

Diabetes Facts And Figures

Diabetes mellitus is a chronic disease, characterized by high blood glucose levels

- The human body uses glucose as its main source of energy and metabolizes this from foods containing carbohydrates
- Glucose is transported in the blood and called **glycemia**
- The glucose must transfer from the blood into the body cells to allow the body to function
- This process of energy conversion within the cells is called **glucose metabolism**

Insulin

- **Insulin** is a hormone produced in the pancreas
- Insulin is responsible for opening the glucose channels that allow the glucose to transfer from the blood to the cells where glucose metabolism takes place
- In diabetes, the pancreas either cannot produce insulin, or the insulin that is produced cannot work properly
- Without insulin performing its role, the glucose channels remain closed, causing glucose to build up in the blood, which then leads to high blood glucose levels - **hyperglycemia**
- High glucose levels cause significant health problems linked to diabetes

Diabetes complications

- Blindness
- Kidney failure
- Neuropathic complications
- Coronary heart disease
- Hypertension
- Cardiac abnormalities
- Stroke
- Peripheral vascular disease

Diabetes facts

- 90% of people with type 2 diabetes are overweight or obese¹
- Diabetes patients are 2-3 times more likely to have cardiovascular disease²
- 80% of all diabetes sufferers die of cardiovascular disease¹
- 20.8 million people or 7% of the US population have diabetes³
- Total direct/indirect costs- \$132 billion⁴

Diabetes treatment

- Goal: maintain the blood glucose levels as close to non-diabetic range as possible
- Measurement – **Hemoglobin A1c (HbA1c)**
 - 3.5-5.5% = non-diabetic
 - 4-6% = acceptable in diabetes
 - >7% = poor control of blood sugar
- Treatment also includes lifestyle management
 - Continuous monitoring of diet
 - Regular exercise regime
- Nearly 50% of diabetes patients are also being treated for hypertension⁵

Disease Progression



For both type 1 and type 2 diabetes, the aim of any diabetes treatment program is to maintain the blood sugar level as close to normal range as possible and reduce cardiac risk.

Types of diabetes

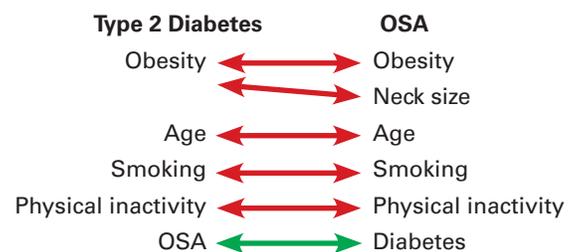
Type 1 diabetes

- The pancreas cannot produce insulin because the insulin-producing cells have been destroyed by the body's own immune system
- Least common form of diabetes – affecting 5-10% of all diabetes patients
- Type 1 diabetes cannot be prevented or cured

Type 2 diabetes

- This is a lifestyle disease where poor nutritional behavior leads to elevated blood glucose levels
- Continuously high glycemia increases the insulin demand from the insulin-producing β -cells in the pancreas
- The pancreas is able to produce insulin but when the β -cells become overloaded, the insulin production reduces to a point where it is insufficient to meet the body's requirements
- This leads to a low sensitivity within the body to insulin
- Type 2 diabetes sufferers are "**insulin resistant**"
- Type 2 diabetes is often associated with high cholesterol, high blood pressure and obesity
- Type 2 diabetes is the most common form of diabetes, affecting 85-90% of all diabetes patients
- Type 2 diabetes is preventable but not curable

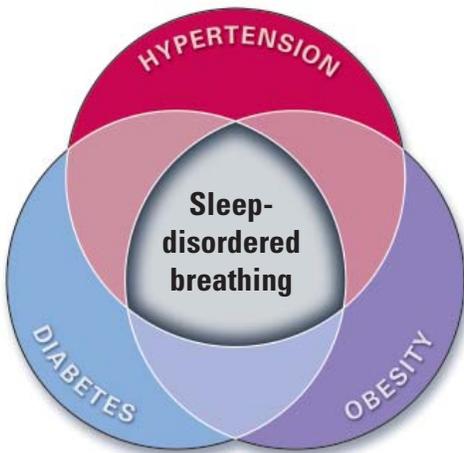
Diabetes & OSA Risk Factors



1. WHO 2005 2. Diabetes Australia 2004 3. CDC NHIS Report 2005
4. ADA 2002 5. Fuller et al

The link between sleep-disordered breathing (SDB) and diabetes

Sleep-disordered breathing (SDB), of which obstructive sleep apnea (OSA) is the most common form, is a significant problem that affects many serious chronic conditions. 35% of patients with high blood pressure suffer from sleep apnea while 77% of the morbidly obese suffer.^{6,7} Recent research demonstrates the likelihood of a relationship between type 2 diabetes and sleep apnea, in particular obstructive sleep apnea (OSA).⁸ New evidence also shows that 50% of patients with type 2 diabetes suffer from sleep apnea.⁹



Physiological link between sleep apnea, insulin resistance and diabetes

Research indicates that sleep apnea is independently associated with insulin resistance. However, it is not clear what mechanisms of action are responsible.

Researchers are evaluating:

- Increased sympathetic nervous activity resulting from repeated apneas may cause the release of glucose from the muscles into the bloodstream to instigate an arousal, and result in residual circulating glycemia
- Elevated levels of the hormone cortisol, which is released under conditions of stress in the body, can contribute to increased energy production and sympathetic nervous activity, leading to excessive blood sugar levels and reduced insulin sensitivity
- Accumulation of sleep debt due to sleep fragmentation
- Recurrent intermittent hypoxia leads to the impairment in glucose homeostasis (lack of maintenance of the blood glucose equilibrium), leading to insulin resistance

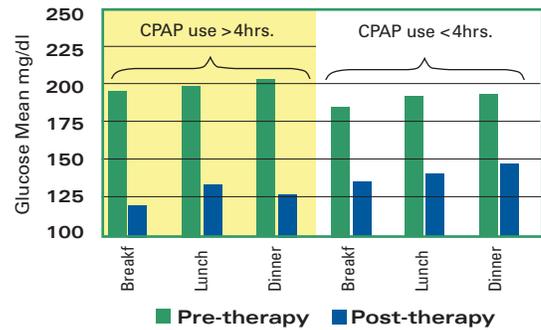
Effects of CPAP therapy on diabetes

Within 48 hours, significant improvements have been demonstrated in insulin sensitivity using CPAP therapy¹⁰

– Controlling insulin sensitivity and therefore blood glucose is the key goal for diabetes patients

After-meal blood glucose levels can be reduced with compliant CPAP therapy¹¹

– Suggests that sustained CPAP use may be an important therapy for diabetes patients with sleep apnea



Treatment of sleep apnea with CPAP therapy has been associated with a fall in mean systemic blood pressure of 10 mmHg¹²

– Controlling high blood pressure and the associated cardiac complications are priorities for diabetes patients and educators

Suggested patient screening for diabetes centers

Currently, very few diabetes education centers include sleep apnea screening in the regular assessment (including diet and exercise) of diabetes patients. After educating diabetes centers on the relationship between sleep apnea and diabetes, discuss the 3-step screening process outlined below.

- 1 → Assess**
 Ask patients 3 simple questions:
Do you snore?
Do you wake up tired after a full night of sleep?
Do you have high blood pressure?
≥1 positive screen
- 2 → Screen**
 Use the validated Berlin Questionnaire (provided by ResMed)
≥2 high risk categories
- 3 → Refer**
 To a sleep clinic directly or their physician for a referral to a sleep clinic

6. Sjoström et al 7. O'Keefe et al 8. IDF 2008 9. Einhorn et al
10. Harsch et al 11. Babu et al 12. Becker et al