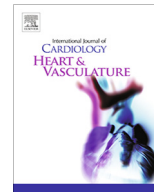




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Correspondence

Nationwide trends in stroke hospitalizations among patients with prediabetes


To the Editor,

Hyperglycemia is a well-known risk factor for development of cerebrovascular diseases, thus transient ischemic attacks and stroke [1]. Furthermore, studies have also established the future risk of stroke with prediabetes (a state of impaired glucose tolerance or impaired fasting glucose or high glycosylated hemoglobin) and mortality outcomes for stroke patients. A meta-analysis by Lee et al. showed that patients with prediabetes had 20 times increased risk of stroke (OR 1.20, CI 1.07 to 1.35; $p < 0.001$) after exclusion of studies with potential undiagnosed diabetes patients [2]. Forti et al. studied the mortality in stroke patients with prediabetes and diabetes. They found a hazard ratio of 1.58 (95% CI 1.07–2.35) for stroke in patients with prediabetes in comparison to normoglycaemic patients [3]. Data on the risk stratification for stroke patients remain scant and based on observational studies. However, there is lack of large-scale data on the trends in stroke admissions among patients with prediabetes (see Fig. 1).

In this first large-scale population-based analysis, we assessed the trends in stroke among inpatient encounters with prediabetic patients in the United States. We queried the National Inpatient Sample (2007–2014) to study the frequency and trends in stroke hospitalizations (Clinical Classification Software 109: ICD 9 34660 34661 34662 34663 430 431 4320 4321 4329 43301 43311 43321 43331 43381 43391 4340 43400 43401 4341 43410 43411 4349 43490 43491 436) with prediabetes using ICD-9 CM codes (790.21, 790.22, 790.29). SPSS v24 (IBM Corp, Armonk, NY, USA) was utilized to complete statistical analyses using defined strata/cluster designs. A linear-by-linear association test was used to evaluate trends and $p < 0.05$ was considered statistically significant.

Amongst a total of 3,667,391 hospitalizations among prediabetics, 3.9% ($n = 144,037$) of admission were related to stroke. From 2007 to 2014, there has been a rising trends in stroke admissions among prediabetics from 3.5% to 4.3% which shows an increase by 1.2-fold. More importantly, most pronounced rising trends in

stroke-related hospitalizations in prediabetics were observed in geriatric age group (overall 4.8%; increased from 4.3% to 5.2%), males (overall 4.1%, increases from 3.5% to 4.4%), Asian/Pacific Islander (overall 6.5%, increased from 6.5% to 6.6%) followed by African Americans (overall 4.7%, increased from 3.9% to 5.1%) from 2007 to 2014 ($p_{\text{trend}} < 0.001$). In our previous analysis of geriatric patients with prediabetes, we observed that the odds of stroke were higher in males (OR 1.07, 4.8% vs. 4.6%, $p < 0.001$) in comparison with females [4]. Asian or Pacific Islander patients with prediabetes demonstrated highest frequency (6.5%) of stroke admissions which might hint toward the genetic predisposition of Asians to high cardiovascular disease risk factors and high prevalence of modifiable risk factors. Further studies are required to curtail risk of premature cardiovascular disease in Asian prediabetics. Furthermore, African American patient population with prediabetes also showed higher rates (4.7%) of stroke admissions.

In conclusion, while the role of diabetes mellitus and hyperglycemia as a risk factor are established in patients with stroke, data in our analysis show alarming trends of stroke-related admissions among patients with prediabetes from 2007 to 2014. This subject needs to be addressed beyond observational studies and there remains a dire need for controlling conversion from prediabetes to diabetes at an early age to prevent stroke events later in life especially in high-risk patients with other cardiovascular disease risk factors.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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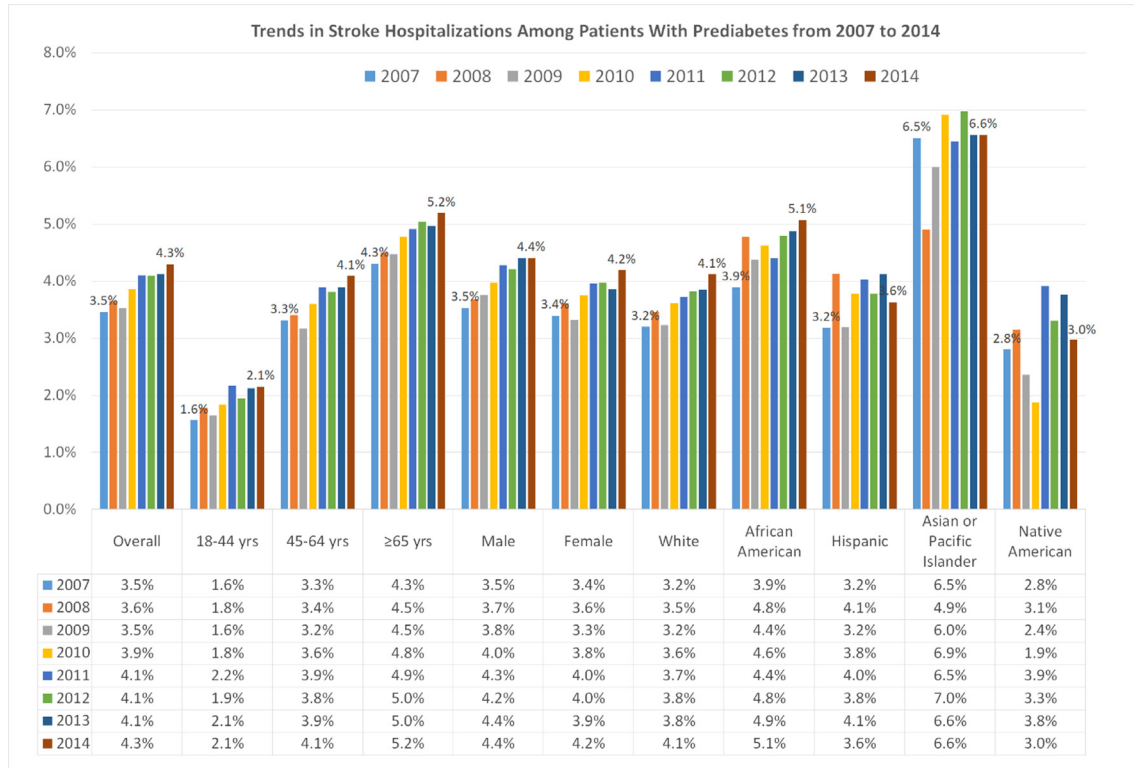


Fig. 1. Trends in Stroke-related Admissions among Patients with Prediabetes: 2007–2014.

References

[1] M.D. Mijajlović, V.M. Aleksić, N.M. Šternić, M.M. Mirković, N.M. Bornstein, Role of prediabetes in stroke, *Neuropsychiatr. Dis. Treat.* 13 (2017) 259–267, <https://doi.org/10.2147/NDT.S128807>.
 [2] M. Lee, J.L. Saver, K.S. Hong, S. Song, K.H. Chang, B. Ovbiagele, Effect of prediabetes on future risk of stroke: meta-analysis, *BMJ* 344 (2012) e3564, <https://doi.org/10.1136/bmj.e3564>.
 [3] P. Forti, F. Maioli, V. Nativio, et al, Association of prestroke glycemic status with stroke mortality, *BMJ Open Diab. Res. Care.* 8 (2020), <https://doi.org/10.1136/bmjdr-2019-000957>.
 [4] H.K. Fong, R. Desai, M. Faisaluddin, et al, Sex disparities in cardiovascular disease outcomes among geriatric patients with prediabetes [published online ahead of print, 2020 Jul 3], *Prim Care Diab.* (2020), <https://doi.org/10.1016/j.pcd.2020.06.005>.

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