a kidney transplant.^[8]

Table 1: Treatment of elderly and CKD patients.

	Elderly patient	Chronic kidney disease
Metformin	Can either be used alone or in combination with other OAD	May be used in full doses if GFR >45ml/min
	Does not cause hypoglycaemia	Reduce dose if GFR <45ml/min and discontinue if GFR <30ml/min
	Avoid if there are intercurrent disorders (tissue hypoperfusion)	Contraindicated if Cr \geq 1.5mg/dl in males or \geq 1.4mg/dl in females
Sulphonylureas	Avoid due to risk of hypoglycaemia	Glipizide and gliclazide do not require a dose adjustment
Meglitinides	Preferable as insulin secretagogues	Repaglinide preferable
Alpha-glucosidase inhibitors	Effective and safe	Avoid if GFR <25ml/min or Cr >2mg/dl
	Adverse gastrointestinal effects	Do not use in dialysis
Pioglitazone	Does not cause hypoglycaemia	Does not require a dose adjustment
	Potentially adverse effects	Potentially adverse effects
DPP-4 inhibitors	Effective alone and in combined treatment	Linagliptin does not require a dose adjustment
	No hypoglycaemia, good tolerance and oral administration	Dose reduction in the rest
GLP-1 receptor agonists	Potentially adverse effects	Contraindicated if GFR <30ml/min
SGLT2 inhibitors	Potentially adverse effects	Not recommended if GFR <45-60ml/min
Insulin	Lower risk of hypoglycaemia associated with insulin analogues	Lower risk of hypoglycaemia associated with insulin analogues

OBJECTIVES

- To estimate the history of Diabetes mellitus in patients.
- To assess the percentage of population at risk for CKD in Diabetes Mellitus
- To determine the stages of CKD.
- To assess the quality of life of the patient.

MATERIALS AND METHODS

Methodology: This study was done in Mallareddy Narayana Multispeciality Hospital, Suraram, Hyderabad, which contains all major services and departments including General medicine, intensive care units and Dialysis.

This study was prospective and observational and was conducted for 6 months by collecting data that included - Age, Gender, BMI, Serum Creatinine, Hemoglobin, eGFR, Final diagnosis, Laboratory data and Treatment.

A total of 200 patients data was collected out of which 77 patients were suffering from CKD, Out of which 28 patients are under dialysis. In this study, the subjects with eGFR value of $<60 \text{ mL/min/1.73m}^2$ were considered as CKD.

In this study the quality of life of patients was assessed by using SF-36 HS form which contains 36 items of questionnaire. They include - Physical functioning, Role limitations due to physical health, Role limitations due to emotional problems, Energy/fatigue, Emotional well-being, Social functioning, Pain, General health, and Health change.

RESULTS AND DISCUSSION

Results: In our current observational study, a total of 200 subjects attended the OP and IP of MRNMH were assessed. The subjects included were Diabetes mellitus and DM with CKD subjects. The factors effecting quality of life of DM and DM with CKD subjects were assessed.

1. GENDER-WISE DISTRIBUTION OF SUBJECTS

Table 2:

GENDER	TOTAL	PERCENTAGE (%)
Male	125	62.5
Female	75	37.5

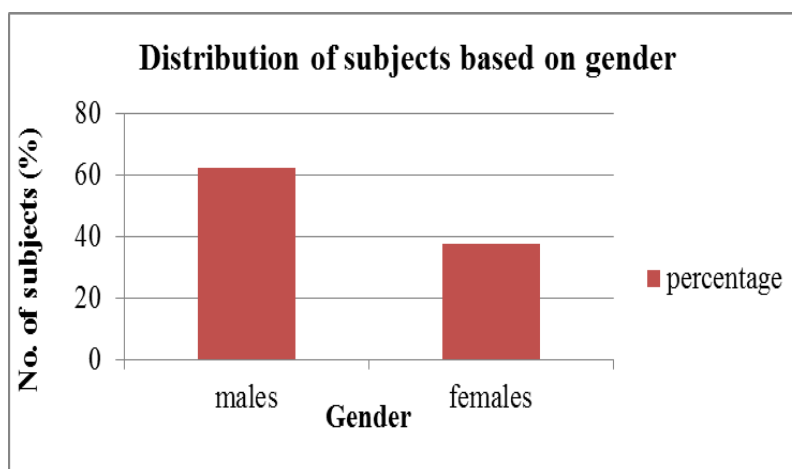


Figure 2

2. GENDER WISE DISTRIBUTION COMPARING WITH CKD.

Table 3:

Gender	Diabetic subjects without CKD(%)	Diabetic subjects with CKD(%)	Diabetic subjects with CKD on Haemodialysis(%)
Males	60	20.8	19.2
Females	64	30.66	5.33

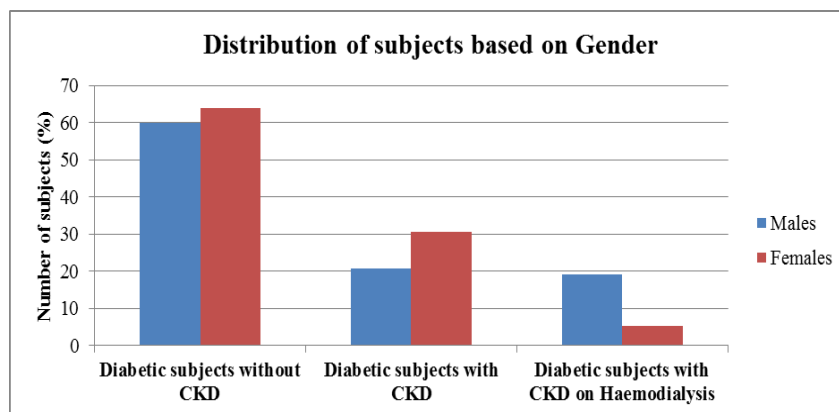


Figure 3:

3. DISTRIBUTION OF SUBJECTS BASED ON AGE.

Table 4:

Age group	MALE (%)					FEMALE (%)				Total (%)
	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-1	Stage-2	Stage-3	Stage-5	
<20 years	0	0	0	0	0	0	0	0	0	0
20-44 years	8.8	4	0	0	5.6	9.3333	2.667	1.333	0	15.86
45-64 years	24.8	12.8	7.2	7.2	9.6	25.333	21.333	6.667	5.33	60.08
>65 years	3.2	6.4	4.8	0.8	4.8	2.667	2.667	4	1.33	15.33

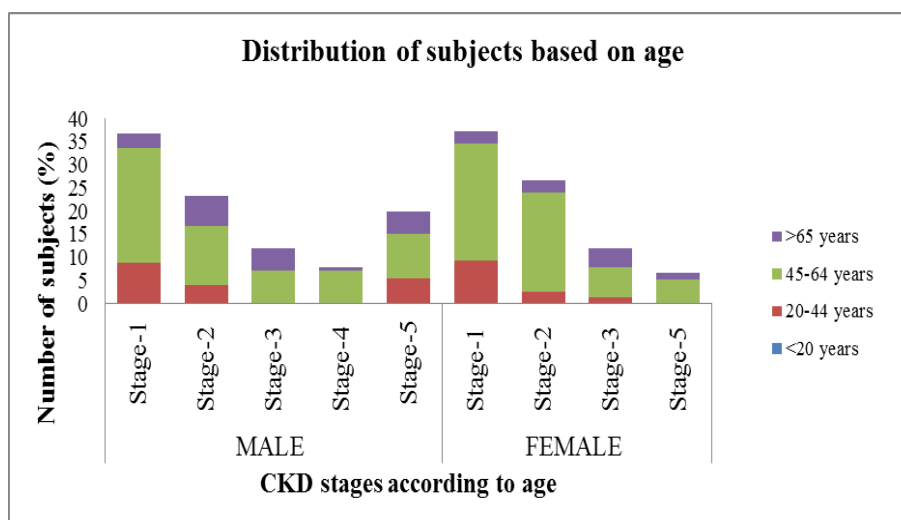


Figure 4:

4. DISTRIBUTION OF SUBJECTS BASED ON BMI.

Table 5:

BMI	MALE (%)					FEMALE (%)					Total(%)
	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	
Underweight	0.8	0.8	1.6	0	4	5.33	2.667	1.333	2.67	1.333	10.26
Normal weight	24.8	14.4	7.2	6.4	13.6	25.33	10.67	6.667	8	4	60.53
Overweight	8	6.4	2.4	0.8	1.6	4	12	1.33	4	1.33	20.9
Obesity	3.2	1.6	0.8	0.8	0.8	2.67	1.333	2.67	2.67	0	8.26

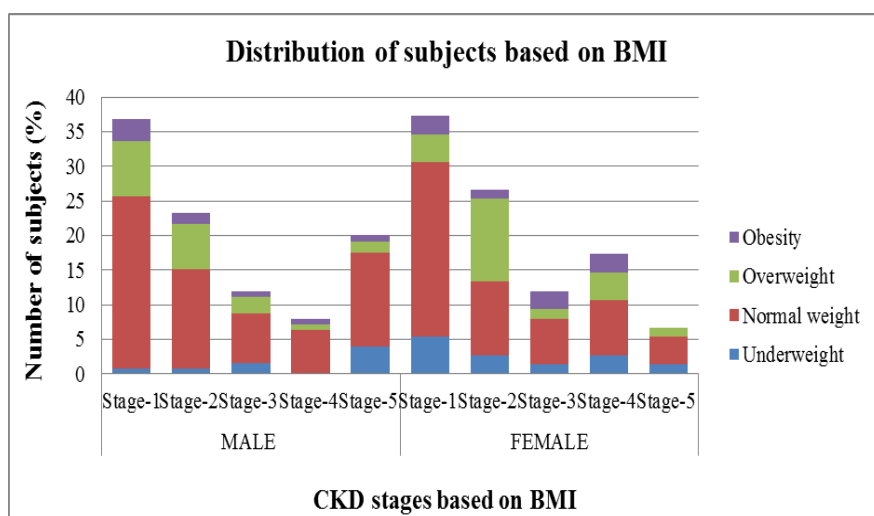


Figure 5:

5. SOCIO-ECONOMIC STATUS OF SUBJECTS.

Table 6:

Socio-economic status	MALE(%)					FEMALE (%)					Total (%)
	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	
Upper middle	5.6	1.6	0.8	0	0	0	0	0	0	0	7.5
Middle	31.2	18.4	10.4	7.2	18.4	1.3333	0	1.3333	4	0	84
Poor	0	3.2	0.8	0.8	1.6	33.333	20	10.667	12	5.3333	8.5

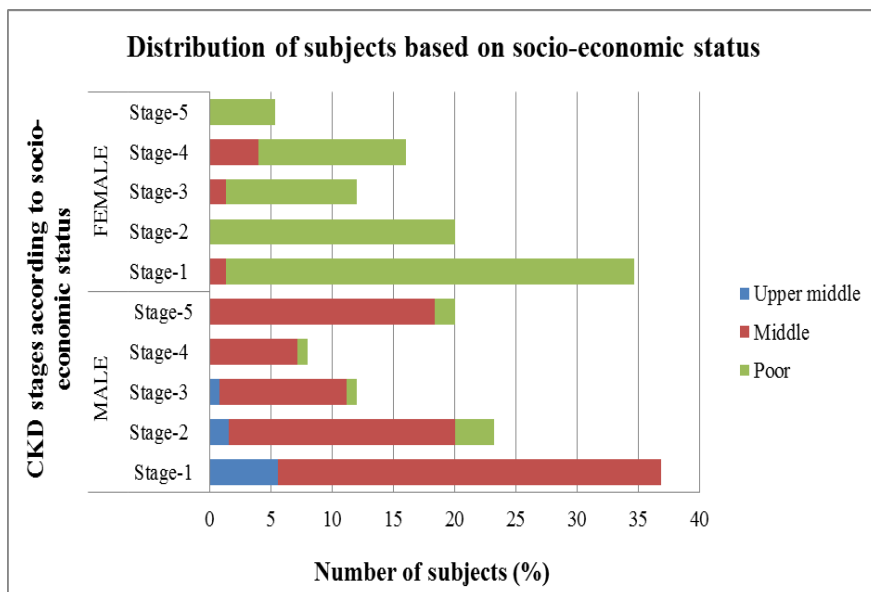


Figure 6:

6. DISTRIBUTION OF SUBJECTS BASED ON AREA OF RESIDENCE.

Table 7:

Area of residence	MALE (%)					FEMALE (%)					Total (%)
	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	
Rural	14.4	13.6	5.6	4.8	10.4	17.333	13.333	4	8	5.3333	48.4
Urban	22.4	9.6	6.4	3.2	9.6	20	13.333	8	9.3333	1.3333	51.6

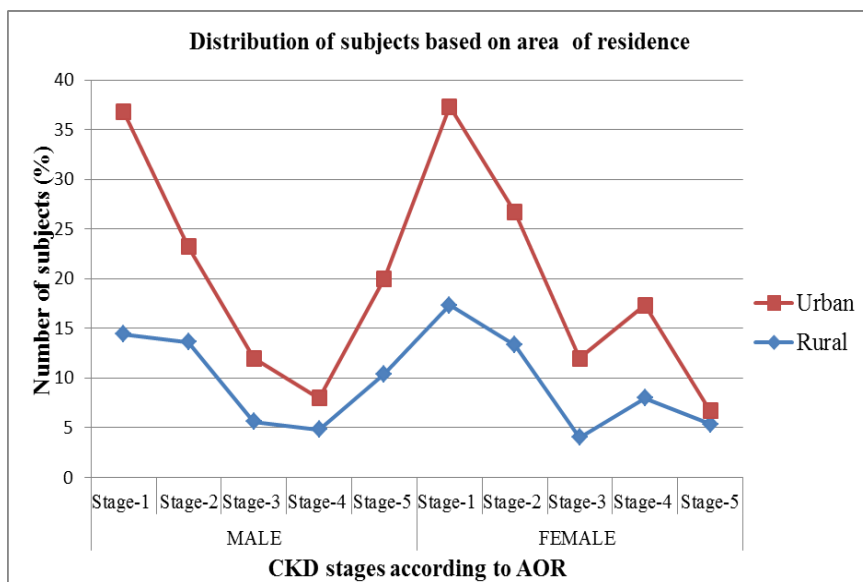


Figure 7:

7. DURATION OF DM OF SUBJECTS.

Table 8:

Duration of DM	MALE (%)					FEMALE(%)					Total (%)
	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	
<1 year	8	6.4	1.6	1.6	0	12	5.333	0	1.333	0	18.13
1-3 years	8	3.2	2.4	0.8	2.4	2.67	9.333	2.67	0	1.333	16.4
3-5 years	8.8	4.8	3.2	0	1.6	14.667	2.667	1.333	2.667	1.33	20.5
5-10 years	8.8	4	2.4	3.2	7.2	6.6667	2.667	1.333	2.667	2.667	20.8
>10 years	3.2	4.8	2.4	2.4	8.8	1.33	6.67	6.67	10.67	1.333	24.13

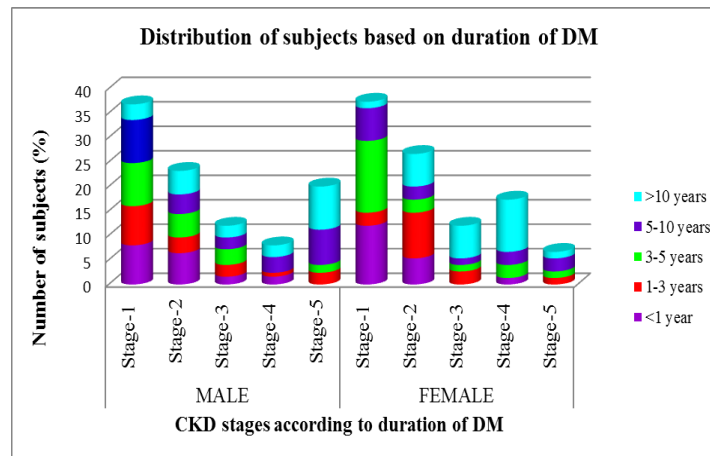


Figure 8:

8. DISTRIBUTION OF SUBJECTS BASED ON DIABETIC TREATMENT

Table 9:

Treatment	MALE					FEMALE					Total (%)
	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	
Insulin	8	7.2	4	4	12	16	6.67	2.67	8	1.33	34.9
Oral	22.4	9.6	5.6	2.4	4.8	12	9.33	2.67	8	4	40.4
Both	6.4	6.4	2.4	1.6	3.2	9.33	10.66	6.67	1.33	1.33	24.5

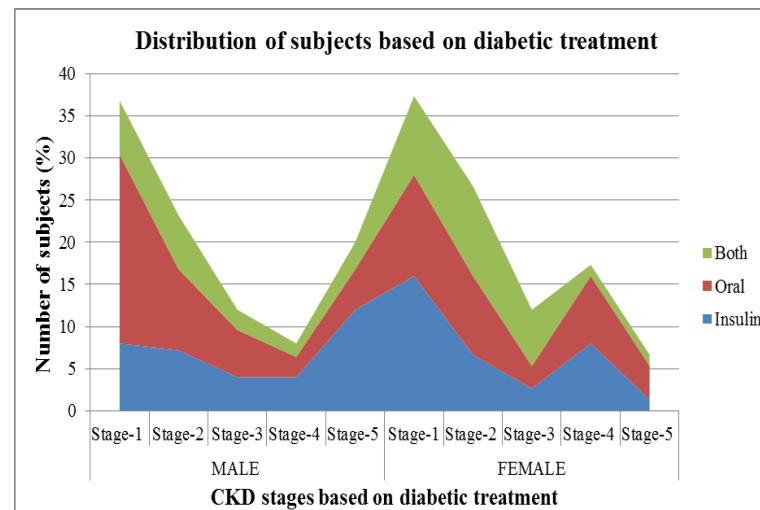


Figure 9:

9. DISTRIBUTION OF SUBJECTS BASED ON STAGES OF CKD

Table 10:

Stages of CKD	Male (%)	Female (%)	Total
Stage-1	36.8	37.33333333	37.065
Stage-2	23.2	26.66666667	24.93
Stage-3	12	12	12
Stage-4	8	17.33333333	12.665
Stage-5	20	6.666666667	13.33
Cummulative frequency	100	100	100
>60 mL/min/1.73m ²	60	64	124
<60 mL/min/1.73m ²	40	36	76

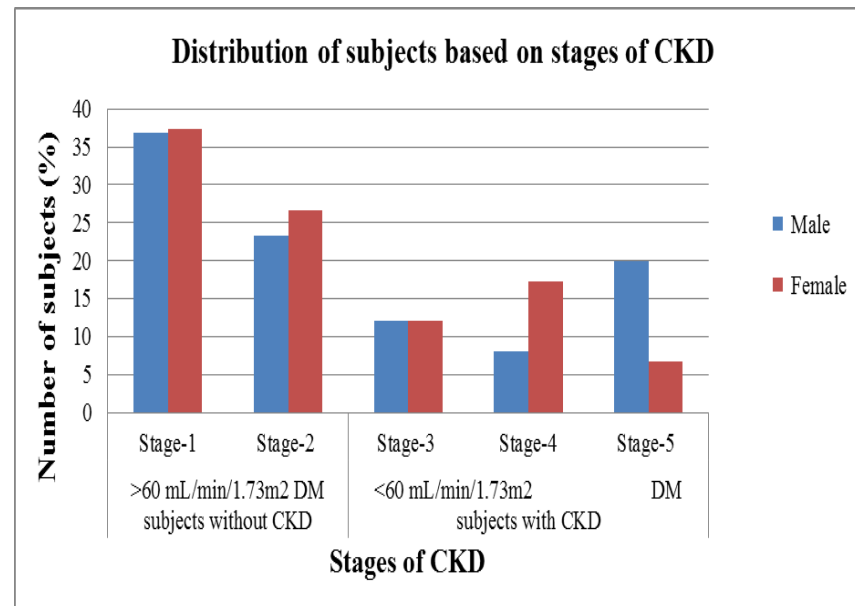
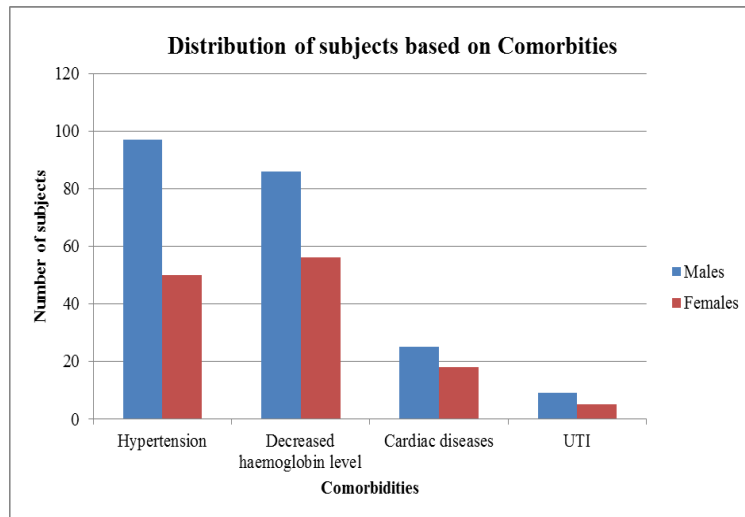


Figure 10:

10. DISTRIBUTION OF SUBJECTS BASED ON COMORBITIES.**Table 11:**

Comorbidities	Males	Females	Total	Percentage
Hypertension	97	50	147	73.5
Decreased haemoglobin level	86	56	142	71
Cardiac diseases	25	18	43	21.5
UTI	9	5	14	7

**Figure 11:**

11. QUALITY OF LIFE.

Table 12:

Items	Physical functioning	Role limitations due to physical health	Role limitations due to emotional problems	Energy/fatigue	Emotional well-being	Social functioning	Pain	General health	Health change
Average	38.455	22.5	30	41.55	56.59	68.97	59.68	52.654	38.625

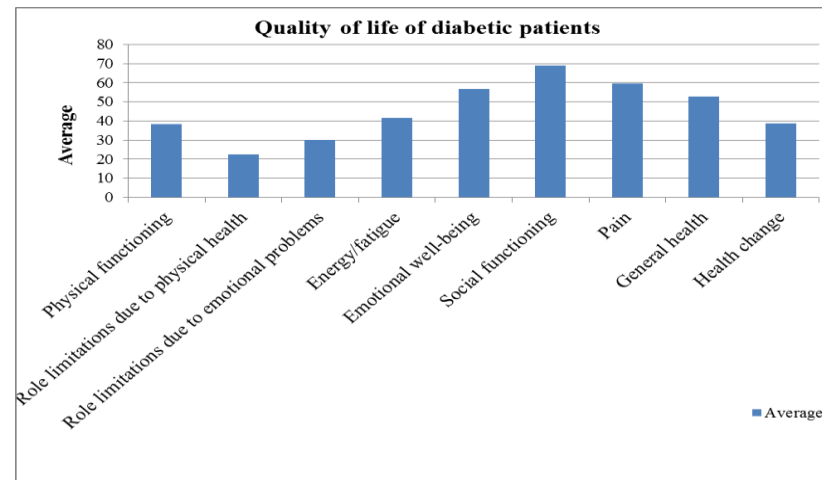


Figure 12:

DISCUSSION

- CKD and its complications are more prevalent among Indian diabetic patients due to late presentation, screening, poor glycemic control and inadequate treatment of complications at an early age. This study used the KDIGO guidelines to establish the prevalence and also identified risk factors of CKD among diabetes patients in India.

- In this observational study, a total of 200 study subjects were considered based on exclusion and inclusion criterion. Out of these study subjects the prevalence among the male subjects are more (125) with a percentage of 62.5%. This was similar to the study done by Rajesh Rajput, *et, al* studied the prevalence of CKD in Type 2 diabetes mellitus patients.^[4]
- The prevalence of CKD is more in age group of 45 – 64 years with a percentage of 60.08%. This was similar to the study done by Richard K.D Ephraim, *et, al* on CKD stages among diabetes patients in the Cape Cost Metropolis.^[5]
- The prevalence of CKD is more in normal BMI (18.5 – 24.5) with a percentage of 60.53% but overweight are more in the study conducted by Yi Zohu, *et, al* on prevalence of CKD across levels of glycemia among adults in Pudong New Area, Shanghai, China.^[6] The difference could be due to diagnosed diabetes, undiagnosed diabetes, pre-diabetes and normal glucose tolerance.
- The prevalence of CKD is more in duration of diabetes of >10 years with a percentage of 24.13% but the duration of diabetes of 5-10 years is more in the study done by Richard K.D Ephraim, *et, al* on CKD stages among diabetes patients in the Cape Cost Metropolis^[5] because the difference could be lack of awareness of screening and medication adherence.
- In this study, most of the subjects are under oral hypoglycaemic therapy with a percentage of 40.4% which is similar to the study done by Richard K.D Ephraim, *et, al* on CKD stages among diabetes patients in the Cape Cost Metropolis.^[5]
- In this study most of the subjects are under stage-1 CKD with a percentage of 37.06% which is similar to the study done by Richard K.D Ephraim, *et, al* on CKD stages among diabetes patients in the Cape Cost Metropolis.^[5]
- The prevalence of CKD is more in males with a percentage of 40% which is not similar to the study conducted by Yi Zohu, *et, al* on prevalence of CKD across levels of glycaemia among adults in Pudong New Area, Shanghai, China⁽⁶⁾. The difference could be due to lack of motivation in female subjects.
- In this study most of the subjects are under eGFR value of >60 mL/min/1.73m² with a percentage of 62% and eGFR value of <60 mL/min/1.73m² was with a percentage of 38% which is similar to the study done by Richard K.D Ephraim, *et, al* on CKD stages among diabetes patients in the Cape Cost Metropolis.^[5]

- In this study, role limitations due to physical health was effected more with a percentage of 22.5%. According to the Short Form (36) Health Survey^[2], physical health is most effected.

CONCLUSION

CKD is one of the major risk in Diabetes Mellitus patients. The prevalence of CKD in DM among males 50 (40%) subjects were more when compared to females 27 (36%) subjects. The present study clearly suggests that the causes of the Chronic Kidney Disease in diabetic subjects are due to increased age, low socio-economic status, prolonged duration of diabetes, improper adherence to the treatments, irregular checkups and screening tests like serum creatinine, estimated Glomerular Filtration Rate, Complete Blood Picture and albuminuria, life style changes include improper food habits and lack of exercise.

According to SF-36 HS, the Quality Of Life includes Physical functioning, Role limitations due to physical health, Role limitations due to emotional problems, Energy/fatigue, Emotional well-being, Social functioning, Pain, General health, Health change. In our study, Role limitations due to physical health was effected more and Social functioning was less effected. Individual counseling and family support, reassurance to be given to the patient.

To avoid the risk of CKD in DM patients, the subjects should frequently undergo regular screening tests, should adhere to medications, should maintain the food habits and follow moderate exercises.

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