DIABETES & U.S. AGRICULTURAL WORKERS

Diabetes mellitus is a disease of enormous burden in the United States, particularly among American Indians, Hispanics, and non-Hispanic blacks.[1] Diabetes causes more blindness, kidney failure, and lower limb amputations than any other single disease, and underserved populations may struggle to be screened, diagnosed, and treated in a timely manner. Agricultural workers may be particularly vulnerable to the development of type 2 diabetes mellitus due to a variety of factors, ranging from conditions of poverty to cultural practices to genetic predispositions.[2,3]

EPIDEMIOLOGY

- The total prevalence of type 1 and type 2 diabetes among agricultural workers is unknown, but it is likely to be similar to that found among U.S. Hispanics with similar acculturation levels. Nationally, 6.1% of Hispanics of all ages had type 1 or type 2 diabetes mellitus in 2011.[4]
- In a study of administrative data collected from 164 Migrant Health Centers on more than 793,000 agricultural worker patients in 2012, a prevalence rate of 7.8% for type 1 and type 2 diabetes combined was documented among patients of all ages.[5] This type of data may underestimate the true prevalence of diabetes, based on Health Center billing practices.

GENETIC & ENVIRONMENTAL RISK FACTORS

- A controversial concept called the “thrifty genotype” was hypothesized in 1962, which posed that certain people groups, such as American indigenous peoples, evolved with a metabolic susceptibility to type 2 diabetes mellitus due to an extensive human history rooted in feast-or-famine conditions.[6] However, evidence for this hypothesis is somewhat weak, and many researchers feel that diabetes disparities among ethnic minorities are more closely related to their social and economic conditions rather than to specific ethnic genotypes.
- Long-term exposure to certain pesticides has been found to increase the risk of developing diabetes among pesticide applicators.[7]
- Women who experienced exposure to pesticide application or to pesticide application equipment during pregnancy were twice as likely to report gestational diabetes compared to women who were not exposed to pesticides.[8]

SOCIAL & CULTURAL RISK FACTORS

- Stress may be an important contributor to the development of type 2 diabetes through the physiologic effects of stress on blood glucose. Agricultural workers may face high stress levels from food insecurity, labor rights abuses & wage theft, and migration challenges. Fasting blood glucose have been associated with perceived stress among migrant agricultural workers.[9] Job

strain has been shown to be an independent risk factor for type 2 diabetes among working men and women, regardless of lifestyle choices.[10]

- A study conducted with 107 Mixtec migrant agricultural workers in northern Mexico found that females had a disproportionate burden of diabetes.[11] Men had a diabetes prevalence of 12.8%, while women had a prevalence of 36.7%, which may be due to lower education levels, less physically demanding occupations, or dietary differences among women.
- A systematic review of 59 indigenous populations around the world found that indigenous groups in North America had the highest prevalence of type 2 diabetes, with increasing acculturation and urbanization contributing to higher rates of diabetes in the vast majority of people groups.[12]
- Local food culture and the built environment can have a major impact on the development of diabetes.[13] The risk for diabetes increases in impoverished, "obesogenic" environments, where unhealthy food is inexpensive and accessible and the built environment lacks safe spaces for physical activity.

HIGH-RISK SUBGROUPS

- Indigenous agricultural workers may be particularly vulnerable to the development of diabetes and more severe effects of the disease. Indigenous workers face more barriers in accessing care because of cultural, linguistic, and socioeconomic disparities.[14] They may not speak English or Spanish, and may experience severe discrimination from both U.S. citizens and from Spanish-speaking immigrants. Indigenous workers have also been found to be among the poorest subgroups of agricultural workers,[15] which may lead to a reliance on unhealthy but inexpensive and easily accessible foods.
- Nearly three-fourths of agricultural workers are foreign-born, and foreign-born persons in the U.S. have a very high tuberculosis (TB) incidence rate of 15.8 cases per 100,000 people compared to 0.8 cases for non-Hispanic Whites.[16,17] Diabetes and TB may interact much in the way that HIV/AIDS and TB interact – when both conditions are present, they produce more severe effects and may make management and treatment more difficult. Research conducted with Hispanic populations in the U.S. and Mexico has found that patients with diabetes had three times the risk of developing tuberculosis.[18] Providers that care for agricultural worker patients from regions where TB is endemic may need to be particularly aware of the potential for an interaction between TB and diabetes.

DIABETES INTERVENTION PROGRAMS

- Research conducted with a migratory population of male agricultural workers in South Carolina indicated that 81% of the 80 participants had a mobile telephone and that the majority of participants were very positive about the idea of using mobile technologies for management of hypertension and/or diabetes.[19] Workers unfamiliar with mobile devices also indicated a willingness to participate in mHealth (mobile health) programs if they had access to an initial tutorial.
- A quasi-experimental study with migrant agricultural workers in Virginia found that community health workers (*promotores de salud*) could screen for diabetes in this population as effectively as

a registered nurse.[20] This may mean that screening programs for farmworkers could be increased and could potentially reach more workers.

- An intervention program focused on migratory agricultural workers in California screened for hypertension, diabetes, hypercholesterolemia and depression in 1,300 participants and enrolled 338 with these chronic conditions into a family intervention program.[21] Many of the participants migrated internationally. The intervention program consisted of nutrition education, education about chronic conditions and was focused on engaging the entire family. At 6, 12, and 18 month follow-ups, hemoglobin A1c (HbA1c) was significantly reduced among those with pre-diabetes or diabetes who participated in the intervention program.

Agricultural Worker Factsheets are published by the National Center for Farmworker Health, Inc. 1770 FM 967, Buda, TX 78610, (512) 312-2700. This publication was made possible through grant number U30CS0 9737 from the Health Resources and Services Administration, Bureau of Primary Health Care, and its contents are solely the responsibility of the authors and do not necessarily represent the official views of HRSA.

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