Online Quiz

Ten Questions about Diabetes Mellitus

This quiz is related to the Research in Translation article in the December issue of *PLoS Medicine* (DOI: 10.1371/journal.pmed.0010058).

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Question 1. In the year 2000, roughly how many adults (20 years of age and older) worldwide had diabetes mellitus?

- ○ 50 million
- ○ 170 million
- ○ 500 million

Question 2. What is the approximate annual direct cost of intensive insulin treatment?

- ○ About $3,500 per patient
- ○ About $7,000 per patient
- ○ About $10,000 per patient

Question 3. What is the approximate cost of islet cell transplantation?

- ○ $50,000 per patient, per transplant
- ○ $150,000 per patient, per transplant
- ○ $250,000 per patient, per transplant

Question 4. After 20 years of type 1 diabetes, what is the estimated cumulative risk of albuminuria?

- ○ Around 5%
- ○ Around 16%
- ○ Around 30%
- ○ Around 50%

Question 5. Which of the following interventions for reducing the risk of progression of early diabetic nephropathy is best supported by evidence?

- ○ Tight blood pressure control
- ○ Protein restriction
- ○ Lipid lowering

Question 6. Which of the following best reflects the association between blood glucose level and mortality in people with type 2 diabetes?

- ○ There is a positive, although weak, association between increased glucose and increased mortality
- ○ There is a positive, and very strong, association between increased glucose and increased mortality
- ○ There is no association between glucose level and mortality

Question 7. For people with healed diabetic foot ulcers, what is the 5-year cumulative rate of ulcer recurrence?

- ○ 15%
- ○ 30%
- ○ 45%
- ○ 66%

Question 8. Which of the following interventions for preventing foot complications in people with diabetes is best supported by evidence?

- ○ Therapeutic footwear for preventing ulcer recurrence
- ○ Screening and referral to foot care clinics to prevent major amputations in those at high risk
- ○ Education programs for preventing ulcer recurrence, serious foot lesions, and major amputations

Question 9. What proportion of patients with type 1 diabetes have thyroid peroxidase autoantibodies?

- ○ About one in five
- ○ About one in ten
- ○ About one in 100

Question 10. Which of the following best reflects the evidence from randomized controlled trials on the optimum HbA1C for people with diabetes?

- ○ These trials found that development or progression of complications increases progressively as HbA1c increases above the nondiabetic range, and that there is a glycemic threshold above which there is a risk of complications
- ○ These trials found that development or progression of complications increases progressively as HbA1c increases above the nondiabetic range, but there is no lower glycemic threshold for the risk of complications

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Answer 1. 170 million

Wild and colleagues estimated that the number of cases of diabetes worldwide in the year 2000 among adults 20 years of age and older was about 171 million [1]. Data on the prevalence of diabetes according to age and sex from a limited number of countries were extrapolated to all 191 World Health Organization member states and applied to United Nations' population estimates for the year 2000 and the year 2030. The authors estimated that there will be 366 million people with diabetes in the year 2030.

References

1. Wild S, Roglic G, Green A, Sicree R, King H (2004) Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care 27: 1047–1053.

Answer 2. About $3,500 per patient

In one study performed in Israel, the approximate annual direct cost of intensive insulin treatment was around $3,300 per patient, which is about three times more than that of standard insulin treatment [1]. However, when other factors such as the reduction in complications are taken into account, such treatment appears to be cost-effective [2,3].

References

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2. Herman WH, Eastman RC (1998) The effects of treatment on the direct costs of diabetes. Diabetes Care 21: C19–C24.
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Answer 3. $150,000 per patient, per transplant

In the United States, islet cell transplantation costs approximately $150,000 per patient, per transplant [1].

References

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Answer 4. Around 30%

One study showed that the cumulative risk of proteinuria is similar in type 2 and type 1 diabetes—27% and 28%, respectively, after 20 years of diabetes [1]. Another showed that around 30% of patients with type 1 diabetes had developed sustained microalbuminuria within 20 years [2].

References

1. Hasslacher C, Ritz E, Wahl P, Michael C (1989) Similar risks of nephropathy in patients with type I or type II diabetes mellitus. Nephrol Dial Transplant 4: 859–863.
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Answer 5. Tight blood pressure control

Although there have been no systematic reviews that prove the benefit of any of these three interventions [1], there is, nevertheless, evidence to support a correlation between tight blood pressure control and a decreased rate of nephropathy progression [2,3,4,5]. Importantly, the United Kingdom Prospective Diabetes Study Group found that the control of blood pressure was a far more important intervention to prevent mortality than blood glucose control [5].

References

1. Shlipak M (2004) Diabetic nephropathy. Clin Evid 2004. In press.
2. Andersen S, Brochner-Mortensen J, Parving HH (2003) Kidney function during and after withdrawal of long-term irbesartan treatment in patients with type 2 diabetes and microalbuminuria. Diabetes Care 26: 3296–3302.
3. Gaede P, Vedel P, Parving HH, Pedersen O (1999) Intensified multifactorial intervention in patients with type 2 diabetes mellitus and microalbuminuria: The Steno type 2 randomised study. Lancet 353: 617–622.
4. Hovind P, Tarnow L, Parving HH (2004) Remission and regression of diabetic nephropathy. Curr Hypertens Rep 6: 377–382.
5. UK Prospective Diabetes Study Group (1998) Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes. BMJ 317: 703-713.

Answer 6. There is a positive, although weak, association between increased glucose and increased mortality

A systematic review of 27 studies examining the relationship between blood glucose level and mortality in type 2 diabetes found a positive but weak association between high glucose and increased mortality [1].

References

1. Groeneveld Y, Petri H, Hermans J, Springer MP (1999) Relationship between blood glucose level and mortality in type 2 diabetes mellitus: A systematic review. Diabet Med 16: 2–13.

Answer 7. 66%

Although the incidence of new ulcers is relatively low—around 2% per year [1,2]—the risk of recurrence for people with healed diabetic foot ulcers is very high: the 5-year cumulative rate of ulcer recurrence is 66%, and the rate of amputation is 12% [3].

References

1. Muller IS, de Grauw WJ, van Gerwen WH, Bartelink ML, van Den Hoogen HJ, et al. (2002) Foot ulceration and lower limb amputation in type 2 diabetic patients in Dutch primary health care. Diabetes Care 25: 570–574.
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3. Apelqvist J, Larsson J, Agardh CD (1993) Long-term prognosis for diabetic patients with foot ulcers. J Intern Med 233: 485–491.

Answer 8. Screening and referral to foot care clinics to prevent major amputations in those at high risk

One randomized, controlled trial, involving 2002 patients attending a general diabetes clinic, found that a diabetes screening program (involving referral to a foot clinic if high-risk features were present) reduced the risk of major amputation compared with usual care after two years [1].

One randomized, controlled trial involving 400 people with diabetes and previous foot ulcer but without severe deformity (mean age 62 years), found no significant difference in rates of foot ulceration between patients using therapeutic footwear and those using usual footwear [2].

One systematic review identified three randomized, controlled trials and one quasi-randomized trial evaluating the effects of education programs on the prevention of diabetic foot ulcers [3]. The trials were of poor methodological quality and had conflicting results.

References

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3. Valk GD, Kriegsman DMW, Assendelft WJJ (2002) Patient education for preventing diabetic foot ulceration. A systematic review. Endocrinol Metab Clin North Am 31: 633–658.

Answer 9. About one in five

The Belgian Diabetes Registry indicated that the prevalence of thyroid peroxidase autoantibodies is 22% in patients with type 1 diabetes [1].

References
1. Devendra D, Liu E, Eisenbarth GS (2004) Type 1 diabetes: Recent developments. BMJ 328: 750–754.

Answer 10. These trials found that development or progression of complications increases progressively as HbA1c increases above the nondiabetic range, but there is no lower glycemic threshold for the risk of complications

Two large randomized, controlled trials in people with type 1 and type 2 diabetes found that development or progression of complications increases progressively as HbA1c increases above the nondiabetic range [1,2]. The data suggested that that there is no lower glycemic threshold for the risk of complications—the better the glycemic control, the lower the risk of complications.

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2. UK Prospective Diabetes Study Group (1998) Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes. Lancet 352: 837–853.

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