

Type I Diabetes and Exercise

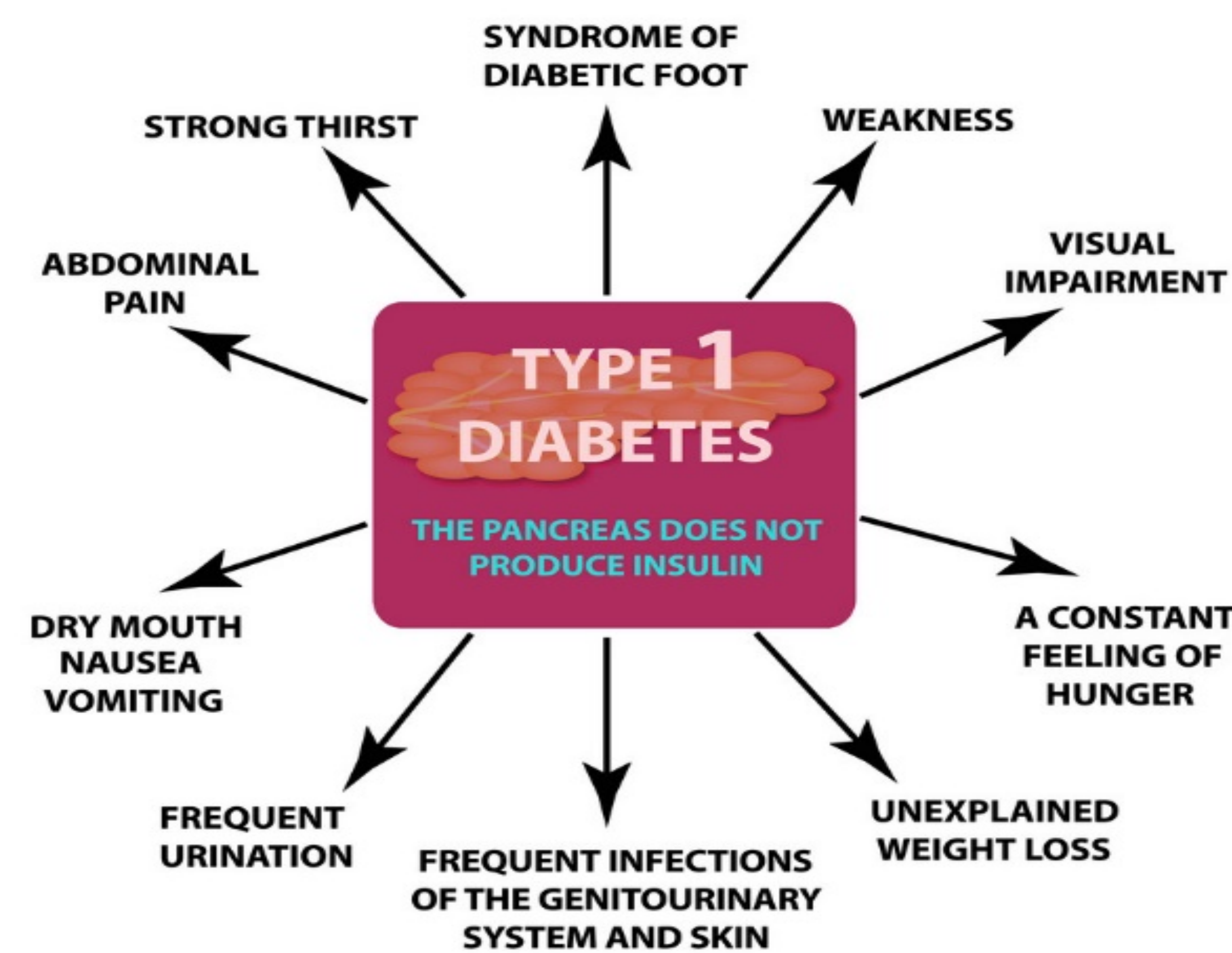
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Introduction

Type 1 diabetes is generally associated with autoimmune breakdown of the pancreatic beta cells which produce insulin. This insulin deficiency causes glucose to be insufficiently converted and absorbed, resulting in higher blood glucose levels (Thrower & Bingley, 2014). Fasting blood glucose levels above 126 mg/dL. This disease can occur in any population, although it is very prevalent in adolescents and pubescent children, especially males (Atkinson, Eisenbarth, & Michels, 2014). Type 1 diabetes rates increase by approximately 2-3% each year, with about every 23 out of 10,000 people in the United States being diagnosed. Type 1 Diabetes may be caused by a number of factors, including genetic disposition, diet, Vitamin D exposure, environment (DiMeglio, Evans-Molina, & Oram, 2018). In fact, individuals born in the spring are more at risk for developing Type 1 diabetes than those who are not (DiMeglio et al., 2018). Northern European countries such as Finland or Sardinia have even higher incidences, coming in at 40-60 cases per every 100,000 people (Atkinson et al., 2014). The most common pharmacological solution is exogenous insulin replacement (Atkinson et al., 2014). Testing for type 1 diabetes can be diagnosed using fasting or random blood glucose tests via blood draw (Atkinson et al., 2014).

SYMPTOMS OF TYPE 1 DIABETES



<https://www.vectorstock.com/royalty-free-vector/symptoms-type-1-diabetes-infographics-vector-20422204>

Exercise Testing

Persons diagnosed with Type 1 diabetes only wanting to engage in light exercise activity may not need exercise testing performed if they are low to no risk for cardiovascular disease (Pescatello, 2014). However, cardiovascular disease risk should be assessed annually. For those wanting to perform moderate to vigorous intensity exercise who are older than 15 years old must have exercises testing performed while connected to an ECG and have a medical professional present (Pescatello, 2014).

Exercise Prescription

Table 1.

Exercise Prescription for Type I Diabetes (Jacobs, 2018).

Component	Type	Frequency	Intensity	Volume
Aerobic exercise training	Large muscle groups and rhythmical movements (ex. Walking, jogging, biking, swimming, stair stepping)	3-7 days per week (2 days between training days)	Moderate (40%-60% VO ₂ or heart rate reserve) to vigorous (60%-90% VO ₂ or heart rate reserve)	10 minutes (per session); goal is 150 (per week)
Resistance training	All types of exercises qualify; an emphasis on larger muscle groups is ideal	2-3 non consecutive days per week	At least 8-10 exercises; 1-3 sets; 6-15 RM loads	20-30 min (depending on number of exercises and sets)
Flexibility training	Static and dynamic stretching; yoga	2-3 days per week	To the point of tightness; repeat 2-4 times	Hold a static stretch for 10-30 sec; repeat a dynamic stretch for 10-30 sec
Balance training	Single-leg stands; tai chi; yoga	2-3 days per week	Light to moderate	Any duration

Despite benefits, exercise can cause hypoglycemia during or after exercise, or during sleep after exercise (nocturnal hypoglycemia). Along with that, some studies only support moderate-intensity exercise benefiting blood glucose levels, rather than high-intensity interval training. Research primarily supports aerobic exercise being beneficial to those with type 1 diabetes, but resistance training may reduce chance of exercise-induced hypoglycemia.

After consistent training, the following adaptations may be present:

- Reduced HbA1c levels
- Improved body composition
- Reduced high blood pressure
- Decreased elevated blood lipid levels
- Decreased mortality rate

Conclusion

Type I diabetes is characterized by an insulin deficiency that results in irregular blood glucose levels. This condition is diagnosed when one's fasting glucose is greater than 126 mg/dL. Most individuals diagnosed with type I diabetes use insulin injections or an insulin pump to manage their blood glucose. Exercise is also an intervention used to treat type I diabetics by decreasing HbA1c levels, which is obtained through consistent aerobic training. Along with that, resistance training can be used to decrease blood glucose levels almost immediately. Blood glucose levels should be checked prior to and throughout the duration of exercise, and additional carbohydrates should be on hand in case of a drastic decrease in blood glucose. Exercise induced hypoglycemia is common in physically active type I diabetics, but it is controllable in order to reach the ultimate goal of blood glucose management.

Special Considerations

Individuals with this pathology are unique while exercising because it can be difficult to manage the timing of regular insulin administration with pre-exercise food, such as carbohydrates, and the time, type, duration, and intensity of the exercise being performed. Exercise induced hypoglycemia is very common and should be anticipated. The following recommendations can reduce the likelihood of dangerously reduced blood glucose:

- Increase time between pre-exercise insulin administration and beginning of exercise
- Reduce the amount of pre-exercise insulin
- Increase the amount of carbohydrate consumed before exercising
- Lowering the amount of post exercise insulin

Blood glucose levels should be checked not only before exercise, but throughout the duration of the session. Carbohydrates consumption and insulin injections should be adjusted as necessary.

References

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