

T2DM – Initial screening for complications

National Type 2 Diabetes study day, 24th April 2024

Dr Sejal Patel, General Paediatrician with diabetes interest

Paediatric diabetes clinical lead, Wexham Park Hospital

Dr Princy Paul, Paediatric Diabetes Consultant, Alderhey Children's Hospital

Paediatric diabetes clinical lead, Cheshire and Merseyside

Content

- Why screen early?
- Case studies
- How and when to screen

How are we doing currently?

National Paediatric Diabetes Audit (NPDA) Report on Care and Outcomes 2022/23

- Published in April 2024

- 36.0% of those with Type 2 diabetes aged 12 and above received all six 'key' health checks



- 33.0% in 2021/22.

- 63.4% of those with Type 1 diabetes aged 12 and above

The top part of the image shows the cover of the NPDA report. It has a blue header with the text 'NPDA National Paediatric Diabetes Audit' and 'RCPCHAudits'. Below this, the title 'National Paediatric Diabetes Audit (NPDA) Report on Care and Outcomes 2022/23' is written in white. Below the cover are two children's drawings. Each drawing shows a boy in a green football kit and a girl in a blue swimming cap. The text in the drawings reads: 'I Can Still do What I want Diabetes doesn't stop me'. At the bottom of the image are the logos for HQIP (Healthcare Quality Improvement Partnership) and RCPCH (Royal College of Paediatrics and Child Health).

What percentage of CYP with diabetes were at risk of macrovascular and microvascular complications 2022/23?

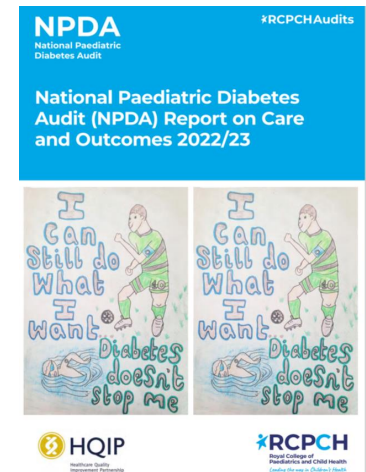
TYPE 2 DIABETES

46.5% (all ages) had a diastolic or systolic blood pressure in the hypertensive range

29.6% (all ages) had a total blood cholesterol of 5mmol/l or higher

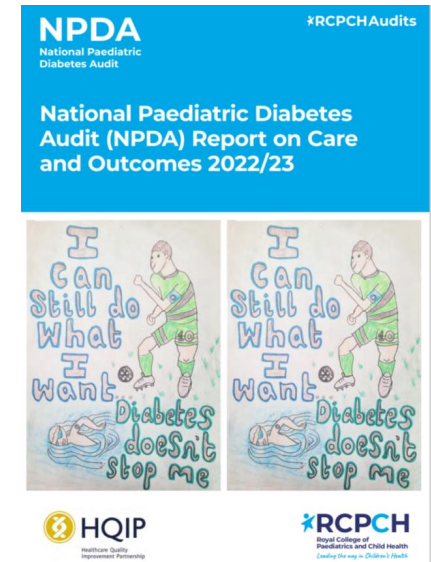
6.3% (aged 12 and above) had an abnormal retinopathy screen

21.4% (all ages) had micro- or macroalbuminuria



What percentage of CYP with diabetes were at risk of macrovascular and microvascular complications?

TYPE 1 DIABETES	TYPE 2 DIABETES
29.6% (all ages) had a diastolic or systolic blood pressure in the hypertensive range	46.5% (all ages) had a diastolic or systolic blood pressure in the hypertensive range
19.6% (all ages) had a total blood cholesterol of 5mmol/l or higher	29.6% (all ages) had a total blood cholesterol of 5mmol/l or higher
10.9% (aged 12 and above) had an abnormal retinopathy screen	6.3% (aged 12 and above) had an abnormal retinopathy screen
10.4% (all ages) had micro- or macroalbuminuria	21.4% (all ages) had micro- or macroalbuminuria



Why screen at diagnosis?

Long-Term Complications in Youth-Onset Type 2 Diabetes

Author: TODAY Study Group

[*Author Info & Affiliations](#)

Published July 28, 2021

N Engl J Med 2021;385:416-426

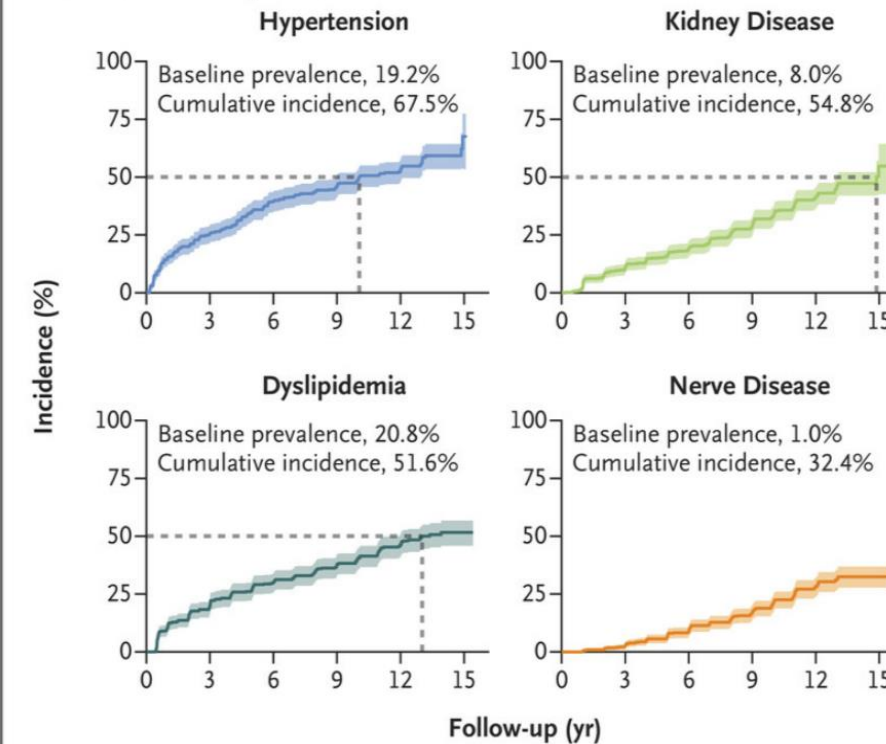
DOI: 10.1056/NEJMoa2100165

[VOL. 385 NO. 5](#)

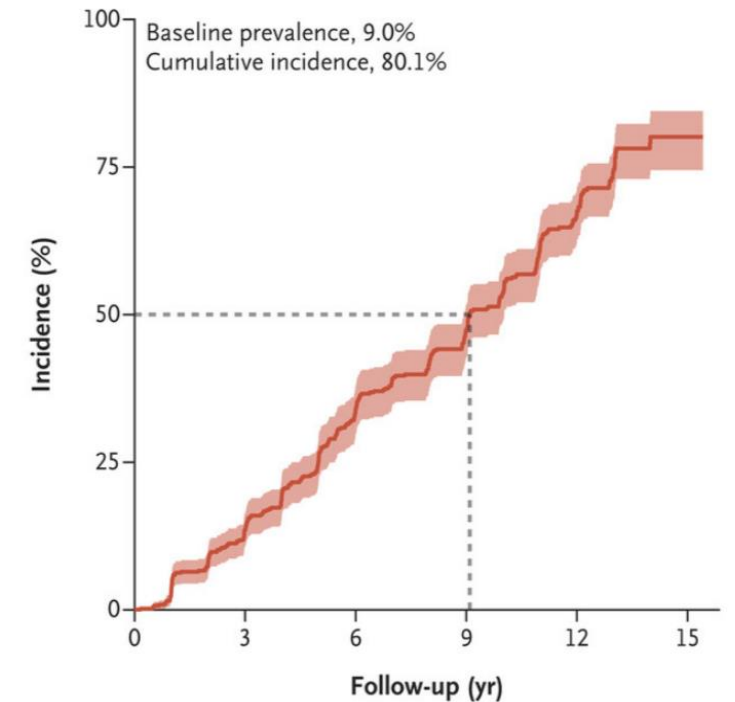
FIGURE 2

Diabetes-Related Complications That Occurred during the Study.

A Incidence of Complications



B Any Microvascular Disease



Barriers to screening/engagement?

- Less expertise in smaller units
- Lack of dedicated Type 2 clinics
- High DNA rates
- Lower and complex socio - economic status
- Ethnic minorities with cultural and language barriers

National Paediatric Diabetes Audit - Spotlight audit report on Type 2 diabetes

Table 2: Number and percentage of PDUs by caseload with Type 2 diabetes, 2019/20

	Number of PDUs n (%)	Number of children and young people with Type 2 diabetes n (%)
Total	172 (100.0)	810 (100.0)
PDUs with 0 children with T2D	24 (14.0)	0 (0.0)
PDUs with 1-5 children with T2D	101 (58.7)	244 (30.1)
PDUs with 6-10 children with T2D	25 (14.5)	194 (24.0)
PDUs with 11-20 children with T2D	16 (9.3)	216 (26.7)
PDUs with 21+ children with T2D	6 (3.5)	156 (19.3)

Case study

14 years old, presented with polydipsia and abdominal pain so had blood tests arranged at the GP surgery:

HbA1c 85mmol/mol

High BP: 141/94

High TG, low LDL

History and Investigations in keeping with a diagnosis of T2DM

Initial management plan?

Case study, 14 years old, new diagnosis T2DM

- Consider hospital admission
- New Diagnosis clinic template
- Type 2 diabetes Clinic template
- Type 2 diabetes clinic

Children with newly diagnosed Type 2 diabetes
pathway



Admit to ward
Newly diagnosed bloods to be taken by medical team
Ward nurse to collect newly diagnosed pack from
diabetes office
Start glucose checks pre and 2 hrs post all meals and
snack
Commence food diary

ACDC screening guidelines - 2021

- Hypertension
 - Dyslipidaemia
 - NAFLD
- Diabetes retinopathy screening
- Microalbuminuria
- Obstructive sleep apnoea

Clinical Guideline A Practical Approach to Management of Type 2 diabetes in Children and Young People (CYP) under 18 years

<https://www.a-c-d-c.org/wp-content/uploads/2012/08/Executive-summary-Management-of-Type-2-diabetes-in-CYP-1.pdf>

New Type 2 Diabetes Clinic Review

Date:

Diagnosis presentation

Symptoms:

Auto antibodies: Y/N

Ketones: Y/N

Urinary C Peptide: Y/N

Comorbidities:

Elevated liver enzymes: Y/N
Liver US requested: Y/N

Dyslipidaemia: Y/N

Hypertension: Y/N

Ambulatory BP needed Y/N

Urine Albumin/Creatinine Ratio: Y/N

Initial retinal screening:

Other medical conditions:

Exercise

Name of programmes

Type of exercises:

Duration:

Frequency:

Exercise app/activity tracker:

Referral to local programmes: Y/N

Comments/Goals:

Family Goals:

Diet

Weekdays

Breakfast:

Lunch:

Dinner:

Snack:

Weekends:

Breakfast:

Lunch:

Dinner:

Snack:

Drinks:

Take away/Restaurants

Food frequency

Fruits

Vegetables (green leafy vegetables)

Dairy

Cereals

Oily fish

Sweets/chocolates

Crisps

Cakes/biscuits

Goals:

Family Goals

Oral Hypoglycaemic Medication:

Side effects:

Medicines Information leaflet given Y/N

Other Medication:

Blood glucose monitoring

- Expected number of tests/day:
- BG tests before meals and bedtime: Y/N
- BG tests 2 hours post meals: Y/N
- Downloading: Y/N
- Food and Glucose diary: Y/N
- Name of app being used:

Other Comorbidities

Sleep

Bedtime:

Wake up time:

Total hours of sleep:

Comments/Goals:

Sleep apnoea: Y/N

Sleep studies needed: Y/N

Mobility/foot issues: Y/N

Foot advice given: Y/N

Menstruation:

Smoking/Alcohol/Drugs Driving

Other:

Sexual Health

Psychology:

Family tree / parent occupation / other carers

Social

Case study

- 14 years old, presented with polydipsia and abdominal pain so had blood tests arranged at the GP surgery:

Hospital admission

- commenced education, dietetic review, blood glucose monitoring and medication
- hypertensive
- microalbuminuria

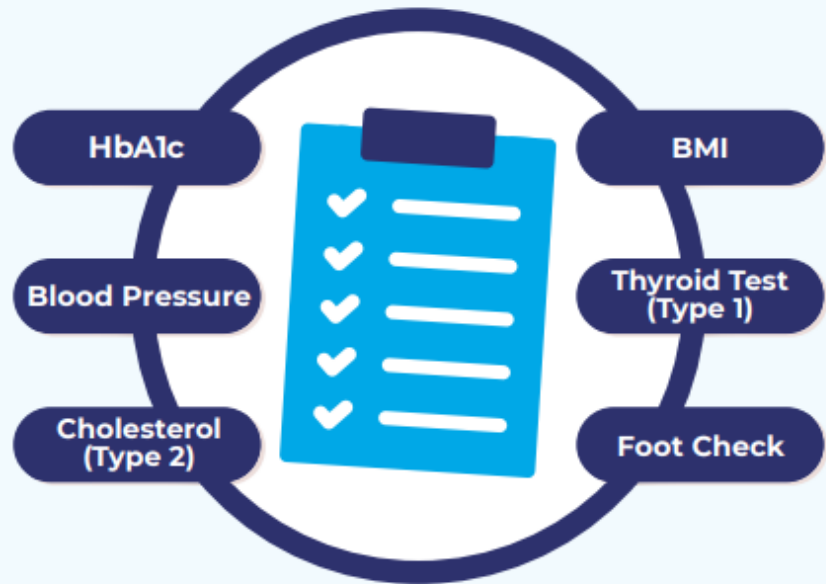
Attends type 2 clinic

Type 2 Diabetes in children, screening for co-morbidities

Dr Princy Paul

*Consultant paediatric diabetes, Alder Hey Children's Hospital
Paediatric diabetes clinical lead, Cheshire & Merseyside*





Percentage of young people aged 12 and above who **received all six 'key' health checks:**

Type 1 Diabetes

64% (60% in 2021/22)

Type 2 Diabetes

36% (33% in 2021/22)

† Please see the full report for details of the outcomes of these health checks.

Blood Pressure and Dyslipidaemia



- BP should be measured in mm of Hg/centile based on age, sex and height
- Hypertension in children under 13 years of age is defined as a systolic and/or diastolic blood pressure that is greater than the 95th centile on three or more occasions and in those over 13 as a blood pressure greater than 130/80
- Increased BMI is a risk factor, needs monitoring in every clinic (3/12)
- Improving BP, improves long term outcomes

https://www.nhlbi.nih.gov/files/docs/guidelines/child_tbl.pdf

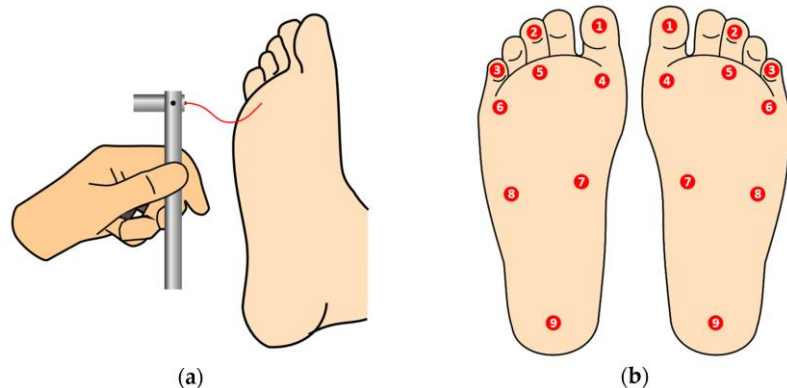
- **Lipid testing** should be performed when initial glycaemic control has been achieved or after 3 months of treatment, and annually thereafter. No fasting needed
- Use LDL/non HDL- C (> 3.6mmol abnormal)



- Albuminuria is strongly associated with the progression of CKD as well as cardiovascular disease (CVD)
- Measurement of albumin-to-creatinine ratio (ACR) in a spot urine sample, is now the preferred method
- Microalbuminuria should be confirmed with urine ACR $>3\text{mg}/\text{mmol}$ on a random urine sample, with a subsequent early morning urine sample
- An abnormal reading of spot urine ACR should be confirmed on two of three consecutive tests obtained on different days within a 3- to 6-month period
- If in doubt, arrange for 24 hr urine sample(30-300g/24hr is microalbuminuria)

Peripheral Neuropathy

- Though rare, occur affecting sensorimotor nerves and may affect autonomic system including the CVS.
- Risk is higher with the duration of diabetes.
- Less than 1% in youth and young adults (Today trial 2021)
- Foot examination is recommended as part of the care process at diagnosis and yearly using a 10g monofilament; should include foot inspection, assessment of pulses, ideally vibration sensation using tuning fork and ankle reflexes



Evaluation and Management of Youth-Onset Type 2
Diabetes: A Position Statement by the American Diabetes
Association Diabetes Care 2018;41:2648–2668 |
<https://doi.org/10.2337/dci18-0052>

Retinopathy screening

- CYP should be referred for formal eye screening at diagnosis and annually (even for those < 12 years)
- Includes the examination of the eye by a optometrist/Ophthalmologist and retinal photography
- 2x higher incidence of retinopathy in teens than adults after 7.9 yrs duration (13.8%)

Higher incidence in CYP with Type 2 than Type1 at similar duration(TODAY study), while recent UK data showing 6.3% retinopathy in T2 compared to 10.9% in T1 (NPDA 2022-23)

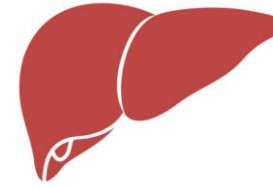
- Higher incidence of glaucoma and cataract, though rare in CYP.
- **Early diagnosis is important as Grade 1 and 2 are reversible with better BG control and receive early treatment for severe retinopathy**

ISPAD Clinical Practice Consensus Guidelines 2018: Type 2 diabetes mellitus in youth

[Phillip Zeitler](#), [Silva Arslanian](#), [Junfen Fu](#), [Orit Pinhas-Hamiel](#), [Thomas Reinehr](#), [Nikhil Tandon](#), [Tatsuhiko Urakami](#), [Jencia Wong](#), [David M. Maahs](#)



Non- Alcoholic Fatty Liver Disease (NAFLD)



- Most common cause of chronic liver disease, silent condition with fatty infiltration of liver (> 5% hepatocytes affected)
- Can lead to NASH - with or without fibrosis and may progress to cirrhosis
- Liver function(ALT,AST) is sensitive and can be used for screening at diagnosis and annually; If abnormal sooner
- Diagnosis by liver biopsy(gold standard)/imaging using USS mostly popular (not very sensitive); ACDC recommend USS Liver, even when LFTs are normal

Transient elastography by Fibroscan- promising; CT/MR useful

- Refer to Tertiary Gastroenterologist if ALT and AST are increased 3 times(to exclude other liver diseases)
- Early diagnosis with improved weight and BG can reverse grade 1 and 2 NAFLD
- **Improvement and reversal of histology, can be achieved with weight loss and improved BG with T2 medications like GLP1 RA and Glitazone**

<https://www.endocrinepractice.org/article/S1530-891X%2822%2900090-8/fulltext#%20:~:text=American%20Association%20of,PlumX%20Metrics>

Obstructive Sleep Apnoea OSA



- Relatively common in YP and adults who are overweight with or without T2DM while asleep-with collapse of airway for >10 sec(apnoea) and partial blockade(hypopnoea)
- Symptoms include snoring, noisy breathing and repeated short periods of stopping breathing including gasping (TODAY trial)
- Initial symptoms screening at diagnosis and annually afterwards , using a sleep apnoea questionnaire
- Refer for overnight pulse oximetry/ to sleep clinic for sleep study- based on the report ?CPAP in rare cases
- **Improves with weight loss and BG control and vice versa**, if no anatomical causes like airway narrowing, nasal septum deviation/polyp/large tonsils etc



Pediatric Sleep Questionnaire

Patient Name: _____

Date of Birth: _____

	Yes	No	Don't Know
While sleeping does your child...			
Snore more than half the time?			
Always snore?			
Snore loudly?			
Have "heavy" or loud breathing?			
Have trouble breathing or struggle to breathe?			
Have you ever...			
Seen your child stop breathing during the night?			
Does your child....			
Tend to breathe through the mouth during the day?			
Have a dry mouth on waking up in the morning?			
Occasionally wet the bed?			
Wake up feeling un-refreshed in the morning?			
Have a problem with sleepiness during the day?			
Has a teacher or other supervisor commented that your child appears sleepy during the day?			
Is it hard to wake your child up in the morning?			
Does your child wake up with headaches in the morning?			
Did your child stop growing at a normal rate at any time since birth?			
Is your child overweight?			
This child often...			
Does not seem to listen when spoken to directly			
Has difficulty organizing tasks			
Is easily distracted by extraneous stimuli			
Fidgets with hands or feet or squirms in seat			
Is "on the go" or often acts as if "driven by a motor"			
Interrupts or intrudes on others (e.g. butts into conversations or games)			

Total Number of "Yes" Responses _____

If eight or more statements are answered "yes", consider referring for sleep evaluation

Sleep Questionnaire - Example

Poly Cystic Ovarian Syndrome (PCOS)

- Menstrual history is important at diagnosis and in every clinic- irregular menstrual cycles-consider screening bloods+/- USS of ovaries and uterus

Screening with Psychology

- Initial screening for depression, special needs, ASD should be considered at diagnosis

Screening with Dietician

- First appointment need to screen for eating disorder, binge eating etc Ref



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ACDC Screening guidelines –summary

- Hypertension

- 3 different occasions
- 24hr ambulatory BP if concerned related to stress/transient

- Dyslipidaemia

- Once initial glycaemic control has been achieved or after 3 months of treatment

- NAFLD

- At diagnosis with liver function tests and then annually; if abnormal liver US, repeat every 3 years

Diabetes retinopathy screening

- Once they are 12 years of age and then annually

Microalbuminuria

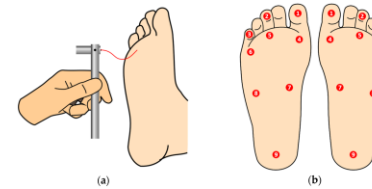
- At diagnosis as a spot urine and then annually
- If raised, 2 further samples on different occasions over 3-6 months

Obstructive sleep apnoea

- Overnight lab PSG is the gold standard but not possible for most units
- A validated sleep questionnaire



All co-morbidities improve with weight reduction and blood sugar control.



Thank you



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