

Evaluation of Factors Associated with Transition from Prediabetes to Diabetes among Residents of Low-income Communities

Arinze Nkemdirim Okere, PharmD, MBA, BCPS, BCCP,¹ Tianfeng Li, PhD,² Askal Ali, PhD,² Eunice Nyasani, PharmD.³

The University of Iowa College of Pharmacy,¹ Florida A&M University College of Pharmacy and Pharmaceutical Sciences, Institute of Public Health,² Walgreens Pharmacy³



Introduction

- Over one-third of the population in the United States (US) has prediabetes.
- Rural or underserved communities experience a higher proportion of patients with diabetes compared to urban communities.
- The high prevalence of diabetes and prediabetes within the underserved communities has been attributed mostly to the presence of social determinants of health.
- No study has evaluated the factors influencing transition of prediabetes to diabetes among rural patients.
- Understanding these risk factors is critical in developing interventions for prevention.

Objective

We aim to evaluate factors associated with transitioning from prediabetes to diabetes among patients residing in rural or underserved communities in the Southeastern United States.

Methods

- Study design:** A retrospective study of patients with a history of pre-diabetes receiving care in rural clinics from 2012 – 2023.
- Study Population:** Patients with a history of pre-diabetes receiving care from low-income serving clinic located in Pensacola, Florida.
- Inclusion and Exclusion Criteria:** Patients had to be at least 18 years old with an annual mean baseline HbA1c of 5.7 – 6.4%. Following the initial extraction based on the mean baseline HbA1c, patients' mean HbA1c trends in subsequent years were followed for up to 5 data points. Patients with only one data point or patients with type 1 diabetes were excluded from the analysis.
- Primary Outcome:** The primary outcome of the study was to identify and rank factors impacting the transition from prediabetes to diabetes.
- Statistical Approach:** Two approaches were used as follows : 1.) Step-wise logistic regression (traditional method) and 2.) Machine Learning.

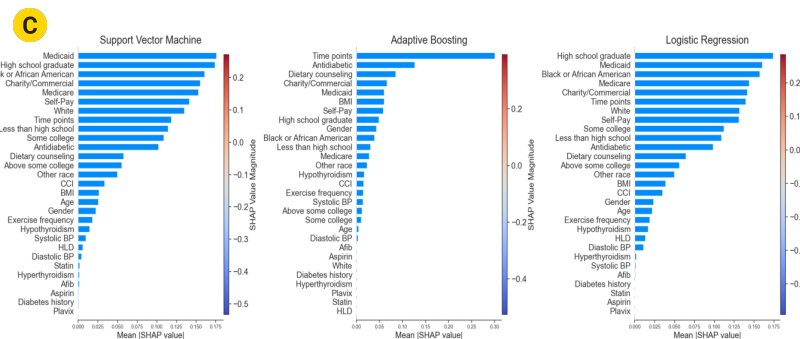
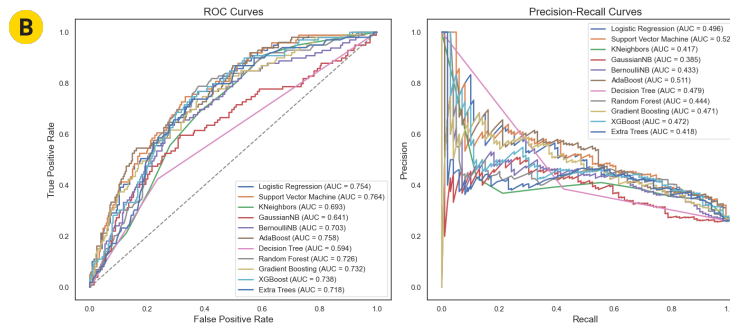
Results

Out of 5,824 patients, 1,910 met our inclusion criteria, and 426 developed diabetes within 10 years. Among the patients who developed diabetes, 50% are White patients, and 40% are Black patients. Forty percent of patients who met our criteria were on Statins and 10% on Aspirin.

A

Logistic Regression (LG) Analyses (Traditional Method)			
Independent variable	OR (95% CI)	Estimate	P-value
BMI	1.018 (1.005 - 1.031)	0.0177	0.0057
Number of Visits	1.166 (1.114 - 1.221)	0.1536	<.0001
Antidiabetic	4.362 (3.434 - 5.540)	1.4729	<.0001
Dietary Counseling	0.531 (0.419 - 0.672)	-0.6334	<.0001

Machine learning (ML) Approach



Discussion

- Several components of socio-demographic (such as race, educational status etc.) tend to rank higher, highlighting the negative impact of socio-economic or other demographic characteristics as predictors.
- In both analyses (LG and ML), BMI and dietary counseling emerged as the predominant predictors among the modifiable risk factors.
- Patients receiving dietary counseling are less likely to develop diabetes, aligning with ADA recommendations emphasizing the positive effects of nutrition in patients with diabetes or prediabetes.
- These findings align with previous research and underscore the importance of targeting BMI reduction to prevent the transition from prediabetes to diabetes.
- Limitation:** Small sample size and retrospective nature of the study.
- Strength:** Our data is robust, incorporating detailed laboratory information to reduce misclassification risk.

Conclusion

- Our machine learning framework exhibited high accuracy with an acceptable AUC in predicting factors affecting patients' transition from prediabetes to diabetes.
- This study is the first to focus on patients receiving care from a rural clinic. It underscores the significant impact of social determinants of health and other modifiable risk factors, such as BMI, as well as the positive effects of dietary counseling among patients with prediabetes.

Acknowledgments

We express gratitude to the following institutions:

- Florida A&M University College of Pharmacy and Pharmaceutical Sciences, Institute of Public Health, Tallahassee, Florida.
- The University of Iowa College of Pharmacy, Iowa City, Iowa.

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