Viruses and diabetes

Rowan Hillson

Five hundred million rhinoviruses (a common cold virus) could fit on the head of a pin.1 ‘If they’re floating around in the air or sitting on a doorknob, they’re inert… But if they come into contact with a suitable plant, animal or bacterial cell, they… take over the cell like pirates hijacking a ship.’2 In someone with diabetes any viral infection may cause hyperglycaemia, superimposed bacterial infection, and diabetic ketoacidosis, especially if the viral infection causes vomiting, e.g. norovirus. People with diabetes can die from the consequences of viral infection.

Influenza

‘So this week has been the worst so far in my 11 months of being a T1. I’ve had flu since last week and sugars kept creeping up even when i didn’t eat for fear of throwing up. I tried my best to keep hydrated but today in work i almost passed out. My sugars were at 22 and ketones 1.4. Went to hospital and spent most of the day there. I was put on a drip after bloods and an urine samples taken. Sugars were down to 14 and ketones 0.4 when discharged. Spoke to my dsn which helped a lot. Flu and my immune system have a lot to answer for’ [sic].3

Complications of influenza in diabetes

These include bacterial respiratory infection, e.g. exacerbation of chronic obstructive airways disease or pneumonia, otitis media, myocarditis and encephalitis. Influenza can prove fatal, especially in elderly patients with comorbidities.

In Canada, having diabetes increased the risk of hospital admission with H1N1 influenza A (prevalence ratio 1.50, 1.29–1.72).4 During an influenza A epidemic, among people with type 2 diabetes, ‘vaccination was associated with 56% reduction in any complication (95% CI 36–70%), 54% reduction in hospitalizations (26–71%), and 58% reduction in deaths (13–80%).’5

Among people with diabetes in Spain, aged ≥65 years, influenza vaccination reduced mortality during influenza periods by 33% (4–53%). ‘One death was prevented for every 435 annual vaccinations.’6 In Taiwan, elderly people with diabetes who had been vaccinated had fewer complications of influenza, were 3.10 times (95% CI 2.04–4.71) more likely to have intensive care unit admission than unvaccinated. They were also less likely to die – HR 3.13 vs 0.88 (0.81–0.96), and were less likely to require intensive care (0.58 vs 2.05 per 100 person-years; HR 0.30 [0.19–0.47]) than the unvaccinated.6

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Viral hepatitis and diabetes

Hepatitis C virus

A meta-analysis found that people with type 2 diabetes have a greater risk of hepatitis C (HCV) than those without diabetes (OR 3.50, 2.54–4.82).8

Immunisations for people with diabetes (unless there are contraindications)

- All routine childhood immunisation
- All usual travel immunisation
- All usual work-related immunisation
- Influenza – annual
- Pneumococcal vaccine – once
- Anti-tetanus if self-blood glucose monitoring
- Hepatitis B – if chronic renal disease; consider in others

Warn patients that vaccination may temporarily upset their glucose control so they should monitor glucose levels afterwards

Reduce cross infection

- Never share finger-prick devices between patients
- If possible, do not share blood glucose meters between patients
- If shared, clean the meter after every use according to manufacturers’ instructions
- Never share insulin pens and/or cartridges between patients

Hepatitis B virus

Hepatitis B (HBV) is more common among people with diabetes than those without. Among adults with diabetes but without other HBV risk behaviours aged 23–59 years the risk of HBV was OR 2.1 (1.6–2.8); aged ≥60 years 1.5 (0.9–2.5) compared with non-diabetic controls.12

Staff doing finger-prick blood glucose tests (assisted monitoring of blood glucose – AMBG) can transmit HBV. Among residents tested during four HBV outbreaks in American ‘assisted living facilities’ 11.8% had acute HBV infection and 3.2% chronic HBV infection. ‘The acute HBV infection attack rate among residents receiving AMBG was 67%… compared to just 2.4%… for those not receiving AMBG (RR 27.7, 10.3–74.4).’ Common infection control breaches included use of reusable finger stick devices, which are intended for personal use, on multiple persons; use of BG meters for more than one person

Box 1. Immunisations for people with diabetes

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Box 2. The US Centers for Disease Control and Prevention advice on infection prevention during glucose testing and insulin administration14

Patients with HCV infection have a greater frequency of insulin resistance (IR) and of diabetes than uninfected people (OR 1.41, 1.17–1.7).9,10 ‘Infection with HCV should be regarded as a systemic disease associated with IR and type 2 diabetes. Curing HCV results in a reduced incidence of type 2 diabetes, and an improvement of type 2 diabetes-related clinical outcomes is possible in diabetic chronic HCV patients who obtain sustained virological response.’11

It is unclear whether both conditions are the result of an underlying susceptibility or whether one influences the development of the other. Some HCV treatments are diabetogenic, but this does not explain most cases.

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without cleaning and disinfection between each use; and comingling of contaminated and clean equipment and supplies.  

The US Centers for Disease Control and Prevention (CDC) provide advice on infection prevention during glucose testing and insulin administration. (Box 2.) They also advise hepatitis B immunisation for all unvaccinated adults with diabetes aged 19–59 years, and those >59 years at clinicians’ discretion.

In the UK, hepatitis B immunisation is advised for patients with chronic kidney disease but not generally for those with diabetes. Should UK guidance be reconsidered?

**Preventing insect-borne viral infections**

People with diabetes should have all relevant immunisations and take the same precautions as everyone visiting countries where insects carry infections. (Box 1.)

Does being sugary attract biting insects? Maybe, but clear evidence is needed. A Ghanaian study found that malaria is more common in people with type 2 diabetes than in those without. Insect bites may become bacterially infected in someone with diabetes.

*Anopheles* mosquitos carrying malaria parasites are most active in the evening. *Aedes* mosquitos that carry dengue fever, chikungunya, yellow fever or zika viruses are active at any time of day. Mosquito bites can transmit West Nile virus or Rift Valley fever. All these viral infections are difficult to treat and may cause severe illness or even death.

During a dengue epidemic in Singapore, adults with diabetes were more likely to develop dengue haemorrhagic fever than those without diabetes.

People with diabetes travelling to the many countries where insect-borne infections occur should wear long-sleeved shirts and trousers and use insect repellent. Like everyone else, they should have relevant immunisations, take malaria prophylaxis if indicated, and protect themselves from biting insects, especially those that carry disease.

**Can viral infection cause type 1 diabetes?**

Viral infection may trigger some cases of type 1 diabetes. There is much animal work and much more to learn in this area.

A meta-analysis of reports where enterovirus RNA or viral protein were measured found a significant association between enterovirus infection and type 1 diabetes-related autoimmunity (OR 3.7, 2.1–6.8) and clinical type 1 diabetes. A systematic review, *Sci Rep* 2013;3:2981. doi:10.1038/srep02981 [accessed 12 April].


**Summary**

Viral infection may be one cause of type 1 diabetes. Viral infections may be dangerous for people with diabetes – not just from problems with eating, insulin management, and hyperglycaemia. Diabetic ketoacidosis may ensue. There is an increased risk of complications from influenza, with associated increased risk of hospital admission, and intensive care admission. Influenza immunisation reduces the risk of admission and of death.

HBV and HCV are more common among people with diabetes than in those without. HCV increases insulin resistance and diabetes risk.

Staff in hospitals, residential care facilities or home visiting who do finger-prick blood glucose tests must observe scrupulous hygiene to prevent cross-infection and transmission of HBV.

People with diabetes can enjoy wonderful holidays. Like everyone else, they should have relevant immunisations, take malaria prophylaxis if indicated, and protect themselves from biting insects, especially those that carry disease.

**Dr Rowan Hillson, MBE, National Clinical Director for Diabetes, England 2008–2013**

**References**

2. www.microbeworld.org/types-of-microbes/viruses [accessed 12 April].
14. www.cdc.gov/mmwr/preview/mmwrhtml/mm6050a4.htm [accessed 12 April].
15. www.cdc.gov/mmwr/preview/mmwrhtml/mm6050a4.htm [accessed 12 April].