

Introduction and Background

Insulin is a synthetic medication that lowers blood sugar levels by allowing sugar (in the form of carbohydrates) to absorb into the muscles while promoting human development and metabolism. Companies manufacture insulin in two forms:

- Basal insulin- slowly metabolized over a period of twenty-four hours
- Bolus insulin- quickly metabolized in a period of four hours

Without insulin, a person will have adverse health effects that include a short life span and improper development. Many diabetics use synthetic insulin due to their resistance of naturally produced insulin or lack of production from the beta cells of the pancreas. Diabetics often overuse synthetic insulin causing:

- Hyperglycemia- elevated blood sugar levels for a long duration of time that causes renal failure, cardiovascular failure, brain damage, neuropathy, and death
- Hypoglycemia- low blood sugar levels that causes brain damage, nerve damage, loss of vision, and death

Today, millions of diabetics use synthetic insulin for the treatment and regulation of high blood sugar levels based on their caloric diet. The caloric diet is the most important management tool for diabetics along with doctor prescribed synthetic insulin. These tools are not a cure for diabetes and without proper continuing education diabetics cannot be expected to safely use insulin nor to monitor their blood sugar levels without healthcare assistance. This causes long-term health problems resulting in early death.

Background

Diabetics use insulin following a sliding scale which is a chart of the current blood sugar level, the anticipated carbohydrate intake, and the amount of synthetic insulin required to maintain proper blood sugar levels. Table one is an example of a sliding scale used by diabetics.

Table One. Diabetic sliding scale (<http://phimaimedicine.blogspot.com>)

Blood Sugar (mg/dl)	Low Dose Scale	Moderate Dose Scale	High Dose Scale
<70	Initiate Hypoglycemia Protocol	Initiate Hypoglycemia Protocol	Initiate Hypoglycemia Protocol
70-130	0 units	0 units	0 units
131-180	2 units	4 units	8 units
181-240	4 units	8 units	12 units
241-300	6 units	10 units	16 units
301-350	8 units	12 units	20 units
351-400	10 units	16 units	24 units
>400	12 units and call MD	20 units and call MD	28 units and call MD

Diabetes exists in three types. Each type requires a different treatment regimen and the proportion of incidence of each type varies (Figure One). Below contains the types of diabetes and the required treatment.

Type-one Diabetes

Type-one diabetes is known as juvenile diabetes because many type-one diabetics are diagnosed during their childhood. Type-one diabetes is the lack of production of insulin from the beta cells of the pancreas. In type-one diabetes, the pancreas can secrete small amounts of insulin, which may not be enough to sustain adequate blood sugar levels.

Type-two Diabetes

Type-two diabetes is known as late onset diabetes. This form of diabetes is diagnosed later in a patient's life and causes a resistance of insulin absorption. The pancreas secretes enough insulin; however, increased lipid cells or the reduction of absorption sites prevents the absorption of insulin.

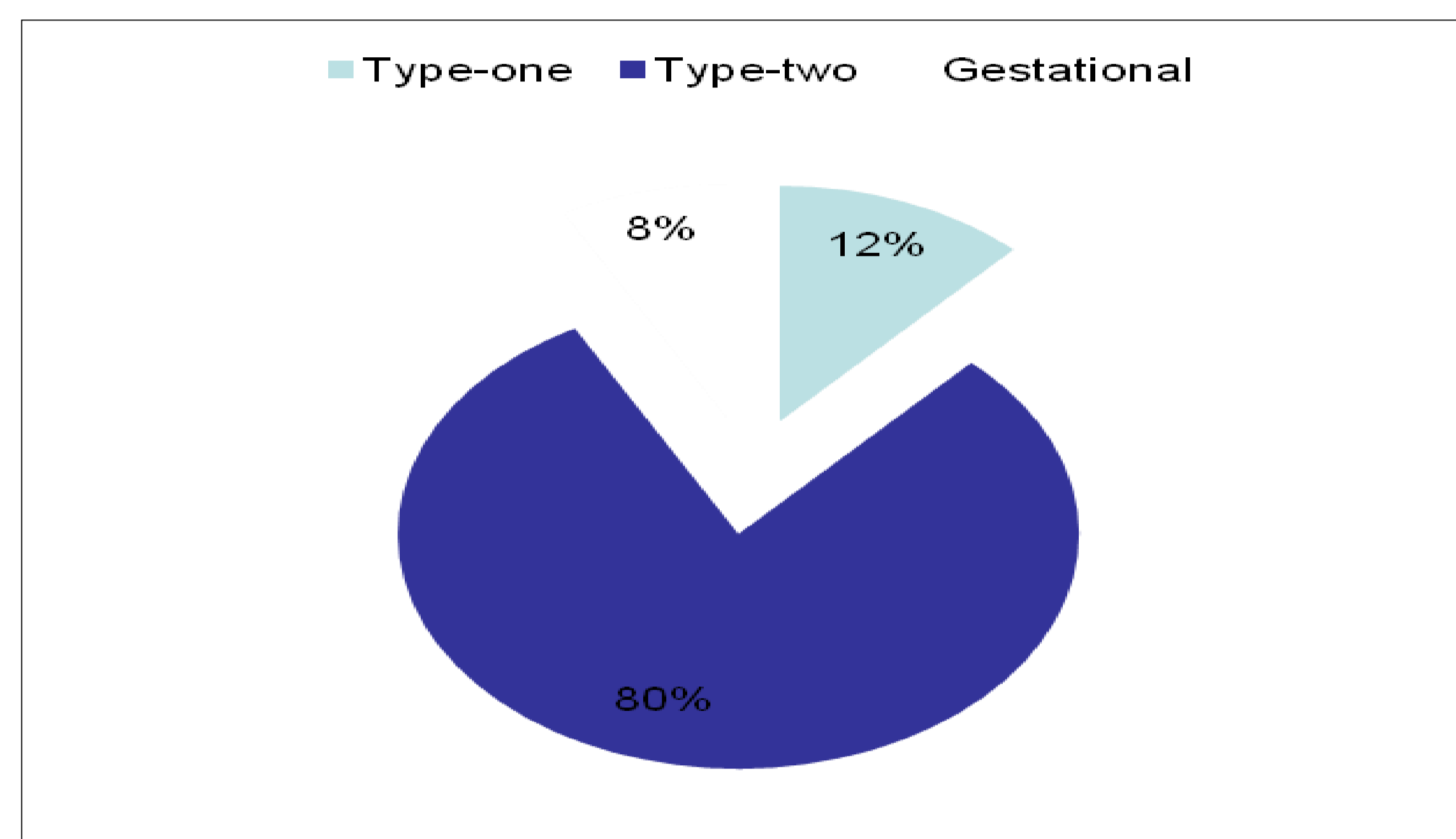


Figure 1. Percent of individuals with each type of diabetes

Gestational Diabetes

Gestational diabetes occurs during pregnancy. The mother's body requires more insulin due to fetal development. Gestational diabetes generally subsides after birth.

Diabetes Treatment

Below are the treatment regimens for each type of diabetes.

Synthetic Insulin

Insulin injections are available for type-one diabetics, gestational diabetics, and some type-two diabetics. Insulin allows glucose to transfer from the blood into the cells for energy. Diabetic patients on insulin require basal rate insulin to accommodate the homeostasis of the body. Patients administer basal insulin once daily to regulate blood sugar levels without the influence of caloric intake. Patients administer bolus insulin following a sliding scale depending on blood sugar levels and expected caloric intake.

Oral Medication

Oral medications are available for type-two diabetes or patients who have insulin resistance. Oral medications such as Avandia, Actos, and Januvia increase the absorption of insulin by using a catalyst to increase absorption into the muscles.

Caloric Intake

The caloric intake is the foundation of treating all types of diabetes. The amount of required bolus insulin depends on caloric intake. Caloric intake is managed through the American Diabetes Association's recommended diet. This recommended diet minimizes the amount of bolus insulin and allows basal insulin to maintain homeostasis. If diabetics do not regulate their caloric intake, they have large swings in blood sugar levels that require high amounts of synthetic insulin.

Materials and Methods

Our literature review focuses on diabetes and synthetic insulin's long-term health effects. Our team researched published peer-reviewed articles using The University of North Texas library's *Academic Search Complete* search engine and educational textbooks. We interviewed doctors and diabetic educators, in the Dallas area, for information about diabetes and synthetic insulin usage.

Results

The literature review indicated that insulin is a requirement for human development and is the best management tool for maintaining blood sugar levels. Elevated blood sugar levels cause brain damage, renal failure, neuropathy, cardiovascular disease, blindness, and death. The literature review revealed the following:

- Diabetics quality of life is effected by erratic blood sugars levels that cause polyuria, polydipisa, headache, loss of weight and strength, and extreme hunger
- Health care systems do not meet the education requirements for diabetics to treat their diabetes. This lack of diabetic education results in the death of thousands of diabetics a year
- Scientists have not found a cure for diabetes; however, researchers found links of pre-depositions of diabetes on chromosomes six and eleven
- Synthetic insulin overuse creates a resistance to insulin. This acquired resistance creates the need for increasing amounts of synthetic insulin to manage blood sugar levels

Future Research

Future research needs to concentrate on the following areas of opportunity:

- Alternative treatments- researching and developing alternatives to synthetic insulin and oral medication
- Early detection- researching early detection methods for diabetes
- Education- researching effective methods for educating diabetics on proper diabetes management
- Gene therapy- curing diabetes through the manipulation of chromosomes six, eleven, and correcting beta cell insulin production
- Insulin pump therapy- creating, testing, and manufacturing of an internal, self regulating insulin pump
- Synthetic insulin- conducting detailed studies that examine the health effects of overuse of synthetic insulin

References

- American Diabetic Association. (2011). "What Can I Eat." <http://www.diabetes.org>.
- K.-U. Lee, et al. "Progression to insulin deficiency in Korean patients with Type 2 diabetes mellitus positive for anti-GAD antibody." *Diabetic Medicine* 28.3 (2011): 319-324. *Academic Search Complete*. EBSCO. Web. 2 Mar. 2011.
- T. Cheetham, et al. "Increased maternal Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) associated with older age at diagnosis of Type 1 diabetes in offspring N. J. Leech et al. Phenotype and diagnosis of Type 1 diabetes." *Diabetic Medicine* 27.12 (2010): 1450-1453. *Academic Search Complete*. EBSCO. Web. 2 Mar. 2011.
- T. Laursen, et al. "Pharmacokinetics and pharmacodynamics of different modes of insulin pump delivery. A randomized, controlled study comparing subcutaneous and intravenous administration of insulin aspart." *Diabetic Medicine* 28.2 (2011): 230-236. *Academic Search Complete*. EBSCO. Web. 2 Mar. 2011.
- U. A. Müller, et al. "Prevalence of injection-meal interval usage and its association with variables of metabolic control in patients with Type 1 and Type 2 diabetes." *Diabetic Medicine* 28.2 (2011): 223-226. *Academic Search Complete*. EBSCO. Web. 2 Mar. 2011.
- Young, Jason R., and Carrie McAdam-Marx. "Treatment of Type 1 and Type 2 Diabetes Mellitus with Insulin Detemir, a Long-Acting Insulin Analog." *Clinical Medicine Insights: Endocrinology & Diabetes* (2010): 65-80. *Academic Search Complete*. EBSCO. Web. 2 Mar. 2011.