Assesment of Insulin Resistence in Different Stages of Chronic Kidney Disease

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ABSTRACT

Introduction: Insulin resistance (IR) is defined as reduced sensitivity of target organs (i.e., the liver, the skeletal muscle, and the adipose tissue) to the effects of insulin. Study aimed at assessment of insulin resistance in different stages of chronic kidney disease

Material and methods: This was a cross sectional Observational Study which was done at tertiary care teaching hospital Department of Medicine at Subharti Medical College, Meerut India. Total 50 patients were enrolled in this study thatfulfilled the inclusion and exclusion criteria after taking written and informed consent. Insulin resistance were measured in both case and control group by HOMA IR. HOMA IR- Homeostatic Model Assessment Is A Method To Quantify The Insulin Resistance And Beta Cell Function. Formula Fasting Insulin mu/Lx Fasting Glucose mg/dl 405 Low HOMA IR- It indicates high insulin sensitivity, whereas high HOMA-IR values indicate low insulin sensitivity.

Results: Prevalence of insulin resistance with chronic kidney disease; the majority of patients with insulin resistance having CKD stage 4 11 (68.7%) followed by stage 5 9 (52.9%) while the patients without insulin resistance were having CKD stage 3 in majority 10 (58.8%) followed by stage 5 8 (41.1%). Correlation between stages of CKD was found to be non-significant association among them ($p>0.05$).

Conclusion: Majority of patients showed normal insulin resistance 21 (42.0%) followed by moderate insulin resistance 16 (32.0%) and severe insulin resistance 10 (20.0%). Increase in the insulin resistance with progression of chronic kidney disease is known to increase the morbidity and mortality by negatively affecting the risk factors for cardiovascular disease.

Keywords: Insulin Resistence, Stages of Chronic Kidney Disease

INTRODUCTION

Insulin resistance (IR) is defined as reduced sensitivity of target organs (i.e., the liver, the skeletal muscle, and the adipose tissue) to the effects of insulin. To compensate for the attenuated biological response to insulin in target organs, β cells increase insulin synthesis and secretion, which results in hyperinsulinemia. IR can be of hepatic or peripheral origin. The first is characterized by impaired suppression of liver gluconeogenesis, the second by reduced glucose disposal in the skeletal muscle and the adipose tissue.[1]

Chronic kidney disease is one of the global health problems with a prevalence of about 17.2% in India[1]. It is a pathophysiologic process with multiple etiologies, resulting in exorable attrition of nephron number and function. CKD patients have reduced life span and substantial proportion of these individuals die from cardiovascular complications[2]. The CKD patients present with a high prevalence of metabolic syndrome (MS) which is associated with high risk for developing Diabetes Mellitus, Cardiovascular disease and high all-cause mortality[3].

The presence of insulin resistance in the early stages of CKD suggests that insulin resistance may be a driver, rather than a consequence, of CKD, even in non-diabetic subject. Chen et al. have shown a strong, positive, significant, and dose-response relationship between insulin resistance, insulin level and risk of CKD among nondiabetic subjects[4]. Although data on the relationship between insulin resistance and non-diabetic CKD is sparse, several small studies have shown the presence of insulin resistance in non-diabetic CKD patients[5,6,7]

From this perspective, we will review recent progress, highlight areas of uncertainty or controversy and suggest potential new mechanisms that may be involved in the cellular mechanisms of IR during CKD. The purpose of this study of reasoning and future research was to apply an intervention grounded on physiologic evidence of insulin resistance in CKD, improving the prognosis in our patients. Study aimed to assess and study the correlation of insulin resistance in patients with different stages of chronic kidney disease

MATERIAL AND METHODS

This was a study design cross sectional observational study which was conducted at CSS Hospital Subharti Medical College, Meerut UP. Total 50 cases were enrolled in the study who fulfil the criteria of LOW HOMA-IR and qualifying all inclusion and exclusion criteria were enrolled in the study after taking written and informed consent. The sample size was estimated on the basis of a single proportion design. The target population from which we randomly selected

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our sample was considered 20,000. We assumed that the confidence interval of 13.84% and confidence level of 95%. The sample size actually obtained for this study was 50 patients.

Inclusion criteria

1. Patients of more than 18 years of age
2. Patients with chronic kidney disease

Exclusion criteria

Patients excluded with-

- Patients with acute kidney disease
- Diabetic mellitus
- Not consenting to participate in the study Tool

METHODOLOGY

Insulin resistance will be measure in both case and control group by HOMA IR. HOMA IR- Homeostatic Model Assessment Is A Method To Quantify the Insulin Resistance And Beta Cell Function. FormulaFasting Insulin mu/Lx Fasting Glucose mg/dl 405

Low HOMA IR- It indicates high insulin sensitivity, whereas high HOMA-IR values indicate low insulin sensitivity.

Category homascore

1. Normal Insulin Resistance <3
2. Moderate Insulin Resistance 3-5
3. Severe Insulin Resistance >5

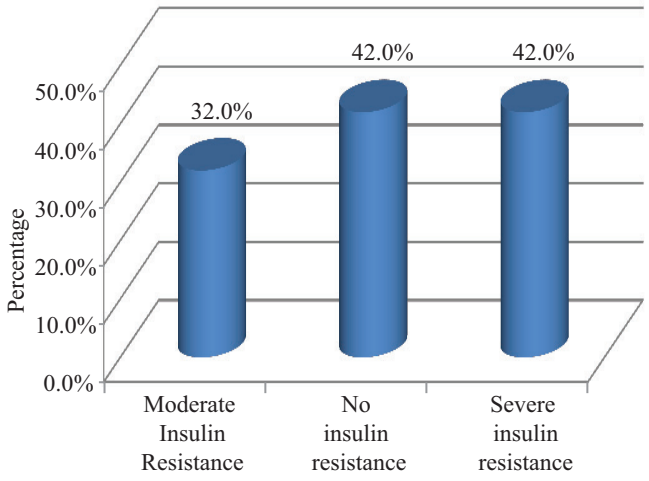
STATISTICAL ANALYSIS

Data was analyzed using Statistical Package for Social Sciences, version 23 (SPSS Inc., Chicago, IL). Results for continuous variables are presented as mean ± standard deviation, whereas results for categorical variables are presented as number (percentage). The level $P < 0.05$ was considered as the cutoff value or significance

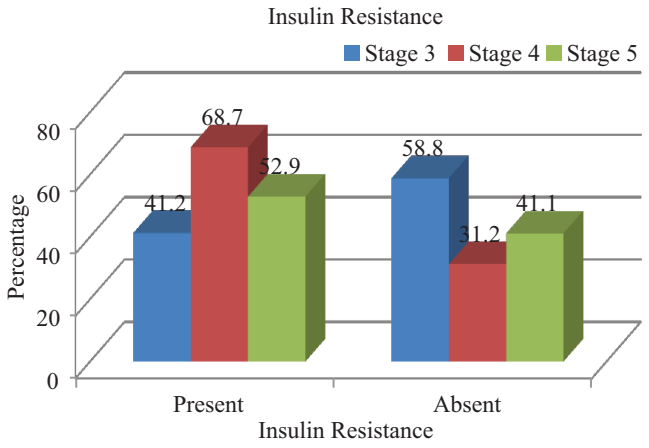
RESULTS

Out of 50 studied patients, majority 56.0% were 51 -60 years of age with mean age 55.46±7.11 years of all studied patients where male were prominent (56.0%). Three groups were included in this study where mean insulin and HOMA-IR index values were found to be higher in the (stage 4) 3.81±1.85. Most of patient were found in stage 3 and 4 of CKD 17 (34.0%), 17 (34%) followed by stage 2 16 (32.0%). The table-1 depicts the result of the studied patients in which the majority of patients showed normal insulin resistance 21 (42.0%) followed by moderate insulin resistance 16 (32.0%) and severe insulin resistance was in 10 (20.0%) while the least patients were having no insulin level i.e. 2 (4.0%).

The table-2 shows the prevalence of insulin resistance with chronic kidney disease; the majority of patients with insulin resistance having CKD stage 4 11(68.7%) followed by stage 5 9(52.9%) while the patients without insulin resistance were having CKD stage 3 in majority 10 (58.8%) followed by stage 5 8(41.1%). Correlation between stages of CKD was found to be non-significant association among them ($p>0.05$).



Graph-1: Result of studied patients.



Graph-2: Insulin Resistance

Homa score	Result	Frequency	Percentage
3-5	Moderate Insulin Resistance	16	32.0
<3	Normal insulin resistance	21	42.0
>5	Severe insulin resistance	10	20.0

Table-1: Result of studied patients

Insulin Resistance	Chronic Kidney disease						Total (n=50)		P value
	Stage 3 (n=17)		Stage 4 (n=16)		Stage 5 (n=17)				
	N	%	N	%	N	%	N	%	0.281
Present	7	41.2%	11	68.7%	9	52.9%	27	54.0%	
Absent	10	58.8%	5	31.2%	8	41.1%	23	46.0%	

Table-2: Prevalence of Insulin Resistance (IR) in Chronic Kidney Disease patients.

DISCUSSION

The prevalence of insulin resistance with chronic kidney disease in the present study; the majority of patients with insulin resistance having CKD stage 4 11(68.7%) followed by stage 5 9(52.9%) while the patients without insulin resistance were having CKD stage 3 in majority 10(58.8%) followed by stage 5 8 (41.1%). Selin Abraham et al[9] demonstrated an ascending pattern of prevalence as 27.6%, 31.1%, and 41.4% in stage 3, stage 4, and stage 5 CKD respectively of insulin resistance. Stefikova et al.[1] studied IR in 66 non diabetic CKD patients and found that although the prevalence of IR is more in CKD patients compared to the general population. Several lines of evidence suggest a pathogenic role of IR on kidney dysfunction. Potential mechanisms are mostly due to the effect of single abnormalities related to IR and clustering into the metabolic syndrome. Hyperinsulinemia, which is inevitably associated with IR in non-diabetic states, also appears to play a role on kidney function by inducing glomerular hyper filtration and increased vascular permeability.

Furthermore, no studies have mentioned HOMA-IR value in non-diabetic CKD population in India; however, there are several studies which describe HOMA-IR in diabetic CKD population in India (HOMA-IR: 2.4). Only one study recently on non- diabetic CKD population in India done by Srivastava N et al[10] where the mean HOMA-IR reported is 2.5 in cases and 1.9 in controls, the mean fasting insulin level is 11.34 in cases and 8.15 in controls, which is significantly high.

CONCLUSION

Majority of patients showed normal insulin resistance 21 (42.0%) followed by moderate insulin resistance 16 (32.0%) and severe insulin resistance 10 (20.0%). Increase in the insulin resistance with progression of chronic kidney disease is known to increase the morbidity and mortality by negatively affecting the risk factors for cardiovascular disease. Patients with CKD have an alarmingly high risk for cardiovascular morbidity and mortality. This applies even to patients with minor degree of renal dysfunction.

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