

# Economic Burden of Chronic Kidney Disease with Type 2 Diabetes in Türkiye

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## INTRODUCTION

- Globally in 2017, chronic kidney disease (CKD) affected approximately 10% of the population, or 843.6 million individuals. In Türkiye, the prevalence of CKD in the adult population is 15.7%. Based on these rates, it's estimated that nearly 9 million adults in Türkiye are affected by CKD.<sup>1</sup>
- CKD is classified into five stages based on eGFR levels. An eGFR level of less than 60 mL/min/1.73 m<sup>2</sup> is sufficient for a CKD diagnosis.<sup>2</sup>
- Type 2 diabetes is a one of the leading global cause of CKD. Despite recommended treatments, the risk of CKD progression persists, underscoring the need for novel therapeutic approaches.<sup>3</sup>
- This study seeks to determine the stage-specific costs of chronic kidney disease (CKD) associated with type 2 diabetes (T2DM) in Türkiye.

## METHOD

- In the context of this study, a disease cost methodology was employed. When calculating the cost of the disease, only direct costs were incorporated into the analysis. To estimate the disease cost, an expert opinion form was devised based on national guidelines. This form was finalized using the Delphi Panel method with six expert physicians. To calculate the total cost, expenses related to diagnostic tests, monitoring/hospitalization, and medication treatments were determined. Epidemiological data specific to Türkiye were utilized to compute the disease cost.
- For the calculation of direct disease costs, the method developed by Cowley et al. on behalf of the World Bank and WHO was utilized.<sup>4</sup> In this method, the clinical pathway is followed, aiming to reach the total expenditure by multiplying the frequency of each expenditure item, the percentage of cases using it, and unit costs. The formulation used is as follows:

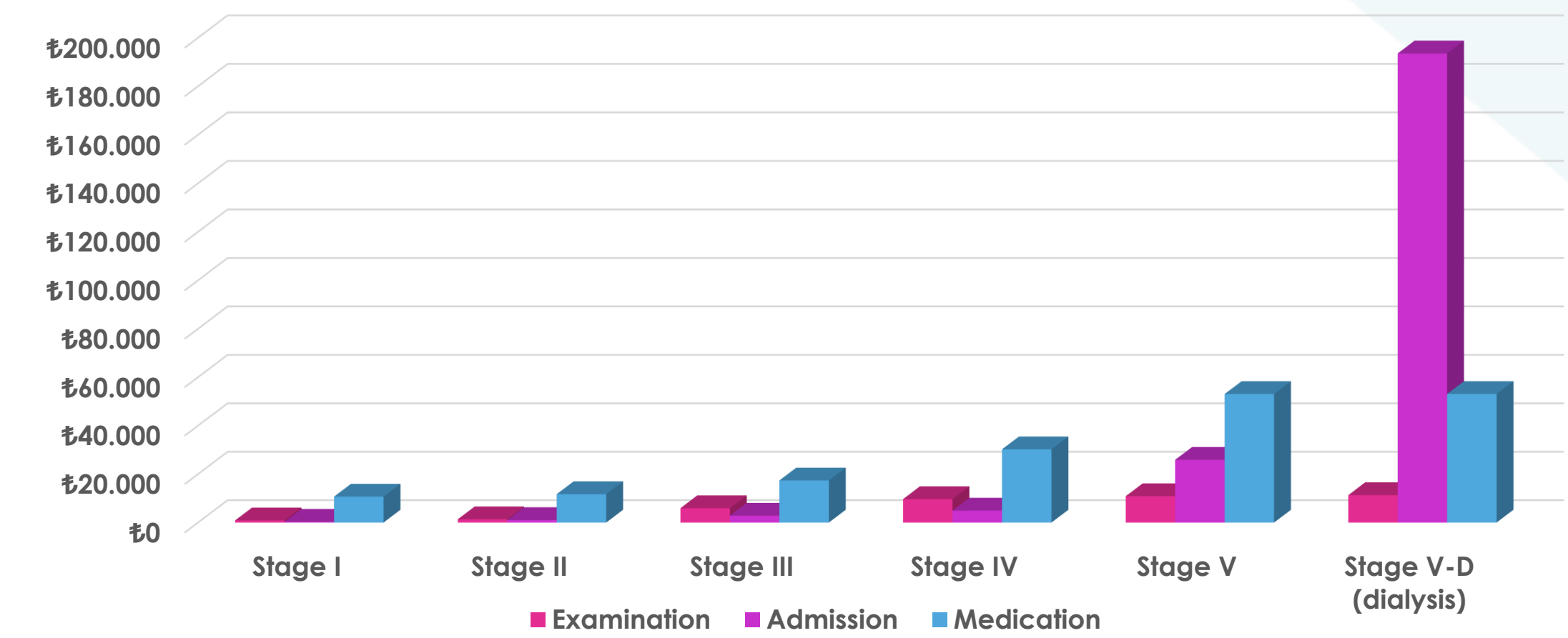
$$M_j = \sum_{i=1}^S C_{ij} V_{ij} n_{ij}$$

Where:  
C represents the unit cost of health services required to deliver the intervention.  
V denotes the quantity of each type of service needed for the intervention.  
n indicates the number of individuals seeking that service at the health institution.  
In the above equation, "i" represents the service levels, and "j" denotes the required services for the intervention. It's assumed in the equation that there are 's' types of appropriate services. If certain services are not needed for the production of intervention "j", the values of V will be zero.

## RESULTS

### Costs Per Patient (Examination, Admission, Medication)

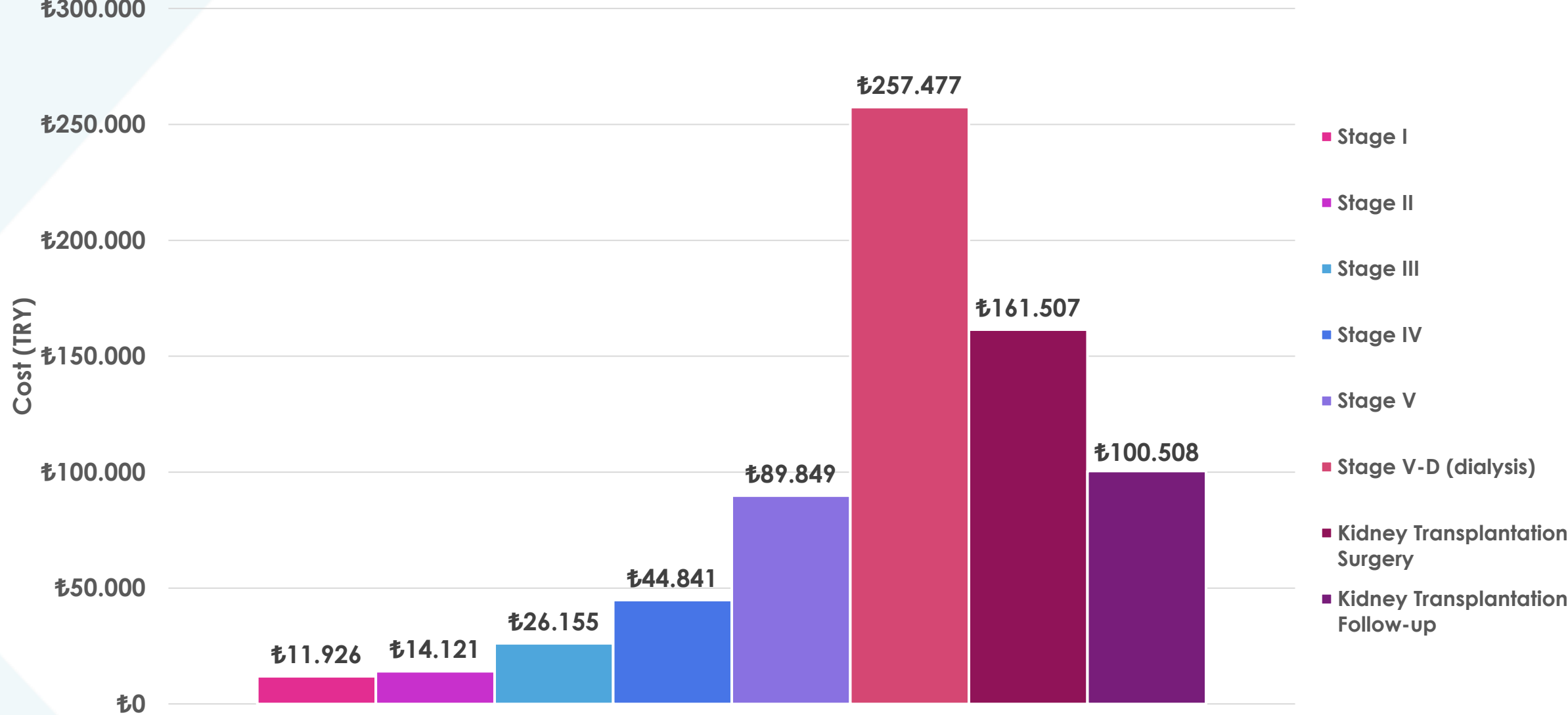
Stage	Cost per Patient		
	Examination (TRY)	Admission (TRY)	Medication (TRY)
Stage I	887.66	336.13	10,701.78
Stage II	1,350.32	1,043.32	11,727.81
Stage III	5,921.24	2,852.63	17,381.51
Stage IV	9,685.07	4,935.15	30,221.27
Stage V	10,877.44	25,904.62	53,067.25
Stage V-D (dialysis)	11,308.56	193,542.90	53,085.36



### Total Costs Per Patient

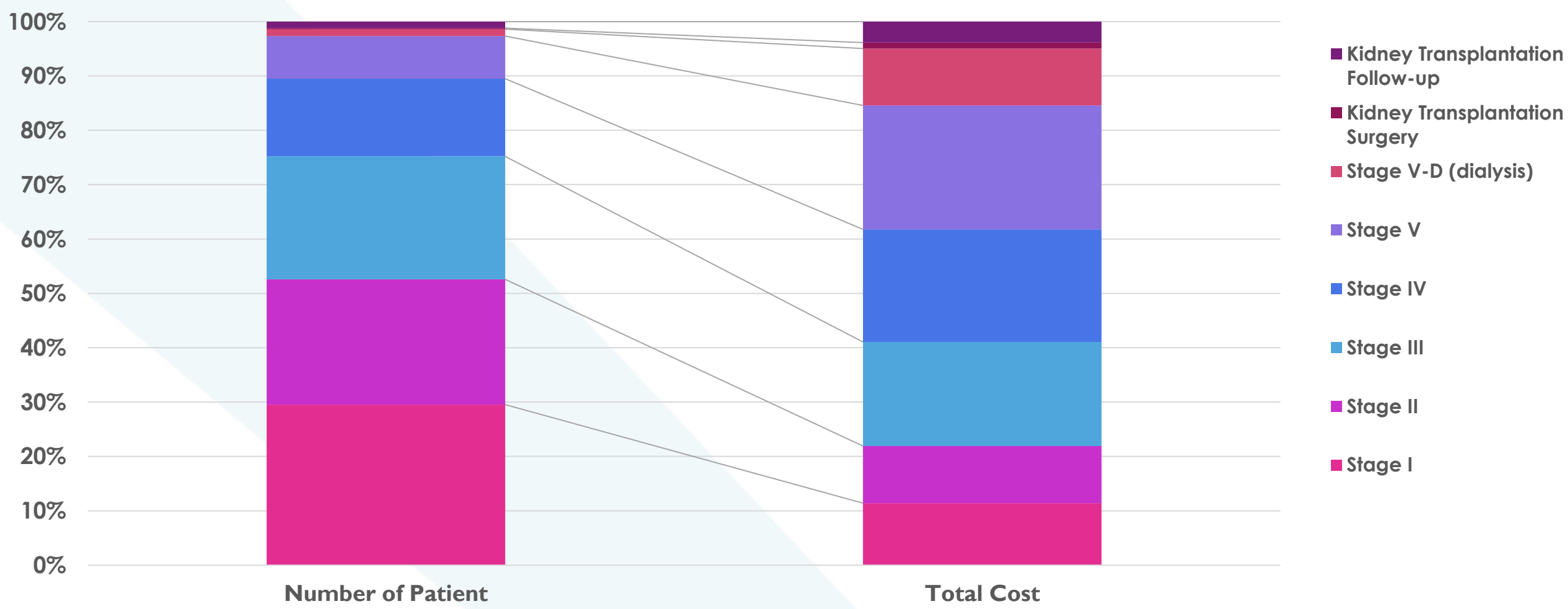
- In the analysis of costs per patient for different stages of the condition, it was determined that Stage I incurs a cost of TRY11.926, progressing to TRY14.121 for Stage II, TRY26.155 for Stage III, TRY44.841 for Stage IV, and TRY89.849 for Stage V. Notably, the cost escalates substantially for patients in Stage V-D, requiring dialysis, reaching TRY257.477. The cost of kidney transplantation surgery in Türkiye has been calculated at TRY161,507, with a subsequent follow-up expense also calculated at TRY100,508.

Stage	Cost per Patient (TRY)
Stage I	11,926
Stage II	14,121
Stage III	26,155
Stage IV	44,841
Stage V	89,849
Stage V-D (dialysis)	257,477
Kidney Transplantation Surgery	161,507
Kidney Transplantation Follow-up	100,508



### Cost Analysis of Patients by CKD Stage in Türkiye

- In examining the distribution and economic burden of patients across different stages, we observe the following:
- Stage I has the highest patient count, numbering 165,965, with an associated cost of TRY1,979,229,266.
- Stage II accounts for 129,660 patients and a cost of TRY1,830,991,081. Although Stage III has a slightly reduced patient population of 127,067 compared to Stage II, it registers a substantially higher overall expense at TRY3,323,487,394. In Stage IV, there are 80,389 patients, yet the financial implications remain significant, amounting to TRY3,604,779,448. Stage V, which consists of 44,084 patients, carries a cost of TRY3,960,961,234. The dialysis-required Stage V-D has the smallest cohort, with 7,066 patients, but incurs a cost of TRY1,819,455,740. The cost for kidney transplantation surgery is estimated at TRY186,378,693, with a follow-up cost of TRY674,984,117.
- The cumulative number of patients suffering from chronic renal failure with T2DM in Türkiye stands at 554,233, leading to an overarching economic burden of TRY17,380,266,972.



## CONCLUSIONS

- During the pharmacoeconomic analyses, it was assumed that all patients were fully adherent to their treatments. However, achieving full treatment adherence in real-world practice is inherently challenging and may not be realistic.
- In analyzing the data on patients across various stages of the disease:
  - Stages I and II have the most substantial patient populations, with counts of 165,965 and 129,660, incurring costs of 1.98 billion TRY and 1.83 billion TRY respectively. Moving forward to Stages III and IV, we notice a decline in patient counts, but there's a surge in the associated costs, suggesting increased expenditure for a reduced number of patients.
  - Stage V-D, which represents those on dialysis, demonstrates the most pronounced cost per patient, amassing a total expense of 1.82 billion TRY for a mere 7,066 patients. This pronounced disparity underscores the significant financial implications associated with advanced stages of the disease.
- The total count of individuals with chronic renal failure due to T2DM in Türkiye is 554,233, resulting in an overall economic impact of TRY17,380,266,972. The findings indicate that the expenses associated with stage V-D CKD in patients with T2DM are notably elevated in Türkiye. Controlling the treatment prior to patients advancing to stage V-D is of significant clinical and economic importance.

## REFERENCES

<sup>1</sup>Sağlık Bakanlığı, 2018. Turkey Böbrek Hastalıkları Önleme Ve Kontrol Programı (2018-2023). <sup>2</sup>KDIGO, KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney International Supplements, 2013. 3(1). <sup>3</sup>Bakris, G. L., Agarwal, R., Anker, S. D., Pitt, B., Ruilope, L. M., Rossing, P., ... & Filippatos, G. (2020). Effect of finerenone on chronic kidney disease outcomes in type 2 diabetes. New England Journal of Medicine, 383(23), 2219-2229. <sup>4</sup>Cowley P, Bodabilla L, Musgrove P, Saxenian H. "Content and Financing of an Essential National Package of Health Services, Global Assessments in the Health Sector", World Health Organization, 1994: 171-181

Abbreviations: CKD:Chronic Kidney Disease, T2DM: Type 2 Diabetes, TRY: Turkish Lira

## CONTACT

