

## METABOLIC SYNDROME IN PATIENTS OF CHRONIC KIDNEY DISEASE PRESENTING TO THE NEPHROLOGY DEPARTMENT OF A TERTIARY CARE HOSPITAL.

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### Abstract

**Background & Objective:** The prevalence of metabolic syndrome (MetS) is on rise and is proven to be a known factor for cardiovascular diseases. However, its association with chronic kidney disease is also emerging which can accentuate the risk of cardiovascular events in patients of CKD. Therefore, this study was conducted to determine the frequency of metabolic syndrome and its related factors among patients with chronic kidney disease presenting to the Nephrology outdoor.

**Methods:** It was a cross sectional study conducted at Nephrology department Jinnah hospital Lahore. About 110 patients of CKD diagnosed for atleast 6 months, aged 18-60 and fulfilling the selection criteria were enrolled after an informed consent by non-probability consecutive sampling. Measurement of blood pressure and central obesity was done as per standard protocol and all the information was recorded in proforma. A 5 ml of blood sample was taken for triglyceride, HDL, and fasting blood sugar levels after ensuring overnight fasting. Frequency percentages were calculated for qualitative variables by using SPSS26. Chi-square test was applied to check statistical significance between metabolic syndrome and effect modifiers.

**Results:** The Mean age of patients was 42.46 + 5.580 with about 63(57%) being male. Majority had CKD stage-V 64(58%), and had the disease for more than 5 years i.e. 75(68%). The frequency of MetS was 39(35%) with that of high blood pressure 68(62%) being the most common among all components, followed by high fasting plasma glucose levels 52(47%), high triglyceride levels 35(32%), high HDL levels 32(29%) and central obesity 30(27%). A statistically insignificant relationship of MetS was seen on stratification for age, gender, duration, and stage of CKD.

**Conclusion:** It can be concluded that a considerable frequency of MetS 35% is present among patients with CKD. Thus, there is a dire need to screen all the patients with CKD for the presence of MetS as an essential component of their routine follow up. This will help in its early diagnosis and management which may halt the disease progression and decrease the morbidity and mortality associated with this lethal but manageable double burden of disease.

**Keywords:** chronic kidney disease (CKD), metabolic syndrome (MetS), end-stage renal disease (ESRD)

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Chronic kidney disease (CKD) is increasingly recognized as a global public health problem with a prevalence of 11% to 14%.<sup>1</sup> Globally, the CKD mortality rate had enhanced up to 42% approximately in 2017.<sup>2</sup> CKD is responsible for 60% of the 58 million fatalities worldwide, with 4 out of 5 deaths occurring in low- and middle-income countries, and it is anticipated that by 2030, chronic diseases would account for three of the four primary

causes of death, suggesting a serious threat to health and health system.<sup>3</sup> Moreover, CKD increases the risk of death, cardiovascular events, and hospitalization leading to a greater disease burden especially in under-developing countries.<sup>3</sup>

Metabolic Syndrome (MetS) is characterized as having three or more of the five risk factors according to the World Health Organization criteria: abdominal obesity, fasting serum triglycerides ( $>150$  mg/dl), fasting lower high-density lipoprotein (HDL) cholesterol levels ( $<40$  in males &  $<50$  mg/dl in females), blood pressure  $> 130/85$  mmHg (lying), and serum fasting glucose  $> 110$  mg/dL, MetS have been linked to CKD in several studies.<sup>5,7-9</sup> Moreover, each element of MetS has been linked to the onset and development of CKD. A complicated bidirectional correlation exists between MetS and CKD. Obesity is also associated with CKD and both are on the rise in both advanced and developing worlds.<sup>2,10,11</sup> Lin et al. evaluated the relationship between CKD and MetS, revealed that the participants with MetS were significantly more likely to have CKD than those without MetS, and MetS is an independent risk factor for CKD. Therefore, an effective screening program for the early detection of people with MetS is required.<sup>12</sup>

A cross-sectional study was conducted earlier with the goal to find out the prevalence and association between MetS and CKD patients. Among the five components of MetS, waist circumference has the highest positive predictive value for CKD. The study concluded that MetS occurs in more than one-third of CKD patients which is quite alarming.<sup>13</sup> Hassan et al. conducted a cross-sectional study, which also showed similar results that a considerable number of patients of CKD had metabolic syndrome.<sup>14</sup>

The rationale of this study is to identify the frequency of MetS among patients with CKD. In Pakistan, the prevalence of cardiovascular complications in CKD patients is considerably large, whereas the survival rate is considerably low. MetS is a powerful predictor of CVS problems, and its occurrence in combination with CKD may have a synergistic role in the develop-

ment of cardiac problems.<sup>15,16</sup> However, studies conducted on this has shown wide variability ranging from 28.9% to 70% of the prevalence of metabolic syndrome among patients of CKD.<sup>11,13</sup> Thus, this study will bridge this gap and provide information regarding the overall magnitude of the problem, helping in evidence-based decision-making regarding screening of patients with CKD for early detection. It will help to develop focus lifestyle intervention to guide individualized therapeutic regimen leading to better outcomes in these patients.

## METHODS

It was a cross-sectional study conducted in Nephrology outdoor, Jinnah hospital Lahore from July 2020 to December 2020. A sample size of 110 cases was calculated with a 95% confidence level, a 5% margin of error, and taking an expected percentage of metabolic syndrome among patients of chronic kidney disease as 28.9%.

Patients with CKD for at least 6 months duration, aged 18 to 60 years were included in the study by non-probability consecutive sampling. Patients already suffering from hypertension, SLE, having coronary artery disease, nephrotic syndrome (Proteinuria greater than 3 g/24 hours), or nephritic syndrome (Proteinuria less than 3 g/24 hours along with hematuria on urine examination and BP  $>140/90$  mm of Hg), dyslipidemia or those not willing to participate were excluded. An informed consent was taken from patients before enrolling in the study. A structured proforma was used as data collection tool and Information regarding study variables was noted in that proforma. Measurement of blood pressure and central obesity was done using standard protocol. Over-night fasting was ensured and an early morning fasting blood sample of about 5 ml was taken by venipuncture using an aseptic technique for triglyceride, HDL, and serum fasting blood sugar levels. Results were also noted in the proforma by ensuring confidentiality.

Data were entered and analyzed using the SPSSv.26. Numerical variable i.e. age was summarized as mean and standard deviation. Qualitative variables like sex and the presence of metabolic syndrome were presented

in the form of frequency and percentages. Data were stratified for the age, sex, duration, and stages of CKD to control any effect modifiers, and the chi-square test was used post-stratification taking p-value < 0.05 as significant.

**RESULTS**

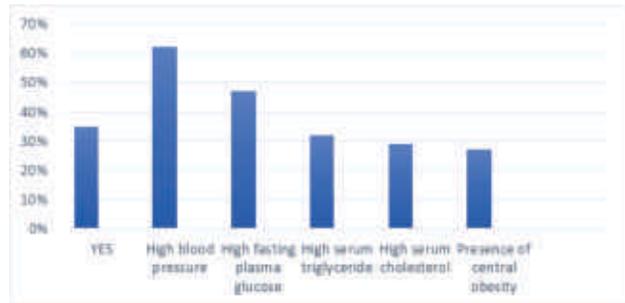
About 110 patients with CKD presenting to the nephrology department were included in the study. Table 1 displays the frequency distribution of patients' characteristics. It can be seen that about 79(72%) patients belong age group of 40-60 years of age, majority 63(57%) were male, had CKD stage-V (58%) and 75(68%) had the disease for more than 5 years.

Figure 1 presents that the frequency of MetS among CKD patients was 39(35%) with that of high blood pressure 68(62%) being the most common among all components, followed by high fasting plasma glucose level 52(47%), high triglycerides levels 35(32%), high cholesterol level 32(29%) and central obesity 30(27%).

Table 3 displays the post-stratification data to control effect modifiers. A statistically insignificant relationship of MetS was seen on stratification for age, gender, stage, and duration of CKD with p-value as 0.996, 0.590, 0.453, 0.861 respectively.

**Table 1:** Frequency distribution of patients' characteristics (n=110).

Patient's Characteristics	Frequency	Percentage (100%)
<b>Age Group</b>		
18-39 years	31	28%
40-60 years	79	72%
<b>Gender</b>		
Male	63	57%
Female	47	43%
<b>Stage of ckd</b>		
Stage III	14	12%
Stage IV	32	29%
Stage V	64	58%
<b>Duration of ckd</b>		
Less Than 5 Years	35	32%
5 Years And More	75	68%



**Figure 1:** frequency Distribution of metabolic syndrome and its components (n=110).

**DISCUSSION**

Patients of CKD are at an increased risk of cardiovascular complications while metabolic syndrome comprises of constellation of risk factors the presence

**Table 2:** Stratification of data to control effect modifiers(n=110)

EFFECT MODIFIERS		Metabolic syndrome present		Metabolic syndrome absent		Total	P-value*
		N	%	N	%		
Age group	18-39 years	11	35%	20	65%	31	0.996
	40 – 60 years	28	35%	51	65%		
Gender	Male	21	33%	42	67%	63	0.590
	Female	18	38%	29	62%		
Stage of CKD	Stage III	3	27%	1	73%	14	0.453
	Stage IV	11	34%	21	66%	32	
	Stage V	25	39%	39	61%	64	
Duration of CKD	< 5 years	12	34%	23	66%	35	0.861
	≥ 5 years	27	36%	48	64%		

\* p value < 0.05 taken as statistically significant

of which also increases the risk of cardiovascular diseases. The simultaneous occurrence of CKD and metabolic syndrome can be considered to accelerate the development of cardiovascular components. Therefore, timely identification of this issue and its management is the cornerstone for tertiary prevention against cardiovascular diseases. This study explored the frequency of metabolic syndrome in patients of CKD. About 110 patients of CKD were included in this study from the nephrology unit of a tertiary care hospital Lahore which caters to the health care needs of rural as well as urban population. The results of this study showed that majority of the patients with CKD were above 40 years of age which depicts that CKD is more prevalent in higher age groups as compared to the younger ones. These results are consistent with the findings of O Hare and colleagues who reported not only a higher incidence of CKD in the older age group but also concluded that age is an important effect modifier in the outcome of CKD. The high prevalence of CKD with advancing age, reflects the presence of a variety of different risk factors for CKD with increasing age as well as an age-associated decline in kidney function that is not explained by other known risk factors.

Similarly, the results of this study revealed that a higher proportion of males 57% presented with advanced CKD stage V. This phenomenon was also pointed in earlier studies that prevalence of CKD tends to be higher in women, but the disease is more severe in men, who also have a higher prevalence of ESRD.<sup>15</sup> Studies have reported that gender difference is seen in epidemiology of risk factors, evolution, and prognosis of CKD.<sup>16</sup>

The results of current study revealed that a considerable proportion of patients (35.5%) were having metabolic syndrome. This is much less as compared to an earlier study conducted in Pakistan reporting a much higher frequency of MetS (70%) among diabetic patients.<sup>13</sup> This high proportion can be attributed to the fact that known diabetics are at much higher risk of having all the components of MetS therefore they were excluded in the selection criteria in the current study. However, the results of current study are consis-

tent existing literature which reported the frequency of metabolic syndrome among patients of CKD ranging from 28.9% to 37.5%.<sup>11,12</sup>

On analysis of effect modification of age, gender, stage, and duration of CKD it was seen that none of the factors was significantly related to metabolic syndrome. These findings are in contrast with previous data. It is well known that the epidemiology of renal and metabolic disease is mostly different in males and females, and gender seems to be an inevitable predictor of the initiation or progression of CKD.<sup>14</sup> The significant relationship of gender with metabolic syndrome was reported in another study with a female preponderance to this condition.<sup>17</sup> Similarly another study found that having metabolic syndrome results in a 2-fold higher chance of developing CKD compared with the general population.<sup>18</sup> Studies have reported that metabolic syndrome is a significant determinant of CKD progression in the early stage and exerted a 34% higher risk for progression to CKD stages 3-5 with higher number of components directly related to increase in CKD risk.<sup>19,20</sup> This also highlights that subjects having only two components of metabolic syndrome and not yet meeting the criteria of metabolic syndrome, maybe the potential candidate for metabolic syndrome. These patients can be labeled as 'high-risk individual' and their earlier diagnosis and prophylaxis can not only halt their progression towards metabolic syndrome but may also decelerate the progression of CKD and further deterioration in the renal function.

The limitation of this study was that it was a cross-sectional study so a temporal relationship cannot be demonstrated in such design. Further research for a better understanding of the relationship between components of metabolic syndrome, its treatment and role in progression of CKD should be conducted to identify risk of renal deterioration at an early stage, and that in turn may help us to find out more effective prevention strategies and slow down the progression of CKD.

## CONCLUSIONS

This exploratory study showed that estimates of metabolic syndrome were considerable high which

is quite in concordance with other studies conducted in various regions of the world. This implies that special attention should be given to these patients as they may be more prone to further deterioration and progression of the disease. This calls for screening the patients of chronic kidney disease for the presence of metabolic syndrome for its early detection and management. Patients should be sensitized for its management through proper education and orientation to assess these problems at an early stage. This will lead to primary prophylaxis to avoid those factors as well as timely consultation with the clinicians to improve the outcome resulting in decrease mortality and morbidity, directly and indirectly, leading to an improvement in the overall health status of the population and development of the country.

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