

The Relationship between Fruit and Vegetable Intake and Chronic Kidney Disease Among Patients with and without Hypertension

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ABSTRACT

Objective: The aim of this study is to compare the association between chronic kidney disease (CKD) and the frequency of consuming at least one serving of fruits and vegetables daily among those with and without hypertension and health care access.

Methods: Data from the 2019 Behavioral Risk Factor Surveillance System (BRFSS) analysis was analyzed using crosstabs within the web enabled analysis tool. Self-reported fruit and vegetable intake of at least one serving a day was compared in those with and without the chronic health condition kidney disease, high blood pressure (excluding pregnancy), and health care coverage. To account for multiple comparisons, significance for all analyses was set at 0.003.

Results: Overall, there was a relationship between self-reported CKD and the consumption of more than one serving of vegetables ($\chi^2 = 11.29, p < 0.001$) but not fruit ($\chi^2 = 0.8, p = .370$) per day. However, the significant relationship between CKD and vegetable intake did not remain significant when controlling for hypertension and health care access.

Implications: Patients with CKD were less likely to consume at least one serving of vegetables, but not fruit, per day. Fruit and vegetable intake has been shown to slow CKD progression, therefore, research into the factors contributing to these different intakes including messaging from healthcare practitioners and ways to increase vegetable intake in the patients may be warranted.

BACKGROUND

- Hypertension is a common cause of chronic kidney disease.
- Fruit and vegetable intake can positively impact blood pressure and is commonly encouraged for patients with hypertension.
- Education for chronic kidney disease may focus on limiting intake of potassium which is common in fruits and vegetables.

AIM

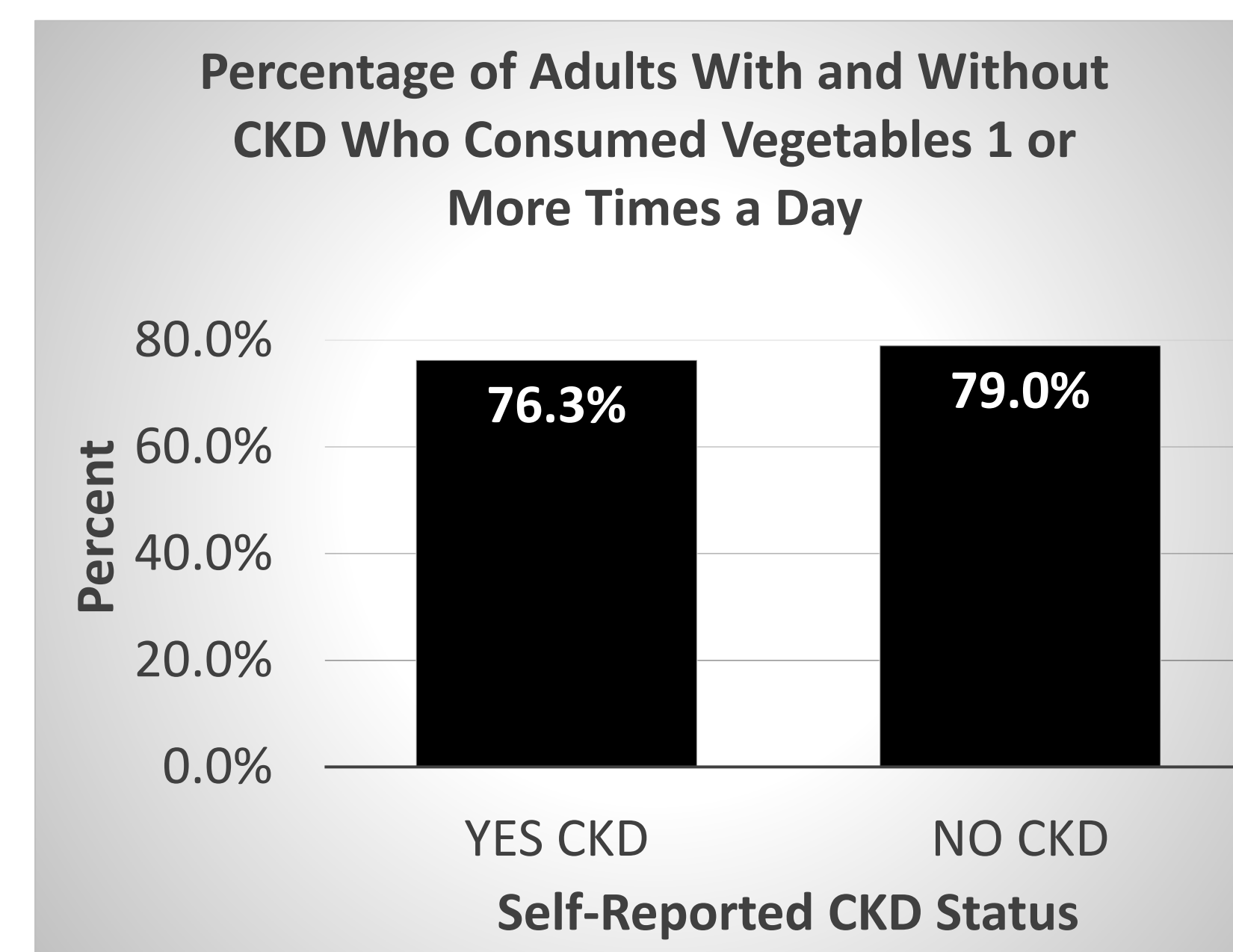
The aim of this study is to compare the association between chronic kidney disease (CKD) and the frequency of consuming at least one serving of fruits and vegetables daily among those with and without hypertension and health care access.

METHODS

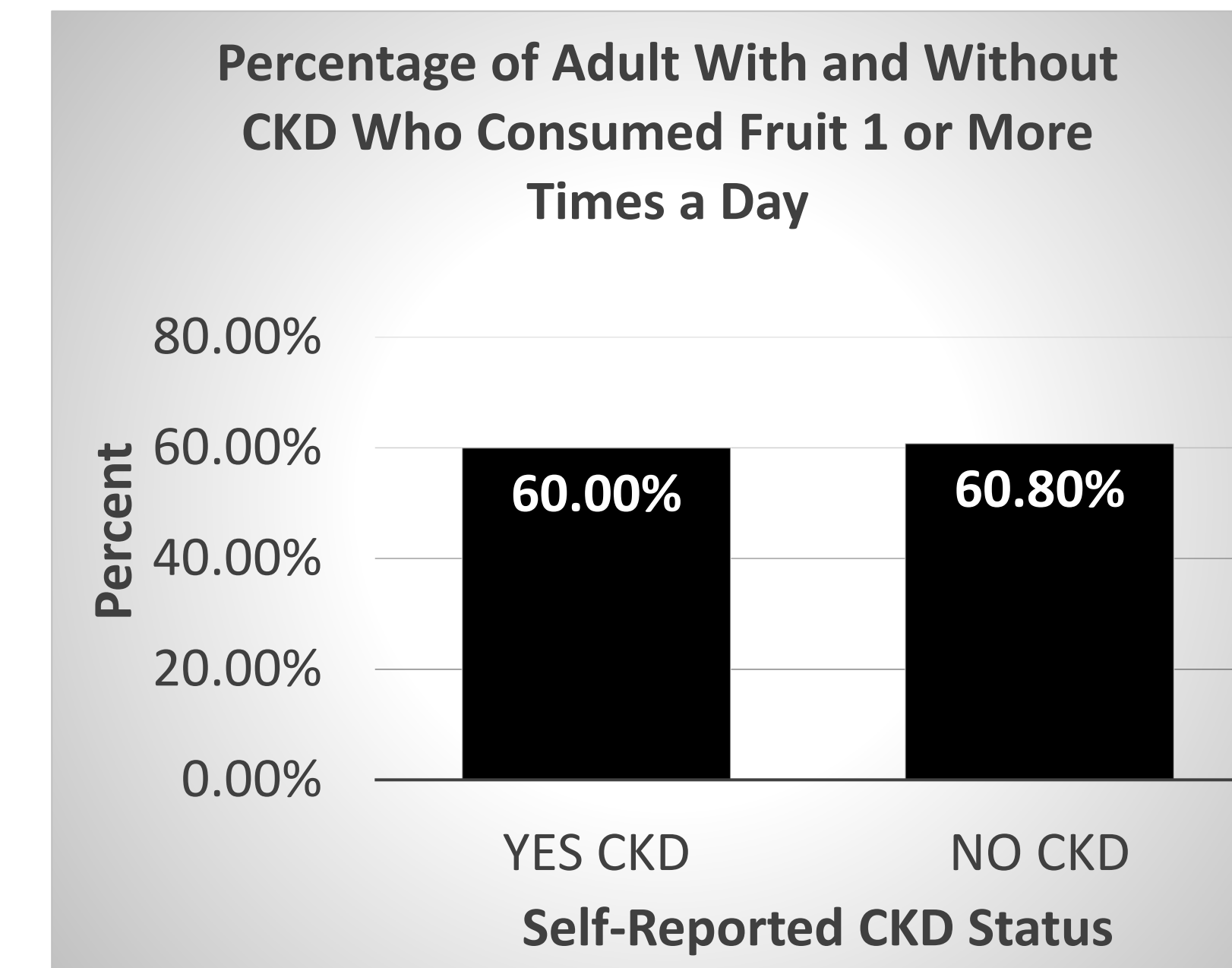
- Data from the 2019 Behavioral Risk Factor Surveillance System (BRFSS) was analyzed using crosstabs within the web enabled analysis tool.
- Self-reported fruit and vegetable intake of at least one serving a day was compared in those with and without chronic kidney disease (CKD) and corrected for high blood pressure (excluding pregnancy)
- To account for multiple comparisons, significance for all analyses was set at 0.003

RESULTS

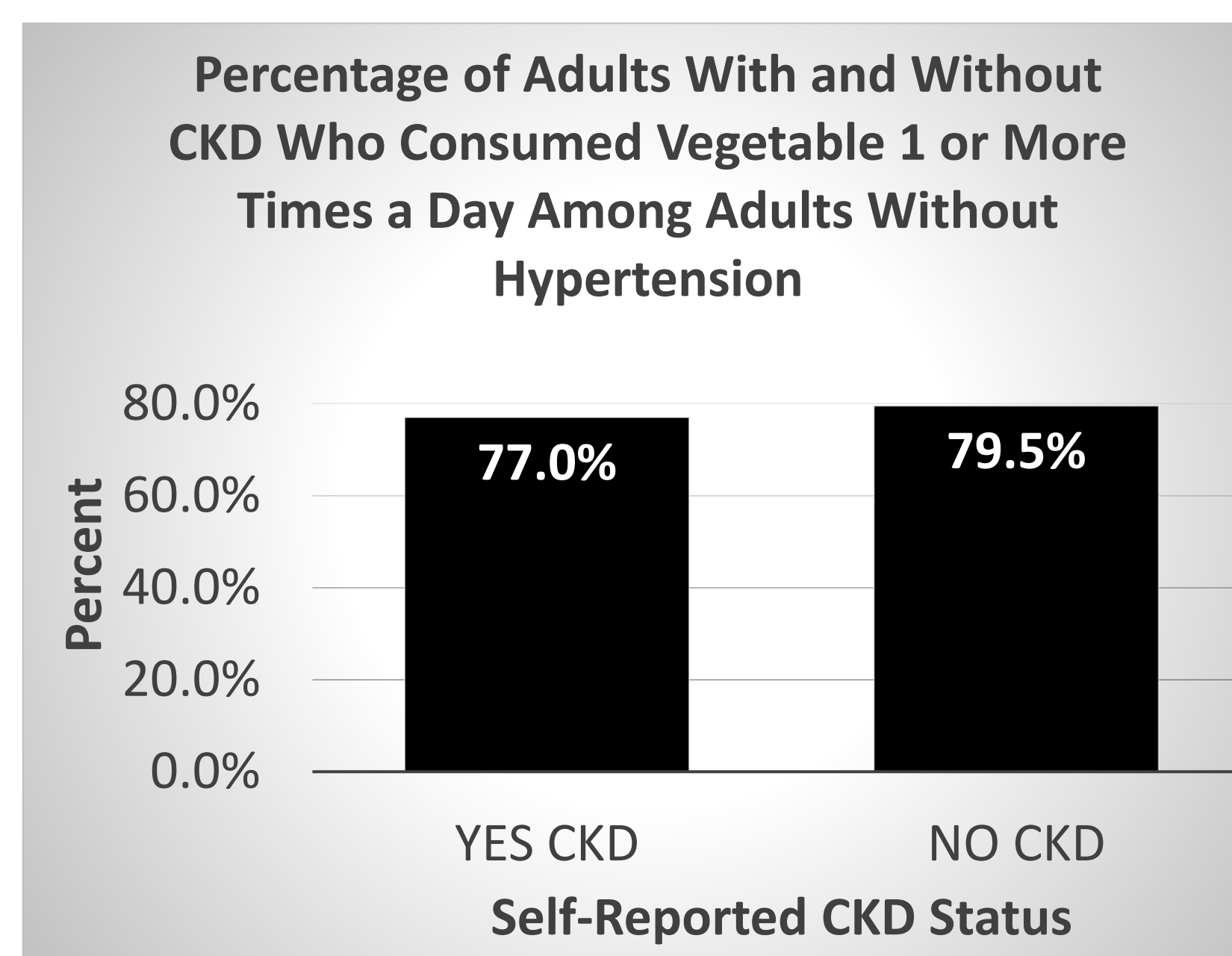
Overall, there was a relationship between self-reported CKD and the consumption of more than one serving of vegetables ($\chi^2 = 11.29, p < 0.001$) but not fruit ($\chi^2 = 0.8, p = .370$) per day. However, the significant relationship between CKD and vegetable intake did not remain significant when controlling for hypertension and health care access.



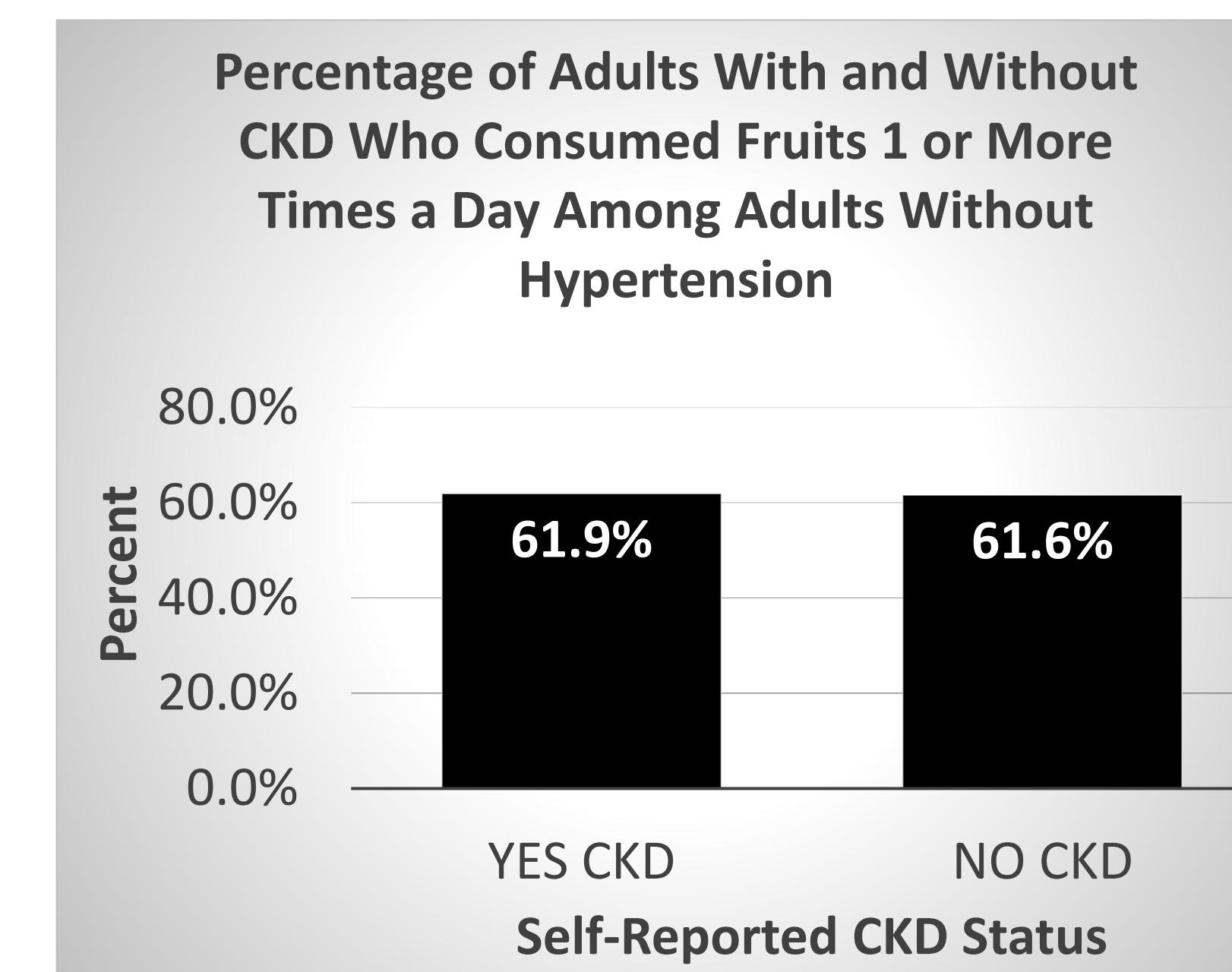
Chi Square = 11.29, P = 0.0008



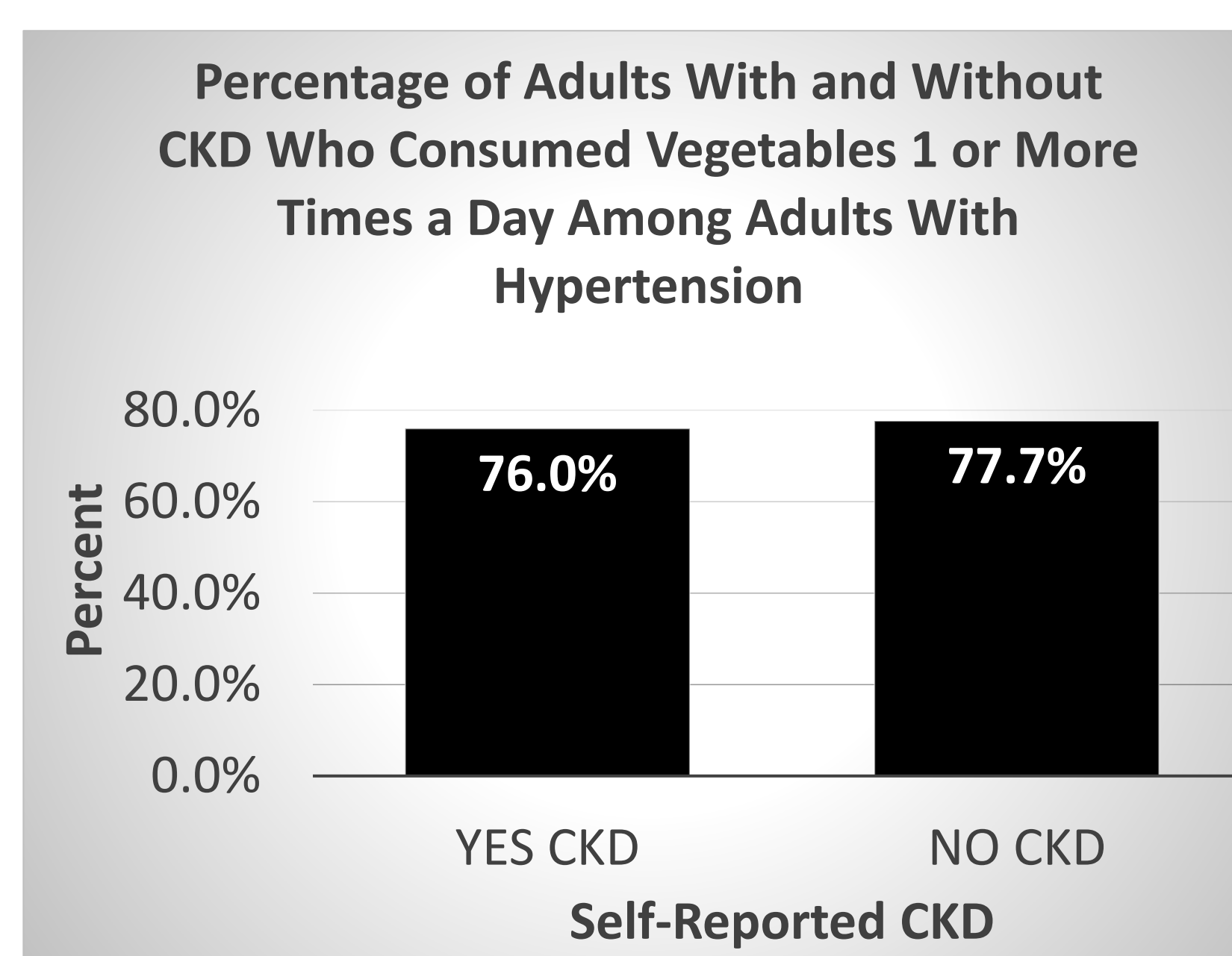
Chi Square = 0.80, P = 0.37



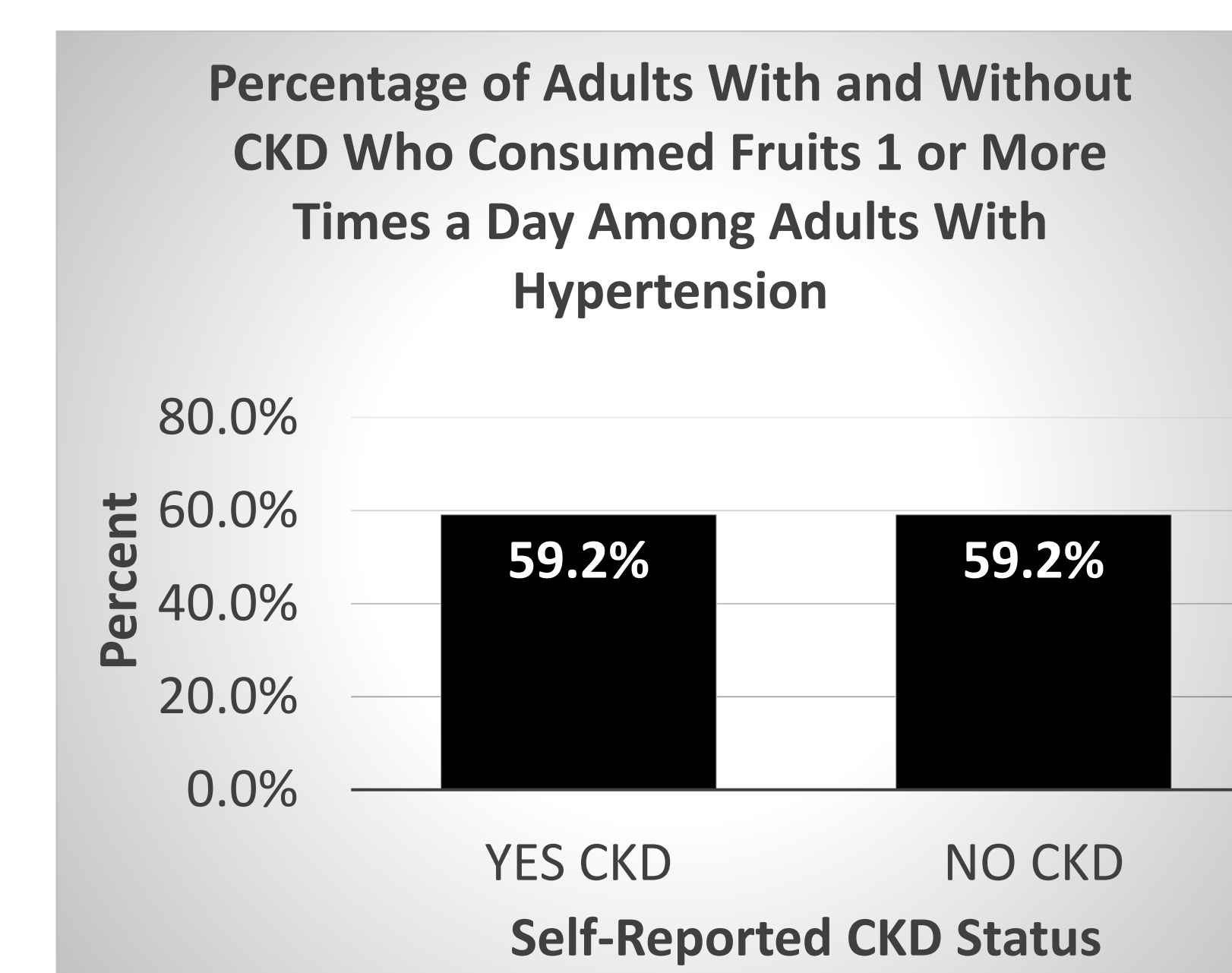
Chi Square = 2.51, P = 0.11



Chi Square = 0.03, P = 0.86



Chi Square = 3.45, P = 0.06



Chi Square = 0.00, P = 0.96

DISCUSSION

- We compared self-reported fruit and vegetable intake of at least one serving in individuals with and without CKD controlling for high blood pressure.
- After adjusting for multiple comparisons, we found a relationship between self-reported CKD and more than one serving of vegetables ($\chi^2 = 11.29, p < 0.001$).
- However, this relationship did not remain significant when controlling for hypertension.

STRENGTHS AND LIMITATIONS

Strengths

- Large sample size
- Representative sample
- Data on reliability and validity

Limitations

- Cross sectional design
- Self-reported data
- Crosstabs does not allow for more complex statistical models
- Not all relevant variables were in the database
- No causation, only correlations, could be identified

IMPLICATIONS

Patients with CKD were less likely to consume at least one serving of vegetables, but not fruit, per day. Fruit and vegetable intake has been shown to slow CKD progression.

Therefore, research into the factors contributing to these different intakes including messaging from healthcare practitioners and ways to increase vegetable intake in patients may be warranted.

REFERENCES

References:

- Chronic Kidney Disease Surveillance System – United States. cdc.gov. <https://nccd.cdc.gov/ckd/detail.aspx?Qnum=Q8#refreshPosition>. Accessed January 25, 2022.
- Li PKT, Garcia G, Lui SF, et al. Kidney healthy for everyone everywhere—from prevention to detection and equitable access to care. *Braz J Med Biol Res.* 2020;53(3). <https://doi.org/10.1590/1414-431X20209614>
- Goraya N, Simoni J, Jo CH, Wesson DE. A Comparison of Treating Metabolic Acidosis in CKD Stage 4 Hypertensive Kidney Disease with Fruits and Vegetables or Sodium Bicarbonate. *Clin J Am Soc Nephrol.* 2013;8:371-381. doi: 10.2215/CJN.02430312
- Kim H, Caulfield LE, Garcia-Larsen V, et al. Plant-Based Diets and Incident CKD and Kidney Function. *Clin J Am Soc Nephrol.* 2019;14(5):682-691. <https://doi.org/10.2215/CJN.12391018>
- Rebholz CM, Crews DC, Grams ME, et al. DASH (Dietary Approaches to Stop Hypertension) Diet and Risk of Subsequent Kidney Disease. *Am J Kidney Dis.* 2016;68(6):853-861. <https://doi.org/10.1053/j.ajkd.2016.05.019>
- Chiu S, Bergeron N, Williams PT, Bray GA, Sutherland B, Krauss RM. Comparison of the DASH (Dietary Approaches to Stop Hypertension) diet and a higher-fat DASH diet on blood pressure and lipids and lipoproteins: a randomized controlled trial. *Am J Clin Nutr.* 2016;103(2):341-347. <https://doi.org/10.3945/ajcn.115.123281>
- Suarez JJ, Isakova T, Anderson CA, Bouliware LE, Wolf M, Scialla JJ. Food Access, Chronic Kidney Disease, and Hypertension in the U.S. *Am J Prev Med.* 2015;49(6):912-920. <https://doi.org/10.1016/j.amepre.2015.07.017>
- National Academies of Sciences, Engineering, and Medicine. *Factors That Affect Health-Care Utilization. Health-Care Utilization as a Proxy in Disability Determination.* The National Academies Press; 2018. Accessed January 25, 2022. <https://www.ncbi.nlm.nih.gov/books/NBK500977>
- de Waal D, Heaslip E, Callas P. Medical Nutrition Therapy for Chronic Kidney Disease Improves Biomarkers and Slows Time to Dialysis. *J Ren Nutr.* 2016;26(1):1-9. <https://doi.org/10.1053/j.jrn.2015.08.002>