Nutrition Assessment, Interventions, and Monitoring for Patients with Celiac Disease: An Evidence Analysis Center Scoping Review

Feon W. Cheng, PhD, MPH, RDN, CHTS-CP; Deepa Handu, PhD, RD, LDN

ABSTRACT

The objectives of this scoping review were to identify and characterize studies examining nutrition assessment, interventions, and measures to monitor gluten-free diet (GFD) adherence/compliance in patients with celiac disease (CD). An electronic literature search of four databases (Cochrane Database for systematic reviews, CINAHL, Embase, and Ovid MEDLINE) was conducted to identify articles examining nutrition care in CD individuals. Except for narrative review, grey literature, and case study/report, all types of peer-reviewed articles published between January 2007 and August 2018 were eligible. There were a total of 10,823 records; 10,368 were excluded during the first round of screening due to irrelevancy and/or duplication. Of the 455 full-text articles that were assessed, 292 met the criteria and were included. Most of the studies were observational studies (n=212), followed by experimental trials (n=50), evidence-based practice guideline (EBPG)/report/statement (n=16), and systematic review (SR) (n=14). Nine original studies examined assessment, focusing mainly on different tools/ways to assess GFD adherence. The majority of the included original articles (n=235) were in the nutrition intervention category with GFD, oats, and prebiotics/probiotics as the top-three most studied interventions. There were eight SRs on GFD and five on oats. One SR and 21 original studies investigated the effectiveness of different measures to monitor GFD adherence/compliance. Although recent CD EBPGs were identified, different methods with varying levels of rigor, in terms of literature search and assessment of evidence strength, were used. Based on this scoping review, interventions focused on gluten-free diet and oats have been significantly covered by either SRs or EBPGs. Studies related to prebiotics/probiotics and education program/counseling focused interventions, as well as assessment, in CD patients have increased in recent years. Thus, it might be beneficial to conduct SRs/EBPGs focused on these topics to guide practitioners.

J Acad Nutr Diet. 2020;120(8):1381-1406.

CELIAC DISEASE (CD) IS defined as "a small intestinal immune-mediated enteropathy" triggered by gluten ingestion in genetically predisposed individuals.[1] Serologic tests (eg, anti-tissue transglutaminase antibodies, endomysial antibodies, and deamidated gliadin peptide antibodies), intestinal biopsies, and sometimes genetics tests are used as part of the diagnostic process to confirm CD.[2] This condition affects approximately 1% of the population, with slight prevalence differences among countries.[3] Currently, the most effective treatment for CD is a lifelong gluten-free diet.[4,5] Among those with this disease, higher compliance to a gluten-free diet is associated with better health outcomes (eg, returning to normal growth/development in children and fewer complications).[2] However, adhering to this type of restrictive diet is often challenging, and it also can contribute to potential nutrition imbalance (eg, micronutrients deficiency).[6] Therefore, nutrition care is crucial for individuals with CD and registered dietitian nutritionists can play an important role at each step of the Nutrition Care Process from nutrition assessment to nutrition monitoring and evaluation to improve the health of those patients.

In 2009, the Evidence Analysis Library (EAL) at the Academy of Nutrition and Dietetics published a guideline on CD. It included recommendations for nutrition assessment, nutrition intervention, and nutrition monitoring and evaluation—all based on systematic reviews.[7] Because the last guideline was 10 years ago, the EAL set out to update its current guideline to incorporate any new evidence from the past 10 years. Thus, the first step of the process is to conduct a scoping review to investigate and map out the availability of new literature. Similar to a systematic review, a scoping review follows the same methodological rigor (eg, performing a comprehensive literature search in various databases); the only difference is that a scoping review does not evaluate the methodological quality of the included studies.[8] That is because the purpose of a scoping review is for researchers to evaluate whether or not there is enough evidence (or in which area) to undertake systematic reviews and/or evidence-based practice guidelines, and also to see whether there are recent systematic reviews or guidelines with similar scope and methodological rigor that could potentially be adapted or recommended.[8]

Therefore, the aim of this scoping review was to identify and characterize studies examining the validity and reliability of nutrition assessment methods, nutrition interventions, and tools/measures to monitor gluten-free diet adherence/compliance among individuals with CD. This resulted in three research questions for this scoping review:

1. In individuals with CD, what is the availability of the literature

2212-2672/
https://doi.org/10.1016/j.jand.2019.09.019
Available online 14 January 2020

Cochrane Database for systematic reviews [August 29, 2018]
#1 celiac* or coeliac*
#2 (toxicity or inulin or (Photon Absorptiometry or dexa) or skinfold* or (body next composition) or (arsenic* or heavy metal*) or (nutrition* or diet* or feed* or eating or malnutrition*) or (probiotic* or prebiotic* or microbial supplement or vitamin* or micronutrient or B vitamins or folate or niacin or B12 or riboflavin or calcium or iron or zinc or magnesium or fiber or protein* or grain* or seed* or starch* or cereal or gliadin* or glutenin*) or (gluten* or oat or Avena or wheat or Triticum or rye or Secale or barley or Hordeum or triticale or kamut or spelt or semolina or durum))
#3 #1 and #2
#4 accession near2 pubmed
#5 accession near3 embase
#6 #3 not (#4 or #5)
Hits: 97
CINAHL (ebsco)
(MH "Celiac Disease+") OR TI ((celiac* or coeliac*)) OR AB ((celiac* or coeliac*))
AND
((MH "Gluten") OR (MH "Diet, Gluten-Free") or (MH "Micronutrients")) OR ((MH "Dietary Fiber") OR (MH "Cereals+") OR (MH "Dairy Products+") OR (MH "Dietary Fats+") OR (MH "Calcium, Dietary") OR (MH "Bread") OR (MH "Nutrients+") OR (MH "Nuts+") OR (MH "Seeds+")) OR ((MH "Skinfold Thickness") OR (MH "Body Composition+") OR (MH "Metals, Heavy+") OR (MH "Diet+") OR (MH "Malnutrition") OR (MH "Nutrition+") OR (MH "Eating") OR (MH "Probiotics") OR (MH "Prebiotics") OR (MH "Vitamins+") or (MH "Absorptiometry, Photon")) OR TI (toxicity or inulin or (Photon Absorptiometry or dexa) or skinfold* or (body n1 composition) or (arsenic* or heavy metal*) or (nutrition* or diet* or feed* or eating or malnutrition*) or (probiotic* or prebiotic* or microbial supplement or vitamin* or micronutrient or B vitamins or folate or niacin or B12 or riboflavin or calcium or iron or zinc or magnesium or fiber or protein* or grain* or seed* or starch* or cereal or gliadin* or glutenin*) or (gluten* or oat or Avena or wheat or Triticum or rye or Secale or barley or Hordeum or triticale or kamut or spelt or semolina or durum)) OR AB (toxicity or inulin or (Photon Absorptiometry or dexa) or skinfold* or (body n1 composition) or (arsenic* or heavy metal*) or (nutrition* or diet* or feed* or eating or malnutrition*) or (probiotic* or prebiotic* or microbial supplement or vitamin* or micronutrient or B vitamins or folate or niacin or B12 or riboflavin or calcium or iron or zinc or magnesium or fiber or protein* or grain* or seed* or starch* or cereal or gliadin* or glutenin*) or (gluten* or oat or Avena or wheat or Triticum or rye or Secale or barley or Hordeum or triticale or kamut or spelt or semolina or durum))
Hits: 1,859
Embase [August 20, 2018]
1. exp CELIAC DISEASE/
2. (celiac* or coeliac*).ti,ab.
3. 1 or 2
4. (nutrition* or diet* or feed* or eating or malnutrition*).ti,ab.
5. exp DIET/
6. exp nutritional therapy/ or exp diet therapy/
7. exp MALNUTRITION/
8. exp Eating/
9. exp FEEDING BEHAVIOR/
10. exp Gluten/
(continued on next page)

Figure 1. Search strategy for the celiac disease scoping review.

11. exp dietary fiber/
12. (probiotic* or prebiotic* or microbial supplement or vitamin* or micronutrient or B vitamins or folate or niacin or B12 or riboflavin or calcium or iron or zinc or magnesium or fiber or protein* or grain* or seed* or starch* or cereal or gliadin* or glutenin*).ti,ab.
13. exp STARCH/
14. (gluten* or oat or Avena or wheat or Triticum or rye or Secale or barley or Hordeum or triticale or kamut or spelt or semolina or durum).ti,ab.
15. exp plant seed/
16. exp VITAMIN/
17. exp carbohydrate diet/
18. exp trace element/
19. exp probiotic agent/
20. exp MINERAL/
21. exp heavy metal/
22. exp ARSENIC/
23. exp Body Composition/
24. (arsenic* or heavy metal*).ti,ab.
25. (body adj1 composition).ti,ab.
26. bioelectrical impedance analysis.ti,ab.
27. exp impedance/
28. exp SKINFOLD THICKNESS/
29. skinfold*.ti,ab.
30. exp photon absorptiometry/
31. (Photon Absorptiometry or dexa).ti,ab.
32. exp toxicity testing/
33. toxicity.ti,ab.
34. exp INULIN/
35. inulin.ti,ab.
36. or/4-35
37. 3 and 36
38. animals/ not humans/
39. 37 not 38
40. (random$ or placebo$ or single blind$ or double blind$ or triple blind$).ti,ab.
41. RETRACTED ARTICLE/
42. (animal$ not human$).sh,hw.
43. (book or conference paper or editorial or letter or review).pt. not exp randomized controlled trial/
44. (random sampl$ or random digit$ or random effect$ or random survey or random regression).ti,ab. not exp randomized controlled trial/
(continued on next page)

Figure 1. *(continued)* Search strategy for the celiac disease scoping review.

45. (40 or 41) not (42 or 43 or 44)
46. exp cohort analysis/ or exp longitudinal study/ or exp prospective study/ or exp follow up/ or cohort$.tw. or exp case control study/ or (case$ and control$).tw.
47. exp review/ or exp meta analysis/
48. exp Systematic Review/
49. (literature adj3 review$).ti,ab.
50. (medline or medlars or embase or pubmed or cinahl or amed or psychlit or psyclit or psychinfo or psycinfo or scisearch or cochrane).ti,ab.
51. (47 or 48 or 49) and (50 or 41)
52. (systematic$ adj2 (review$ or overview)).ti,ab.
53. (meta?anal$ or meta anal$ or meta-anal$ or metaanal$ or metanal$).ti,ab.
54. 39 and (51 or 52 or 53 or 45 or 46)
55. limit 54 to (english language and yr="2007 -Current")
Hits: 5465
Medline ovid [July 28, 2018]
1. exp CELIAC DISEASE/
2. (celiac* or coeliac*).ti,ab.
3. 1 or 2
4. (nutrition* or diet* or feed* or eating or malnutrition*).ti,ab.
5. exp DIET/
6. exp NUTRITION THERAPY/ or exp NUTRITION ASSESSMENT/
7. exp MALNUTRITION/
8. exp Eating/
9. exp FEEDING BEHAVIOR/
10. exp Glutens/
11. animals/ not humans/
12. (probiotic* or prebiotic* or microbial supplement or vitamin* or micronutrient or B vitamins or folate or niacin or B12 or riboflavin or calcium or iron or zinc or magnesium or fiber or protein* or grain* or seed* or starch* or cereal or gliadin* or glutenin*).ti,ab.
13. exp STARCH/
14. (gluten* or oat or Avena or wheat or Triticum or rye or Secale or barley or Hordeum or triticale or kamut or spelt or semolina or durum).ti,ab.
15. exp seeds/
16. exp VITAMINS/
17. exp dietary carbohydrates/ or exp dietary fiber/ or exp starch/
18. exp micronutrients/ or vitamins/
19. exp Probiotics/
20. exp MINERALS/
(continued on next page)

Figure 1. *(continued)* Search strategy for the celiac disease scoping review.

21. Metals, Heavy/
22. exp ARSENIC/
23. exp Body Composition/
24. (arsenic* or heavy metal*).ti,ab.
25. (body adj1 composition).ti,ab.
26. bioelectrical impedance analysis.ti,ab.
27. exp Electric Impedance/
28. exp SKINFOLD THICKNESS/
29. skinfold*.ti,ab.
30. exp Absorptiometry, Photon/
31. (Photon Absorptiometry or dexa).ti,ab.
32. exp TOXICITY TESTS/
33. toxicity.ti,ab.
34. exp INULIN/
35. inulin.ti,ab.
36. or/4-35
37. 3 and 36
38. animals/ not humans/
39. 37 not 38
40. randomized controlled trial.sh.
41. controlled clinical trial.pt.
42. randomized controlled trial*.sh.
43. random allocation.sh.
44. double blind method.sh.
45. single blind method.sh.
46. clinical trial.pt.
47. exp Clinical Trial/
48. (clinical* adj25 trial*).ti,ab.
49. ((singl* or doubl* or trebl* or tripl*) adj25 (blind* or mask*)).ti,ab.
50. placebos.sh.
51. Placebo*.ti,ab.
52. random*.ti,ab.
53. research design.sh.
54. comparative study.sh.
55. exp evaluation studies/
56. follow up studies.sh.
57. prospective studies.sh.
(continued on next page)

Figure 1. *(continued)* Search strategy for the celiac disease scoping review.

58. (control* or prospectiv* or volunteer*).ti,ab.
59. exp cohort studies/
60. cohort*.tw.
61. controlled clinical trial.pt.
62. epidemiological methods/
63. limit 62 to yr=1971-1988
64. exp case-control studies/
65. (case adj2 control*).tw.
66. (review or review,tutorial or review, academic).pt.
67. meta-analysis.pt.
68. meta-analysis.sh.
69. (meta-analys$ or meta analys$ or metaanalys$).tw,sh.
70. (systematic$ adj5 review$).tw,sh.
71. "Cross-Sectional Studies"/ or cross sectional.ti,ab.
72. exp Regression Analysis/ or Regression analyses.ti,ab.
73. exp "Surveys and Questionnaires"/
74. (survey* or questionnaire*).ti,ab.
75. exp Regression Analysis/ or (Regression adj1 analyses).ti,ab.
76. or/40-75
77. 39 and 76
78. limit 77 to (english language and yr="2007 -Current")
Hits: 3389
Total hits: 10,810

Figure 1. *(continued)* Search strategy for the celiac disease scoping review.

examining the validity and reliability of nutrition assessment methods?

2. In individuals with CD, what is the availability of the literature examining the effects of different nutrition interventions on nutrition-related health outcomes?
3. In individuals with CD, what is the availability of the literature examining the effectiveness of various tools/measures to monitor gluten-free diet adherence/compliance?

Before the start to this scoping review, the authors searched PROSPERO,[9] an international database of prospective systematic reviews in health and other fields, using the terms *celiac* and *coeliac* to identify any potential scoping review with similar scope, but none were identified. There were a few systematic review protocols registered on PROSPERO that may be relevant, and these protocols will be highlighted in the discussion section.

PROTOCOL

This scoping review used and adapted the methodological framework from the works of Arskey and O'Malley,[10] Levac and colleagues (updated version),[8] and the Joanna Briggs Institute,[11] and also followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews checklist.[12]

Search Strategy and Study Selection

An electronic literature search of four databases—Cochrane Database for systematic reviews, CINAHL (EBSCO), Embase, and Ovid MEDLINE—was conducted in July/August 2018 by a medical librarian using a combination of search terms (Figure 1). The *a priori* eligibility criteria were categorized based on the population, concept, and context mnemonic, as recommended by the Joanna Briggs Institute.[11] The population of this scoping review included any individuals with CD, with no limit on age or sex. The concept related to nutrition care based on the Nutrition Care Process framework[13] (eg, nutrition assessment, intervention, and monitoring). To increase the breadth of this scoping review, the context was left open so evidence could be from any context (eg, setting or geographical locations). Because it is not necessary to specify outcomes for a scoping review,[11] that was left open as well.

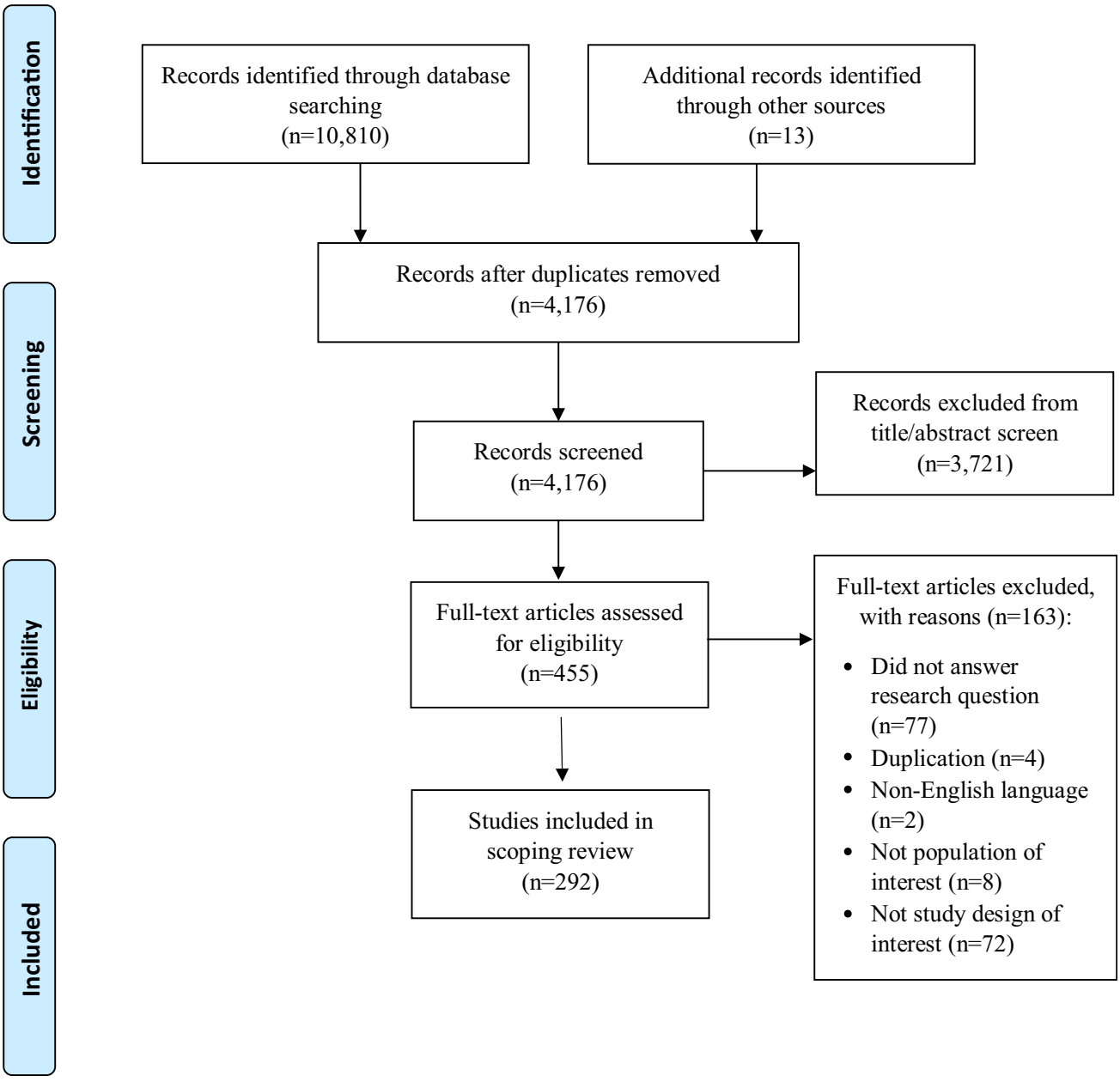

Figure 2. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram: Celiac disease scoping review.

While a scoping review is broad in nature, it is also important to balance with the availability of resources. Because the goal of this scoping review was to help provide a better direction (eg, whether there is a need/adequate evidence, and/or in which area) when updating the Celiac Disease Guideline[7] by the Academy of Nutrition and Dietetics, the search was limited to any relevant guidelines, consensus statements, recommendations, clinical updates, technical reports, systematic reviews/meta-analysis, experimental trials, and observational studies that were published in English and between 2007 (the literature search for the last CD guideline[7] by the Academy of Nutrition and Dietetics ended in January 2007) and 2018.

For the purpose of this scoping review, guidelines, consensus statements, recommendations, clinical updates, and technical reports published before 2007 were also included in this scoping review to provide better understanding of the breadth and depth of the existing ones that were completed by different organizations. Only the most updated version was included. For example, the American Gastroenterological Association published a technical review on diagnosis and management of CD in 2001 and an update in 2006, only the 2006 version[14] was included.

Data Extraction and Evidence Mapping

Search results were uploaded to Rayyan,[15] an abstract screening web tool, and screened by EAL staff. After title/abstract and full-text articles screening, information (eg, publication

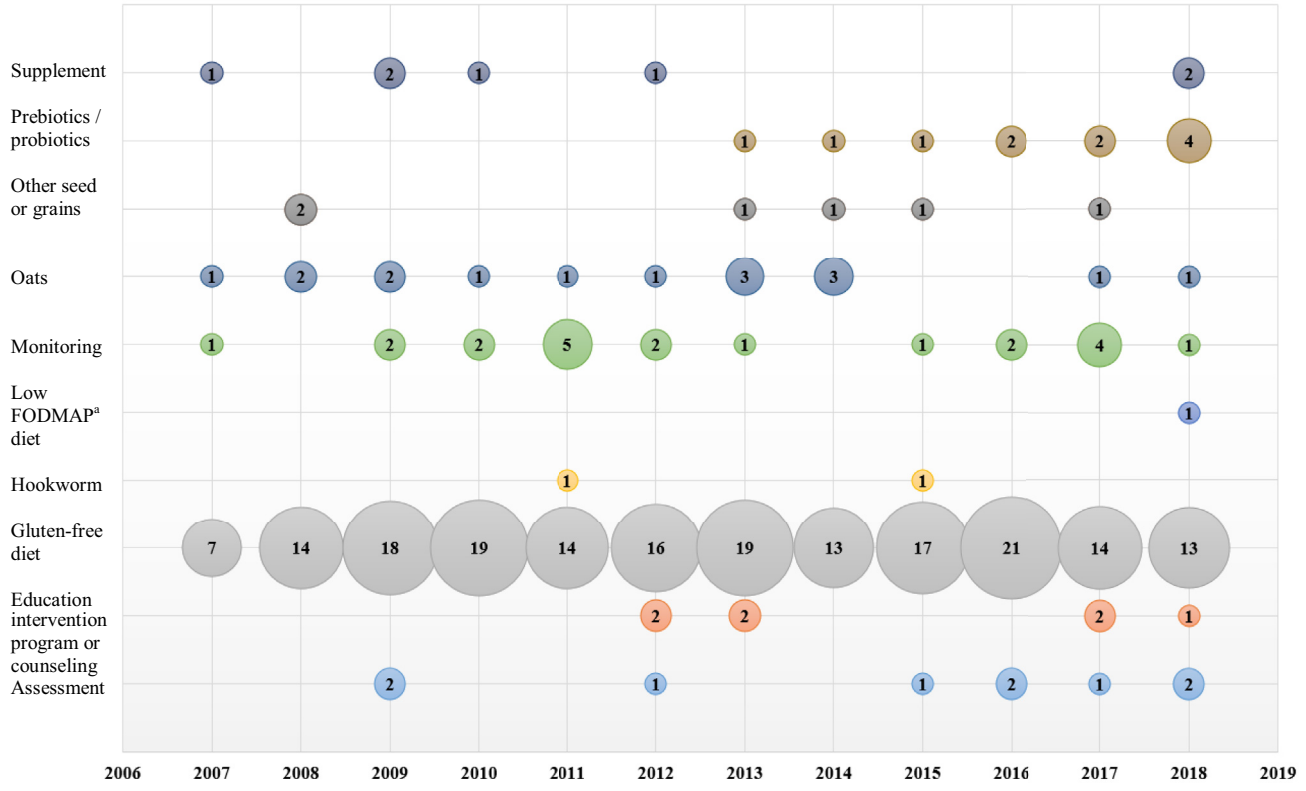

Figure 3. Bubble chart of original research published by year and by topics. The bubble size is proportional to the number of original research studies published in the year and topic. [a]FODMAP=fermentable oligosaccharides, disaccharides, monosaccharides, and polyols.

year and authors list) from the included articles was exported from Rayyan to Excel (Microsoft). Study design, population (adult, pediatric, or combined), Nutrition Care Process categories (eg, assessment, intervention, or monitoring), subtopics (eg, gluten-free diet, oats, supplements, and prebiotics/probiotics), and outcomes (eg, adherence/management, anthropometrics/growth, bone health, and gastrointestinal symptoms/conditions) were further manually extracted and recorded using the same Excel spreadsheet.

To provide better visualization of the evidence, a bubble chart was used to show the number of original research articles published by year and by topic. For illustrating the distribution of outcomes assessed in the included original intervention studies by study design and by type of intervention, a heat map was used. Lastly, traditional tables were used to show the existing CD guidelines, consensus reports, recommendations, clinical update or report, and technical review and their focuses; relevant systematic review/meta-analysis and outcomes; and original studies examining tools to monitor diet compliance.

Consultation

Two content advisors with experience working with CD patients were recruited as volunteers of the Academy of Nutrition and Dietetics to help guide the scoping review process. They were involved with reviewing the initial scoping review search plan to ensure all the necessary search terms were included. They also provided comments on the manuscript.

FINDINGS

The literature search resulted in 10,810 articles with 13 additional studies identified through other sources. A total of 6,647 and 3,721 records were removed because of duplication and lack of relevancy, respectively (Figure 2). Of the 455 full-text articles that were assessed, 292 met the *a priori* inclusion criteria and were included in this scoping review.

The majority of the studies were observational studies (ie, cohort, case-control, cross-sectional, or validation studies) (n=212), followed by experimental trials (ie, randomized or non-randomized controlled trials or noncontrolled trials) (n=50), guidelines, consensus reports, recommendation statement, clinical update or report, or technical review (n=16), and systematic reviews/meta-analyses (n=14). The number of original research articles by publication year and by topic is illustrated with a bubble chart in Figure 3.

CD Guidelines, Consensus Reports, Recommendation Statement, Clinical Update or Report, and Technical Review

There were nine CD guidelines,[2-5,7,16-19] three consensus reports,[20-22] one recommendation statement,[23] two clinical updates[24] or report,[25] and one technical review,[14] which were

published between 2004[20] and 2017[2,23] and by various organizations (Table 1). Most of the publications[2,4,5,14,16-21,24,25] covered CD diagnosis and management[7] and 10 of them[2,5,7,14,16-19,24,25] also included monitoring. The three most recent guidelines were published by the National Institute for Health and Care Excellence (2015),[5] Indian Council of Medical Research (2016),[4] and World Gastroenterology Organisation (2017).[2]

Assessment

Nine observational studies[26-34] focused on assessment; four[26,27,31,34] in adults, three[31-33] in pediatrics, and two[29,30] in both age groups. While six of the included assessment studies[26-29,33,34] aimed to evaluate gluten-free diet adherence, the instruments that were examined varied. For example, some[26,27] developed and validated a gluten-free diet score, while others[28,29,33,34] focused on a new or an adopted food frequency questionnaires or a simple questionnaire/survey. The objectives of the other three studies were slightly different; one[30] developed and validated a scale to evaluate specific self-efficacy (determinants in gluten-free diet adherence), another article[32] focused on the development and validation of the Celiac Disease-Children's Activities Report for advocating self-management. The last study[31] evaluated a modified version of the Italian European Prospective Investigation into Cancer and Nutrition Food Frequency Questionnaire to assess the overall nutrient intake among individuals with CD.

Intervention

Included studies investigated various nutrition interventions in patients with CD, such as education intervention program or counseling; low fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) diet; gluten-free diet; and supplements. The distribution of outcomes assessed in the original intervention studies by study design and by type of intervention is illustrated with a heat map (Figure 4).

Education Intervention Program or Counseling. Five experimental trials[35-39] and two observational studies[40,41] investigated the effects of education intervention program or counseling on various health outcomes, but the types of intervention and the components that they entailed were heterogeneous in nature. One study[40] conducted a cross-sectional survey to assess the effects of a single educational meeting on disease knowledge and awareness among adults with CD. The other observational study[41] also used a survey to examine whether dietitian use (ie, the number of times the participant had seen a dietitian) had positive effects on quality of life, severity of symptom, and adherence in adult CD patients.

Different types of interventions were noted in the five included experimental trials for individuals with CD[35-39]: in-person educational program for adults,[36,37] online educational program for adults,[38] text message intervention for both children and adults,[35] and online follow-up consultations for both children and adults.[39] These studies assessed various outcomes, including adherence/management,[35,38] gastrointestinal symptoms and conditions,[35,36] immunology/serology measures,[35,39] mental/cognitive health,[35,37] and quality of life (Figure 4).[35,37,39]

Gluten-Free Diet. Eight systematic review/meta-analysis,[42-49] 9 experimental trials,[50-58] and 176 observational studies[59-234] examined the effects of gluten-free diet. Most of the systematic reviews/meta-analyses[44-49] were published between 2015[44,45] and 2018.[48,49] They covered various outcomes, such as bone health,[44] mental health,[45,49] gastrointestinal symptoms/conditions,[47] heart health,[48] and quality of life (Table 2).[46] The included experimental trials were published between 2007[50] and 2016,[56,57] with a majority of the studies focusing on adults with CD.[50-53,55,57,58] They assessed a range of outcomes, including anthropometrics/growth,[51,52,54] bone health,[51,52,58] gastrointestinal symptoms/conditions,[50-52,57] immunology/serology measures,[50,52] mental/cognitive health,[51-53] neuro-/autoimmune diseases,[55] nutritional status,[51,52,56] and quality of life (Figure 4).[51] Of the 176 observational studies, 44% focused on adults, 44% on children, and the remaining 12% included both age groups. All of the outcomes listed in Figure 4, except for nutrition knowledge/awareness, were assessed by the included observational studies.

Hookworm. Two experimental trials[235,236] examined whether the use of hookworm infection could be an effective treatment strategy for CD patients. Both studies recruited adult patients, with the length of study ranging from 21[236] to 52[235] weeks. After inoculation, participants underwent gluten/wheat challenge in both studies. Similar outcomes, such as gastrointestinal symptoms and conditions, immunology/serology measures, and quality of life, were collected (Figure 4).

Low FODMAP Diet. Only one intervention study[237] examined the effectiveness of a low FODMAP diet in CD patients who are on a gluten-free diet. These adult participants were educated on a low FODMAP diet in the beginning and were asked to follow this diet throughout the study. Outcomes, such as quality of life, mental health, and gastrointestinal symptoms, were assessed at baseline, 1 month, and 3 months (Figure 4).

Oats. Of the 21 included studies, 5[238-242] were systematic reviews/meta-analysis, 8[243-250] were experimental trials, and 8[205,251-257] were observational studies. Three of the systematic reviews/meta-analysis were published in 2016[238,240] or 2017.[241] They included both children and adults with dermatitis herpetiformis, gastrointestinal symptoms/conditions, and/or immunology/serology measures as the outcomes of interest (Table 2). The included experimental studies were published between 2008[246] and 2018[248] with two studies[245,246] from the same trial. Four[244,247,248,250] of the studies focused on children; two[243,249] focused on adults and two[245,246] included both age groups. Outcomes, such as gastrointestinal symptoms/conditions[244,246-249] and immunology/serology measures,[243,244,246-248] were reported by most of those trials (Figure 4). Most of the observational studies[205,252-255] focused on the adult population; two[256,257] included children and one[251] included both age groups. Similar to experimental trials, most observational studies collected outcomes on gastrointestinal symptoms/conditions[205,251,253,256,257] and immunology/serology measures[251,252,254] (Figure 4).

Other Seed or Grains. Six studies examined whether consuming other

Table 1. Celiac disease guidelines, consensus reports, recommendation, clinical update or report, and technical review

Year	Association (reference)	Title	Type	Focus
2004	National Institutes of Health (NIH)[20]	NIH Consensus Development Conference on Celiac Disease	Consensus report	Celiac disease diagnosis; management
2005	North American Society for Pediatric Gastroenterology, Hepatology and Nutrition[16]	Guideline for the diagnosis and treatment of celiac disease in children: Recommendations of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition	Guideline	Celiac disease diagnosis; management; monitoring
2006	American Gastroenterological Association (AGA)[14]	American Gastroenterological Association (AGA) Institute technical review on the diagnosis and management of celiac disease	Technical review	Celiac disease diagnosis; management; monitoring
2007	Gastroenterological Society of Australia[24]	*Coeliac Disease*, 4th edition	Clinical update	Celiac disease diagnosis; management; monitoring
2008	Federation of International Societies of Pediatric Gastroenterology, Hepatology, and Nutrition[21]	Federation of International Societies of Pediatric Gastroenterology, Hepatology, and Nutrition consensus report on celiac disease	Consensus report	Celiac disease diagnosis; management
2009	Academy of Nutrition and Dietetics[7]	Celiac Disease Guideline	Guideline	Nutrition assessment; management; monitoring
2012	European Society for Pediatric Gastroenterology, Hepatology, and Nutrition guidelines[3]	European Society for Pediatric Gastroenterology, Hepatology, and Nutrition guidelines for the diagnosis of coeliac disease	Guideline	Celiac disease diagnosis
2013	American College of Gastroenterology (ACG)[17]	ACG clinical guidelines: diagnosis and management of celiac disease	Guideline	Celiac disease diagnosis; management; monitoring
2013	British Society of Paediatric Gastroenterology, Hepatology and Nutrition (BSPGHAN); Coeliac UK[18]	Joint BSPGHAN and Coeliac UK guidelines for the diagnosis and management of coeliac disease in children	Guideline	Celiac disease diagnosis; management; monitoring
2014	British Society of Gastroenterology[19]	Diagnosis and management of adult coeliac disease: guidelines from the British Society of Gastroenterology	Guideline	Celiac disease diagnosis; management; monitoring
2015	National Institute for Health and Care Excellence[5]	Coeliac Disease: Recognition, Assessment and Management	Guideline	Celiac disease diagnosis; management; monitoring
2016	Association of European Coeliac Societies; US Celiac Disease Foundation[22]	Transition from childhood to adulthood in coeliac disease: the Prague consensus report	Consensus report	Management (transition from childhood to adulthood in celiac disease)
2016	Indian Council of Medical Research (ICMR)[4]	ICMR Guideline on Diagnosis and Management of Celiac Disease	Guideline	Celiac disease diagnosis; management

(*continued on next page*)

Table 1. Celiac disease guidelines, consensus reports, recommendation, clinical update or report, and technical review (*continued*)

Year	Association (reference)	Title	Type	Focus
2016	North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN)[25]	NASPGHAN Clinical Report on the Diagnosis and Treatment of Gluten-related Disorders	Clinical report	Celiac disease diagnosis; management; monitoring
2017	US Preventive Services Task Force[23]	Screening for Celiac Disease: US Preventive Services Task Force Recommendation Statement	Recommendation statement	Celiac disease screening
2017	World Gastroenterology Organisation[2]	World Gastroenterology Organisation Global Guidelines: Celiac Disease February 2017	Guideline	Celiac disease diagnosis; management; monitoring

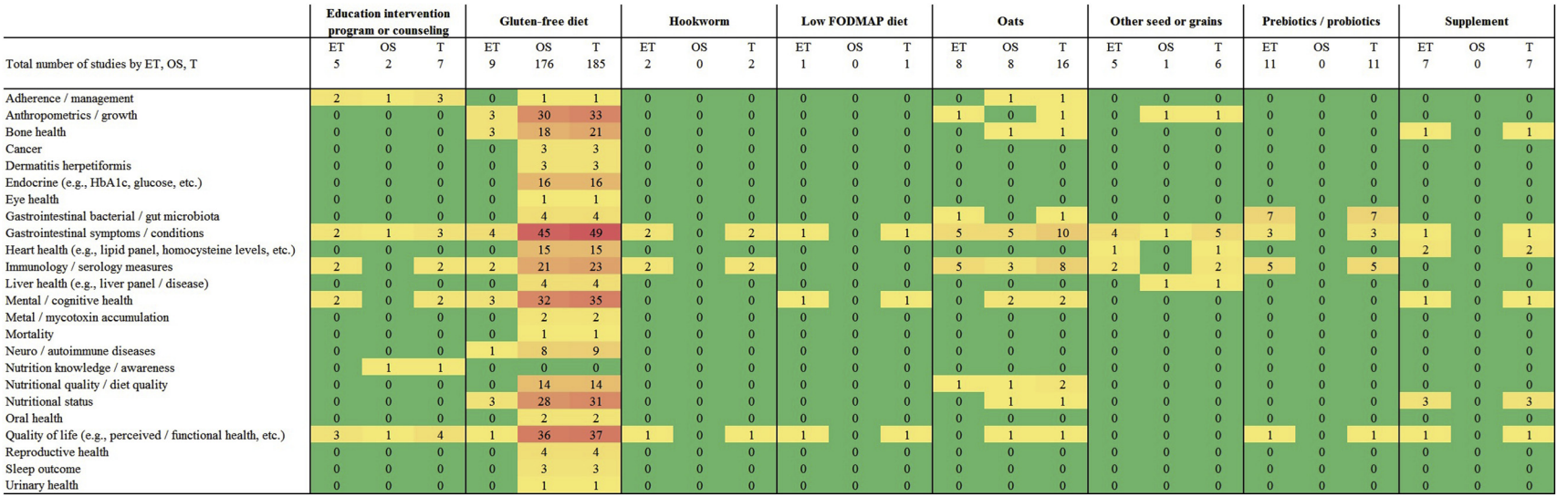

Figure 4. The distribution of outcomes assessed in the included original intervention studies by study design and type of intervention is illustrated with a heat map. Red=highest number of studies. Yellow=number of studies at around the 50th percentile. Green=lowest number of studies. ET=experimental trial. OS=observational studies. T=total number of studies within each type of intervention.

seed or grains—quinoa,[258] teff,[259] *Triticum monococcum*,[260,261] and wheat-based starch hydrolysates[262,263]—could negatively affect health outcomes among CD patients. Except for one observational study,[259] all of them[258,260-263] were experimental trials. Three studies[258,259,262] focused on the adult populations, while the other three studies[260,261,263] included both children and adults. Outcomes assessed are displayed in Figure 4.

Probiotics/Prebiotics. Of the 11 experimental trials included, 2 studies[264,265] (from the same trial) investigated the effects of oligofructose-enriched inulin, and the other 9 studies[266-274] investigated the effect of either a single or a mixture of different probiotic strains. Five studies[266,267,269,273,274] included adult patients and the rest of the studies[264,265,268,270-272] focused on the pediatric population. Various outcomes, such as gastrointestinal bacterial/gut microbiota, gastrointestinal symptoms/conditions, immunology/serology measures, and quality of life, were collected (Figure 4).

Supplements. Different types of supplements were studied in the 7 included experimental trials: L-carnitine,[275] iron,[276] B vitamins,[277,278] zinc,[279,280] and calcium and alfacalcidol.[58] Five[58,275-278] of the studies focused on adults, while the other two[279,280] studied the pediatric population. These studies collected different outcomes, such as bone health,[280] gastrointestinal symptoms and conditions,[276] plasma homocysteine,[277,278] mental/cognitive health,[275] nutritional status (eg, hemoglobin, iron, ferritin, zinc, and copper levels),[276,279,280] and quality of life (Figure 4).[275]

Monitoring. One systematic review/meta-analysis[281] examined the sensitivity and specificity of serum transglutaminase and endomysial antibodies on detecting patients with villous atrophy (Table 2). There were 21 original studies[33,141,282-300] investigating the effectiveness of different tools/measures, such as immunoglobulin G anti-tissue deamidated gliadin peptides and immunoglobulin A anti-tissue transglutaminase, on monitoring adherence/compliance. Nine studies[282-284,286,289,291,293,295,297] focused on adults, six studies[33,141,287,288,294,298] focused on children, and six studies[285,290,292,296,299,300] included on both age groups (Table 3).

Summary

The goal of this scoping review was to gain a better understanding of the landscape of CD literature, which could help to inform the need/scope of the development of future systematic reviews and evidence-based practice guidelines in this area.

One of the reasons to include guidelines as part of the search was to examine whether there are recently published guidelines with similar scope and methodological rigor that could be adopted/recommended. In fact, this scoping review found several recent CD guidelines that were developed by different organizations, that is, the National Institute for Health and Care Excellence (2015),[5] Indian Council of Medical Research (2016),[4] and the World Gastroenterology Organisation (2017).[2] All three guidelines included some aspects of nutrition care and the role of dietitians in this process (eg, "Lifelong and complete avoidance of gluten or gluten containing dietary items is the most effective and the main stay of treatment of CeD. While planning gluten-free diet, all patients should be counselled for a balanced diet as per their nutritional requirement."[4]). However, different methods in terms of literature search and assessment of evidence strength were used. This underscores the importance of careful consideration and using a tool, such as AGREE II (Appraisal of Guidelines Research and Evaluation II),[301] to evaluate the methodological quality of existing guidelines even when they seem to be appropriate and applicable to registered dietitian nutritionists when deciding whether they could be adopted or recommended.

The search results for assessment studies presented an interesting phenomenon. Most of the included studies investigated different tools/ways to assess gluten-free diet adherence, yet none of them directly examined the validity and reliability of an assessment tool for nutrition status. A similar situation also was noted in the last Celiac Disease Guideline[7] by the Academy of Nutrition and Dietetics. For example, there was a recommendation for "assessing biochemical data and results of medical procedures: the registered dietitian (RD) should assess the biochemical data and review the results of medical procedures in individuals with celiac disease, regardless of presentation and clinical symptoms, including (but not limited to) the following: Gastrointestinal profile [e.g., intestinal biopsy (or skin biopsy in the case of dermatitis herpetiformis) and celiac antibodies]; Nutritional anemia profile (e.g., folate, ferritin and vitamin B12); Vitamin profile (e.g., thiamin, vitamin B6 and 25-hydroxy vitamin D); Mineral profile (e.g., copper and zinc); Lipid profile; Electrolyte and renal profile." The supporting evidence was from intervention studies that had examined the effects of gluten-free diet among individuals with CD.[7] It is also important to note that most of the adherence studies focused on identifying different factors that are associated with adherence, which is not the goal of this scoping review, instead of an actual adherence assessment tool that practitioners can use. Therefore, those studies were excluded.

There were a total of 235 original intervention studies that met the eligibility criteria. Of those included, the majority (~79%) examined the effects of gluten-free diet, followed by oats (~7%), prebiotics/probiotics (~4%), education intervention program or counseling (~3%), supplement (~3%), other seed or grains (~3%), hookworm (<1%), and low FODMAP diet (<1%). The fact that most of the studies focused on gluten-free diet aligns with the unequivocal recommendation that lifelong gluten-free diet is the most effective treatment for CD.[4,5] Thus, it appears that most of the research in this area focused on the effect of gluten-free diet on various health outcomes and nutrition status (eg, bone health), with a secondary goal to explore whether individuals with CD would require additional assessment (eg, iron status) or intervention as a result of this restrictive diet. Similarly, when searching in PROSPERO for similar reviews in the beginning of the project, most of the potentially relevant systematic review protocols were related to gluten-free diet. In fact, three were identified: two[302,303] focused on the effect of gluten-free diet on bone health and

one[304] focused on its effect on body mass.

The second category with the most studies was oats. According to the National Institute for Health and Care Excellence, individuals "can choose to include gluten-free oats in their diet at any stage and they will be advised whether to continue eating gluten-free oats depending on their immunological, clinical or histological response."[5] Similarly, the World Gastroenterology Organisation Global Guidelines mentioned that "oats may be consumed," but cautioned about potential contamination with wheat.[2] The Indian Council of Medical Research,[4] on the other hand, recommended to completely avoid oats, as they are often contaminated with wheat. The differences in recommendations seem to be due to the availability of gluten-free oats in those geographical locations instead of based on the effect of consumption of gluten-free oats. In fact, three of the most recent systematic reviews/meta-analysis[238,240,241] supported this rationale and found that the consumption of gluten-free oats was generally safe but some oat cultivars may produce an immune reaction in those who are more sensitive.[238] Thus, as recommended by the National Institute for Health and Care Excellence, long-term regular follow-up is the key.

Prebiotics/probiotics was next on the list; no systematic review/meta-analysis was found in the search and this topic was also not mentioned in the three recent guidelines.[2,4,5] This may be due to the lack of literature during the development of those guidelines, considering the first study on this topic was published in 2013, given our search criteria included articles published betwen January 2007 and August 2018.[273] However, there was a systematic review protocol[305] on the clinical efficacy and safety of probiotics among children with gastrointestinal conditions, including CD, registered on PROSPERO in 2016. It appears that this review has not been started and no published article was found.

Education intervention program or counseling is important to help improve diet adherence when gluten-free diet is the most effective treatment for CD. However, it is important to note that the included studies focused on different types of intervention program (eg, online, text message, and in person), potentially increasing the difficulty of synthesizing those data. The search in PROSPERO identified two prospective systematic reviews that may fall under this category, both systematic review protocols were registered in 2018 and are still in progress. One[306] is evaluating the effectiveness of mobile and web-based applications to support self-management during transition from pediatric to adult among those with chronic illness, including CD. The other systematic review[307] is focusing on determining which behavior-change techniques could improve adherence in patients with CD.

A similar situation was also noted with supplement and other seed or grains. Although approximately 3% of the studies examined each of these two topics, the actual intervention differed. For instance, of the seven experimental trials included in the supplement category, only one study looked at each of these supplements: L-carnitine, iron, and calcium+alfacalcidol; and two studies looked each of these supplements: B vitamins and zinc. The last two topics (ie, hookworm and low FODMAP diet) are interesting types of intervention for CD, yet the number of the included studies was sparse.

The third research question was about examining tools/measures to monitor adherence/compliance among individuals with CD. Of the three most recent guideline, the World Gastroenterology Organisation Global Guidelines[2] mentioned that "studies suggest that periodic testing for IgA anti-tTG or IgA anti-DGP is the preferred method for monitoring compliance," the Indian Council of Medical Research[4] recommended "serological tests at 6 months and one year can be used to monitor adherence," but did not specify one. Lastly, the National Institute for Health and Care Excellence[5] recommended not using "serological testing alone to determine whether gluten has been excluded from the person's diet" because low- or very-low-quality evidence was available to support the use of various serology measures to monitor compliance. Similar to the results found in this scoping review, although 21 original studies focused on this area, they differed in their tools/measures of interest, as well as in their methods to assess those tools/measures (eg, comparison with reference standard and control). For example, of the 21 studies, only 1 study[292] examined the effectiveness of using gliadin 33-mer—equivalent peptidic epitopes in human feces to monitor compliance. The heterogeneity and availability of studies for each of the serology measures may potentially result in low- or very-low-quality evidence, as seen in the CD guideline published by the National Institute for Health and Care Excellence.[5]

Strengths and Limitations

There are several strengths in this scoping review: content advisors reviewed the initial scoping review search plan to ensure that all of the relevant search terms were included and a medical librarian conducted a comprehensive literature search in four databases and tailored search strategy/term specific to each database, EAL staff used and adapted a methodological framework based on the works of Arskey and O'Malley,[10] Levac and colleagues (updated version),[8] and the Joanna Briggs Institute,[11] and this scoping review also followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews checklist.

Several limitations should be noted. While it is preferred to have two reviewers screen through all of the abstracts from the beginning, only one reviewer screened the abstracts during the title/abstract screening round due to the lack of resources (eg, financial). However, to address this limitation, extreme cautious was exercised to ensure that only the "true" excludes were being eliminated during this first round. Any unsure ones were treated as "includes" and went to the full-text screening round, where two reviewers reviewed all of the included studies. Although the search plan was comprehensive, there is always a possibility that it did not capture all of the studies that met the inclusion criteria. However, efforts were made to look for potential studies through the existing included ones and content advisors also reviewed the manuscript.

Table 2. Relevant celiac disease systematic review or meta-analysis published between 2007 and 2018

Intervention and year	Author (reference)	Title	Outcomes
Gluten-free diet			
2008	Akobeng[42]	Systematic review: Tolerable amount of gluten for people with coeliac disease	Threshold of tolerable amount of gluten
2008	Haines[43]	Systematic review: The evidence base for long-term management of coeliac disease	Management of celiac disease (eg, the effect of gluten-free diet on various health outcomes)
2015	Grace-Farfaglia[44]	Bones of contention: Bone mineral density recovery in celiac disease—A systematic review	Bone mineral density
2015	Zingone[45]	Psychological morbidity of celiac disease: A review of the literature	Anxiety, depression, fatigue
2017	Burger[46]	Systematic review with meta-analysis: Dietary adherence influences normalization of health-related quality of life in coeliac disease	Health-related quality of life
2017	Szakacs[47]	Younger age at diagnosis predisposes to mucosal recovery in celiac disease on a gluten-free diet: A meta-analysis	Mucosal recovery
2018	Potter[48]	Effect of the gluten-free diet on cardiovascular risk factors in patients with coeliac disease: A systematic review	Cardiovascular risk factors
2018	Sainsbury[49]	The relationship between gluten free diet adherence and depressive symptoms in adults with coeliac disease: A systematic review with meta-analysis	Depressive symptoms
Monitoring			
2017	Silvester[281]	Tests for serum transglutaminase and endomysial antibodies do not detect most patients with celiac disease and persistent villous atrophy on gluten-free diets: A meta-analysis	Sensitivity and specificity of serum transglutaminase and endomysial antibodies in detecting individuals with villous atrophy
Oats			
2007	Garsed[239]	Can oats be taken in a gluten-free diet? A systematic review	Gastrointestinal symptoms/conditions, immunology/serology measures
2009	Pulido[242]	Introduction of oats in the diet of individuals with celiac disease: A systematic review	Gastrointestinal symptoms/conditions, immunology/serology measures
2016	de Souza[238]	Pure oats as part of the Canadian gluten-free diet in celiac disease: The need to revisit the issue	Gastrointestinal symptoms/conditions, immunology/serology measures
2016	La Vieille[240]	Celiac disease and gluten-free oats: A Canadian position based on a literature review	Gastrointestinal symptoms/conditions, immunology/serology measures
2017	Pinto-Sanchez[241]	Safety of adding oats to a gluten-free diet for patients with celiac disease: Systematic review and meta-analysis of clinical and observational studies	Dermatitis herpetiformis, gastrointestinal symptoms/conditions, immunology/serology measures

Table 3. Original research studies examining tools to monitor diet compliance

Year	Author (reference)	Title	Methods to assess the tools/measures (eg, comparison with reference standard, control)	Tools/measures
2007	Leffler[282]	A prospective comparative study of five measures of gluten-free diet adherence in adults with coeliac disease	Expert nutritionist evaluation	Self-reported adherence IgG[a] anti-DGP[b] IgA[c] anti-DGP IgG-IgA anti-DGP IgA anti-t[d]TG[e]
2009	da Silva Kotze[283]	A Brazilian experience of the self transglutaminase-based test for celiac disease case finding and diet monitoring	Upper gastrointestinal endoscopy with duodenal biopsies and IgA EmA[f]	IgA anti-tTG (rapid)
2009	Leffler[284]	A validated disease-specific symptom index for adults with celiac disease	Test-retest reliability; second validation study (SF-36[g] and EQ-5D[h])	CSI[i]
2010	Koskinen[285]	Usefulness of small-bowel mucosal transglutaminase-2 specific autoantibody deposits in the diagnosis and follow-up of celiac disease	Conventional celiac serology; mucosal morphology and to the density of IELs[j]	IgA-anti-TG2[k]
2010	Sugai[286]	Dynamics of celiac disease-specific serology after initiation of a gluten-free diet and use in the assessment of compliance with treatment	Compliance assessment based on opinion of physician, dietitians, and self-reported	IgA anti-tTG IgA anti-DGP IgG anti-DGP IgG-IgA anti-DGP DPG/tTG Screen IgA AGA[l] IgA AAA[m] IgA EmA
2011	Laadhar[287]	Is the rapid whole blood test useful for diagnosis and monitoring celiac disease in children?	IgA anti-tTG (ELISA[n])	IgA anti-tTG (rapid)
2011	Monzani[288]	Use of deamidated gliadin peptide antibodies to monitor diet compliance in childhood celiac disease	Compliance assessment by investigator or calculated cutoff based on ROC[o] curve	IgA anti-DGP IgG-IgA anti-DGP IgA anti-tTG IgA AGA
2011	Nachman[289]	Serological tests for celiac disease as indicators of long-term compliance with the gluten-free diet	Compliance assessment based on clinical assessment and self-reported; calculated cutoff based on ROC curve and manufacturer	IgA anti-tTG IgA anti-DGP IgG anti-DGP IgG-IgA anti-DGP DPG/tTG Screen IgA AAA IgA EmA

(*continued on next page*)

Table 3. Original research studies examining tools to monitor diet compliance (*continued*)

Year	Author (reference)	Title	Methods to assess the tools/measures (eg, comparison with reference standard, control)	Tools/measures
2011	Planas[290]	Regenerating gene Ialpha is a biomarker for diagnosis and monitoring of celiac disease: A preliminary study	IgA anti-tTG and IgA AGA	REG1α[p]
2011	Purnak[291]	Mean platelet volume could be a promising biomarker to monitor dietary compliance in celiac disease	Control group, level of adherence	MPV[q]
2012	Comino[292]	Monitoring of gluten-free diet compliance in celiac patients by assessment of gliadin 33-mer equivalent epitopes in feces	Different levels to gluten ingestion	33EPs[r]
2012	Leffler[293]	Open conformation tissue transglutaminase testing for celiac dietary assessment	Adherence determined by dietitian	O-tTG[s] C-tTG[t]
2013	Aita[294]	Chemiluminescence and ELISA-based serum assays for diagnosing and monitoring celiac disease in children: A comparative study	ELISAs: IgA anti-tTG IgG anti-tTG IgA anti-DGP IgG anti-DGP IgG-IgA anti-DGP	Chemiluminescent assays: IgA anti-tTG IgG anti-tTG IgA anti-DGP IgG anti-DGP IgG-IgA anti-DGP
2015	Srinivasan[295]	Usefulness of recombinant gamma-gliadin 1 for identifying patients with celiac disease and monitoring adherence to a gluten-free diet	IgA anti-tTG2 IgA anti-DGP IgG anti-DGP	GG1[u]
2016	Comino[296]	Fecal gluten peptides reveal limitations of serological tests and food questionnaires for monitoring gluten-free diet in celiac disease patients	Dietary compliance; IgA anti-tTG; IgA anti-DGP	GIP[v]
2016	Lind[297]	Plasma alkylresorcinols reflect gluten intake and distinguish between gluten-rich and gluten-poor diets in a population at risk of metabolic syndrome	Gluten-rich and gluten-poor diet	Plasma total alkylresorcinol concentrations
2017	Adriaanse[298]	Progress towards non-invasive diagnosis and follow-up of celiac disease in children; a prospective multicentre study to the usefulness of plasma I-FABP[w]	Gluten-free diet (26 wk), histological and serological disease markers.	Plasma I-FABP

(*continued on next page*)

Table 3. Original research studies examining tools to monitor diet compliance (*continued*)

Year	Author (reference)	Title	Methods to assess the tools/measures (eg, comparison with reference standard, control)	Tools/measures
2017	Lau[299]	The role of an IgA/IgG-deamidated gliadin peptide point-of-care test in predicting persistent villous atrophy in patients with celiac disease on a gluten-free diet	Duodenal histology	IgA anti-tTG IgA EmA IgG-IgA anti-DGP (Simtomax)
2017	Leonard[141]	Value of IgA tTG in predicting mucosal recovery in children with celiac disease on a gluten-free diet	Duodenal histology	IgA anti-tTG
2017	Moreno[300]	Detection of gluten immunogenic peptides in the urine of patients with coeliac disease reveals transgressions in the gluten-free diet and incomplete mucosal healing	Gluten ingestion (25 and 50 mg)	GIP
2018	Wessels[33]	Assessment of dietary compliance in celiac children using a standardized dietary interview	Standardized dietary interview	IgA-anti-TG2

[a]IgG=immunoglobulin G.
[b]DGP=deamidated gliadin peptide.
[c]IgA=immunoglobulin A.
[d]anti-t=anti-tissue.
[e]TG=transglutaminase.
[f]IgA EmA=antiendomysial antibody.
[g]SF-36=36-Item Short Form Health Survey.
[h]EQ-5D=EuroQol-5 Dimension.
[i]CSI=Celiac Symptom Index (disease-specific).
[j]IEL=intraepithelial lymphocyte.
[k]TG2=transglutaminase-2.
[l]IgA AGA=IgA type antigliadin antibody.
[m]IgA AAA=IgA isotype antiactin antibody.
[n]ELISA=enzyme-linked immunosorbent assay.
[o]ROC=receiver operating characteristic curve.
[p]REG1α=regenerating gene 1α.
[q]MPV=mean platelet volume.
[r]33Eps=gliadin 33-mer equivalent peptidic epitopes in human feces.
[s]O-tTG=stabilized open (active) conformation tTG.
[t]C-tTG=closed or undefined conformation tTG.
[u]GG1=γ-gliadin 1.
[v]GIP=gluten immunogenic peptide.
[w]I-FABP=intestinal-fatty acid binding protein.

CONCLUSIONS AND FUTURE DIRECTION

This scoping review completed a comprehensive literature search to examine the availability of literature on the validity and reliability of nutrition assessment methods, nutrition interventions, and tools/measures to monitor adherence/compliance among individuals with CD.

Based on the scoping review, some topics (eg, gluten-free diet, oats) were already covered by either a recent guideline or systematic review. For instance, a 2017 systematic review on consumption of oat[241] included 12 of the 16 original studies founded in this scoping review. Thus, the expert panel on a future CD systematic review/guideline project can evaluate whether to use this type of recent systematic review by examining the scope and the rigor of the methodology used. A similar approach can be implemented when determining whether a recent guideline can be adapted or recommended. Other topics (eg, prebiotics/probiotics, education program/counseling focused interventions) that have not been covered by a recent review or guideline could be potential areas to focus on in a new CD systematic review/guideline project. However, consideration also should be balanced with the number of available studies in certain topics, such as with low FODMAP diet.

References

1. Ludvigsson JF, Leffler DA, Bai JC, et al. The Oslo definitions for coeliac disease and related terms. *Gut*. 2013;62(1):43-52.
2. Bai JC, Ciacci C. World Gastroenterology Organisation Global Guidelines: Celiac Disease February 2017. *J Clin Gastroenterol*. 2017;51(9):755-768.
3. Husby S, Koletzko S, Korponay-Szabo IR, et al. European Society for Pediatric Gastroenterology, Hepatology, and Nutrition guidelines for the diagnosis of coeliac disease. *J Pediatr Gastroenterol Nutr*. 2012;54(1):136-160.
4. Indian Council of Medical Research. *ICMR Guideline on Diagnosis and Management of Celiac Disease*. New Delhi, India: Indian Council of Medical Research; 2016.
5. Internal Clinical Guidelines Team. *National Institute for Health and Care Excellence: Clinical Guidelines: Coeliac Disease: Recognition, Assessment and Management*. London, UK: National Institute for Health and Care Excellence; 2015.
6. Leonard MM, Sapone A, Catassi C, Fasano A. Celiac disease and nonceliac gluten sensitivity: A review. *JAMA*. 2017;318(7):647-656.
7. Academy of Nutrition and Dietetics. Evidence Analysis Library. Celiac disease guideline. https://www.andeal.org/topic.cfm?menu=5279. Published 2009. Accessed November 26, 2018.
8. Levac D, Colquhoun H, O'Brien KK. Scoping studies: Advancing the methodology. *Implement Sci*. 2010;5:69.
9. Booth A, Clarke M, Dooley G, et al. The nuts and bolts of PROSPERO: An international prospective register of systematic reviews. *Syst Rev*. 2012;1:2.
10. Arskey H, O'Malley L. Scoping studies: Towards a methodological framework. *Int J Soc Res Methodol*. 2005;8(1):19-32.
11. Peters M, Godfrey C, McInerney P, Baldini Soares C, Khalil H, Parker D. Chapter 11: Scoping reviews. In: Aromataris E, Munn Z, eds. Joanna Briggs Institute Reviewer's Manual. The Adelaide, South Australia: Joanna Briggs Institute; 2017. https://reviewersmanual.joannabriggs.org/. Accessed October 24, 2019.
12. Tricco AC, Lillie E, Zarin W, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and explanation. *Ann Intern Med*. 2018;169(7):467-473.
13. Academy of Nutrition and Dietetics. The Nutrition Care Process. In: https://www.ncpro.org/nutrition-care-process. Published 2018. Accessed November 29, 2018.
14. Rostom A, Murray JA, Kagnoff MF. American Gastroenterological Association (AGA) Institute technical review on the diagnosis and management of celiac disease. *Gastroenterology*. 2006;131(6):1981-2002.
15. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—A web and mobile app for systematic reviews. *Syst Rev*. 2016;5(1):210.
16. Hill ID, Dirks MH, Liptak GS, et al. Guideline for the diagnosis and treatment of celiac disease in children: Recommendations of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. *J Pediatr Gastroenterol Nutr*. 2005;40(1):1-19.
17. Rubio-Tapia A, Hill ID, Kelly CP, Calderwood AH, Murray JA. ACG clinical guidelines: Diagnosis and management of celiac disease. *Am J Gastroenterol*. 2013;108(5):656-676; quiz 677.
18. Murch S, Jenkins H, Auth M, et al. Joint BSPGHAN and Coeliac UK guidelines for the diagnosis and management of coeliac disease in children. *Arch Dis Child*. 2013;98(10):806-811.
19. Ludvigsson JF, Bai JC, Biagi F, et al. Diagnosis and management of adult coeliac disease: Guidelines from the British Society of Gastroenterology. *Gut*. 2014;63(8):1210-1228.
20. NIH Consensus Development Conference on Celiac Disease. *NIH Consens State Sci Statements*. 2004;21(1):1-23.
21. Fasano A, Araya M, Bhatnagar S, et al. Federation of International Societies of Pediatric Gastroenterology, Hepatology, and Nutrition consensus report on celiac disease. *J Pediatr Gastroenterol Nutr*. 2008;47(2):214-219.
22. Ludvigsson JF, Agreus L, Ciacci C, et al. Transition from childhood to adulthood in coeliac disease: The Prague consensus report. *Gut*. 2016;65(8):1242-1251.
23. Bibbins-Domingo K, Grossman DC, Curry SJ, et al. Screening for Celiac Disease: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2017;317(12):1252-1257.
24. Gastroenterological Society of Australia. *Coeliac Disease*. 4th ed. Syndey, NSW, Australia: Digestive Health Foundation; 2007.
25. Hill ID, Fasano A, Guandalini S, et al. NASPGHAN clinical report on the diagnosis and treatment of gluten-related disorders. *J Pediatr Gastroenterol Nutr*. 2016;63(1):156-165.
26. Biagi F, Andrealli A, Bianchi PI, Marchese A, Klersy C, Corazza GR. A gluten-free diet score to evaluate dietary compliance in patients with coeliac disease. *Br J Nutr*. 2009;102(6):882-887.
27. Biagi F, Bianchi PI, Marchese A, et al. A score that verifies adherence to a gluten-free diet: A cross-sectional, multicentre validation in real clinical life. *Br J Nutr*. 2012;108(10):1884-1888.
28. Crespo Escobar P, Calvo Lerma J, Hervas Marin D, et al. Development and validation of two food frequency questionnaires to assess gluten intake in children up to 36 months of age. *Nutr Hosp*. 2015;32(5):2080-2090.
29. Fueyo-Diaz R, Gascon-Santos S, Asensio-Martinez A, Sanchez-Calavera MA. Magallon-Botaya R. Transcultural adaptation and validation of the Celiac Dietary Adherence Test. A simple questionnaire to measure adherence to a gluten-free diet. *Rev Esp Enferm Digest*. 2016;108(3):138-144.
30. Fueyo-Díaz R, Magallón-Botaya R, Gascón-Santos S, Asensio-Martínez Á, Palacios-Navarro G, Sebastián-Domingo JJ. Development and validation of a specific self-efficacy scale in adherence to a gluten-free diet. *Front Psychol*. 2018;9:342.
31. Mazzeo T, Roncoroni L, Lombardo V, et al. Evaluation of a modified Italian European prospective investigation into cancer and nutrition food frequency questionnaire for individuals with celiac disease. *J Acad Nutr Diet*. 2016;116(11):1810-1816.
32. Meyer S, Rosenblum S. Development and validation of the Celiac Disease-Children's Activities Report (CD-Chart) for promoting self-management among children and adolescents. *Nutrients*. 2017;9(10).
33. Wessels MMS, Te Lintelo M, Vriezinga SL, Putter H, Hopman EG, Mearin ML. Assessment of dietary compliance in celiac children using a standardized dietary interview. *Clin Nutr*. 2018;37(3):1000-1004.
34. Leffler DA, Dennis M, Edwards George JB, et al. A simple validated gluten-free diet adherence survey for adults with celiac disease. *Clin Gastroenterol Hepatol*. 2009;7(5):530-536, 536.e531-532.
35. Haas K, Martin A, Park KT. Text Message Intervention (TEACH) improves quality

of life and patient activation in celiac disease: A randomized clinical trial. *J Pediatr*. 2017;185:62-67.e62.

36. Jacobsson LR, Friedrichsen M, Goransson A, Hallert C. Impact of an active patient education program on gastrointestinal symptoms in women with celiac disease following a gluten-free diet: A randomized controlled trial. *Gastroenterol Nurs*. 2012;35(3):200-206.
37. Ring Jacobsson L, Friedrichsen M, Goransson A, Hallert C. Does a coeliac school increase psychological well-being in women suffering from coeliac disease, living on a gluten-free diet? *J Clin Nurs*. 2012;21(5-6):766-775.
38. Sainsbury K, Mullan B, Sharpe L. A randomized controlled trial of an online intervention to improve gluten-free diet adherence in celiac disease. *Am J Gastroenterol*. 2013;108(5):811-817.
39. Vriezinga S, Borghorst A, van den Akker-van Marle E, et al. E-healthcare for celiac disease-a multicenter randomized controlled trial. *J Pediatr*. 2018;195:154-160.e157.
40. Barzegar F, Rostami-Nejad M, Mohaghegh Shalmani H, Sadeghi A, Allahverdi Khani M, Aldulaimi D. The effect of education on the knowledge of patients with celiac disease. *Gastroenterol Hepatol Bed Bench*. 2017;10(suppl1):S15-S19.
41. Mahadev S, Simpson S, Lebwohl B, Lewis SK, Tennyson CA, Green PH. Is dietitian use associated with celiac disease outcomes? *Nutrients*. 2013;5(5):1585-1594.
42. Akobeng AK, Thomas AG. Systematic review: Tolerable amount of gluten for people with coeliac disease. *Aliment Pharmacol Ther*. 2008;27(11):1044-1052.
43. Haines ML, Anderson RP, Gibson PR. Systematic review: The evidence base for long-term management of coeliac disease. *Aliment Pharmacol Ther*. 2008;28(9):1042-1066.
44. Grace-Farfaglia P. Bones of contention: Bone mineral density recovery in celiac disease—a systematic review. *Nutrients*. 2015;7(5):3347-3369.
45. Zingone F, Swift GL, Card TR, Sanders DS, Ludvigsson JF, Bai JC. Psychological morbidity of celiac disease: A review of the literature. *United European Gastroenterol J*. 2015;3(2):136-145.
46. Burger JPW, de Brouwer B, IntHout J, Wahab PJ, Tummers M, Drenth JPH. Systematic review with meta-analysis: Dietary adherence influences normalization of health-related quality of life in coeliac disease. *Clin Nutr*. 2017;36(2):399-406.
47. Szakacs Z, Matrai P, Hegyi P, et al. Younger age at diagnosis predisposes to mucosal recovery in celiac disease on a gluten-free diet: A meta-analysis. *PLoS One*. 2017;12(11):e0187526.
48. Potter MDE, Brienesse SC, Walker MM, Boyle A, Talley NJ. Effect of the gluten-free diet on cardiovascular risk factors in patients with coeliac disease: A systematic review. *J Gastroenterol Hepatol*. 2018;33(4):781-791.
49. Sainsbury K, Marques MM. The relationship between gluten free diet adherence and depressive symptoms in adults with coeliac disease: A systematic review with meta-analysis. *Appetite*. 2018;120:578-588.
50. Catassi C, Fabiani E, Iacono G, et al. A prospective, double-blind, placebo-controlled trial to establish a safe gluten threshold for patients with celiac disease. *Am J Clin Nutr*. 2007;85(1):160-166.
51. Kurppa K, Collin P, Sievanen H, Huhtala H, Maki M, Kaukinen K. Gastrointestinal symptoms, quality of life and bone mineral density in mild enteropathic coeliac disease: A prospective clinical trial. *Scand J Gastroenterol*. 2010;45(3):305-314.
52. Kurppa K, Paavola A, Collin P, et al. Benefits of a gluten-free diet for asymptomatic patients with serologic markers of celiac disease. *Gastroenterology*. 2014;147(3):610-617.e611.
53. Lichtwark IT, Newnham ED, Robinson SR, et al. Cognitive impairment in coeliac disease improves on a gluten-free diet and correlates with histological and serological indices of disease severity. *Aliment Pharmacol Ther*. 2014;40(2):160-170.
54. Lukic M, Segec A, Segec I, et al. The effects of gluten-free diet on body weight in children with celiac disease. *Coll Antropol*. 2010;34(suppl 1):55-60.
55. Metso S, Hyytia-Ilmonen H, Kaukinen K, et al. Gluten-free diet and autoimmune thyroiditis in patients with celiac disease. A prospective controlled study. *Scand J Gastroenterol*. 2012;47(1):43-48.
56. Romanczuk B, Szaflarska-Poplawska A, Chelchowska M, Hozyasz KK. Analysis of the concentration of vitamin E in erythrocytes of patients with celiac disease. *Prz Gastroenterol*. 2016;11(4):282-285.
57. Zanini B, Marullo M, Villanacci V, et al. Persistent intraepithelial lymphocytosis in celiac patients adhering to gluten-free diet is not abolished despite a gluten contamination elimination diet. *Nutrients*. 2016;8(9).
58. Szymczak J, Bohdanowicz-Pawlak A, Waszczuk E, Jakubowska J. Low bone mineral density in adult patients with coeliac disease. *Endokrynol Pol*. 2012;63(4):270-276.
59. Aomari A, Firwana M, Amjahdi A, Rahaoui A, Benelbarhdadi I, Ajana F. Evolution of reproductive disorders related to celiac disease under gluten-free diet. *J Gastrointest Dig Syst*. 2017;7(506).
60. Abid N, McGlone O, Cardwell C, McCallion W, Carson D. Clinical and metabolic effects of gluten free diet in children with type 1 diabetes and coeliac disease. *Pediatr Diabetes*. 2011;12(4 Pt 1):322-325.
61. Alzaben AS, Turner J, Shirton L, Samuel TM, Persad R, Mager D. Assessing nutritional quality and adherence to the gluten-free diet in children and adolescents with celiac disease. *Can J Diet Pract Res*. 2015;76(2):56-63.
62. Amato M, Zingone F, Caggiano M, Iovino P, Bucci C, Ciacci C. Tooth wear is frequent in adult patients with celiac disease. *Nutrients*. 2017;9(12).
63. Arigo D, Anskis AM, Smyth JM. Psychiatric comorbidities in women with celiac disease. *Chronic Illn*. 2012;8(1):45-55.
64. Ashorn S, Valineva T, Kaukinen K, et al. Serological responses to microbial antigens in celiac disease patients during a gluten-free diet. *J Clin Immunol*. 2009;29(2):190-195.
65. Atteno M, Costa L, Cozzolino A, et al. The enthesopathy of celiac patients: Effects of gluten-free diet. *Clin Rheumatol*. 2014;33(4):537-541.
66. Bakker SF, Tushuizen ME, von Blomberg ME, Mulder CJ, Simsek S. Type 1 diabetes and celiac disease in adults: Glycemic control and diabetic complications. *Acta Diabetol*. 2013;50(3):319-324.
67. Balamtekin N, Aksoy C, Baysoy G, et al. Is compliance with gluten-free diet sufficient? Diet composition of celiac patients. *Turk J Pediatr*. 2015;57(4):374-379.
68. Barbato M, Curione M, Amato S, et al. Autonomic imbalance in celiac children. *Minerva Pediatr*. 2010;62(4):333-338.
69. Barone M, Della Valle N, Rosania R, et al. A comparison of the nutritional status between adult celiac patients on a long-term, strictly gluten-free diet and healthy subjects. *Eur J Clin Nutr*. 2016;70(1):23-27.
70. Barratt SM, Leeds JS, Sanders DS. Quality of life in coeliac disease is determined by perceived degree of difficulty adhering to a gluten-free diet, not the level of dietary adherence ultimately achieved. *J Gastrointest Liver Dis*. 2011;20(3):241-245.
71. Bayar N, Cekin AH, Arslan S, et al. Assessment of aortic elasticity in patients with celiac disease. *Korean Circ J*. 2016;46(2):239-245.
72. Bella R, Lanza G, Cantone M, et al. Effect of a gluten-free diet on cortical excitability in adults with celiac disease. *PLoS One*. 2015;10(6):e0129218.
73. Benelli E, Carrato V, Martelossi S, Ronfani L, Not T, Ventura A. Coeliac disease in the ERA of the new ESPGHAN and BSPGHAN guidelines: A prospective cohort study. *Arch Dis Child*. 2016;101(2):172-176.
74. Biagetti C, Gesuita R, Gatti S, Catassi C. Quality of life in children with celiac disease: A paediatric cross-sectional study. *Dig Liver Dis*. 2015;47(11):927-932.
75. Black JL, Orfila C. Impact of coeliac disease on dietary habits and quality of life. *J Hum Nutr Diet*. 2011;24(6):582-587.
76. Blazina S, Bratanic N, Campa AS, Blagus R, Orel R. Bone mineral density and importance of strict gluten-free diet in children and adolescents with celiac disease. *Bone*. 2010;47(3):598-603.
77. Bolia R, Srivastava A, Kapoor A, Yachha SK, Poddar U. Children with untreated coeliac disease have sub-clinical cardiac dysfunction: A longitudinal

observational analysis. *Scand J Gastroenterol*. 2018;53(7):803-808.

78. Bongiovanni TR, Clark AL, Garnett EA, Wojcicki JM, Heyman MB. Impact of gluten-free camp on quality of life of children and adolescents with celiac disease. *Pediatrics*. 2010;125(3):e525-529.
79. Borghini R, Di Tola M, Salvi E, et al. Impact of gluten-free diet on quality of life in celiac patients. *Acta Gastroenterol Belg*. 2016;79(2):447-453.
80. Brambilla P, Picca M, Dilillo D, et al. Changes of body mass index in celiac children on a gluten-free diet. *Nutr Metab Cardiovasc Dis*. 2013;23(3):177-182.
81. Cakir D, Tosun A, Polat M, et al. Subclinical neurological abnormalities in children with celiac disease receiving a gluten-free diet. *J Pediatr Gastroenterol Nutr*. 2007;45(3):366-369.
82. Campisi G, Di Liberto C, Carroccio A, et al. Coeliac disease: Oral ulcer prevalence, assessment of risk and association with gluten-free diet in children. *Dig Liver Dis*. 2008;40(2):104-107.
83. Capriati T, Francavilla R, Ferretti F, Castellaneta S, Ancinelli M, Diamanti A. The overweight: A rare presentation of celiac disease. *Eur J Clin Nutr*. 2016;70(2):282-284.
84. Capristo E, Malandrino N, Farnetti S, et al. Increased serum high-density lipoprotein-cholesterol concentration in celiac disease after gluten-free diet treatment correlates with body fat stores. *J Clin Gastroenterol*. 2009;43(10):946-949.
85. Casella G, Antonelli E, Di Bella C, et al. Prevalence and causes of abnormal liver function in patients with coeliac disease. *Liver Int*. 2013;33(7):1128-1131.
86. Casellas F, Rodrigo L, Vivancos JL, et al. Factors that impact health-related quality of life in adults with celiac disease: A multicenter study. *World J Gastroenterol*. 2008;14(1):46-52.
87. Casellas F, Rodrigo L, Lucendo AJ, et al. Benefit on health-related quality of life of adherence to gluten-free diet in adult patients with celiac disease. *Rev Esp Enferm Digest*. 2015;107(4):196-201.
88. Castilhos AC, Goncalves BC, Silva MM, et al. Quality of life evaluation in celiac patients from southern Brazil. *Arq Gastroenterol*. 2015;52(3):171-175.
89. Castillo NE, Vanga RR, Theethira TG, et al. Prevalence of abnormal liver function tests in celiac disease and the effect of a gluten-free diet in the US population. *Am J Gastroenterol*. 2015;110(8):1216-1222.
90. Chauhan JC, Kumar P, Dutta AK, Basu S, Kumar A. Assessment of dietary compliance to gluten free diet and psychosocial problems in Indian children with celiac disease. *Indian J Pediatr*. 2010;77(6):649-654.
91. Choudhary G, Gupta RK, Beniwal J. Bone mineral density in celiac disease. *Indian J Pediatr*. 2017;84(5):344-348.
92. Ciacci C, Spagnuolo G, Tortora R, et al. Urinary stone disease in adults with celiac disease: Prevalence, incidence and urinary determinants. *J Urol*. 2008;180(3):974-979.
93. Collado MC, Donat E, Ribes-Koninckx C, Calabuig M, Sanz Y. Specific duodenal and faecal bacterial groups associated with paediatric coeliac disease. *J Clin Pathol*. 2009;62(3):264-269.
94. Collin P, Kaukinen K, Mattila AK, Joukamaa M. Psychoneurotic symptoms and alexithymia in coeliac disease. *Scand J Gastroenterol*. 2008;43(11):1329-1333.
95. Comba A, Caltepe G, Yuce O, Erena E, Kalayci AG. Effects of age of diagnosis and dietary compliance on growth parameters of patients with celiac disease. *Arch Argent Pediatr*. 2018;116(4):248-255.
96. Cosnes J, Cellier C, Viola S, et al. Incidence of autoimmune diseases in celiac disease: Protective effect of the gluten-free diet. *Clin Gastroenterol Hepatol*. 2008;6(7):753-758.
97. Dall'Asta C, Scarlato AP, Galaverna G, Brighenti F, Pellegrini N. Dietary exposure to fumonisins and evaluation of nutrient intake in a group of adult celiac patients on a gluten-free diet. *Mol Nutr Food Res*. 2012;56(4):632-640.
98. De Marchi S, Chiarioni G, Prior M, Arosio E. Young adults with coeliac disease may be at increased risk of early atherosclerosis. *Aliment Pharmacol Ther*. 2013;38(2):162-169.
99. Delvecchio M, Faienza MF, Lonero A, Rutigliano V, Francavilla R, Cavallo L. Prolactin may be increased in newly diagnosed celiac children and adolescents and decreases after 6 months of gluten-free diet. *Horm Res Paediatr*. 2014;81(5):309-313.
100. Deora V, Aylward N, Sokoro A, El-Matary W. Serum vitamins and minerals at diagnosis and follow-up in children with celiac disease. *J Pediatr Gastroenterol Nutr*. 2017;65(2):185-189.
101. Di Cagno R, Rizzello CG, Gagliardi F, et al. Different fecal microbiotas and volatile organic compounds in treated and untreated children with celiac disease. *Appl Environ Microbiol*. 2009;75(12):3963-3971.
102. Diamanti A, Ferretti F, Guglielmi R, et al. Thyroid autoimmunity in children with coeliac disease: A prospective survey. *Arch Dis Child*. 2011;96(11):1038-1041.
103. Dickey W, Ward M, Whittle CR, et al. Homocysteine and related B-vitamin status in coeliac disease: Effects of gluten exclusion and histological recovery. *Scand J Gastroenterol*. 2008;43(6):682-688.
104. Duerksen DR, Wilhelm-Boyles C, Veitch R, Kryszak D, Parry DM. A comparison of antibody testing, permeability testing, and zonulin levels with small-bowel biopsy in celiac disease patients on a gluten-free diet. *Dig Dis Sci*. 2010;55(4):1026-1031.
105. Elli L, Rossi V, Conte D, et al. Increased mercury levels in patients with celiac disease following a gluten-free regimen. *Gastroenterol Res Pract*. 2015;2015:953042.
106. Ertekin V, Selimoglu MA, Turgut A, Bakan N. Fecal calprotectin concentration in celiac disease. *J Clin Gastroenterol*. 2010;44(8):544-546.
107. Esenyel S, Unal F, Vural P. Depression and anxiety in child and adolescents with follow-up celiac disease and in their families. *Turk J Gastroenterol*. 2014;25(4):381-385.
108. Ferrara P, Cicala M, Tiberi E, et al. High fat consumption in children with celiac disease. *Acta Gastroenterol Belg*. 2009;72(3):296-300.
109. Forchielli ML, Fernicola P, Diani L, et al. Gluten-free diet and lipid profile in children with celiac disease: Comparison with general population standards. *J Pediat Gastroenterol Nutr*. 2015;61(2):224-229.
110. Ford S, Howard R, Oyebode J. Psychosocial aspects of coeliac disease: A cross-sectional survey of a UK population. *Br J Health Psychol*. 2012;17(4):743-757.
111. Frisullo G, Nociti V, Iorio R, et al. Increased CD4+CD25+Foxp3+ T cells in peripheral blood of celiac disease patients: Correlation with dietary treatment. *Hum Immunol*. 2009;70(6):430-435.
112. Gabrieli D, Ciccone F, Capannolo A, et al. Subtypes of chronic gastritis in patients with celiac disease before and after gluten-free diet. *United European Gastroenterol J*. 2017;5(6):805-810.
113. Galli G, Esposito G, Lahner E, et al. Histological recovery and gluten-free diet adherence: A prospective 1-year follow-up study of adult patients with coeliac disease. *Aliment Pharmacol Ther*. 2014;40(6):639-647.
114. Goh VL, Estrada DE, Lerer T, Balarezo F, Sylvester FA. Effect of gluten-free diet on growth and glycemic control in children with type 1 diabetes and asymptomatic celiac disease. *J Pediatr Endocrinol Metab*. 2010;23(11):1169-1173.
115. Golfetto L, de Senna FD, Hermes J, Beserra BT, Franca Fda S, Martinello F. Lower bifidobacteria counts in adult patients with celiac disease on a gluten-free diet. *Arq Gastroenterol*. 2014;51(2):139-143.
116. Gopee E, van den Oever EL, Cameron F, Thomas MC. Coeliac disease, gluten-free diet and the development and progression of albuminuria in children with type 1 diabetes. *Pediatr Diabetes*. 2013;14(6):455-458.
117. Hauser W, Stallmach A, Caspary WF, Stein J. Predictors of reduced health-related quality of life in adults with coeliac disease. *Aliment Pharmacol Ther*. 2007;25(5):569-578.
118. Hauser W, Janke KH, Klump B, Gregor M, Hinz A. Anxiety and depression in adult patients with celiac disease on a gluten-free diet. *World J Gastroenterol*. 2010;16(22):2780-2787.
119. Heyman R, Guggenbuhl P, Corbel A, et al. Effect of a gluten-free diet on bone mineral density in children with celiac disease. *Gastroenterol Clin Biol*. 2009;33(2):109-114.
120. Hogberg L, Danielsson L, Jarleman S, Sundqvist T, Stenhammar L. Serum zinc

in small children with coeliac disease. *Acta Paediatr*. 2009;98(2):343-345.

121. Hogen Esch CE, Wolters VM, Gerritsen SA, et al. Specific celiac disease antibodies in children on a gluten-free diet. *Pediatrics*. 2011;128(3):547-552.

122. Hollon JR, Cureton PA, Martin ML, Puppa EL, Fasano A. Trace gluten contamination may play a role in mucosal and clinical recovery in a subgroup of diet-adherent non-responsive celiac disease patients. *BMC Gastroenterol*. 2013;13:40.

123. Hopman EG, Koopman HM, Wit JM, Mearin ML. Dietary compliance and health-related quality of life in patients with coeliac disease. *Eur J Gastroenterol Hepatol*. 2009;21(9):1056-1061.

124. Imperatore N, Rispo A, Capone P, et al. Gluten-free diet does not influence the occurrence and the Th1/Th17-Th2 nature of immune-mediated diseases in patients with coeliac disease. *Dig Liver Dis*. 2016;48(7):740-744.

125. Ioannou HP, Fotoulaki M, Pavlitou A, Efstratiou I, Augoustides-Savvopoulou P. Plasma citrulline levels in paediatric patients with celiac disease and the effect of a gluten-free diet. *Eur J Gastroenterol Hepatol*. 2011;23(3):245-249.

126. Jadresin O, Misak Z, Sanja K, Sonicki Z, Zizic V. Compliance with gluten-free diet in children with coeliac disease. *J Pediatr Gastroenterol Nutr*. 2008;47(3):344-348.

127. Jafari SA, Talebi S, Mostafavi N, Moharreri F, Kianifar H. Quality of life in children with celiac disease: A cross-sectional study. *Int J Pediatr*. 2017;5(7):5339-5349.

128. Catal F, Topal E, Ermistekin H, et al. The hematologic manifestations of pediatric celiac disease at the time of diagnosis and efficiency of gluten-free diet. *Turk J Med Sci*. 2015;45(3):663-667.

129. Jericho H, Sansotta N, Guandalini S. Extraintestinal manifestations of celiac disease: Effectiveness of the gluten-free diet. *J Pediatr Gastroenterol Nutr*. 2017;65(1):75-79.

130. Joelson AM, Geller MG, Zylberberg HM, Green PHR, Lebwohl B. The effect of depressive symptoms on the association between gluten-free diet adherence and symptoms in celiac disease: Analysis of a patient powered research network. *Nutrients*. 2018;10(5).

131. Joshi A, Falodia S, Kumar N, Gupta P, Khatri PC. Prevalence of celiac disease among pediatric patients with cryptogenic cirrhosis and effect of gluten-free-diet. *Indian J Gastroenterol*. 2018;37(3):243-247.

132. Kabbani TA, Goldberg A, Kelly CP, et al. Body mass index and the risk of obesity in coeliac disease treated with the gluten-free diet. *Aliment Pharmacol Ther*. 2012;35(6):723-729.

133. Karadas U, Eliacik K, Baran M, et al. The subclinical effect of celiac disease on the heart and the effect of gluten-free diet on cardiac functions. *Turk J Pediatr*. 2016;58(3):241-245.

134. Kautto E, Ivarsson A, Norstrom F, Hogberg L, Carlsson A, Hornell A. Nutrient intake in adolescent girls and boys diagnosed with coeliac disease at an early age is mostly comparable to their non-coeliac contemporaries. *J Hum Nutr Diet*. 2014;27(1):41-53.

135. Khashan AS, Henriksen TB, Mortensen PB, et al. The impact of maternal celiac disease on birthweight and preterm birth: A Danish population-based cohort study. *Hum Reprod*. 2010;25(2):528-534.

136. Kinsey L, Burden ST, Bannerman E. A dietary survey to determine if patients with coeliac disease are meeting current healthy eating guidelines and how their diet compares to that of the British general population. *Eur J Clin Nutr*. 2008;62(11):1333-1342.

137. Kotze LM, Skare T, Vinholi A, Jurkonis L, Nisihara R. Impact of a gluten-free diet on bone mineral density in celiac patients. *Rev Esp Enferm Digest*. 2016;108(2):84-88.

138. Lanzini A, Lanzarotto F, Villanacci V, et al. Complete recovery of intestinal mucosa occurs very rarely in adult coeliac patients despite adherence to gluten-free diet. *Aliment Pharmacol Ther*. 2009;29(12):1299-1308.

139. Laurikka P, Salmi T, Collin P, et al. Gastrointestinal symptoms in celiac disease patients on a long-term gluten-free diet. *Nutrients*. 2016;8(7).

140. Lee AR, Ng DL, Diamond B, Ciaccio EJ, Green PH. Living with coeliac disease: Survey results from the USA. *J Hum Nutr Diet*. 2012;25(3):233-238.

141. Leonard MM, Weir DC, DeGroote M, et al. Value of IgA tTG in predicting mucosal recovery in children with celiac disease on a gluten-free diet. *J Pediatr Gastroenterol Nutr*. 2017;64(2):286-291.

142. Levran N, Wilschanski M, Livovsky J, et al. Obesogenic habits among children and their families in response to initiation of gluten-free diet. *Eur J Pediatr*. 2018;177(6):859-866.

143. Lewis NR, Sanders DS, Logan RF, Fleming KM, Hubbard RB, West J. Cholesterol profile in people with newly diagnosed coeliac disease: A comparison with the general population and changes following treatment. *Br J Nutr*. 2009;102(4):509-513.

144. Lionetti E, Catassi C, Francavilla R, et al. Subclinic cardiac involvement in paediatric patients with celiac disease: A novel sign for a case finding approach. *J Biol Regul Homeost Agents*. 2012;26(1 suppl):S63-S68.

145. Osman M, Taha B, Al Duboni G. Assessment of the response to gluten-free diet in an Iraqi population with coeliac disease. A histological and serological follow-up study. *Arch Med Sci*. 2014;10(2):294-299.

146. Mager DR, Qiao J, Turner J. Vitamin D and K status influences bone mineral density and bone accrual in children and adolescents with celiac disease. *Eur J Clin Nutr*. 2012;66(4):488-495.

147. Maggio MC, Corsello G, Iacono G, et al. Gluten-free diet impact on leptin levels in asymptomatic coeliac adolescents: One year of follow-up. *Horm Res*. 2007;67(2):100-104.

148. Margoni D, Chouliaras G, Duscas G, et al. Bone health in children with celiac disease assessed by dual x-ray absorptiometry: Effect of gluten-free diet and predictive value of serum biochemical indices. *J Pediatr Gastroenterol Nutr*. 2012;54(5):680-684.

149. Margoni D, Michalakakou K, Angeli E, et al. Serum brain-derived neurotrophic factor in children with coeliac disease. *Eur J Clin Invest*. 2018;48(5):e12916.

150. Martin J, Geisel T, Maresch C, Krieger K, Stein J. Inadequate nutrient intake in patients with celiac disease: Results from a German dietary survey. *Digestion*. 2013;87(4):240-246.

151. Mazzone L, Reale L, Spina M, et al. Compliant gluten-free children with celiac disease: An evaluation of psychological distress. *BMC Pediatr*. 2011;11:46.

152. Mishra K, Kumar P, Kumar R, Kaur S, Basu S, Dutta AK. Assessment of sexual maturity in a cohort of adolescents with celiac disease on gluten-free diet. *Indian J Gastroenterol*. 2012;31(3):130-132.

153. Nachman F, Maurino E, Vazquez H, et al. Quality of life in celiac disease patients: Prospective analysis on the importance of clinical severity at diagnosis and the impact of treatment. *Dig Liver Dis*. 2009;41(1):15-25.

154. Nachman F, del Campo MP, Gonzalez A, et al. Long-term deterioration of quality of life in adult patients with celiac disease is associated with treatment noncompliance. *Dig Liver Dis*. 2010;42(10):685-691.

155. Nachman F, Vazquez H, Gonzalez A, et al. Gastroesophageal reflux symptoms in patients with celiac disease and the effects of a gluten-free diet. *Clin Gastroenterol Hepatol*. 2011;9(3):214-219.

156. Newnham ED, Shepherd SJ, Strauss BJ, Hosking P, Gibson PR. Adherence to the gluten-free diet can achieve the therapeutic goals in almost all patients with coeliac disease: A 5-year longitudinal study from diagnosis. *J Gastroenterol Hepatol*. 2016;31(2):342-349.

157. Norsa L, Branchi F, Bravo M, et al. Celiac disease 30 years after diagnosis: Struggling with gluten-free adherence or gaining gluten tolerance? *J Pediatr Gastroenterol Nutr*. 2018;67(3):361-366.

158. Norsa L, Shamir R, Zevit N, et al. Cardiovascular disease risk factor profiles in children with celiac disease on gluten-free diets. *World J Gastroenterol*. 2013;19(34):5658-5664.

159. Norstrom F, Sandstrom O, Lindholm L, Ivarsson A. A gluten-free diet effectively reduces symptoms and health care consumption in a Swedish celiac disease population. *BMC Gastroenterol*. 2012;12:125.

160. Belei O, Dobrescu A, Heredea R, Iacob ER, David V, Marginean O. Histologic recovery among children with celiac disease on a gluten-free diet. A long-term follow-up single-center experience. *Arch Med Sci*. 2018;14(1):94-100.

161. Ohlund K, Olsson C, Hernell O, Ohlund I. Dietary shortcomings in children on a

gluten-free diet. *J Hum Nutr Diet*. 2010;23(3):294-300.

162. Olen O, Askling J, Ludvigsson JF, Hildebrand H, Ekbom A, Smedby KE. Coeliac disease characteristics, compliance to a gluten free diet and risk of lymphoma by subtype. *Dig Liver Dis*. 2011;43(11):862-868.
163. Oliveira GN, Mohan R, Fagbemi A. Review of celiac disease presentation in a pediatric tertiary centre. *Arq Gastroenterol*. 2018;55(1):86-93.
164. Paavola A, Kurppa K, Ukkola A, et al. Gastrointestinal symptoms and quality of life in screen-detected celiac disease. *Dig Liver Dis*. 2012;44(10):814-818.
165. Pantaleoni S, Luchino M, Adriani A, et al. Bone mineral density at diagnosis of celiac disease and after 1 year of gluten-free diet. *Sci World J*. 2014;2014:173082.
166. Parisi P, Pietropaoli N, Ferretti A, et al. Role of the gluten-free diet on neurological-EEG findings and sleep disordered breathing in children with celiac disease. *Seizure*. 2015;25:181-183.
167. Pekki H, Kurppa K, Maki M, et al. Predictors and significance of incomplete mucosal recovery in celiac disease after 1 year on a gluten-free diet. *Am J Gastroenterol*. 2015;110(7):1078-1085.
168. Pereyra L, Gonzalez R, Mohaidle A, et al. Risk of colorectal neoplasia in patients with celiac disease: A multicenter study. *J Crohns Colitis*. 2013;7(12):e672-e677.
169. Petroff D, Wolf J, Richter T, et al. Antibody concentrations decrease 14-fold in children with celiac disease on a gluten-free diet but remain high at 3 months. *Clin Gastroenterol Hepatol*. 2018;16(9):1442-1449.e1445.
170. Pham-Short A, C Donaghue K, Ambler G, et al. Early elevation of albumin excretion rate is associated with poor gluten-free diet adherence in young people with coeliac disease and diabetes. *Diabet Med*. 2014;31(2):208-212.
171. Pham-Short A, Donaghue KC, Ambler G, Garnett S, Craig ME. Quality of life in type 1 diabetes and celiac disease: Role of the gluten-free diet. *J Pediatr*. 2016;179:131-138.e131.
172. Poulain C, Johanet C, Delcroix C, Levy-Marchal C, Tubiana-Rufi N. Prevalence and clinical features of celiac disease in 950 children with type 1 diabetes in France. *Diabetes Metab*. 2007;33(6):453-458.
173. Pulido O, Zarkadas M, Dubois S, et al. Clinical features and symptom recovery on a gluten-free diet in Canadian adults with celiac disease. *Can J Gastroenterol*. 2013;27(8):449-453.
174. Radlovic N, Mladenovic M, Lekovic Z, et al. Effect of gluten-free diet on the growth and nutritional status of children with coeliac disease. *Srp Arh Celok Lek*. 2009;137(11-12):632-637.
175. Rajani S, Huynh HQ, Shirton L, et al. A Canadian study toward changing local practice in the diagnosis of pediatric celiac disease. *Can J Gastroenterol Hepatol*. 2016;2016:6234160.
176. Regula J, Smidowicz A. Share of dietary supplements in nutrition of coeliac disease patients. *Acta Sci Polon Technol Aliment*. 2014;13(3):301-307.
177. Reilly NR, Aguilar K, Hassid BG, et al. Celiac disease in normal-weight and overweight children: Clinical features and growth outcomes following a gluten-free diet. *J Pediatr Gastroenterol Nutr*. 2011;53(5):528-531.
178. Rodrigo L, Blanco I, Bobes J, de Serres FJ. Clinical impact of a gluten-free diet on health-related quality of life in seven fibromyalgia syndrome patients with associated celiac disease. *BMC Gastroenterol*. 2013;13:157.
179. Rodriguez Almagro J, Hernandez Martinez A, Lucendo AJ, Casellas F, Solano Ruiz MC, Siles Gonzalez J. Health-related quality of life and determinant factors in celiac disease. A population-based analysis of adult patients in Spain. *Rev Esp Enferm*. 2016;108(4):181-189.
180. Roos S, Karner A, Hallert C. Gastrointestinal symptoms and well-being of adults living on a gluten-free diet: A case for nursing in celiac disease. *Gastroenterol Nurs*. 2009;32(3):196-201.
181. Rubio-Tapia A, Rahim MW, See JA, Lahr BD, Wu TT, Murray JA. Mucosal recovery and mortality in adults with celiac disease after treatment with a gluten-free diet. *Am J Gastroenterol*. 2010;105(6):1412-1420.
182. Russo F, Chimienti G, Clemente C, Ferreri C, Orlando A, Riezzo G. A possible role for ghrelin, leptin, brain-derived neurotrophic factor and docosahexaenoic acid in reducing the quality of life of coeliac disease patients following a gluten-free diet. *Eur J Nutr*. 2017;56(2):807-818.
183. Saadah OI. Celiac disease in children and adolescents at a singe center in Saudi Arabia. *Ann Saudi Med*. 2011;31(1):51-57.
184. Sainsbury K, Mullan B, Sharpe L. Reduced quality of life in coeliac disease is more strongly associated with depression than gastrointestinal symptoms. *J Psychosom Res*. 2013;75(2):135-141.
185. Salardi S, Maltoni G, Zucchini S, et al. Whole lipid profile and not only HDL cholesterol is impaired in children with coexisting type 1 diabetes and untreated celiac disease. *Acta Diabetol*. 2017;54(10):889-894.
186. Saps M, Sansotta N, Bingham S, et al. Abdominal pain-associated functional gastrointestinal disorder prevalence in children and adolescents with celiac disease on gluten-free diet: A multinational study. *J Pediatr*. 2017;182:150-154.
187. Sayar E, Ozdem S, Uzun G, Islek A, Yilmaz A, Artan R. Total oxidant status, total antioxidant capacity and ischemia modified albumin levels in children with celiac disease. *Turk J Pediatr*. 2015;57(5):498-503.
188. Schosler L, Christensen LA, Hvas CL. Symptoms and findings in adult-onset celiac disease in a historical Danish patient cohort. *Scand J Gastroenterol*. 2016;51(3):288-294.
189. Shepherd SJ, Gibson PR. Nutritional inadequacies of the gluten-free diet in both recently-diagnosed and long-term patients with coeliac disease. *J Hum Nutr Diet*. 2013;26(4):349-358.
190. Silano M, Volta U, Vincenzi AD, Dessi M, Vincenzi MD. Effect of a gluten-free diet on the risk of enteropathy-associated T-cell lymphoma in celiac disease. *Dig Dis Sci*. 2008;53(4):972-976.
191. Silvester JA, Weiten D, Graff LA, Walker JR, Duerksen DR. Living gluten-free: Adherence, knowledge, lifestyle adaptations and feelings towards a gluten-free diet. *J Hum Nutr Diet*. 2016;29(3):374-382.
192. Silvester JA, Graff LA, Rigaux L, Walker JR, Duerksen DR. Symptomatic suspected gluten exposure is common among patients with coeliac disease on a gluten-free diet. *Aliment Pharmacol Ther*. 2016;44(6):612-619.
193. Silvester JA, Graff LA, Rigaux L, et al. Symptoms of functional intestinal disorders are common in patients with celiac disease following transition to a gluten-free diet. *Dig Dis Sci*. 2017;62(9):2449-2454.
194. Simsek S, Baysoy G, Gencoglan S, Uluca U. Effects of gluten-free diet on quality of life and depression in children with celiac disease. *J Pediatr Gastroenterol Nutr*. 2015;61(3):303-306.
195. Singh P, Agnihotri A, Jindal G, et al. Celiac disease and chronic liver disease: Is there a relationship? *Indian J Gastroenterol*. 2013;32(6):404-408.
196. Singhal N, Alam S, Sherwani R, Musarrat J. Serum zinc levels in celiac disease. *Indian Pediatr*. 2008;45(4):319-321.
197. Smith MM, Goodfellow L. The relationship between quality of life and coping strategies of adults with celiac disease adhering to a gluten-free diet. *Gastroenterol Nurs*. 2011;34(6):460-468.
198. Solakivi T, Kaukinen K, Kunnas T, Lehtimaki T, Maki M, Nikkari ST. Serum fatty acid profile in celiac disease patients before and after a gluten-free diet. *Scand J Gastroenterol*. 2009;44(7):826-830.
199. Sponzilli I, Chiari G, Iovane B, et al. Celiac disease in children with type 1 diabetes: Impact of gluten free diet on diabetes management. *Acta Biomed*. 2010;81(3):165-170.
200. Sud S, Marcon M, Assor E, Daneman D, Mahmud FH. Quality of life in children with diabetes and celiac disease: Minimal impact of the 'double diagnosis'. *Pediatr Diabetes*. 2012;13(2):163-169.
201. Sun S, Puttha R, Ghezaiel S, Skae M, Cooper C, Amin R. The effect of biopsy-positive silent coeliac disease and treatment with a gluten-free diet on growth and glycaemic control in children with type 1 diabetes. *Diabet Med*. 2009;26(12):1250-1254.
202. Tjellstrom B, Hogberg L, Stenhammar L, et al. Faecal short-chain fatty acid pattern in childhood coeliac disease is normalised after more than one year's gluten-free diet. *Microb Ecol Health Dis*. 2013;24.

203. Tontini GE, Rondonotti E, Saladino V, Saibeni S, de Franchis R, Vecchi M. Impact of gluten withdrawal on health-related quality of life in celiac subjects: An observational case-control study. *Digestion*. 2010;82(4):221-228.

204. Tovoli F, Negrini G, Fari R, et al. Increased risk of nonalcoholic fatty liver disease in patients with coeliac disease on a gluten-free diet: Beyond traditional metabolic factors. *Aliment Pharmacol Ther*. 2018;48(5):538-546.

205. Tuire I, Marja-Leena L, Teea S, et al. Persistent duodenal intraepithelial lymphocytosis despite a long-term strict gluten-free diet in celiac disease. *Am J Gastroenterol*. 2012;107(10):1563-1569.

206. Tuna Kirsaclioglu C, Kuloglu Z, Tanca A, et al. Bone mineral density and growth in children with coeliac disease on a gluten free-diet. *Turk J Med Sci*. 2016;46(6):1816-1821.

207. Tursi A, Elisei W, Giorgetti GM, Brandimarte G, Aiello F. Complications in celiac disease under gluten-free diet. *Dig Dis Sci*. 2009;54(10):2175-2182.

208. Tursi A, Giorgetti G, Brandimarte G, Elisei W. Effect of gluten-free diet on pregnancy outcome in celiac disease patients with recurrent miscarriages. *Dig Dis Sci*. 2008;53(11):2925-2928.

209. Ukkola A, Maki M, Kurppa K, et al. Diet improves perception of health and well-being in symptomatic, but not asymptomatic, patients with celiac disease. *Clin Gastroenterol Hepatol*. 2011;9(2):118-123.

210. Ukkola A, Maki M, Kurppa K, et al. Changes in body mass index on a gluten-free diet in coeliac disease: A nationwide study. *Eur J Intern Med*. 2012;23(4):384-388.

211. Usai P, Manca R, Cuomo R, Lai MA, Boi MF. Effect of gluten-free diet and co-morbidity of irritable bowel syndrome-type symptoms on health-related quality of life in adult coeliac patients. *Dig Liver Dis*. 2007;39(9):824-828.

212. Usai P, Manca R, Cuomo R, Lai MA, Russo L, Boi MF. Effect of gluten-free diet on preventing recurrence of gastro-esophageal reflux disease-related symptoms in adult celiac patients with nonerosive reflux disease. *J Gastroenterol Hepatol*. 2008;23(9):1368-1372.

213. Usai-Satta P, Oppia F, Scarpa M, Giannetti C, Cabras F. Delayed gastric emptying does not normalize after gluten withdrawal in adult celiac disease. *Scand J Gastroenterol*. 2016;51(8):923-926.

214. Uspenskaya ID, Erzutova MV, Korkotashvili LV, Kolesov SA, Shirokova NY. The significance of increased levels of end nitric oxide metabolites in blood serum of children with celiac disease. *Bratisl Lek Listy*. 2014;115(11):712-717.

215. Usta M, Urganci N. Does gluten-free diet protect children with celiac disease from low bone density? *Iran J Pediatr*. 2014;24(4):429-434.

216. Valente FX, Campos Tdo N, Moraes LF, et al. B vitamins related to homocysteine metabolism in adults celiac disease patients: A cross-sectional study. *Nutr J*. 2015;14:110.

217. Valerio G, Spadaro R, Iafusco D, et al. The influence of gluten free diet on quantitative ultrasound of proximal phalanxes in children and adolescents with type 1 diabetes mellitus and celiac disease. *Bone*. 2008;43(2):322-326.

218. Valletta E, Fornaro M, Cipolli M, Conte S, Bissolo F, Danchielli C. Celiac disease and obesity: Need for nutritional follow-up after diagnosis. *Eur J Clin Nutr*. 2010;64(11):1371-1372.

219. Valletta E, Ulmi D, Mabboni I, Tomasselli F, Pinelli L. Early diagnosis and treatment of celiac disease in type 1 diabetes. A longitudinal, case-control study. *Pediatr Med Chir*. 2007;29(2):99-104.

220. van Hees NJ, Giltay EJ, Tielemans SM, et al. Essential amino acids in the gluten-free diet and serum in relation to depression in patients with celiac disease. *PLoS One*. 2015;10(4):e0122619.

221. van Hees NJ, Van der Does W, Giltay EJ. Coeliac disease, diet adherence and depressive symptoms. *J Psychosom Res*. 2013;74(2):155-160.

222. van Koppen EJ, Schweizer JJ, Csizmadia CG, et al. Long-term health and quality-of-life consequences of mass screening for childhood celiac disease: A 10-year follow-up study. *Pediatrics*. 2009;123(4):e582-e588.

223. Venkatasubramani N, Telega G, Werlin SL. Obesity in pediatric celiac disease. *J Pediatr Gastroenterol Nutr*. 2010;51(3):295-297.

224. Vilppula A, Kaukinen K, Luostarinen L, et al. Clinical benefit of gluten-free diet in screen-detected older celiac disease patients. *BMC Gastroenterol*. 2011;11:136.

225. Wessels MM, van Veen II, Vriezinga SL, Putter H, Rings EH, Mearin ML. Complementary serologic investigations in children with celiac disease is unnecessary during follow-up. *J Pediatr*. 2016;169:55-60.

226. Wolf RL, Lebwohl B, Lee AR, et al. Hypervigilance to a gluten-free diet and decreased quality of life in teenagers and adults with celiac disease. *Dig Dis Sci*. 2018;63(6):1438-1448.

227. Yerushalmy-Feler A, Tauman R, Derowe A, et al. Gluten-free diet may improve obstructive sleep apnea-related symptoms in children with celiac disease. *BMC Pediatr*. 2018;18(1):35.

228. Zanchetta MB, Longobardi V, Costa F, et al. Impaired bone microarchitecture improves after one year on gluten-free diet: A prospective longitudinal HRpQCT study in women with celiac disease. *J Bone Miner Res*. 2017;32(1):135-142.

229. Zanchi C, Di Leo G, Ronfani L, Martelossi S, Not T, Ventura A. Bone metabolism in celiac disease. *J Pediatr*. 2008;153(2):262-265.

230. Zanini B, Mazzoncini E, Lanzarotto F, et al. Impact of gluten-free diet on cardiovascular risk factors. A retrospective analysis in a large cohort of coeliac patients. *Dig Liver Dis*. 2013;45(10):810-815.

231. Zarkadas M, Dubois S, MacIsaac K, et al. Living with coeliac disease and a gluten-free diet: A Canadian perspective. *J Hum Nutr Diet*. 2013;26(1):10-23.

232. Zingone F, Siniscalchi M, Capone P, et al. The quality of sleep in patients with coeliac disease. *Aliment Pharmacol Ther*. 2010;32(8):1031-1036.

233. Zuccotti G, Fabiano V, Dilillo D, Picca M, Cravidi C, Brambilla P. Intakes of nutrients in Italian children with celiac disease and the role of commercially available gluten-free products. *J Hum Nutr Diet*. 2013;26(5):436-444.

234. Zylberberg HM, Demmer RT, Murray JA, Green PHR, Lebwohl B. Depression and insomnia among individuals with celiac disease or on a gluten-free diet in the USA: Results from a national survey. *Eur J Gastroenterol Hepatol*. 2017;29(9):1091-1096.

235. Croese J, Giacomin P, Navarro S, et al. Experimental hookworm infection and gluten microchallenge promote tolerance in celiac disease. *J Allergy Clin Immunol*. 2015;135(2):508-516.

236. Daveson AJ, Jones DM, Gaze S, et al. Effect of hookworm infection on wheat challenge in celiac disease—a randomised double-blinded placebo controlled trial. *PLoS One*. 2011;6(3):e17366.

237. Testa A, Imperatore N, Rispo A, et al. Beyond irritable bowel syndrome: The efficacy of the low FODMAP diet for improving symptoms in inflammatory bowel diseases and celiac disease. *Dig Dis*. 2018;36(4):271-280.

238. de Souza MC, Deschenes ME, Laurencelle S, Godet P, Roy CC, Djilali-Saiah I. Pure oats as part of the canadian gluten-free diet in celiac disease: The need to revisit the issue. *Can J Gastroenterol Hepatol*. 2016;2016:1576360.

239. Garsed K, Scott BB. Can oats be taken in a gluten-free diet? A systematic review. *Scand J Gastroenterol*. 2007;42(2):171-178.

240. La Vieille S, Pulido OM, Abbott M, Koerner TB, Godefroy S. Celiac disease and gluten-free oats: A Canadian position based on a literature review. *Can J Gastroenterol Hepatol*. 2016;2016:1870305.

241. Pinto-Sanchez MI, Causada-Calo N, Bercik P, et al. Safety of adding oats to a gluten-free diet for patients with celiac disease: Systematic review and meta-analysis of clinical and observational studies. *Gastroenterology*. 2017;153(2):395-409.e393.

242. Pulido OM, Gillespie Z, Zarkadas M, et al. Introduction of oats in the diet of individuals with celiac disease: A systematic review. *Adv Food Nutr Res*. 2009;57:235-285.

243. Cooper SE, Kennedy NP, Mohamed BM, et al. Immunological indicators of coeliac disease activity are not altered by long-term oats challenge. *Clin Exp Immunol*. 2013;171(3):313-318.

244. Gatti S, Caporelli N, Galeazzi T, et al. Oats in the diet of children with celiac

disease: Preliminary results of a double-blind, randomized, placebo-controlled multicenter Italian study. *Nutrients*. 2013;5(11):4653-4664.

245. Kemppainen TA, Heikkinen MT, Ristikankare MK, Kosma VM, Julkunen RJ. Nutrient intakes during diets including unkilned and large amounts of oats in celiac disease. *Eur J Clin Nutr*. 2010;64(1):62-67.

246. Kemppainen TA, Heikkinen MT, Ristikankare MK, et al. Unkilned and large amounts of oats in the coeliac disease diet: A randomized, controlled study. *Scand J Gastroenterol*. 2008;43(9):1094-1101.

247. Koskinen O, Villanen M, Korponay-Szabo I, Lindfors K, Maki M, Kaukinen K. Oats do not induce systemic or mucosal autoantibody response in children with coeliac disease. *J Pediatr Gastroenterol Nutr*. 2009;48(5):559-565.

248. Lionetti E, Gatti S, Galeazzi T, et al. Safety of oats in children with celiac disease: A double-blind, randomized, placebo-controlled trial. *J Pediatr*. 2018;194:116-122.e112.

249. Sey MS, Parfitt J, Gregor J. Prospective study of clinical and histological safety of pure and uncontaminated Canadian oats in the management of celiac disease. *JPEN J Parenter Enteral Nutr*. 2011;35(4):459-464.

250. Tjellstrom B, Stenhammar L, Sundqvist T, et al. The effects of oats on the function of gut microflora in children with coeliac disease. *Aliment Pharmacol Ther*. 2014;39(10):1156-1160.

251. Aaltonen K, Laurikka P, Huhtala H, Maki M, Kaukinen K, Kurppa K. The long-term consumption of oats in celiac disease patients is safe: A large cross-sectional study. *Nutrients*. 2017;9(6).

252. Guttormsen V, Lovik A, Bye A, Bratlie J, Morkrid L, Lundin KE. No induction of anti-avenin IgA by oats in adult, diet-treated coeliac disease. *Scand J Gastroenterol*. 2008;43(2):161-165.

253. Kaukinen K, Collin P, Huhtala H, Maki M. Long-term consumption of oats in adult celiac disease patients. *Nutrients*. 2013;5(11):4380-4389.

254. Kemppainen T, Janatuinen E, Holm K, et al. No observed local immunological response at cell level after five years of oats in adult coeliac disease. *Scand J Gastroenterol*. 2007;42(1):54-59.

255. Lee AR, Ng DL, Dave E, Ciaccio EJ, Green PH. The effect of substituting alternative grains in the diet on the nutritional profile of the gluten-free diet. *J Hum Nutr Diet*. 2009;22(4):359-363.

256. Tapsas D, Falth-Magnusson K, Hogberg L, Forslund T, Sundqvist T, Hollen E. Urinary nitric oxide metabolites in children with celiac disease after long-term consumption of oats-containing gluten-free diet. *Scand J Gastroenterol*. 2014;49(11):1311-1317.

257. Tapsas D, Falth-Magnusson K, Hogberg L, Hammersjo JA, Hollen E. Swedish children with celiac disease comply well with a gluten-free diet, and most include oats without reporting any adverse effects: A long-term follow-up study. *Nutr Res*. 2014;34(5):436-441.

258. Zevallos VF, Herencia LI, Chang F, Donnelly S, Ellis HJ, Ciclitira PJ. Gastrointestinal effects of eating quinoa (*Chenopodium quinoa* Willd.) in celiac patients. *Am J Gastroenterol*. 2014;109(2):270-278.

259. Hopman E, Dekking L, Blokland ML, et al. Tef in the diet of celiac patients in The Netherlands. *Scand J Gastroenterol*. 2008;43(3):277-282.

260. Zanini B, Petroboni B, Not T, et al. Search for atoxic cereals: A single blind, cross-over study on the safety of a single dose of *Triticum monococcum*, in patients with celiac disease. *BMC Gastroenterol*. 2013;13:92.

261. Zanini B, Villanacci V, De Leo L, Lanzini A. *Triticum monococcum* in patients with celiac disease: A phase II open study on safety of prolonged daily administration. *Eur J Nutr*. 2015;54(6):1027-1029.

262. Kaukinen K, Salmi T, Collin P, Huhtala H, Karja-Lahdensuu T, Maki M. Clinical trial: Gluten microchallenge with wheat-based starch hydrolysates in coeliac disease patients—A randomized, double-blind, placebo-controlled study to evaluate safety. *Aliment Pharmacol Ther*. 2008;28(10):1240-1248.

263. Mandile R, Picascia S, Parrella C, et al. Lack of immunogenicity of hydrolysed wheat flour in patients with coeliac disease after a short-term oral challenge. *Aliment Pharmacol Ther*. 2017;46(4):440-446.

264. Drabinska N, Jarocka-Cyrta E, Markiewicz LH, Krupa-Kozak U. The effect of oligofructose-enriched inulin on faecal bacterial counts and microbiota-associated characteristics in celiac disease children following a gluten-free diet: Results of a randomized, placebo-controlled trial. *Nutrients*. 2018;10(2).

265. Drabinska N, Krupa-Kozak U, Ciska E, Jarocka-Cyrta E. Plasma profile and urine excretion of amino acids in children with celiac disease on gluten-free diet after oligofructose-enriched inulin intervention: Results of a randomised placebo-controlled pilot study. *Amino Acids*. 2018;50(10):1451-1460.

266. Francavilla R, Piccolo M, Francavilla A, et al. Clinical and microbiological effect of a multispecies probiotic supplementation in celiac patients with persistent IBS-type symptoms: A randomized, double-blind, placebo-controlled, multicenter trial. *J Clin Gastroenterol*. 2019;53(3):e117-e125.

267. Harnett J, Myers SP, Rolfe M. Probiotics and the microbiome in celiac disease: A randomised controlled trial. *Evid Based Complement Alternat Med*. 2016;2016:9048574.

268. Klemenak M, Dolinsek J, Langerholc T, Di Gioia D, Micetic-Turk D. Administration of *Bifidobacterium breve* decreases the production of TNF-alpha in children with celiac disease. *Dig Dis Sci*. 2015;60(11):3386-3392.

269. Martinello F, Roman CF, Souza PA. Effects of probiotic intake on intestinal bifidobacteria of celiac patients. *Arq Gastroenterol*. 2017;54(2):85-90.

270. Olivares M, Castillejo G, Varea V, Sanz Y. Double-blind, randomised, placebo-controlled intervention trial to evaluate the effects of *Bifidobacterium longum* CECT 7347 in children with newly diagnosed coeliac disease. *Br J Nutr*. 2014;112(1):30-40.

271. Primec M, Klemenak M, Di Gioia D, et al. Clinical intervention using *Bifidobacterium* strains in celiac disease children reveals novel microbial modulators of TNF-alpha and short-chain fatty acids. *Clin Nutr*. 2019;38(3):1373-1381.

272. Quagliariello A, Aloisio I, Bozzi Cionci N, et al. Effect of *Bifidobacterium breve* on the intestinal microbiota of coeliac children on a gluten free diet: A pilot study. *Nutrients*. 2016;8(10).

273. Smecuol E, Hwang HJ, Sugai E, et al. Exploratory, randomized, double-blind, placebo-controlled study on the effects of Bifidobacterium infantis natren life start strain super strain in active celiac disease. *J Clin Gastroenterol*. 2013;47(2):139-147.

274. Pinto-Sanchez MI, Smecuol EC, Temprano MP, et al. *Bifidobacterium infantis* NLS super strain reduces the expression of alpha-defensin-5, a marker of innate immunity, in the mucosa of active celiac disease patients. *J Clin Gastroenterol*. 2017;51(9):814-817.

275. Ciacci C, Peluso G, Iannoni E, et al. l-Carnitine in the treatment of fatigue in adult celiac disease patients: A pilot study. *Dig Liver Dis*. 2007;39(10):922-928.

276. Elli L, Ferretti F, Branchi F, et al. sucrosomial iron supplementation in anemic patients with celiac disease not tolerating oral ferrous sulfate: A prospective study. *Nutrients*. 2018;10(3).

277. Hadithi M, Mulder CJ, Stam F, et al. Effect of B vitamin supplementation on plasma homocysteine levels in celiac disease. *World J Gastroenterol*. 2009;15(8):955-960.

278. Hallert C, Svensson M, Tholstrup J, Hultberg B. Clinical trial: B vitamins improve health in patients with coeliac disease living on a gluten-free diet. *Aliment Pharmacol Ther*. 2009;29(8):811-816.

279. Negi K, Kumar R, Sharma L, Datta SP, Choudhury M, Kumar P. Serum zinc, copper and iron status of children with coeliac disease on three months of gluten-free diet with or without four weeks of zinc supplements: A randomised controlled trial. *Trop Doct*. 2018;48(2):112-116.

280. Rawal P, Thapa BR, Prasad R, Prasad KK, Nain CK, Singh K. Zinc supplementation to patients with celiac disease—Is it required? *J Trop Pediatr*. 2010;56(6):391-397.

281. Silvester JA, Kurada S, Szwajcer A, Kelly CP, Leffler DA, Duerksen DR. Tests for serum transglutaminase and endomysial antibodies do not detect most patients with celiac disease and persistent villous atrophy on gluten-free diets: A meta-analysis. *Gastroenterology*. 2017;153(3):689-701.e681.

282. Leffler DA, Edwards George JB, Dennis M, Cook EF, Schuppan D, Kelly CP. A prospective comparative study of five measures of gluten-free diet adherence in adults with coeliac disease. *Aliment Pharmacol Ther*. 2007;26(9):1227-1235.

283. da Silva Kotze LM, Rodrigues APB, Kotze LR, Nisihara RM. A Brazilian experience of the self transglutaminase-based test for celiac disease case finding and diet monitoring. *World J Gastroenterol*. 2009;15(35):4423-4428.

284. Leffler DA, Dennis M, Edwards George J, et al. A validated disease-specific symptom index for adults with celiac disease. *Clin Gastroenterol Hepatol*. 2009;7(12):1328-1334, 1334.e1321-1323.

285. Koskinen O, Collin P, Lindfors K, Laurila K, Maki M, Kaukinen K. Usefulness of small-bowel mucosal transglutaminase-2 specific autoantibody deposits in the diagnosis and follow-up of celiac disease. *J Clin Gastroenterol*. 2010;44(7):483-488.

286. Sugai E, Nachman F, Vaquez H, et al. Dynamics of celiac disease-specific serology after initiation of a gluten-free diet and use in the assessment of compliance with treatment. *Dig Liver Dis*. 2010;42(5):352-358.

287. Laadhar L, Kallel-Sellami M, Zitouni M, Mehrezi A, Makni S, Ben Hariz M. Is the rapid whole blood test useful for diagnosis and monitoring celiac disease in children? *Tunis Med*. 2011;89(1):16-17.

288. Monzani A, Rapa A, Fonio P, Tognato E, Panigati L, Oderda G. Use of deamidated gliadin peptide antibodies to monitor diet compliance in childhood celiac disease. *J Pediatr Gastroenterol Nutr*. 2011;53(1):55-60.

289. Nachman F, Sugai E, Vazquez H, et al. Serological tests for celiac disease as indicators of long-term compliance with the gluten-free diet. *Eur J Gastroenterol Hepatol*. 2011;23(6):473-480.

290. Planas R, Pujol-Autonell I, Ruiz E, et al. Regenerating gene Ialpha is a biomarker for diagnosis and monitoring of celiac disease: A preliminary study. *Transl Res*. 2011;158(3):140-145.

291. Purnak T, Efe C, Yuksel O, Beyazit Y, Ozaslan E, Altiparmak E. Mean platelet volume could be a promising biomarker to monitor dietary compliance in celiac disease. *Ups J Med Sci*. 2011;116(3):208-211.

292. Comino I, Real A, Vivas S, et al. Monitoring of gluten-free diet compliance in celiac patients by assessment of gliadin 33-mer equivalent epitopes in feces. *Am J Clin Nutr*. 2012;95(3):670-677.

293. Leffler D, Pallav K, Bennett M, et al. Open conformation tissue transglutaminase testing for celiac dietary assessment. *Dig Liver Dis*. 2012;44(5):375-378.

294. Aita A, Rossi E, Basso D, et al. Chemiluminescence and ELISA-based serum assays for diagnosing and monitoring celiac disease in children: A comparative study. *Clin Chem Acta*. 2013;421:202-207.

295. Srinivasan B, Focke-Tejkl M, Weber M, et al. Usefulness of recombinant gamma-gliadin 1 for identifying patients with celiac disease and monitoring adherence to a gluten-free diet. *J Allergy Clin Immunol*. 2015;136(6):1607-1618.e1603.

296. Comino I, Fernandez-Banares F, Esteve M, et al. Fecal gluten peptides reveal limitations of serological tests and food questionnaires for monitoring gluten-free diet in celiac disease patients. *Am J Gastroenterol*. 2016;111(10):1456-1465.

297. Lind MV, Madsen ML, Rumessen JJ, et al. Plasma alkylresorcinols reflect gluten intake and distinguish between gluten-rich and gluten-poor diets in a population at risk of metabolic syndrome. *J Nutr*. 2016;146(10):1991-1998.

298. Adriaanse MPM, Mubarak A, Riedl RG, et al. Progress towards non-invasive diagnosis and follow-up of celiac disease in children; a prospective multicentre study to the usefulness of plasma I-FABP. *Sci Rep*. 2017;7(1):8671.

299. Lau MS, Mooney PD, White WL, et al. The role of an IgA/IgG-deamidated gliadin peptide point-of-care test in predicting persistent villous atrophy in patients with celiac disease on a gluten-free diet. *Am J Gastroenterol*. 2017;112(12):1859-1867.

300. Moreno ML, Cebolla A, Munoz-Suano A, et al. Detection of gluten immunogenic peptides in the urine of patients with coeliac disease reveals transgressions in the gluten-free diet and incomplete mucosal healing. *Gut*. 2017;66(2):250-257.

301. Brouwers MC, Kho ME, Browman GP, et al. AGREE II: Advancing guideline development, reporting, and evaluation in health care. *Prev Med*. 2010;51(5):421-424.

302. Bentley J, Fedewa M. The effect of celiac disease on bone health in children and adolescents: A systematic review and meta-analysis. PROSPERO: International Prospective Register of Systematic Reviews 2018 CRD42018088330. http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018088330. Accessed December 5, 2018.

303. Lorenzo C, Massignam C, Maciel M, et al. Bone mineralization in children and adolescents with celiac disease: A systematic review and meta-analysis. PROSPERO: International Prospective Register of Systematic Reviews 2016 CRD42016035745. http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42016035745. Accessed December 5, 2018.

304. Costa A, Pereira de Brito GA, Kenji Nampo F. Body mass in celiacs: A systematic review with meta-analysis. PROSPERO: International Prospective Register of Systematic Reviews 2018 CRD42018106087. http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018106087. Accessed December 5, 2018.

305. Chau K, Kennedy D, Smy L, et al. Clinical efficacy and safety of probiotics in paediatric gastroenterology: An overview of systematic reviews. PROSPERO: International Prospective Register of Systematic Reviews 2016 CRD42016032907. http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42016032907. Accessed December 5, 2018.

306. Virella-Pérez Y, Steinbeck K, Medlow S, Ho J. A systematic review of mobile and web-based apps that support self-management as this specifically relates to transition from paediatric to adult care in adolescents with chronic illness. PROSPERO: International Prospective Register of Systematic Reviews 2018 CRD42018104611. https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=104611. Accessed December 5, 2018.

307. Power B, Verra D, Iorga E. A systematic review of behaviour change techniques to improve gluten-free diet adherence in individuals with coeliac disease. PROSPERO: International Prospective Register of Systematic Reviews 2018 CRD42018105551. http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018105551. Accessed December 5, 2018.

AUTHOR INFORMATION

F. W. Cheng is a nutrition researcher and D. Handu is senior scientific director, Evidence Analysis Center, Academy of Nutrition and Dietetic, Chicago, IL.

Address correspondence to: Feon W. Cheng, PhD, MPH, RDN, CHTS-CP, Evidence Analysis Center, Academy of Nutrition and Dietetics, 120 S Riverside Plaza, Suite 2190, Chicago, IL 60606-6995. E-mail: fcheng@eatright.org

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

FUNDING/SUPPORT

Funding provided by the Academy of Nutrition and Dietetics, Medical Nutrition Practice Group DPG, Academy of Nutrition and Dietetics Foundation.

ACKNOWLEDGEMENTS

The authors would like to thank Anne Lee, EdD, RDN, LD (content advisor), Mary Sharrett, MS, RD, LD, CNSC (content advisor), and Margaret Foster, MS, MPH, AHIP (librarian) for their contributions to this project. The authors would also like to thank the Academy of Nutrition and Dietetics, Medical Nutrition Practice Group DPG, and the Academy of Nutrition and Dietetics Foundation for their financial support.

AUTHOR CONTRIBUTIONS

Both authors were involved in the data collection and manuscript writing.