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Type One Diabetes Mellitus in Immigrant and
Minority Pediatric Populations

Kristina Nielson

A scholarly paper submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Science

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ABSTRACT

Type One Diabetes Mellitus in Immigrant and Minority Pediatric Populations

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Type 1 diabetes mellitus (T1DM) is a prevalent chronic illness affecting children and adolescents. Globally, it is estimated that at least 1 million children under the age of 19 years are affected by T1DM. Immigrants and minorities have worse diabetic outcomes than the majority population. The purpose of this article is to identify common challenges in children with T1DM who are part of immigrant or minority populations. Major health challenges for children with T1DM who are immigrants or minorities include issues regarding access to healthcare, communication, and cultural adaptation. Access of children with T1DM to high-quality healthcare and new diabetes technology (such as insulin pumps) is often impeded by low socioeconomic status. Many minority children with T1DM live in homes where the primary language is different than that of the healthcare team, causing barriers in communication. Lastly, immigrant children, by definition, relocate to a new geographical location, where they must adapt to new a new culture and diet changes. Identifying and mitigating for these challenges can improve glycemic control and subsequently reduce diabetic costs, while improving quality of life and reducing mortality.

Keywords: type 1 diabetes, pediatric, ethnic, immigrant, minority, race, glycemic control

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Type One Diabetes Mellitus in Immigrant and Minority Pediatric Populations

Type 1 diabetes mellitus (T1DM) is a prevalent chronic illness affecting children and adolescents (International Diabetes Federation, 2017). In fact, about 200,000 Americans under the age of 20 years have T1DM, and the incidence is increasing annually (Centers for Disease Control and Prevention, 2017). Diabetes is not a uniquely American problem. The global incidence of T1DM was 175 out of 100,000 children in 2010 and is rapidly growing worldwide (Kiess, Gorski, Penke, Klamt & Kapellen, 2015). Globally, it is estimated that at least 1 million children under the age of 19 years are affected by T1DM (International Diabetes Federation, 2017).

While T1DM can be successfully controlled with regular blood glucose evaluation and insulin management, as well as exercise and nutrition (American Diabetes Association, 2019), immigrant and minority populations are at increased risk for unfavorable diabetic outcomes (Borschuk & Everheart, 2015). Patients from these two groups are often associated with a lower socioeconomic status (SES) and worse glycemic control (Rose et al., 2018). Immigrants with T1DM tend to have higher glycosylated hemoglobin (HbA1c) levels and more diabetes-related complications than their native counterparts (Söderström, Samuelsson, Sahlqvist, & Åman, 2014). Ethnic minority groups with T1DM also exhibit higher rates of morbidity and mortality (Willi et al., 2015).

Generally, immigrants and minorities, regardless of geographic location, have worse diabetic outcomes than the majority population (Borschuk & Everhart, 2015). However, the reasons for these disparities worldwide are not well understood. Therefore, there is a need to identify global T1DM patterns among children, especially those who are immigrants or

minorities. Consequently, the purpose of this article is to identify common challenges in children with T1DM who are part of immigrant or minority populations.

Methods

CINAHL, *MEDLINE*, and *COCHRANE* databases were searched to identify international studies relating to children diagnosed with T1DM. In addition to electronic databases, select websites, such as the American Diabetes Association, Centers for Disease Control and Prevention, and International Diabetes Federation, were also reviewed.

Peer-reviewed, English-language research published in professional journals from 2014 to 2019 was initially included, but only nine published studies met these inclusion criteria. Therefore, inclusion criteria were expanded to include published articles from 2010 to 2019. Expansion to include articles from 2010 led to the discovery of an additional eight articles. Review of the references list for each article identified four classic studies regarding ethnicity, culture, and communication with families of children with T1DM: one from 2005, two from 2007, and one from 2008 which were also included. Search terms included “type 1 diabetes,” “pediatric,” “family,” “child,” “ethnic,” “immigrant,” “minority,” “language,” and “race.”

Results

Twenty-one articles were identified and reviewed (See Table 1). Each study included children with T1DM who were immigrants or from minority groups. The subjects represented various regions of the world, including six continents. Children with T1DM from immigrant and minority groups experienced similar health challenges, regardless of location. Major health challenges included issues regarding access to healthcare, communication, and cultural adaptation.

Access to Healthcare

One explanation for the disparate glycemic control among immigrant and native children is socioeconomic status (Berhan et al., 2015; Gandhi et al., 2016). On average, immigrants and ethnic minorities have an SES significantly lower than those of their native counterparts (Gandhi et al., 2016; Phan et al., 2014; Söderström et al., 2014). In fact, immigrant families frequently have a greater need for social welfare services and experience higher rates of unemployment than native families (Frey et al., 2007; Söderström et al., 2014). The number of immigrants who rent housing is also disproportionate to the number of immigrants who own housing, meaning there is a greater number of immigrants who lack shelter stability (Frey et al., 2007). Furthermore, immigrant and minority families typically have lower education levels, larger families, and higher rates of single parent households (Monaghan et al., 2012). Not only do immigrant and minority children with T1DM experience higher rates of morbidity, Berhan et al. (2015) found that low maternal education and the need for income support also contributed to early mortality in children with T1DM. These socioeconomic disparities increase stress for families and make it more difficult to afford medications, supplies and healthcare in general.

T1DM is an expensive and complex disease to manage (Berhan et al., 2015; Lin et al., 2013; Pulgarón et al., 2014; Söderström et al., 2016). Experts recommend a minimum of quarterly visits with healthcare providers (HCPs), frequent lab draws, strict observance of an insulin regimen and special attention to diet (Phan et al., 2014; Pulgarón et al., 2014; Söderström et al., 2016). However, frequent HCP visits, lab evaluations, and medications are expensive and, consequently, difficult for immigrants and minorities to access. The use of insulin pumps and continuous glucose monitors has been widely shown to improve glycemic control in children with T1DM (Fredheim et al., 2014; Lin et al., 2013). However, these newer technologies are

more expensive than older standard equipment and are often difficult for immigrants and minorities to obtain (Fredheim et al., 2014; Lin et al., 2013). For example, Lin et al. (2013) found that insulin pump use was significantly higher for children who were non-Hispanic white, from families with private insurance, or whose household annual income was greater than \$100,000. Further, children from food-insecure households have higher HbA1c concentrations when compared to their food-secure counterparts (Marjerrison et al., 2011). Children from socioeconomically-challenged families are, therefore, at a great disadvantage in effectively managing T1DM (Frey et al., 2007; Phan et al., 2014).

Communication

Communication and language can be formidable barriers that negatively affect health outcomes of children with T1DM (Hassan & Heptulla, 2010; Palau-Collazo et al., 2013; Pulgarón et al., 2014). In fact, many immigrant and minority families have difficulty communicating, in a non-native language, with the HCPs who care for their children with T1DM (Gandhi et al., 2016; Hassan & Heptulla, 2009; Palau-Collazo et al., 2013; Povlsen et al., 2005; Vanelli et al., 2012). Notwithstanding the presence of conversational language fluency, immigrant parents of children with T1DM still report difficulty communicating with HCPs because they have a limited understanding of complex medical subjects (Hassan & Heptulla, 2009; Povlsen et al., 2005). Regardless of fluency, speaking a non-native language in the home is associated with poor glycemic control in children with T1DM (deBeaufort et al., 2007). Furthermore, a significantly increased risk in diabetic complications was noted in children outside the United States with T1DM from families identified as primarily speaking a foreign language (deBeaufort et al., 2007; Vanelli et al., 2012).

Communication challenges of immigrants or minority populations are not unique to specific dialects or countries; communication challenges also involve issues with reading comprehension and health literacy (Hassan & Heptulla, 2010; Povlsen et al., 2005; Pulgarón et al., 2014). For example, children with T1DM from Spanish-speaking families in the United States, whose parents also have poor numeracy and reading comprehension, have less strict insulin regimens than those who have parents with higher comprehension (Hassan & Heptulla, 2010). In addition, bilingual minority adolescents with T1DM have better glycemic control only when their parents also demonstrate a high level of health literacy (Gandhi et al., 2016).

Cultural Adaptation

Immigrant and minority populations often live in environments that are different from their cultural upbringing or native traditions (Banin et al., 2010; Galler et al., 2012; Kalyva et al., 2016; Povlsen et al., 2008; Söderström et al., 2014). These differences create unique stressors for children with T1DM (Kalyva et al., 2016; Söderström et al., 2014), such as adapting to diet changes and eating habits. Immigrant and minority populations also report poorer quality of life and higher levels of stress, which could account for increased HbA1c levels among cultural minorities when compared to majority counterparts (Kalyva et al., 2016; Söderström, et al., 2014) because stress can increase blood glucose levels.

Generally speaking, ethnic minorities have less strict practices when managing T1DM, often resulting in suboptimal glycemic control (Fredheim et al., 2014). For instance, non-native children with T1DM have a lower number of daily insulin injections and higher insulin doses compared to native peers, translating into higher HbA1c levels (Fredheim et al., 2014). Galler et al. (2012), hypothesized that “disparities in lifestyle and nutrition habits may account for [worse] health status in immigrant families” (p. 496). While the societal norm in Western cultures may

be eating several small meals throughout the day, many immigrants and minorities may have family traditions that focus on one or two large group meals per day (Galler et al., 2012; Kalyva et al., 2016). This discrepancy in eating schedules can significantly alter insulin dosing and, subsequently, glycemic control (Galler et al., 2012; Kalyva et al., 2016).

Immigrant children with T1DM are, on average, diagnosed 6 months younger than children in the native population (Banin et al., 2010). While the reason for diagnosis at an earlier age is unclear, it is possible that environmental determinants in the new country of residence, such as improvements to hygiene or consumption of different foods, expedite new onset symptoms (Fredheim et al. 2014; Söderström et al., 2014). Some authors also hypothesize that newly immigrated children may have lost certain protective factors they had in their countries of origin, such as intestinal biota or foods unique to the native area, placing them at greater risk for early onset (Banin et al., 2010). In changing their environment and lifestyle, immigrants often experience an increased risk of developing T1DM (Söderström et al., 2014).

In addition to immigrant children being younger at diagnosis, they are also more ill and require longer hospitalization upon diagnosis (Maahs et al., 2015; Söderström et al., 2014). Poor living conditions and unvaried diet in the country of origin can mask new onset of T1DM symptoms in childhood, including vomiting, polydipsia, and polyuria, as parents may dismiss these symptoms as common gastrointestinal illnesses, thus delaying appropriate diagnosis (Banin et al., 2010). Certain immigrant groups, particularly those from Africa or Asia, have a low incidence of T1DM and may be, therefore, unfamiliar with the condition (Fredheim et al., 2014; Söderström et al., 2014). Thus, immigrant groups may not recognize T1DM symptoms as indicative of a chronic or severe illness requiring emergent medical attention (Fredheim et al., 2014; Söderström et al., 2014). This impaired perception can cause a delay in care which,

consequently, increases the chance of developing the life-threatening condition - diabetic ketoacidosis (DKA) (Söderström et al., 2016; Vanelli et al., 2012). Indeed, cultural minorities are more likely than the majority population to present with DKA at diagnosis (Maahs et al., 2015).

Discussion

Healthcare Access

It is well established that effective management of T1DM is heavily associated with healthcare access (Berhan et al., 2015; Gandhi et al., 2016). Often, immigrants migrate from less developed countries where access to healthcare is neither equally distributed nor readily available. After immigrating to a more economically stable country, however, one would expect that immigrants would experience improved access to healthcare services (Galler et al., 2012) which, in turn, would improve the health outcomes of immigrant children with T1DM. Nevertheless, when immigrant families were afforded access to the same healthcare services as their native peers, many immigrant children with T1DM still suffered poorer glycemic control (Söderström et al., 2014). Remarkably, the poor glycemic control of immigrant children persisted, even after adjusting to life in the new country for up to three years (Söderström et al., 2016). Overwhelmingly, minority and immigrant children with T1DM have both worse access to healthcare and worse glycemic control, despite their locale, when compared to native children.

There is also a clear correlation between SES and glycemic control (Rose et al., 2018; Willi et al., 2015). To compensate for low SES and potentially improve health outcomes for children with T1DM, it has been hypothesized that offering free or discounted healthcare services can successfully mitigate immigrant and ethnic disparities in glycemic control (Borschuk & Everhart, 2015; Fredheim et al., 2014). Indeed, Fredheim et al. (2014) found fewer pronounced differences in the HbA1c between natives and non-natives living in countries with

socialized medicine, when compared to other regions lacking free healthcare. However, American researchers found that even after adjusting for SES differences, minority children continued to exhibit poorer glycemic control than their majority peers (Willi et al., 2015). Similarly, Carter et al. (2008) found Australian minorities, consisting mainly of Maori and Pacific Islanders, had higher HbA1c levels, hypoglycemic events, and long-term complications of T1DM when compared to mainstream populations of European descent, despite adjustments for SES. In the majority of articles reviewed, no significant improvement in glycemic control was noted despite increased access to and affordability of healthcare. Given the lack of a clear benefit, it is difficult to discern whether or not the costs of these interventions to improve healthcare access are justified.

Communication

Making specific adjustments to language and communication needs can significantly improve diabetic outcomes. Spanish-language clinic attendees in the United States, who spoke native Spanish, had a one-point reduction in HbA1c after one year of attendance, but the Spanish-speaking families treated at English-speaking clinics showed no reduction in HbA1c (Palau-Collazo et al., 2013). In addition, Chinese-speaking patients in the United States felt a greater sense of connection with Chinese-speaking providers and displayed an enhanced ability to manage their care when they could easily communicate with the HCP (Gandhi et al., 2016).

While it may be unrealistic for HCPs to be fluent in the preferred language of each of their patients, many interpretation services are available for use. In fact, use of certified interpreters is recommended even if parents show advanced understanding of their non-native language (such as conversational fluency), particularly for topics such as anatomy and physiology (Gandhi et al., 2016; Hassan & Heptulla, 2010). For immigrants or minorities with

language barriers, interpretation services have a positive effect on the health outcomes of children with T1DM; however, even when there is an established need for interpretation services, such services are often severely underused as a resource (Povlsen et al., 2005).

Interpretation should be used whenever possible with patients who are not medically fluent in the HCP's preferred language(s).

Aside from oral communication, many minority and immigrant families have difficulty with literacy and numeracy in a foreign language (Pulgarón et al., 2014). Some immigrant and minority parents request print materials in their native language to better understand their children's T1DM (Vanelli et al., 2012). Providing printed materials in a native language is helpful but should be coupled with oral interpretation to foster effective communication with parents of children with T1DM (Gandhi et al., 2016). It may be helpful to assess patients' health literacy using established tools, such as those available through the Health Literacy Tool Shed (healthliteracy.bu.edu). Parents with low health literacy or numeracy should receive more detailed teaching about treatment plans and medication dosing (Pulgarón et al., 2014). When communication barriers are identified and mitigated through interpretation and print materials, children with T1DM consistently have improved diabetic outcomes (Hassan & Heptulla, 2010; Palau-Collazo et al., 2013; Pulgarón et al., 2014).

Cultural Adaptation

There are no studies isolating ethno-genetic factors as the sole reason for poor diabetic outcomes in immigrants and minorities; most of the causes for poor diabetic health had large cultural components. Cultural differences largely attribute for the higher HbA1c level and worse diabetic outcomes in immigrant and minority groups (Borschuk & Everhart, 2015). Living in a new area poses the challenge of eating new, and sometimes expensive, foods, as well as

adjusting to different eating schedules. HCPs should inquire when and what children with T1DM eat and make medication adjustments, rather than assume immigrant families are on a similar schedule as native families. Children who are referred to dieticians, to help with nutrition, experience improved HbA1c, as well as lower body mass index and cholesterol levels (Cadario et al., 2012). These interventions can have long-term benefits as better glycemic control in youth will likely continue into adulthood (Mazarello et al., 2018). Palau-Collazo et al. (2013) found that HCP cultural training correlates with increased patient compliance and fosters trust between the healthcare team and patient families. The investment of instituting such interventions has the potential to reduce future costs by preventing hospitalizations and diabetic related morbidities, such as DKA, neuropathies, and microalbuminuria (Galler et al., 2012). Thus, newly immigrated or minority children diagnosed with T1DM need culturally appropriate teaching and referrals from HCPs in order to successfully manage their diabetes.

Implications for Practice

In a world of increasing healthcare costs and finite funding, it is imperative to know where to best allocate resources for at risk groups (Iovane et al., 2017; Palau-Collazo et al., 2013), such as immigrant and minority children with T1DM. In this literature review, little evidence was found to support a clear improvement to diabetic outcomes when immigrant families relocated to countries with socialized medicine or when access to healthcare was improved. Such interventions are complex and require involvement of national governments and major policy changes (Fredheim et al., 2014; Söderström et al., 2014). Despite the complexities associated with institution of socialized medicine, HCPs can still effectively advocate for patients with T1DM (Hilliard et al., 2015; Jaser, 2011) who have also immigrated or who are from ethnic minority groups by working closely with insurance and medical supply companies.

Although it can be time consuming, HCPs who find opportunities for patients and families to apply for financial assistance from pharmaceutical companies or write pre-authorization letters to insurance companies may find greater compliance and outcomes with treatment plans.

Interventions regarding language and communication strategies can be beneficial to immigrant and minority patients with T1DM (Palau-Collazo et al., 2013). Interpretation, printing materials in multiple languages, and spending extra time with non-native language speakers all require financial and time commitments (Jaser, 2011). However, the benefits from communication interventions seem to heavily outweigh the costs.

Lastly, adapting to cultural changes is a complex topic because HCPs may deal with a myriad of different cultural practices in their patient population (Gandhi et al., 2016). The literature shows improvements to glycemic control when HCPs received cultural training. Great improvements can also be made when HCPs spend more time with their patients and patient families, trying to adapt care plans to their individual needs (Frey et al., 2007; Hassan & Heptulla, 2010). HCPs should provide family-centered interventions to reduce cultural isolation and increase social support (Hilliard et al., 2015; Jaser, 2011). These costs are difficult to quantify due to the differentiation of patients and working habits of each HCP. Altogether, HCPs should focus on spending more time with at-risk groups, and invest in interpretation services whenever possible. The investment of instituting such interventions has the potential to reduce future costs by preventing hospitalizations and diabetic-related morbidities (Galler et al., 2012).

Conclusion

The world is becoming more globally fluid, and individual nations' populations are becoming increasingly diverse. As a result, HCPs must be attuned to a growingly diverse patient base. Overwhelmingly, immigrant and minority children with T1DM have worse diabetic

outcomes, higher HbA1c levels, increased complications, and earlier mortality when compared with native and majority children. These same groups frequently have lower SES, more communication barriers, and must make significant cultural adaptations when living in a new or different environment. Provision of interpretation services and enhanced teaching from HCPs have been correlated with improved health and diabetic outcomes. Additional research is desired to weigh the cost-benefit ratio of subsidized healthcare in order to help lower SES groups. Regardless, it is imperative HCPs are aware of the inherent risks of immigrant and minority patients with chronic disease, especially those diagnosed with T1DM.

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Table 1

Literature Review Findings

Authors	Location	Type of Article	Summary of Conclusions
Banin, et al., 2010	Italy	Observational study; 780 subjects	Mean age of immigrant children at onset was lower than native children with T1DM; poorer metabolic control than Western children
Berhan, et al., 2015	Sweden	Prospective chart review; 14,647 subjects	Low SES increases mortality in children with T1DM
deBeaufort, et al., 2007	International	Observational cross-sectional international study in 21 centers	Language difficulties associated with worse glycemic control
Fredheim, et al., 2014	Denmark, Iceland, Norway, & Sweden	Multinational register-based study; 12,000 subjects	Socialized medicine associated with narrower SES gap between native and immigrant populations
Frey, et al., 2007	United States	Convenience sample; accelerated longitudinal design; 71 subjects	Race is a better predictor than age, gender, or age for HbA1c
Galler, et al., 2012	Germany and Austria	Prospective nationwide German and Austrian diabetes survey (DPV); 683 subjects	Immigrant status is a risk factor for higher HbA1c and microalbuminuria
Gandhi, et al., 2016	United States	Literature review	~50% of Latino and Asian-American youth with T1DM have suboptimal glycemic control due to SES, literacy, English proficiency, family functioning, and nutrition influence

Authors	Location	Type of Article	Summary of Conclusions
Hassan & Heptulla, 2010	United States	Clinical trial; 200 subjects	Caregiver literacy affects HbA1c in children with T1DM
Kalyva, et al., 2016	Greece, Hungary, & Kuwait	Convenience sample questionnaire; 416 subjects	Culture affects perceived quality of life in children with T1DM
Lin, et al., 2013	United States	Chart review/interviews; 1012 subjects	Non-Hispanic white children with T1DM are more likely to use insulin pump therapy than ethnic minorities
Maahs et al., 2015	Austria, England, Germany, United States & Wales	Multinational registries/audits; ~50,000 subjects	Immigrants more likely to present in DKA than native children with T1DM
Marjerrison, et al., 2011	Canada	Telephone interviews and chart reviews; 183 subjects	Children with T1DM from food-insecure families had higher rates of hospitalization
Monaghan, et al., 2012	United States	Questionnaires; 95 subjects	Authoritative parenting is associated with stricter glycemic control in children with T1DM
Palau-Collazo et al., 2013	United States	Randomized control trial; 42 subjects	Spanish-speaking patients who attended Spanish-speaking clinic had significant HbA1c reductions
Phan, et al., 2014	United States	Retrospective longitudinal cohort study; 1,449 subjects	Frequent HCP visits lower HbA1c

Authors	Location	Type of Article	Summary of Conclusions
Povlsen, Karlberg, & Ringsberg, 2008	Denmark & Turkey	Case study; 11 subjects	Non-western immigrants have a considerable need for special support to help them learn to manage a chronic disease due to different culture and traditions
Povlsen, Olsen, & Ladelund, 2005	Denmark	Prospective chart study; 977 subjects	Ethnic minorities have higher HbA1c than native children with T1DM
Pulgarón et al., 2014	United States	Cross-sectional study; 70 subjects	Parental numeracy affects glycemic control in children with T1DM
Söderström, Samuelsson, & Åman, 2016	Sweden	Observational nationwide population-based cohort study; 2,627 subjects	Immigrants have worse glycemic control compared to native children with T1DM
Söderström, et al., 2014	Sweden	Prospective chart study; 2,627 subjects	Immigrants have higher HbA1c 3 years after diagnosis and lower SES than native children with T1DM
Vanelli et al., 2012	Italy	Prospective chart study with interviews; 35 subjects	Cultural, educational, and economic deficiencies cause immigrants to have poorer glycemic control than native children with T1DM