Umeå universitet
Institutionen för kost- och måltidsvetenskap

Kunskapsprov för dietister

DELPROV 1

VIKTIGT ATT DU SKRIVER DIN TILLDELADE KOD PÅ VARJE SIDA AV PROVET!

Datum: 2024-05-17

Tid: 09.00-15.00

Hjälpmedel: Miniräknare och kladdpapper

Instruktioner

Provet består av 108 frågor där majoriteten av frågorna är flervalsfrågor. Vid flervalsfrågorna är ett svarsalternativ rätt. Läs frågorna noggrant.

Om ett eller flera svarsalternativ är felaktigt ikryssade eller om ett korrekt svar inte är ikryssat ges noll poäng på frågan.

Bilagor finns i separat dokument.

DEL 1 Medicinsk terminologi och magtarmkanalens fysiologi
DEL 2 Dietetik med sjukdomslära, kost och folkhälsa samt näringslära
DEL 3 Analys av vetenskaplig artikel

Kravgräns:

För godkänt på delprovet krävs att **86 av frågorna** är korrekt besvarade.

DEL 1

1. I NNR 2023 anges rekommendation för intag av flertalet vitaminer och mineraler. Markera det påstående nedan som är sant.

- [ ] I NNR 2023 anges rekommendation för intag av vitaminer och mineraler endast som RI - recommended intake.
- [ ] De rekommendationer som ges för vitaminer och mineraler avses för en längre tid och för planering av koster för grupper av individer.
- [ ] Där det vetenskapliga underlaget bedöms vara för svagt anges AI - average requirement som ofta baseras på medelintaget i befolkningen.

2. Vad kallas begreppet som belyser individens förmåga att tolka och förstå hälsoinformation samt kunna införliva det i konkreta beteenden?

- [ ] Kulturell kompetens
- [ ] Self-efficacy
- [ ] Health literacy

3. Vad är den korrekta betydelsen till nedanstående begrepp: Hyperemesis gravidarum?

- [ ] Högt blodtryck under graviditet
- [ ] Järnbrist under graviditet
- [ ] Illamående under graviditet

4. Vad innebär analfylaxi?

- [ ] Allergisk reaktion som karakteriseras av symtom som svullnad och andningsbesvär
- [ ] Havandeskapsförgiftning
- [ ] Svårigheter att utföra viljemässiga rörelser

DEL 1

5. Vilken av följande är inte en formell diagnos enligt diagnosmanualen DSM-5?

- [ ] Hetsätningsstörning
- [ ] Atypisk anorexia nervosa
- [ ] Amenorré UNS

6. Glykolysen är en del i metabolismen. Vilket påstående nedan är rätt?

- [ ] I glykolysen sker betaoxidation
- [ ] I glykolysen ger 1 glukosmolekyl mol glukos 6 ATP
- [ ] Slutprodukten i glykolysen är pyrodruvsyra

7. På vilket sätt beräknas värdet för Food intake level (FIL)? Välj ett alternativ nedan.

- [ ] REE/Energiintag
- [ ] Energiintag/REE
- [ ] BMR/Energiintag

8. Vad avses med Antropometri?

- [ ] Laboratorievärde
- [ ] Energibehov
- [ ] Mänskligt kroppsmått

DEL 1

9. Vad är ett annat ord/beskrivning av Aseptisk?

- [ ] Ren eller steril metod genom hela proceduren
- [ ] Infektion som påverkar hela kroppen och gör att viktiga organ inte fungerar som de ska
- [ ] Infektion i lungparenkymet med symptom och statusfynd förenligt med nedre luftvägsinfektion

10. Vad är ett annat ord/beskrivning av Sepsis?

- [ ] Ren eller steril metod genom hela proceduren
- [ ] Infektion som påverkar hela kroppen och gör att viktiga organ inte fungerar som de ska
- [ ] Infektion i lungparenkymet med symptom och statusfynd förenligt med nedre luftvägsinfektion

11. Vad är ett annat ord/beskrivning av Takykardi?

- [ ] Förändrad andningsfrekvens
- [ ] Spastiska armrörelser
- [ ] Hjärtrytmrubbning

12. Fettets placering på kroppen har betydelse för utveckling av metabola syndromet. Vilka gränsvärden gäller för kvinnor och mäns ökade risk att utveckla metabola syndromet?

- [ ] Midjemått: Kvinnor >88 cm, män> 102 cm
- [ ] BMI> 30 kg/m^2 för både kvinnor och män
- [ ] Midja/höftkvot: kvinnor >0,95, män >1,2

DEL 1

13. Vad innebär en gastric bypass operation?

- [ ] Den yttre delen av magsäcken (ca 80 %) opereras bort och kvar blir ett smalt rör. Den nedre magmunnen bevaras vilket leder vidare magsäcksinnehållet till tunntarmen.
- [ ] Vid operationen kopplas den största delen av magsäcken bort och kvar blir en liten magsäck som kopplas ihop med tunntarmen. Tarmen kopplas sedan ihop med tarmen från den 'gamla' magsäcken.
- [ ] En intragastrisk ballong placeras i magsäcken som fylls med vätska i syfte att minska mängden mat man äter.

14. Vad är Sarkopen obesitas?

- [ ] Samtidig åldersrelaterad muskelförlust och fetma
- [ ] Stressutlöst fetma
- [ ] Ärftlig fetma

15. Vad är Paraplegi?

- [ ] Oförmåga att föra mat till munnen
- [ ] Dubbelsidig lunginflammation
- [ ] Förlamning i ben och bål

16. Vad är Esofageal fas?

- [ ] Tiden efter cytostatikabehandling
- [ ] Period av skov vid Multipel Skleros
- [ ] Födans transport genom matstrupe till magsäck

DEL 1

17. Vad är ett annat ord/beskrivning av Palpation?

- [ ] Undersökningsmetod inom sjukvården som används i utredningar av bl.a. röstrubbningar, dysfagi och gomspalt
- [ ] Diagnostisk undersökning då man med fingrar eller händer känner genom patientens kroppsyta organens storlek, konsistens och sjukliga förändringar
- [ ] Undersökningsmetod som med hjälp av röntgenstrålar och avancerad datorteknik kan ta tredimensionella bilder av organ och vävnader på insidan av kroppen

18. Vad menas med Pulmonell hypertoni?

- [ ] Förhöjt blodtryck i lungkretsloppet hos patienten
- [ ] Utbredningen av emfysem hos patienten
- [ ] Att patienten har Kronisk obstruktiv lungsjukdom

19. Vad är ett annat ord/beskrivning av Fatigue?

- [ ] Smakförlust
- [ ] Muntorrhet
- [ ] Trötthet

20. Vad är Glomulär filtrationshasighet?

- [ ] Analys av magsäckstömning
- [ ] Mått på njurfunktion
- [ ] Sväljfunktionsmätning

DEL 1

21. Vad är ett annat ord/beskrivning av Gastropares?

- [ ] Förändrad magsyraproduktion
- [ ] Magsäcksinflammation
- [ ] Förlångsammad magsäckstömning

22. Vilket ord används för att beskriva att en patient har vätska i buken?

- [ ] Steatos
- [ ] Ascites
- [ ] Ikterus

23. Pankreatit betyder:

- [ ] Blindtarmsinflammation
- [ ] Leverinflammation
- [ ] Bukspottkörtelinflammation

24. Vad betyder det latinska ordet Ileum?

- [ ] Tunntarm
- [ ] Stomi
- [ ] Öppning

DEL 1

25. Helicobacter pylori är en bakterie som kan orsaka:

- [ ] Atrofi av slemhinnan i svalget
- [ ] Fistlar i duodenum
- [ ] Ulcus i ventrikel och duodenum

26. Vilket påstående om insulin är korrekt?

- [ ] Insulinproduktionen avtar alltid snabbt vid debut av Diabetes typ 1
- [ ] En person med diabetes typ 1 har låga nivåer av C-peptid i blodet
- [ ] En person med insulinresistens har låga nivåer av C-peptid i blodet

28. Vad händer när en person med celiaki äter gluteninnehållande livsmedel?

- [ ] Allergisk reaktion, kroppens egna immunförsvar överreagerar och ger upphov till allergiska symtom
- [ ] Ett livshotande tillstånd uppstår som kan orsaka andnöd och blodtrycksfall
- [ ] En skada uppstår i tarmslemhinnan som leder till villusatrofi

DEL 1

29. Vad innebär begreppet "catch-up"?

- [ ] Det tillväxthämmade barnet har kommit i kapp en försenad kognitiv utveckling
- [ ] Pubertet inträffar mycket tidigare än förväntat
- [ ] Det tillväxthämmade barnet växer utifrån sin genetiska potential

30. Vid amning utlöses sväljreflexen av följande beröring:

- [ ] Beröring av munvinklar och kinder
- [ ] Beröring av främre gombågarnas nedre del
- [ ] Beröring av tunga, gom, papilla incisivae

31. Vad betyder neofobi?

- [ ] Rädsla för ny och okänd mat
- [ ] Rädsla för att sätta i halsen
- [ ] Rädsla för viktuppgång

32. Vad kallas samlingsnamnet för den kategori av sjukdom som PKU (Fenylketonuri) tillhör?

- [ ] Neuromuskulära sjukdomar
- [ ] Interstitiella barnsjukdomar
- [ ] Medfödda metabola sjukdomar

DEL 1

33. Vad är den latinska benämningen för sista delen av tunntarmen?

- [ ] Jejunum
- [ ] Ileum
- [ ] Duodenum

34. Vad är den latinska benämningen för den sista delen av colon?

- [ ] Rectum
- [ ] Transversum
- [ ] Sigmoideum

DEL 2

35. Enligt nordiska näringsrekommendationer 2023 är rekommenderat proteinintag för personer över 65 år:

- [ ] 10–15 E%
- [ ] 15–20 E%
- [ ] 10–20 E%

36. I de nordiska näringsrekommendationerna 2023 finner vi följande fiberrekommendation:

- [ ] 30–40 g/dag
- [ ] 25–30 g/dag
- [ ] 25–35 g/dag

37. Icke digererbar är ett begrepp som gäller för samtliga typer av kostfibrer. Men vilket av följande livsmedel är rikt på/innehåller mest av icke fermenterbara fibrer per 100 gram?

- [ ] Vetekli
- [ ] Havrekli
- [ ] Fullkornsberikade havregryn

38. Forskningen säger att mättade fettsyror kan höja LDL-kolesterolet. Men detta stämmer inte för alla mättade fettsyror. Vilken mättad fettsyra anses INTE påverka LDL-kolesterolet negativt?

- [ ] Myristinsyra 14:0
- [ ] Palmitinsyra 16:0
- [ ] Stearinsyra 18:0

DEL 2

39. Natrium höjer blodtrycket - men vilket näringsämne är antagonist till natrium i detta sammanhang?

- [ ] Kalium
- [ ] Kalcium
- [ ] Folat

40. Du äter en vegankost och behöver öka ditt kalciumintag. Vilket av följande livsmedel skulle du då välja i första hand?

- [ ] Sojabönor
- [ ] Kikärtor
- [ ] Röda linser

41. Vilken diagnosgrupp rekommenderas att avstå från att fasta under Ramadan?

- [ ] Muslimer som har diabetes typ 1
- [ ] Muslimer som har höga blodfetter
- [ ] Muslimer som har diabetes typ 2 och behandlas med förändrade levnadsvanor och metformin

42. Patienten kvinna 23 år, BMI 20, låga järnvärden. Patienten behöver kostråd om vegansk kosthållning. Patienten har varit flexitarian sedan 18-årsåldern. Vilka av nedanstående punkter ska dietisten rekommendera?

- [ ] Ät regelbundet bröd och frön. Välj gärna kaffe som dryck, undvik livsmedel med högt kalciuminnehåll eftersom det försämrar absorption av järn.
- [ ] Ät regelbundet baljväxter, frön och nötter. Välj gröna bladgrönsaker och torkad frukt. Välj C-vitaminrika frukter, bär och grönsaker i samband med måltid för att öka järnupptaget.
- [ ] Ät regelbundet vegetabilier men undvik livsmedel med högt innehåll av fytinsyra exempelvis baljväxter och nötter eftersom det hämmar järnupptaget.

DEL 2

43. Vilket påstående är korrekt angående gravida kvinnors intag av koffein?

- [ ] Intaget bör begränsas för att minska risken för hög födelsevikt hos barnet
- [ ] Intaget av behöver begränsas för att minska risken för graviditetsdiabetes
- [ ] Intaget bör begränsas för att minska risken för låg födelsevikt hos barnet

44. Vilket livsmedel är bäst lämpade till bakning för någon med celiaki?

- [ ] Kungsörnen vetemjöl
- [ ] Finax mjölmix
- [ ] Axa rågflingor

45. Du träffar en två-årigt barn med mjölkproteinallergi, vilket av följande alternativ är mest lämpligt som måltidsdryck på förskolan?

- [ ] Getmjölk
- [ ] Havredryck
- [ ] Laktosfri mjölk

46. Vilket av följande kriterier ingår INTE i diagnosen ARFID?

- [ ] Signifikant viktförlust (eller tillväxthämning)
- [ ] Signifikant näringsbrist
- [ ] Funktionell förstoppning

DEL 2

47. För en kontorsarbetande person med stillasittande fritid förutom löpträning 2 timmar per vecka uppskattar vi värdet för Physical Activity Level (PAL-värde) till cirka:

- [ ] 1,5
- [ ] 1,7
- [ ] 1,9

48. Både när vi intar kolhydrater och protein får vi i oss 4 kcal/gram. Men hur är det när vi sedan omsätter dessa näringsämnen i kroppen för att använda oss av energi? Vilket av följande påståenden är korrekt?

- [ ] Kolhydrater och protein ger lika mycket energi vid metabolisering i kroppen
- [ ] Kolhydrater ger något mer energi än protein vid metabolisering i kroppen
- [ ] Protein ger något mer energi än kolhydrater vid metabolisering i kroppen

49. Food Intake Level, dvs. FIL-värdet kan användas för att validera energiintaget vid en kost- och aktivitetsregistrering. Hur kan vi uppskatta/beräkna det, vilket av följande alternativ är rätt?

- [ ] TEE/Energiintag
- [ ] Energiintag x REE
- [ ] Energiintag/REE

50. Beräkna viktförlusten för följande patient.
Aktuellt vikt: 83 kg. Vikt för 6 månader sedan: 91 kg

- [ ] 5%
- [ ] 7%
- [ ] 9%

DEL 2

51. Du träffar en patient som väger 77 kg och är 180 cm lång. Vilket är patientens BMI?

- [ ] 20
- [ ] 22
- [ ] 24

52. Vilken av följande personer räknas som normalviktig enligt BMI?

- [ ] 40 år, 55 kg, 160 cm
- [ ] 50 år, 58 kg, 180 cm
- [ ] 60 år, 80 kg, 163 cm

53. Vad av följande är ett antropometriskt mått?

- [ ] Kroppslängd
- [ ] Fysisk aktivitet
- [ ] Energiintag i kcal

54. Hur många kilokalorier innehåller i normalfallet 100 ml energirik sondnäring?

- [ ] 75 kcal
- [ ] 100 kcal
- [ ] 150 kcal

DEL 2

55. Var mynnar sondspetsen för följande enterala infartsväg? *Nasojejunal sond*

- [ ] Ventrikel
- [ ] Duodenum
- [ ] Jejunum

56. Vilken av följande beskrivningar stämmer bäst överens med ett *intermittent* administreringssätt?

- [ ] Sondmatningen ges under ett kortare tidsintervall (5 – 20 minuter), vanligtvis med hjälp av en sondmatningsspruta
- [ ] Sondmatningen ges under 4 - 6 tillfällen under dagen med hjälp av pump eller gravitationsmatning
- [ ] Matningshastighet i milliliter (ml) per timme räknas ut genom att ta total mängd sondnäring som ska administreras över dygnet dividerat med antal timmar som matningen ska ske (under det dygnet)

57. Vilken hängtid har ett slutet system vid enteral nutrition?

- [ ] Upp till 12 timmar
- [ ] Upp till 24 timmar
- [ ] Upptill 48 timmar

58. Vilket av följande alternativ är korrekt angående förskrivning av enteral nutrition till barn?

- [ ] Enteral nutrition förskrivs vanligen till en subventionerad kostnad
- [ ] Endast barnsjuksköterska på BVC har förskrivningsrätt
- [ ] Endast läkare har förskrivningsrätt

DEL 2

59. Vid uppstart av parenteral nutrition bör vikt följas regelbundet, varför?

- [ ] För att säkerställa att patienten är i energibalans
- [ ] För att säkerställa att patienten inte får för lite energitillförsel
- [ ] För att säkerställa att patienten inte får för mycket energitillförsel

60. Vilken av följande är av litteraturen beskriven en känd kontraindikation för parenteral näringstillförsel?

- [ ] Gastropares
- [ ] Akut lungödem
- [ ] Ileus

61. Vilket av följande näringsämnen ser man oftast låga värden av i blodet hos en patient med refeeding syndrome?

- [ ] Kalium
- [ ] Kalcium
- [ ] Järn

62. Patienten har högt blodtryck, vilket kostråd gällande salt rekommenderar du?

- [ ] Välj örtsalt, det innehåller mindre mängd natrium och är mer naturligt
- [ ] Välj havssalt, det ger en högre smakupplevelse, därför behövs mindre mängd
- [ ] Välj joderat salt, men minska på mängden

DEL 2

63. Patienten har nyligen genomgått en gastric bypass operation och ätit flytande kost men ska nu börja äta fast föda. Vilken av nedanstående menyförslag ger dietisten?

- [ ] Fiskgratäng med potatismos, kokta morötter och mixade bär till dessert
- [ ] Kokt potatis och panerad fisk med remouladsås, tomatsallad. Torkad fukt och vindruvor till dessert
- [ ] Pasta med köttfärssås, kokt broccoli. Vetebulle till dessert

64. Vad av följande kan vara en anledning till att en äldre patient uppträder förvirrat?

- [ ] C-vitaminbrist
- [ ] Hypertoni
- [ ] Dehydrering

65. Vad är korrekt gällande energibehov vid tetraplegi?

- [ ] Vid tetraplegi är energibehovet vanligtvis lägre än innan skadetillfället
- [ ] Vid tetraplegi är energibehovet vanligtvis högre än innan skadetillfället
- [ ] Vid tetraplegi är energibehovet vanligtvis detsamma som innan skadetillfället

66. Vad kan du som dietist anta att följande patient lider av?
Kvinna, 79 år, diagnos: Stroke
Patienten har svårigheter att uppfatta saker som befinner sig på vänster sida av kroppen.

- [ ] Dysfagi
- [ ] Hemipares
- [ ] Neglekt

DEL 2

67. Vad av följande rekommenderar ESPEN gällande screening vid inläggning på sjukhus för patienter med stroke?

- [ ] Alla strokepatienter bör inom 48 timmar screenas för risk för malnutrition
- [ ] Alla strokepatienter bör erbjudas mat och dryck för att vid problem att svälja screenas för dysfagi
- [ ] Alla strokepatienter bör screenas för uttorkning inom 48 timmar vid konstaterad dysfagi

68. Vid dysfagi, vad av följande är viktigt för att förebygga pneumoni?

- [ ] Att använda endast lättflytande (IDDSI nivå 0)
- [ ] Noggrann munhygien
- [ ] Att utesluta mejeriprodukter

69. Patient kvinna 38 år, diagnos HIV/aids, besväras av illamående och kräkningar. Vilka kostråd av nedanstående punkter kan bäst bidra till att mildra patientens besvär?

- [ ] Ät regelbundna små lagade energiberikade varma måltider, vilka efter maten
- [ ] Vila innan måltid, välj energirika livsmedel för att hålla nere portionsstorleken
- [ ] Ät små frekventa måltider, undvik att dricka i samband med måltid, vila efter måltid

70. Vilka av följande utgör en riskgrupp för att utveckla brist på vitamin D?

- [ ] Äldre
- [ ] Gravida
- [ ] Tonåringar

DEL 2

71. Vilket av nedanstående påstående bör dietisten främst prioritera vid kostbehandling av patienten med KOL?

- [ ] Uppmuntra patienten till ett ökat energiintag
- [ ] Uppmuntra patienten med obesitas till viktnedgång
- [ ] Uppmuntra patienten att välja näringsrika och samtidigt energilåga livsmedel

72. Patienten, kvinna 37 år, BMI 21, diagnos: KOL. Patienten klagar på aptitlöshet och fatigue. Vilken av nedanstående rekommendationer är bäst anpassad till patienten?

- [ ] Vila före maten, ät långsamt, ha färdiglagad mat hemma ifall du inte orkar laga mat
- [ ] Vila före maten, drick vatten i samband med måltid, ät kall mat.
- [ ] Välj näringstäta livsmedel, medicinera före maten, välj lågfett produkter

73. Patienten, kvinna 62 år, BMI 27, Diagnos: Coloncancer. Vilka av följande livsmedel bör patienten undvika?

- [ ] Opastöriserad mjölk, Gorgonzola, kalla förpackade sallader som innehåller rökt fisk
- [ ] Färskost, tinade frysta grönsaker som förvarats i kylskåp i två dagar, egengravad fisk
- [ ] Kylvaror som förvarats kallt, helst 4°, frysta grönsaker, hård ost

74. Vilken information är viktig att ge till en person som nyligen genomgått en stamcellstransplantation på grund av myelom?

- [ ] Undvik konserverad mat
- [ ] Tvätta händerna noga innan matlagning och måltid
- [ ] Öka intaget av kaliumrika livsmedel

DEL 2

75. Vilket av nedanstående beskriver begreppet palliativ behandling bäst?

- [ ] Behandling som ges i syfte att lindra symtom vid icke botbar sjukdom
- [ ] Behandling som ges i form av radioterapi
- [ ] Behandling som ges för att bota sjukdomen

76. Personer som behandlas för cancersjukdom kan drabbas av biverkningar relaterat till munhålan. Vilket av följande är exempel på sådana biverkningar?

- [ ] Anorexi
- [ ] Mucosit
- [ ] Fatigue

77. Vilken av följande nivå på proteinintag är lämplig för personer som behandlas med peritonealdialys?

- [ ] 0,6 g/kg/dygn
- [ ] 0,8 g/kg/dygn
- [ ] 1,2 g/kg/dygn

78. Vilken är den vanligaste orsaken till anemi vid kronisk njursvikt?

- [ ] Brist på hormonet erytropoietin
- [ ] Lågt intag av järn via kosten
- [ ] Blödningar

DEL 2

79. Vad är det övergripande syftet med FODMAP-behandling för patienten diagnosticerad med IBS?

- [ ] Att patienten långsiktigt ska lära sig vilka livsmedel som innehåller fermenterbara oligosackarider, laktos och sockeralkoholer och strikt eliminera alla dessa helt ur kosten
- [ ] Läkning och på långsikt att patienten botas från IBS
- [ ] Att patienten ska få minskade IBS symptom och utforma en personlig kostregim där den högsta nivån av FODMAP ingår utan att negativa konsekvenser uppstår för patienten

80. Vilken av följande beskriver inflammationen vid Morbus Chrohn mest korrekt?

- [ ] Transmural inflammation
- [ ] Ytlig inflammation
- [ ] Kontinuerlig inflammation

81. Vilka vitaminer/mineraler är speciellt viktiga att ta hänsyn till vid inflammatorisk tarmsjukdom, IBD?

- [ ] Kalium och A-vitamin
- [ ] Kalcium och D-vitamin
- [ ] Jod och E-vitamin

82. Vilket av följande påståenden är sant gällande energibehovet vid inflammatorisk tarmsjukdom, IBD?

- [ ] Energibehovet är oftast förhöjt
- [ ] Energibehovet är oftast oförändrat
- [ ] Energibehovet är oftast lägre jämfört med en frisk person

DEL 2

83. Vad av följande bör personer med hemokromatos undvika i sin kosthållning?

- [ ] Rapsolja
- [ ] Lever
- [ ] Vete

84. Vad innebär det att en leversjukdom är dekompenserad?

- [ ] Sjukdomen medför komplikationer
- [ ] Sjukdomen neutraliserar smaksinnet
- [ ] Sjukdomen ökar energiförbrukningen

85. Vilket av nedanstående kostråd är mest centralt för patienten med kronisk pankreatit?

- [ ] Avstå från gluteninnehållande livsmedel
- [ ] Avstå från rött kött
- [ ] Avstå från alkohol

86. Ange vilken av nedanstående vitamin som det är särskilt viktigt att uppmärksamma hos patienten med kronisk pankreatit.

- [ ] Vit C
- [ ] Niacin
- [ ] B 12

DEL 2

87. Vilket av nedanstående kostråd är aktuellt för en person med kolostomi som besväras av diarré?

- [ ] Pröva att äta banan
- [ ] Pröva att välja fiberrika livsmedel
- [ ] Pröva att dricka kaffe

88. Vid diagnosen atrofisk gastrit bör man kontrollera status för följande vitamin:

- [ ] Vit D
- [ ] Vit B12
- [ ] Vit A

89. Efter ventrikelkirurgi kan en drabbas av sen dumping. Vilket av följande kostråd är korrekt vid sen dumping?

- [ ] Minska mängden kolhydrater på tallriken
- [ ] Ät färre måltider
- [ ] Öka proteindelen på tallriken

91. Gastropares är en senkomplikation till diabetes. Vilket är det viktigaste kostrådet att ge vid gatropares?

- [ ] Undvik kostfiberrika livsmedel eftersom magsäckstömningen bromsas
- [ ] Välj fettsnåla livsmedel, fett bromsar magsäckstämningen
- [ ] Välj livsmedel som går att mosa med gaffel, ju mindre partikelstorlek desto bättre

DEL 2

92. Patienten är en kvinna, 35 år, (BMI 23 kg/m^2) har nyligen diagnosticerats med celiaki efter att i flera år kämpat med diarré. Patienten har hittills undvikit mjölkprodukter eftersom hon tyckt att det förvärrat symtomen, hon undrar nu om det är okej att dricka mjölk igen. Vad ska dietisten svara?

☐ Ät glutenfritt men fortsätt att undvika mjölkprodukter eftersom det är en livsmedelsgrupp som vanligtvis ställer till besvär hos personer med celiaki.

☐ Ät glutenfritt. Vid celiaki kan tarmens förmåga att bryta ner laktosen som finns i mjölkprodukter påverkas negativt. Initialt kan det därför vara bra att använda laktoslåga produkter men längre fram kan du testa att använda vanliga mejeriprodukter.

☐ Du har diagnosticerats med celiaki som behandlas med strikt glutenfri kost. När du äter strikt glutenfritt kommer inte mjölkprodukterna att vålla dig något besvär i fortsättningen. Mjölkprodukter är glutenfria.

93. Titta på tillväxtkurvan och på barnets tillväxt. Vilket av följande är korrekt utifrån det du kan utläsa? Se Bilaga 1.

☐ Kurvan visar en tidig adiposity rebound

☐ Kurvan visar på uppfödningssvårigheter

☐ Kurvan visar ett spädbarns tillväxtpuckel

DEL 2

94. Vilken av följande information behöver du för att räkna ut ett barns ISO-BMI?

- [ ] Ålder, längd, vikt samt föräldrars längd och vikt
- [ ] Ålder, kön, längd, vikt
- [ ] Ålder, kön samt föräldrars längd och vikt

95. Vilket av följande påstående är rätt angående modersmjölkersättning?

- [ ] Modersmjölksersättning förskrivs av sjuksköterska på barnhälsovården
- [ ] Modersmjölksersättning förskrivs av dietist till självkostnadspris
- [ ] Modersmjölksersättning köps på apotek eller i matvarubutiken

96. Vilket av följande är korrekt gällande smakportioner till barn vid 6 månader ålder?

- [ ] Det går bra att ge t.ex smörgåsrån, och långsamt vänja barnet vid mat som innehåller gluten
- [ ] Smakportioner bör vara industriproducerade och följa EU-standard
- [ ] Om barnet spottar ut maten är hen inte redo, vänta 4–6 veckor med att prova igen

97. Vilken enzymbrist är vanlig hos personer med cystisk fibros, vilket påverkar deras förmåga att bryta ned och absorbera näringsämnen?

- [ ] Laktasbrist
- [ ] Pankreasenzymbrist
- [ ] Amylasbrist

DEL 2

98. Vilken typ av kosttillägg används ofta för att tillgodose näringsbehoven hos personer med PKU (fenylketonuri)?

- [ ] MTC-olja
- [ ] Kolhydratpulver(maltodextrin)
- [ ] Aminosyrablandningar

99. Vilket av följande livsmedel är troligen mest aktuellt att begränsa för en patient som ordinerats ketogen kost?

- [ ] Kokt potatis
- [ ] Ugnsbakad lax
- [ ] Omelett

100. Vilket av följande alternativ är vanligt i relation till tillväxt för barn med medfödda hjärtfel?

- [ ] Lågt energibehov och risk för övervikt/obesitas
- [ ] Lågt energibehov och risk för metabola rubbningar
- [ ] Ökat energibehov och risk för avplanande tillväxt

DEL 3

I denna del ska du läsa en vetenskaplig artikel *”Celiac disease screening at a pediatric outpatient clinic: a feasibility study”* och sedan svara på ett antal frågor kring den.

Det kan vara bra att läsa igenom frågorna innan du börjar läsa artikeln.

101. Vad var det huvudsakliga syftet med studien utförd av Gunnarsdottir et al.?

- ☐ Att bedöma genomförbarheten av celiakiscreening på en barnmottagning
- ☐ Att undersöka prevalensen av celiaki i en specifik population
- ☐ Att jämföra olika diagnostiska verktyg för upptäckt av celiaki

102. Vilken typ av vårdinrättning var involverad i studien?

- ☐ Ett lasarett
- ☐ En barnavårdscentral
- ☐ Ett universitetssjukhus

103. Hur många deltagare testades i studien?

- ☐ Nämns inte i artikeln
- ☐ 481 barn
- ☐ 500 barn

DEL 3

104. Vilket diagnostiskt verktyg användes främst för celiakiscreening i studien?

- [ ] Blodprov
- [ ] Genetisk testning
- [ ] Tarmbiopsier

105. Hur många barn identifierades med celiaki genom screeningprocessen?

- [ ] Ej nämnt i artikeln
- [ ] 11 barn
- [ ] 19 barn

106. Hur många av barnen som identifierades i screeningen hade sökt vård pga gastrointestinala symptom?

- [ ] 3 barn
- [ ] 11 barn
- [ ] 23 barn

107. Hur många barn med positiva serologiska tester bekräftades ha celiaki genom biopsi?

- [ ] 11 barn
- [ ] 8 barn
- [ ] 3 barn

DEL 3

108. Hur upplevde deltagarna att vara med i studien?

- [ ] De var överlag nöjda med sitt deltagande
- [ ] De var överlag missnöjda med sitt deltagande
- [ ] De var överlag osäkra på vad de kände kring sitt deltagande

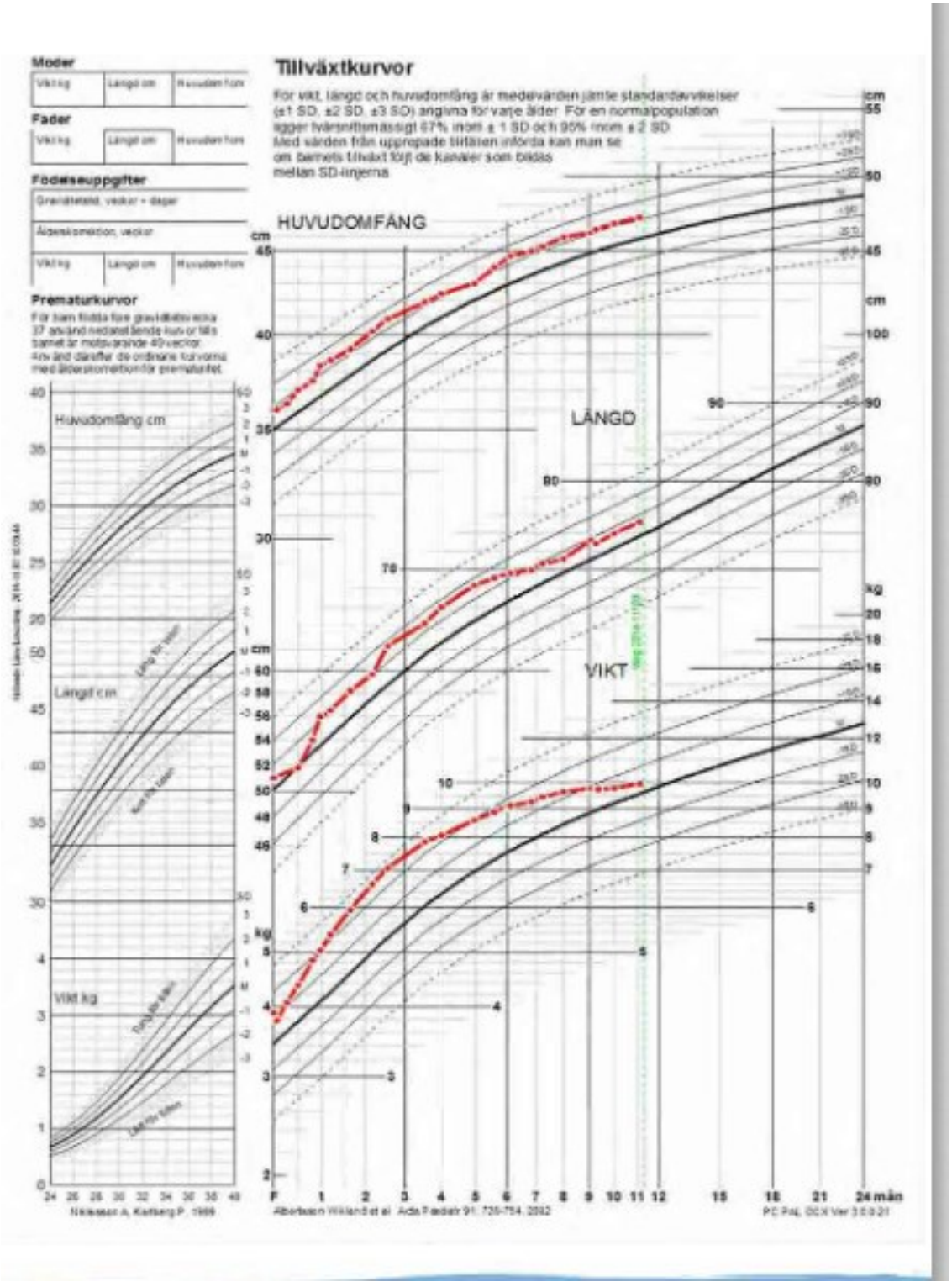
109. Varför underdiagnosticeras celiaki?

- [ ] För att det saknas riktade screeninginsatser
- [ ] För att det gör mer skada än nytta att använda universell screening
- [ ] För att individer med symptom screenas, men många glutenintoleranta har inga symptom

110. Vilka slutsatser drog författarna av denna genomförbarhetsstudie?

- [ ] Celiakiscreening kan framgångsrikt genomföras på barnmottagningar
- [ ] Prevalensen av celiaki bland barn är mycket lägre än tidigare uppskattat
- [ ] Serologisk testning är inte en pålitlig metod för upptäckt av celiaki hos pediatriska patienter

Bilaga 1. Till fråga 93.



Bilaga 2. Del 3.

Scandinavian Journal of Gastroenterology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/igas20

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To cite this article: Sunna Gunnarsdottir, Henrik Albrektsson, Julia Frydebo, Nicolae Miron, Jenny M. Kindblom, Ketil Størdal & Karl Mårild (2022) Celiac disease screening at a pediatric outpatient clinic: a feasibility study, Scandinavian Journal of Gastroenterology, 57:8, 912-920, DOI: 10.1080/00365521.2022.2050292

To link to this article: https://doi.org/10.1080/00365521.2022.2050292

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SCANDINAVIAN JOURNAL OF GASTROENTEROLOGY
2022, VOL. 57, NO. 8, 912–920
https://doi.org/10.1080/00365521.2022.2050292

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ORIGINAL ARTICLE

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Celiac disease screening at a pediatric outpatient clinic: a feasibility study

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ABSTRACT

Objectives: Celiac disease (CD) is a common yet largely underdiagnosed disease. This study aimed to test the feasibility of incorporating a non-targeted CD screening in a pediatric outpatient setting and evaluate its short-term impact on children with serological evidence of disease.

Methods: Over five months, 500 children (aged 2–17 years) attending a general pediatric outpatient clinic in Gothenburg, Sweden, were enrolled and surveyed for current symptoms, quality of life, and background characteristics; 481 children were screened for tissue-transglutaminase antibodies (tTGA); repeated tTGA-positivity was defined as CD autoimmunity (CDA). Children with CDA were investigated for CD and for one year monitored for changes in symptoms, and quality of life.

Results: Eleven of 481 (2.3%) screened children had CDA. Children with CDA were younger (median 3.8 years) than those without CDA (8.8 years). No other major between-group differences were reported in background characteristics, symptoms, or quality of life. The screening was well-accepted by the families/participants. During 1-year follow-up, 8 of 11 children with CDA were diagnosed with CD. Children with screening-detected CD reported no significant changes in symptoms and quality of life and the dietary adherence rate was good.

Conclusions: Non-targeted screening for CD was feasible in a general pediatric outpatient setting. While hampered by small sample size, our results are in line with previous screening studies indicating that symptoms do not differentiate CDA from non-CDA children. Also, among an overall minimal-symptomatic group of children, diagnosing CD and installation of treatment did not significantly change their well-being during 1-year follow-up.

ARTICLE HISTORY
Received 22 December 2021
Revised 1 March 2022
Accepted 2 March 2022

KEYWORDS
Celiac disease; gluten-free diet; mass screening; quality of life

Introduction

Celiac disease (CD) is a chronic autoimmune disorder caused by gluten ingestion [1]. The prevalence of CD is 1% worldwide [2]. In children, CD diagnosis is established by either repeated CD-specific serological markers >10x upper limit of normal or by duodenal biopsy showing villous atrophy [1,3]. The disease is associated with, among others, impaired bone health and psychiatric disorders [4–6]. Early CD diagnosis and installation of a gluten-free diet (GFD) may prevent such complications [4].

Currently, serological screening for CD is advised in children with gastrointestinal symptoms and genetically high-risk groups, such as patients with type 1 diabetes [7]. However, despite today's targeted CD screening, underdiagnosis is common as the disease may cause few or no symptoms at all [2]. Conversely, there is insufficient evidence on whether the benefits of universal screening outweigh potential harms [8], including concerns that a CD diagnosis may not confer clear benefits in asymptomatic individuals [9].

While the best approach to identify CD is not yet established, this study examines a novel, non-targeted CD screening program at a general pediatric outpatient clinic in Sweden [10]. This screening approach may be viewed as a middle ground between present-day high-risk screening and universal screening for CD. Besides studies on CD screening in adult outpatient settings [11–14], there are few data on the diagnostic yield and practical implementation of CD screening of children in a similar healthcare setting [15].

Hence, the primary aim of this study was to test the hypothesis that it is feasible to incorporate a non-targeted CD screening in a general pediatric outpatient clinic and that such screening is well-accepted by the participants and their

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Supplemental data for this article can be accessed online at https://doi.org/10.1080/00365521.2022.2050292.

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parents. Our secondary aim was to describe any short-term changes in the well-being of children with screening-identified CD.

Methods

Study design and setting

Tissue-transglutaminase antibody (tTGA) screening for CD was conducted at the general pediatric outpatient clinic in Hisingen, Gothenburg, Sweden, between November 4, 2019, and March 26, 2020. The clinic provides non-acute pediatric care for a geographical area of some 36,000 children. In 2020, 3559 doctor's visits, including 113 (3.2%) related to CD follow-up, were held at the clinic; other common diagnostic groups were asthma and allergy, obesity, constipation, behavioral and mental disorders.

Briefly, children who after screening were confirmed positive for tTGA were included in a one-year structured follow-up program at Queen Silvia Children's Hospital, Gothenburg, Sweden, for workup of CD and monitoring possible changes in their symptoms and health-related quality of life (HRQoL) from baseline. During the study period, local guidelines required all pediatric CD in Gothenburg to be diagnosed at the Queen Silvia Children's Hospital (including non-biopsy verified CD diagnoses).

Study sample

Children aged 2 to 17 years, who visited the clinic for whatever reason during the study period, were eligible to participate (Figure 1, Flowchart). Patients were recruited by employees at the clinic and dedicated research personnel. Children with pre-existing CD diagnosis or type 1 diabetes (i.e., who are routinely screened for CD) were excluded from serological testing but could participate in study surveys. Swedish language proficiency was required to understand the study surveys and give informed consent.

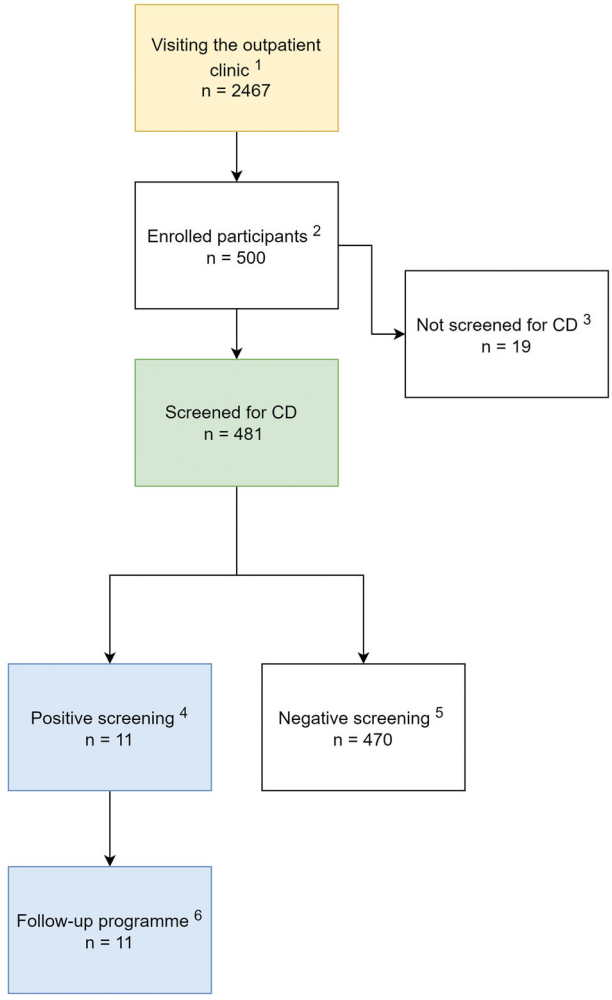

Figure 1. Flowchart of study formation. [1]In total, 2467 children visited the outpatient clinic between November 2019 and March 2020. [2]There were 500 children enrolled aged 2–17 years old. [3]Nineteen children with established celiac disease (CD) were excluded from the serological testing and participated with self-reported questionnaires. [4]A concentration of IgA-tTGA ≥7.0 U/mL or IgG-TGA ≥7.0 U/mL. [5]A concentration of IgA-tTGA <7.0 U/mL or of IgG-TGA <7.0 U/mL. [6]One-year follow-up consisted of four visits at Queen Silvia Children's Hospital in Gothenburg. Serological evidence of CD in 11 children (six boys and five girls).

Serological screening

Participating children were screened for CD using IgA-tTGA measurement by Fluorescence Enzyme Immunoassay (EliA Celikey, Thermo Fisher Scientific, Sweden) at Sahlgrenska University Hospital, Gothenburg, Sweden. Children indicated to have low IgA (<0.07 g/L) were tested for IgG-tTGA. Concentrations of IgA/IgG-tTGA ≥7 U/ml were considered positive [16]. Children positive for tTGA were re-tested two weeks later for confirmation.

Follow-up

Children with confirmed tTGA positivity were included in a one-year structured follow-up program for workup of CD lead by last author KM. The diagnostic process of CD was informed by national guidelines for CD (described below); we did not practice a 'watch and wait' approach to the children with positive tTGA screening. During follow-up, we repeatedly surveyed symptoms and HRQoL. Once CD was diagnosed, we monitored the adherence to the GFD. Supplementary Figure 1 depicts an overview of the collected data. The used questionnaires are described below.

Definition of outcomes

The primary outcome of the study was CD autoimmunity (CDA) defined as repeated tTGA positivity. Children screened negative for tTGA were referred to as non-CDA. The secondary outcome of our study was a clinical diagnosis of CD at the end of a one-year follow-up. Diagnosis of CD was made according to current Swedish national diagnostic guidelines [17]. Accordingly, the diagnosis of CD required either confirmation of small-intestinal villous atrophy or, in a non-biopsy approach, repeated tTGA levels above ten times the upper limit of normal (i.e., ≥70 U/ml) [7]. Although the national guidelines for CD are largely

compliant with the revised ESPGHAN criteria [7], they are adopted to the unavailability of endomysial antibody test in Sweden.

Questionnaire data

At enrollment, we retrieved questionnaire data on socio-demographic characteristics, past medical history of the participant and family and the reason for the visit (i.e., presenting complaint). Data were categorized as shown in Table 1. We surveyed the overall acceptance of the study, and children aged ≥8 years reported the pain from blood draw using a visual analog scale (VAS) ranging from 0 ('no pain at all') to 100 ('pain as bad as it could be'). Children aged ≥12 years (or ≥8 years for specific questionnaires [18–20] mainly answered the questionnaires themselves and otherwise with the support of their parents.

The following questionnaires were used in the study:

Gastrointestinal symptom rating scale (GSRS)

The 15-item GSRS questionnaire assesses the occurrence of gastrointestinal symptoms in the past week within the following five domains: 'Diarrhea', 'Indigestion', 'Constipation', 'Abdominal pain' and 'Reflux'. Each response ranges from 1 (no symptom) to 7 (most severe) forming sub-scores for each domain and a total score where higher scores indicate more severe symptoms [21,22]. While the GSRS was not specifically designed for CD it has been used in CD research [23,24], foremost on adult patients, and more occasionally in children and adolecents [25–27].

Celiac disease symptom index (CSI)

This 16-item disease-specific questionnaire evaluates CD-related symptoms using a 5-point Likert scale. In this study, four questions were selected from CSI to capture extra-intestinal symptoms such as headache, energy level, appetite, and overall health [28]. The CSI has been validated in adults [28], but not in children.

Kidscreen-27

KIDSCREEN-27 is a generic, self-reported, HRQoL instrument that has been extensively validated for children 8–18 years of various countries, including Sweden [18]. The questionnaire is grouped into five dimensions including 'Physical Wellbeing' (covering physical activity and energy), 'Psychological Wellbeing' (emotional balance and life satisfaction), 'Autonomy & Parent Relations' (relationship with parents and having age-appropriate freedom), 'Social Support & Peers' (friendships), and 'School Environment' (cognition and feelings about school). Each item was scored on a 5-point scale and summed by each dimension using a Rasch model [29,30]. As previously described [18], sub-scores were then transformed using country-specific T-values yielding a mean score of 50 (standard deviation [SD] 10) which defines normality for children 8–18 years (higher score = better HRQoL).

Celiac disease DUX (CDDUX)

This is a 12-item CD-specific HRQoL questionnaire using emoji-like smileys responses, ranging from 1 = 'very sad face' to 5 = 'very happy face'. The questionnaire has three dimensions: 'Communication' (including feelings when talking about the disease), 'Diet' (feelings about following a lifelong diet), and 'Having CD' (feelings when offered gluten-containing food). A higher score indicates better health [20,31]. The instrument has been validated for 8–18-year-olds [20,31].

Celiac dietary adherence test (CDAT)

We used the Swedish version of CDAT (CDAT-SWE) to assess GFD adherence of children diagnosed with CD [19,32]. The questionnaire consists of seven items on a 5-point Likert scale from which an additive score from 7 to 35 was calculated. Scores <13 indicate very good adherence, >17 indicate poor adherence, and scores of 13–17 are inconclusive [32]. The test has been validated for adults [32], but also used in children aged ≥12 years [19].

Statistical analyses

We estimated differences in baseline characteristics, surveyed symptoms, and HRQoL between children with vs. without CDA using Fisher's exact test, Chi-Square test, Mann-Whitney U-test, and Wilcoxon Signed-Rank test, as appropriate. We report means/medians, numbers and percentages of non-missing values. Missingness related to incomplete answered questionnaires. All significance tests were two-sided and conducted at the 5% significance level. SAS Version 9.4, (SAS Institute, Cary, NC, USA) was used for the statistical analyses. See Supplementary material, Power analysis.

Post-hoc analysis

In a post-hoc analysis, we used ANCOVA Tukey to adjust for child's age for differences in extra-intestinal manifestations of CSI, GSRS and KIDSCREEN-27 sub-scores of children with vs without CDA.

Ethics

This study was approved by the Swedish Ethical Review Authority (Dnr 2019-01950).

Informed consent was received from all participants.

Results

A total of 2467 children visited the outpatient clinic during the study period, out of whom approximately 2000, aged 2–17 years, were approached and 500 enrolled in the study (the exact number of children approached, and reason for non-participation was not documented). A total of 481 children were serologically screened for CD; the remaining 19 participants had a pre-existing CD diagnosis and were hence not screened (Figure 1, Flowchart). Three children (0.6%) had total IgA levels <0.07 g/L and were tested for IgG-tTGA. The

Table 1. Background characteristics of children with celiac disease autoimmunity (CDA), non-CDA and preexisting celiac disease (CD). Reported numbers, percentages and medians/means relate to non-missing values[a].

Variable	Total ($n = 500$)	CDA ($n = 11$)	Non-CDA ($n = 470$)	Preexisting CD ($n = 19$)
Age, median (min; max)[b]	8.8 (2.0; 17.9)	3.8 (3.1; 14.6)	8.8 (2.0; 17.9)	12.9 (3.6; 17.9)
Girls, *n* (%)	252/500 (50%)	5/11 (46%)	238/470 (51%)	9/19 (47%)
Accompanying parent				
Age [years], median (min; max)	41 (22; 79)	36 (27; 45)	40 (22; 79)	46 (32; 54)
University education, *n* (%)	313/494 (63%)	8/11 (73%)	290/464 (63%)	15/19 (79%)
Employed, *n* (%)	426/494 (86%)	9/11(82%)	399/464 (86%)	18/19 (95%)
Other parent				
Age [years], median (min; max)	42 (25; 78)	38 (31; 50)	42 (25; 78)	47.5 (31; 49)
University education, *n* (%)	248/467 (53%)	8/10 (80%)	232/443 (52%)	8/14 (57%)
Employed, *n* (%)	425/467 (91%)	8/10 (80%)	405/443 (91%)	12/14 (86%)
Parents living together	395/466 (85%)	10/10 (100%)	373/442 (84%)	12/14 (86%)
Birthplace of the participant				
Sweden, *n* (%)	464/490 (95%)	11/11(100%)	435/460 (95%)	18/19 (95%)
Other countries, *n* (%)	26/490 (5%)	0/11 (0%)	25/460 (5%)	1/19 (5%)
Birthplace of the biological mother				
Sweden, *n* (%)	343/490 (70%)	9/11 (82%)	320/460 (70%)	14/19 (74%)
Other countries, *n* (%)	147/490 (30%)	2/11 (18%)	140/460 (30%)	5/19 (26%)
Birthplace of the biological father				
Sweden, *n* (%)	325/487 (67%)	9/11 (82%)	301/457 (66%)	15/19 (79%)
Other countries, *n* (%)	162/487 (33%)	2/11 (18%)	156/457 (34%)	4/19 (21%)
Reason for the visit ('presenting complaint')				
Allergy, asthma, *n* (%)	137/392 (35%)	5/11 (45%)	129/365 (35%)	3/16 (19%)
Gastrointestinal symptoms, *n* (%)	92/392 (23%)	3/11 (27%)	79/365 (22%)	10/16 (63%)
Neurologic disorders (incl. headache), *n* (%)	30/392 (8%)	0/11 (0%)	30/365 (8%)	0/16 (0%)
Overweight and symptoms related to puberty or metabolism, *n* (%)	37/392 (9%)	0/11 (0%)	37/365 (10%)	0/16 (0%)
Respiratory tract infection, *n* (%)	18/392 (5%)	1/11 (9%)	17/365 (5%)	0/16 (0%)
Other, *n* (%)	78/392 (20%)	2/11(18%)	73/365 (20%)	3/16 (19%)
Past medical history[d]				
Abdominal pain, *n* (%)	185/492 (38%)	5/11 (45%)	168/462 (36%)	12/19 (63%)
Anemia, *n* (%)	18/493 (4%)	0/11 (0%)	15/463 (3%)	3/19 (16%)
Asthma, *n* (%)	146/493 (30%)	4/11 (36%)	138/463 (30%)	4/19 (21%)
Diarrhea or constipation, *n* (%)	149/493 (30%)	4/11 (36%)	140/463 (30%)	5/19 (26%)
Eczema, *n* (%)	120/493 (24%)	3/11 (27%)	113/463 (24%)	4/19 (21%)
Failure to thrive, *n* (%)	96/493 (19%)	1/11 (9%)	93/463 (20%)	2/19 (11%)
Food allergy[c], *n* (%)	91/493 (18%)	4/11 (36%)	78/463 (17%)	9/19 (47%)
Pollen allergies, *n* (%)	114/491 (23%)	4/11 (36%)	106/461 (23%)	4/19 (21%)
Psychological symptoms, *n* (%)	67/492 (14%)	0/11 (0%)	63/462 (14%)	4/19 (21%)
Respiratory tract infection, *n* (%)	59/492 (12%)	2/11 (18%)	56/462 (12%)	1/19 (5%)
Urinary tract infection, *n* (%)	40/492 (8%)	2/11 (18%)	35/462 (8%)	3/19 (16%)
Urticaria, *n* (%)	57/492 (12%)	2/11 (18%)	52/462 (11%)	3/19 (16%)
Other diseases, *n* (%)	289/492 (59%)	1/11 (9%)	276/462 (60%)	12/19 (63%)
Number of previous pediatric outpatient visits over the last year				
0, n /%)	23/492 (5%)	0/11 (0%)	21/462 (5%)	2/19 (11%)
1, *n* (%)	178/492 (36%)	5/11 (46%)	164/462 (35%)	9/19 (47%)
2, *n* (%)	125/492 (25%)	3/11(27%)	118/462 (26%)	4/19 (21%)
$\geq$3, *n* (%)	166/492 (34%)	3/11 (27%)	159/462 (34%)	4/19 (21%)
First-degree relative with autoimmune disease				
Celiac disease[e], *n* (%)	20/500 (4%)	1/11 (9%)	14/470 (3%)	5/19 (26%)
Type 1 diabetes, *n* (%)	17/500 (3%)	0/11 (0%)	17/470 (4%)	0/19 (0%)
Other autoimmune diseases[f], *n* (%)	110/500 (22%)	2/11 (18%)	104/470 (22%)	4/19 (21%)
Previously screened for CD antibodies, *n* (%)	95/470 (20%)	0/11 (0%)	95/459 (21%)	–
Weight and height				
Weight, mean SDS (SD)	0.2 (1.7)	−0.1 (1.0)	0.2 (1.8)	0.6 (1.3)
Height, mean SDS (SD)	−0.1 (1.3)	−0.2 (1.1)	−0.1 (1.3)	0.3 (1.2)

Data given as numbers and percentages of non-missing values (%), unless otherwise stated. Missingness relate to varying response rate between questions (i.e., incomplete answering of the questionnaires). Intergroup comparison for children with CDA, without CDA and preexisting CD was mostly not significant (most $p > .20$) except for a few variables that follow below. For pairwise comparison, Fisher's Exact test (2-sided) was used for dichotomous variables, Mantel-Haenszel Chi-Square test was used for ordered categorical variables, Chi-Square test was used for non-ordered categorical variables and Mann-Whitney U-test was used for continuous variables.

[a]Missing values were 0–13 except for 'other parent' and 'parents living together' with 33 and 34 missing, respectively, and 'Reason for the visit', i.e., the presenting complaint, with overall missing for 108 participants.

[b]$p = .001$ for CDA vs preexisting CD and $p = .002$ for non-CDA vs preexisting CD.

[c]$p = .01$ for non-CDA vs preexisting CD.

[d]Self-reported past medical history. 'Other diseases' include reports of liver disease, thyroid disease, rheumatic disease, overweight, developmental delay, headache, short stature, delayed puberty, neuropsychiatric conditions and fractures.

[e]$p < .0001$ for non-CDA vs preexisting CD.

[f]Other autoimmune diseases were psoriasis, liver, rheumatic and thyroid diseases.

SD: standard deviation, SDS = standard deviation score.

Table 2. Gastrointestinal and extra-intestinal symptoms in children with celiac disease autoimmunity (CDA), non-CDA and preexisting celiac disease (CD). Reported numbers, percentages and means relate to non-missing values[a].

Variable	Total ($n = 490$)[a]	CDA ($n = 11$)	Non-CDA ($n = 460$)[a]	Preexisting CD ($n = 19$)
GSRS, mean (SD)				
Total score	1.57 (0.66)	1.52 (0.45)	1.57 (0.64)	1.68 (1.05)
Diarrhea syndrome	1.50 (0.86)	1.64 (0.78)	1.48 (0.83)	1.70 (1.44)
Indigestion syndrome	1.75 (0.93)	1.52 (0.66)	1.74 (0.93)	1.89 (1.14)
Constipation syndrome	1.67 (1.06)	1.91 (0.97)	1.66 (1.05)	1.81 (1.42)
Abdominal pain syndrome	1.69 (0.91)	1.45 (1.01)	1.70 (0.90)	1.75 (1.15)
Reflux syndrome	1.27 (0.67)	1.09 (0.30)	1.27 (0.67)	1.24 (0.81)
Selected items from CSI, *n* (%)				
Low energy level				
None of the time	228/490 (47%)	6/11 (55%)	217/460 (47%)	5/19 (26%)
A small part of the time	135/490 (28%)	2/11 (18%)	126/460 (27%)	7/19 (37%)
Some/most/All of the time	127/490 (26%)	3/11 (27%)	117/460 (25%)	7/19 (37%)
Headache				
None of the time	295/490 (60%)	10/11 (91%)	276/460 (60%)	9/19 (47%)
A small part of the time	121/490 (25%)	1/11 (9%)	111/460 (24%)	9/19 (47%)
Some/most/All of the time	74/490 (15%)	0/11 (0%)	73/460 (16%)	1/19 (5%)
Loss of appetite				
None of the time	278/490 (57%)	7/11 (64%)	260/460 (57%)	11/19 (58%)
A small part of the time	105/490 (21%)	1/11 (9%)	101/460 (22.0%)	3/19 (16%)
Some/most/all of the time	107/490 (22%)	3/11 (27%)	99/460 (22%)	5/19 (26%)
Health overall				
Poor/terrible	15/490 (3%)	0/11 (0%)	14/460 (3.0%)	1/19 (5%)
Fair	102/490 (21%)	4/11 (36%)	95/460 (21%)	3/19 (16%)
Good	213/490 (43%)	5/11 (45%)	196/460 (43%)	12/19 (63%)
Excellent	160/490 (33%)	2/11 (18%)	155/460 (34%)	3/19 (16%)

Data from the Gastrointestinal Symptom Rating Scale (GSRS), where a low score indicates fewer gastrointestinal symptoms, and four items from Celiac symptom index (CSI) on extra-intestinal symptoms. The GSRS domains and total score range from 1 (no symptom) to 7 (most severe). There were no differences between children with CDA, without CDA and preexisting CD (all $p > 0.10$) except in CSI where children with non-CDA and preexisting CD reported more often headache the past four weeks ($p = .05$ and $p = .02$). For pairwise comparison between groups, Fisher's Exact test (2-sided) was used for dichotomous variables, Mantel-Haenszel Chi-Square test was used for ordered categorical variables, Chi-Square test was used for non-ordered categorical variables and the Mann-Whitney U-test was used for continuous variables.
[a]Missing data, $n = 10$ (all within the non-CDA group of children) due to non-response to GSRS and CSI.
SD: standard deviation.

Table 3. Health-related quality of life (HRQoL) using KIDSCREEN-27 in children with celiac disease autoimmunity (CDA), non-CDA and pre-existing celiac disease (CD). Reported means/medians relate to non-missing values[a].

Kidscreen-27 dimension:	CDA ($n = 11$) Mean (SD)	Non-CDA ($n = 460$)[a] Mean (SD)	Preexisting CD ($n = 19$) Mean (SD)
Physical Wellbeing	51.6 (13.8)	49.2 (10.5)	45.2 (8.2)
Psychological Wellbeing	51.8 (7.9)	51.6 (10.0)	48.7 (9.7)
Parents and Autonomy	58.6 (11.6)	55.8 (9.9)	54.3 (8.4)
Social support and Peers	52.4 (9.4)	51.7 (10.7)	51.0 (6.7)
School Environment	60.0 (11.3)	55.1 (10.0)	53.8 (6.7)
Total score, median (min; max)	119 (89; 132)	114 (63; 135)	108 (92; 128)

Displayed KIDSCREEN-27 sub-scores have been transformed into T-scores were a mean (standard deviation, SD) of 50 ± 10 defines normality for European children aged 8–18 years. A higher score indicates a higher HRQoL.
There were no significant differences between children with CDA, without CDA and preexisting. All P-values >0.10 except for comparison between CDA and preexisting CD for 'school environment' ($p = .08$). Mann-Whitney U-test was used for intergroup comparison. Due to internal attrition, total score was only estimated for ten participants with CDA.
[a]Missingness relate to varying response rate between questions in each dimension with missing values in 10–16 of non-CDA children and one ($n = 1$) missing in 'School environment' dimension of CDA children.

majority preferred capillary blood sampling (64%) rather than venous blood sampling. The mean VAS pain score at blood draw was 26 (SD 21) (median 20, range 0–100). Participants reported being overall satisfied with their participation in the study (See Supplementary Table 1).

Screening-detected celiac disease autoimmunity and pre-existing celiac disease

Eleven screened children had persistent tTGA-positivity (i.e., CDA) and 470 children were tTGA negative (non-CDA). No children had transient tTGA positivity at screening (i.e., one positive and one negative test). Most of the children with a pre-existing CD diagnosis ($n = 14/19$, 74%) reported that their diagnostic workup had been initiated due to symptoms of disease which, on average, had been present one year before diagnosis. Almost half of the children had a biopsy-verified CD diagnosis ($n = 9/19$, 47%), and the remaining a serology-based, diagnosis.

Background characteristics at screening

The median age was 8.8 years (range, 2.0–17.9) for all participants, 3.8 years (3.1–14.6) for children with CDA, and 8.8 years (2.0–17.9) for children without CDA ($p < .01$). Half of the participants were girls and there was comparable

ethnicity, autoimmune heredity, parental educational level, and parental employment rate between children with CDA and non-CDA (Table 1). Overall, asthma and allergy (35%) followed by gastrointestinal symptoms (23%) were the most common reasons (i.e., presenting complaint) for attending the pediatric outpatient clinic, with no major differences reported between children with vs. without CDA (Table 1, all $p > .20$). Only three of eleven children with CDA reported gastrointestinal symptoms as their main reason for the visit. Most of the participants (60%) had two or more previous visits over the last 12 months; all children with screening-identified CDA had during the same period at least one previous visit (Table 1).

Gastrointestinal and extra-intestinal symptoms at screening

Generally, the participants experienced minor gastrointestinal symptoms that were similar both in overall severity, and across the five dimensions of GSRS for children with vs. without CDA (all $p > .10$). Also surveyed extra-intestinal symptoms were largely similar between groups (Table 2). Most children reported their overall health as 'good' or 'excellent' (CDA, $n = 7/11$ [63%], non-CDA, $n = 351/460$ [77%]; Table 2). *P*-values adjusted for age were largely unchanged and remained non-significant for differences in GSRS sub-scores and extra-intestinal symptoms of CDA vs non-CDA children (all $p \geq .34$).

Health-related quality of life at screening

Using the generic HRQoL-questionnaire KIDSCREEN-27, overall HRQoL was similar for children with vs. without CDA (median total score, CDA = 119, and non-CDA = 114; $p = .44$). The sub-scores of all five domains had T-values around or above 50, indicating a good HRQoL (Table 3) with no significant differences between CDA and non-CDA children in any of the five dimensions. For instance, the sub-score of psychological well-being was 51.8 in children with CDA and 51.6 in children without CDA ($p = .82$). Age-adjusted *P*-values remained essentially unchanged and non-significant for differences in KIDSCREEN-27 sub-scores of CDA vs non-CDA children (e.g., $p = .85$ for sub-score of psychological well-being).

One-year follow-up program: celiac investigation and monitoring of well-being

Of 11 children with serological evidence of CD, eight were diagnosed with CD: four had repeated tTGA test above ten times the upper limit of normal, and four had villous atrophy (i.e., Marsh 3) at small-intestinal biopsy. Three children were not diagnosed with CD, two because of spontaneous normalization of tTGA during follow-up, and one child, who remained tTGA positive, had normal mucosa at small-intestinal biopsy; none of the children were reported to have lowered their gluten intake during CD investigation. Supplementary Table 2 details clinical data from the CD investigation of children with CDA. Three out of eight children diagnosed with CD had prior to screening reported symptoms or signs which according to ESPGHAN guidelines should have prompt testing for CD [7]. Participants with CDA were overall satisfied with study participation (data not shown).

During the one-year follow-up, children with screening-detected CDA experienced no major changes in symptoms compared to baseline (See Supplementary Table 3). Furthermore, the children reported during follow-up no significant changes in their overall and dimensional sub-scores of HRQoL as measured by KIDSCREEN-27 (Change in overall median score 1.0 [−21;28], $p = .75$; Supplementary Table 3). At the end of one-year follow-up, children diagnosed with CD had a mean CDDUX (CD-specific) HRQoL-score of 3 (indicated by a 'neutral face'-emoji). However, four of the children reported difficulties ('sad' or 'very sad faces') specifically for 'not being able to eat like other people' and 'thinking about gluten-containing food' (Supplementary Figure 2). The mean CDAT adherence score after CD diagnosis was 10 (range, 6–15), indicating 'very good adherence'.

Discussion

This study shows that screening for CD is feasible in a general pediatric outpatient setting. We found that 11 of 481 (2.3%) screened children had serological evidence of CD, out of whom eight fulfilled diagnostic criteria for CD during follow-up. No major differences in symptoms and HRQoL were observed between children with vs. without serological positivity at screening, nor did we observe major changes in symptoms and HRQoL among screening-positive children after CD diagnosis and installation of GFD. Notably, only three out of eight children with screening-identified CD met current criteria for CD case finding (e.g., gastrointestinal symptoms).

To our knowledge, this is one of the first European screening programs for CD incorporated into a pediatric outpatient clinic. Compared to universal, population-based screening, our approach benefits from an existing infrastructure for a blood draw, analyses, and follow-up of screening results. There are also ethical differences between universal screening and screening of patients seeking healthcare who already expect workup for their symptoms or medical condition [9]. Aptly called 'the great pretender', CD may show up masked as many childhood conditions. On the other hand, at best, our approach would only identify those who seek healthcare. Furthermore, in settings without accessible healthcare, such an approach may cause ethical concerns as it may bring more benefits for those with better socio-economic status. From an ethical perspective it is also noteworthy that three out of eleven screening-positive children in this study were eventually not diagnosed and thus had an unnecessary workup.

Strengths and limitations

A strength of this study derives from using validated and extensively researched questionnaires, such as the generic HRQoL-questionnaire KIDSCREEN-27 [18]. Validated questionnaires ensure high-quality data that are comparable, both longitudinally for a specific participant and across studies. However, as CSI and GSRS have only been validated in adults [23,24,28], their use in children should be more cautiously interpreted. Our detailed data on background characteristics are additional strengths. Finally, a structured one-year follow-up of screening-positive children allowed us to establish the diagnosis of CD. While we described major short-term changes in the well-being during workup and post-diagnosis, it was beyond the scope of this study to determine the effect of CD diagnosis and GFD treatment on the asymptomatic child in general.

A limitation of this study was its small sample size ($n = 500$); due to internal attrition (incomplete answered questionnaires) the actual number of included participants was in some analyses even lower. Our sample size meant a risk of committing a type-2 error (i.e., to erroneously accept a false null hypothesis). While our results did not indicate major differences in symptoms and HRQoL between children with vs. without screening-detected CDA, our limited sample size and wide age distribution prevents us from ruling out such differences in specific age-groups of children [18,20,33].

In this study CD was diagnosed based on national diagnostic guidelines. In contrast with ESPGHAN 2020 criteria requiring positive endomysial antibodies for a non-biopsy CD diagnosis [7], the Swedish guidelines [17], due to an unavailability of endomysial antibody tests, allow for a non-biopsy CD diagnosis using repeated tTGA tests above ten times the upper limit of normal. While some reports have indicated that a tTGA-based strategy alone may be predictive of CD even without biopsy [34], we acknowledge that serology strategies beyond ESPGHAN 2020 need to be more carefully evaluated to be fully evidence based [35].

Lastly, even though the participants generally reported few worries regarding screening, and were satisfied with screening and follow-up, only around one in four of those invited for screening agreed to participate in the study. Although the reason for non-participation was not documented, the low participation rate may indicate a lack of awareness of pauci-symptomatic CD and the potential benefits of early detection. It is also possible that a simplified screening process, e.g., expedited consent and information retrieval, could increase the participation rate. Due to lack of data, it is unknow if patient characteristics differed between those included vs. not included in the study. For example, we cannot rule out that the genetic risk of CD (e.g., CD hereditability) may have been higher among those included vs. not included in the study.

Interpretation of findings and previous literature

In this study, 2.3% ($n = 11/481$) of children had serological evidence of CD, a prevalence which is similar to the 2.1% undiagnosed CD reported in a population-based study of Swedish 12-year-olds born during the so-called 'Swedish CD epidemic' (1984–1996), characterized by a high incidence of CD in early life [2]. The prevalence of undetected CD has seemed to be somewhat lower (1.6%) in Swedish children born after the 'epidemic' (1997) [36].

While firm conclusions are hampered by our small sample size, one could have expected a higher underlying CD prevalence in our healthcare setting, where children with CD-related autoimmune conditions (e.g., thyroiditis [37] should be more prevalent compared to the average Swedish population. In adults, the prevalence of undiagnosed CD in primary care settings have been reported to be between 1% (USA and United Kingdom) and 2% (Finland) [11,13,14], and around 3% in secondary care settings [12].

Gastrointestinal symptoms

Overall, participants experienced few gastrointestinal symptoms, although one in four reported such symptoms as their presenting complaint to seek outpatient care. The mean GSRS score was very similar between the children with CDA and without CDA. This finding aligns with previous pediatric studies suggesting that symptoms, including gastrointestinal manifestations, are poor predictors of undiagnosed CD [2,38–40]. Similar findings have been reported in adults with screening-detected CD [11,14].

The overall few symptoms reported at the time of screening may, as indicated by previous works [41], also explain why we did not detect major changes in gastrointestinal or extra-intestinal symptoms related to CD during follow-up.

Health-related quality of life

In our study, the HRQoL measured by the KIDSCREEN-27 questionnaire was similar in children with and without CDA/CD. These results are in accordance with several previous studies indicating that individuals with few symptoms have not or only slightly decreased HRQoL [42–44]. While a formal interaction analysis between HRQoL and symptom score was outside the scope of this study, it is conceivable that the similar HRQoL of CDA and non-CDA groups of children might be explained by the overall few symptoms of this population. Some children may even be accustomed to their condition and not realizing that they have symptoms [42,45].

While some follow-up studies after CD screening have shown an improvement of HRQoL, particularly for children who were symptomatic at the time of diagnosis [44], others have instead shown a reduced HRQoL after diagnosis, follow-up, and installation of GFD [20,46]. Yet other studies have [43,47], similar to our results, found no change on HRQoL during follow-up after CD screening. Similar to above, it is possible that a change in HRQoL after CD screening is directly related to symptom severity at CD diagnosis [44].

Finally, we found children with screening-detected CD to have a good adherence to GFD. Although our data were based on few children, similar findings have been noted in other screening studies for CD [24,45,48].

Conclusions

This study showed that non-targeted screening for CD was feasible in a general pediatric outpatient setting. While hampered by a small sample size, our results are in line with previous studies indicating that symptoms do not differentiate CDA from non-CDA children. Also, among an overall minimal-symptomatic group of children, diagnosing CD and installation of treatment did not significantly change their well-being during one-year follow-up. Therefore, larger-scale studies are needed to determine the diagnostic yield, benefits and cost-effectiveness of CD screening more precisely within real-world clinical settings.

Acknowledgments

The screening approach was developed according to advice from Dr Marian Rewers who has initiated the Autoimmunity Screening for Kids (ASK) program at Barbara Davis Center for Diabetes, CO, USA. The authors are grateful to all families participating in this study and for the support from the personnel at the Hisingen general pediatric outpatient clinic in Gothenburg, Sweden.

Author contributions

Karl Mårild conceptualized and designed the study as well as acquired the data. Statistics were done by Henrik Albrektsson. Sunna Gunnarsdottir wrote the first version of the manuscript. Karl Mårild, Jenny M. Kindblom, Nicolae Miron, Julia Frydebo and Ketil Størdal critically revised the manuscript. Karl Mårild supervised the project and takes responsibility for the integrity of the data. All authors contributed to the interpretation of the data and approved the final manuscript as submitted.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The study was supported by a grant to investigator Karl Ma˚rild from the Swedish state under the agreement between the Swedish government and the country councils, the ALF-agreement [ALFGBG-771121], the regional board of healthcare in Region Västra Götaland [Dnr 845681] and The Swedish Society of Medicine [Dnr SLS-875781 and SLS-877851]. The funders had no role in the design and conduct of the study or the management and interpretation of the data.

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Data availability statement

According to the Ethical approval for this study data cannot be shared. www.clinicaltrial.gov, identification number: NCT03966625.

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