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Original Research

The burden of diagnosed and undiagnosed diabetes in Native Hawaiian and Asian American hospitalized patients

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ABSTRACT

Aims: Little is known about diabetes in hospitalized Native Hawaiians and Asian Americans. We determined the burden of diabetes (both diagnosed and undiagnosed) among hospitalized Native Hawaiian, Asian (Filipino, Chinese, Japanese), and White patients.
Methods: Diagnosed diabetes was determined from discharge data from a major medical center in Hawai'i during 2007–2008. Potentially undiagnosed diabetes was determined by Hemoglobin A1c ≥ 6.5% or glucose ≥ 200 mg/dl values for those without diagnosed diabetes. Multivariable log-binomial models predicted diabetes (potentially undiagnosed and diagnosed, separately) controlling for socio-demographic factors.
Results: Of 17,828 hospitalized patients, 3.4% had potentially undiagnosed diabetes and 30.5% had diagnosed diabetes. In multivariable models compared to Whites, Native Hawaiian and all Asian subgroups had significantly higher percentages of diagnosed diabetes, but not of potentially undiagnosed diabetes. Potentially undiagnosed diabetes was associated with significantly more hospitalizations during the study period compared to both those without diabetes and those with diagnosed diabetes. In all racial/ethnic groups, those with potentially undiagnosed diabetes also had the longest length of stay and were more likely to die during the hospitalization.
Conclusions: Hospitalized Native Hawaiians (41%) and Asian subgroups had significantly higher overall diabetes burdens compared to Whites (23%). Potentially undiagnosed diabetes was associated with poor outcomes. Hospitalized patients, irrespective of race/ethnicity, may require more effective inpatient identification and management of previously undiagnosed diabetes to improve clinical outcomes.

Introduction

Native Hawaiians and Asian Americans are two of the fastest growing populations in the United States (US) [1]. Many members of these racial/ethnic groups have higher rates of diabetes than non-Hispanic Whites [2]. Little is known about the prevalence of diabetes in hospitalized Native Hawaiians and Asian American subgroups.

Understanding the full diabetes burden among hospitalized Native Hawaiian and Asian American populations is important because diabetes contributes to poor health outcomes and high health care costs [3,4]. In the US, approximately 16–25% of hospitalized patients have diagnosed diabetes [5,6]. Previous studies on diabetes prevalence among hospitalized patients have either not included, or have not disaggregated, heterogeneous Asian and Pacific Islander subgroups [6–8].

Estimates of diabetes prevalence in hospitalized patient populations are complicated by the fact that some patients have undiagnosed diabetes. Undiagnosed diabetes represents almost one-third of all diabetes cases in the general population of the United

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States, impacting approximately 8.1 million individuals [9]. Estimates of undiagnosed diabetes among hospitalized patients vary widely, but are higher than 20% in some settings [10–13].

A prior study of hospitalized Black and White patients in Georgia found that patients with previously undiagnosed hyperglycemia had higher rates of in-hospital morality (16%) than those with either previously diagnosed diabetes (3%) or normoglycemia (1.7%) [14]. Poor outcomes from in-hospital hyperglycemia have also been seen in other studies [15]. While admissions for hyperglycemia are currently declining, rates among some populations, including black Medicare beneficiaries, remain high [16].

The prevalence of hyperglycemia and undiagnosed diabetes among hospitalized Native Hawaiian and Asian American populations has not been adequately studied. However, high rates of undiagnosed diabetes have been found among Native Hawaiians and Asian Americans in the general population and in outpatient setting in addition to high rates of diagnosed diabetes [2,17,18]. This suggests that undiagnosed diabetes may also be high for hospitalized patients from these populations. As in-hospital hyperglycemia is associated with poor clinical outcomes and mortality both for those with and without a previous diagnosis of diabetes [14,15], this suggests that higher rates of undiagnosed diabetes among Asians, Native Hawaiians, and other Pacific Islanders might result in worse outcomes for these groups.

Capitalizing on opportunities for screening and early diagnosis is of vital importance. The hospital is a convenient setting for early screening and diagnosis. As type 2 diabetes is usually asymptomatic early in its course, chronic complications are already present in many patients newly diagnosed with the disease, suggesting that the actual onset of the disease precedes the diagnosis by many years [19,20]. It is thus important to consider those who may be undiagnosed at a point of contact in the health care system as a potential opportunity to intervene earlier to reduce preventable complications or morbidity.

The study goals were: (1) to determine the burden of diabetes (both undiagnosed and diagnosed) among Native Hawaiian and Asian hospitalized patients, who are known to be at increased risk of diabetes, and (2) to consider the consequences of diabetes status in terms of readmissions over the 2-year study period. Hospitalizations account for nearly one-third of all health care expenses for the US's non-institutionalized population and a considerable amount of the national diabetes burden [21]. Multiple hospitalizations are very common among those with diabetes [22]. They may be even more common among those with undiagnosed diabetes as these individuals may not be aware of the health impact of diabetes on their overall health status.

The specific racial/ethnic groups studied were Native Hawaiians, Whites, Filipinos, Chinese, Japanese and other Asian American or Pacific Islanders (AA/PI). We hypothesized that there would be differences across Native Hawaiian and Asian American subgroups in the prevalence of both diagnosed and potentially undiagnosed diabetes. Specifically, we expected that Native Hawaiians and Filipinos would have higher rates of both diagnosed and potentially undiagnosed diabetes compared to Whites even in multivariable adjusted models. We also hypothesized that those with potentially undiagnosed diabetes would have more readmissions during the study period than groups with both known diabetes and without diabetes.

Subjects

Data source

Hawai'i is one of four states in the US with a 'majority minority' population, and the state with the largest proportion of Asians and Native Hawaiians. Over 30% of the population is Asian and at least 25% are Native Hawaiian or other Pacific Islander [23,24].

Hawai'i Health Information Corporation data (HHIC)

HHIC collects detailed inpatient discharge data at the patient level from all hospitalizations by all payers in the state. HHIC inpatient data include information on race/ethnicity of patients, insurer, age, gender, and International Classification of Diseases – 9th revision – Clinical Modification (ICD-9) codes [25]. Long-term care and psychiatric hospitals are excluded. These data are cleaned by HHIC and are used as the Hawai'i hospital data source for the major national inpatient data-base [25].

The Queen's Medical Center

The Queen's Medical Center (QMC) is a 500-bed, urban, university-affiliated hospital that is the largest tertiary care referral center in the Pacific Basin.

Study population

We included all acute medical and surgical discharges from hospitalized patients between 1/1/2007 and 12/31/2008 at QMC. Pregnancy-related hospitalizations were excluded. We merged Hemoglobin A1c (HbA1c) and plasma glucose laboratory data from QMC patients with HHIC inpatient data for individuals hospitalized at QMC during the study years. This created a sample of non-pregnancy-related hospitalizations by any individual aged 18+ at QMC between 1/1/2007 and 12/31/2008. A total 35,321 hospitalizations were identified in this way. Hospitalizations were excluded if they did not report race/ethnicity (n = 191) or island of residence (n = 16). This left 35,114 hospitalizations for 24,854 unique patients. A study sample flow diagram can be seen as Fig. 1.

Methods

Diabetes diagnoses

Discharge ICD-9 codes in the HHIC data identified hospitalizations for diabetes, either uncomplicated diabetes (250.00) or diabetes complications (250.02-–250.93).

Lab values

Labs for this study were obtained retrospectively from data collected during usual care at the hospital. The HbA1c test is not part of the routine panel. We thus have HbA1c lab values only for the 5.67% (1010/17,828) of patients who had this test ordered as part of usual care.

Potentially undiagnosed diabetes

Potentially undiagnosed diabetes was defined as HbA1c (≥6.5%) or glucose (≥200 mg/dl). HbA1c values reflect mean glucose levels over the preceding 3 months and have particular value as a diagnostic tool in the hospital setting as it is relatively unaffected by acute elevations in glucose levels (stress hyperglycemia) associated with severe illness [26,27]. However, as only a few individuals with undiagnosed diabetes are likely to have a HbA1c lab value taken in the course of their hospitalization as described above, we also identified potentially undiagnosed diabetes using random plasma glucose (RPG). Those with the first RPG during the visit or the last RPG