COLON

Promotion of Testing for Celiac Disease and the Gluten-Free Diet Among Complementary and Alternative Medicine Practitioners

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INTRODUCTION: **We identified the frequency and assessed the validity of marketing claims made by American chiropractors, naturopaths, homeopaths, acupuncturists, and integrative medicine practitioners relating to the diagnosis and treatment of celiac disease and nonceliac gluten sensitivity (NCGS), both of which have increased in prevalence in recent years.**

METHODS: **We performed a cross-sectional study analyzing websites of practitioners from 10 cities in the United States and analyzed the websites for any mention of celiac or NCGS as well as specific claims of ability to diagnose, ability to treat, and treatment efficacy. We classified treatments promoted as true, false, or unproven, as assessed independently by 2 authors.**

RESULTS: **Of 500 clinics identified, 178 (35.6%) made a claim regarding celiac disease, NCGS, or a gluten-free diet. Naturopath clinic websites have the highest rates of advertising at least one of diagnosis, treatment, or efficacy for celiac disease (40%), followed by integrative medicine clinics (36%), homeopaths (20%), acupuncturists (14%), and chiropractors (12%). Integrative medicine clinics have the highest rates of advertising at least one of diagnosis, treatment, or efficacy for NCGS (45%), followed by naturopaths (37%), homeopaths (14%), chiropractors (14%), and acupuncturists (10%). A geographic analysis yielded no significant variation in marketing rates among clinics from different cities. Of 232 marketing claims made by these complementary and alternative medicine (CAM) clinic websites, 138 (59.5%) were either false or unproven.**

DISCUSSION: **A significant number of CAM clinics advertise diagnostic techniques or treatments for celiac disease or NCGS. Many claims are either false or unproven, thus warranting a need for increased regulation of CAM advertising to protect the public.**

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INTRODUCTION

Celiac disease is an immune-based enteropathy triggered by the ingestion of gluten, the protein component of wheat, rye, and barley. Estimated to affect nearly 1% of the US population, its prevalence has risen in recent decades, due in part to increased awareness and testing, but also in part to a loss in immune tolerance to gluten in a larger proportion of the population (1). Patients with nonceliac gluten sensitivity (NCGS) exhibit symptoms similar to celiac disease but lack autoantibodies and enteropathy. The prevalence of this latter condition is uncertain; however, the prevalence of gluten avoidance among people without celiac disease appears to be far more common than the prevalence of celiac disease, and this phenomenon has risen sharply in recent years (2,3). Given the high public health burden of celiac disease and NCGS and the effectiveness of evidence-based treatments, it is important to ensure that evidence-based treatments are offered to the public.

The reason for the rise in gluten avoidance among people without celiac disease is unknown, but this phenomenon may be due in part to practitioners of complementary and alternative medicine (CAM). This form of health care is widespread in the United States with an estimated 33.2% of adults and 11.6% of children using some form of CAM according to a 2012 survey by the National Health Interview Survey (4). The same survey estimated that the most popular CAM providers were chiropractors, with 8.4% of adults having seen a chiropractor in the past 12 months, followed by acupuncturists (1.4%) and naturopaths (0.3%). The total out-of-pocket expenditure on CAM in 2016 by Americans was $30.2 billion, of which $28.3 billion was for adults and $1.9 billion was for children. Overall, spending on CAM

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represented 9.2% of out-of-pocket spending on healthcare and 1.1% of total health care spending in the United States (5). CAM clinics can be found in great numbers in each major US metropolitan center, and many of those clinics engage in advertising online.

Common examples of CAM include naturopathy, homeopathy, acupuncture, chiropractic, and integrative medicine. Naturopathy emphasizes prevention, treatment, and optimal health through the use of therapeutic methods and substances that encourage individuals' inherent self-healing process. Homeopathy treats disease using minute doses of natural substances that in a healthy person would produce symptoms of a disease. Acupuncture originates in Ancient China and it involves pricking the skin or tissues with needles as a treatment to alleviate pain and to treat various physical, mental, and emotional conditions. Chiropractic is based on the diagnosis and manipulative treatment of misalignments of the joints, which are held to cause other disorders in the body. Integrative medicine combines methods from alternative medicine with practices originating in conventional medicine.

Studies have found that it is not uncommon for CAM clinics to make wide-reaching claims as to their abilities to diagnose and treat a plethora of conditions (6). One study found that nearly 70% of CAM clinics in Canadian metropolitan areas made either a mention or a claim of ability to diagnose or treat allergy, sensitivity, and/or asthma on their websites (7). Because gluten-related disorders are managed by diet alone, they lend themselves to consideration that they may fall in the providence of CAM. Claims by CAM providers as to the ability to diagnose and treat celiac disease and NCGS are understudied. In this study, we analyzed the advertising content of 464 US CAM clinic websites to determine the frequency of the claims made by US CAM clinics regarding celiac disease and NCGS and the validity of the claims.

METHODS

We performed a cross-sectional study assessing the claims made by American CAM practitioners, modeling our methods after the study by Murdoch, et al. (7) surveying Canadian CAM practices. To build a sample of CAM practitioners' websites for analysis, we selected the 10 most populous American metropolitan areas according to 2017 data from the US Census Bureau (8). We then performed Google searches for the following terms: celiac, gluten, gluten intolerance, gluten sensitivity, gluten free, gluten-free. When performing these searches, we used the web tool "isearchfrom.com" to emulate searching from each respective city. This tool also disabled Google's personalized results functionality, ensuring generalizable findings. Search terms were of the form (city practitioner), for example, New York chiropractor, Los Angeles naturopath, Chicago homeopath, Dallas acupuncturist, Houston integrative medicine, etc. Spanish (n = 2) and Chinese (n = 1) language search results were excluded because of coding issues.

We recorded the first 10 results for each of the 5 disciplines (chiropractor, naturopath, homeopath, acupuncture, integrative medicine) in each of the 10 metropolitan areas, yielding 500 search results. When searching for integrative medicine practices, only the practices with an MD on staff were counted. We performed these searches during the month of June, 2018. Only links to clinics or practitioner websites were included; colleges and regulatory bodies were excluded. Advertisements were excluded. Google Maps business results shown at the top of searches were included if they included a link to a clinic or practitioner website. Duplicate links to the same web domain were excluded in the same search, but were not excluded across different searches; this is because the study was designed to focus on what people are actually exposed to when searching. Thirty-three sets of website duplicates were found and one clinic had locations in 4 cities and thus was counted 4 times, meaning there were 464 unique websites. Duplicate websites were counted twice. For example, one example of a website that was counted twice was "naumesnd.com," which appeared in the top 10 in searches for both "Dallas Homeopath" and "Dallas Naturopath." It was counted toward the quota of 10 websites for both naturopaths and homeopaths in Dallas, Texas because the clinic website appeared in unique searches.

We then searched each website for mentions of celiac disease and gluten sensitivity using Google domain search (e.g., "site:http://newyorkhomeopathy.com/celiac"). Owing to the nature of this method, unsearchable text, such as text embedded in image form, was excluded. In addition, we examined each site that made any mention of either celiac or NCGS for medical disclaimers that noted that the information found on the site was not intended to be substituted for medical device. We then compared the different CAM fields with regard to the prevalence of medical disclaimers on their sites.

Based on these results, we then determined whether celiac disease, NCGS, or gluten sensitivity was mentioned; whether claims were made as to the ability to diagnose these conditions; whether claims were made as to the ability to treat these conditions (e.g., "The naturopaths at our clinic treat celiac"); and whether statements were made about the efficacy of the CAM practices in treating these conditions (e.g., "Homeopathy works for celiac disease"). Commonly, a single statement would constitute both a claim of treatment and a claim of efficacy (e.g., "We can treat celiac with chiropractic, which has been shown to work"). Excerpts were recorded for the purpose of sharing qualitative examples. Once the survey of clinics was completed, 232 claims made by the surveyed practitioners' and clinics' websites were collected and assessed independently by 2 authors (P.H.R.G. and B.L.) as either "true or mostly true," or "unproven or false." These classifications were based on the opinion of each of the 2 authors who are regarded as experts having authored several invited reviews in major international medical journals (1,9–11).

RESULTS

Overall, of 500 clinics analyzed, 178 (35.6%) made a claim regarding celiac disease, NCGS, or a gluten-free diet. Celiac disease and NCGS were mentioned by 24.4% and 24.0% of clinic websites, respectively, with 17.8% mentioning both conditions. Naturopath clinic websites had the highest rates of mentioning celiac disease (40%), followed by integrative medicine clinics (36%), homeopaths (20%), acupuncturists (14%), and chiropractors (12%, Table 1 and Figure 1). Integrative medicine clinics had the highest rates of mentioning NCGS (45%), followed by naturopaths (37%), homeopaths (14%), chiropractors (14%), and acupuncturists (10%). Of the clinic websites that made mention of celiac disease or NCGS, a minority made explicit claims of ability to treat or diagnose these conditions with integrative medicine clinics the most likely to advertise diagnosis (22%) and treatment (27%) of celiac disease as well as diagnosis (25%) and treatment (31%) of NCGS. Integrative medicine clinics were followed by

Table 1. Mentions of celiac disease, NCGS, and the gluten-free diet among CAM websites, by clinic type

	No. of websites	Celiac mention (%)	Celiac diagnosis (%)	Celiac treatment (%)	Celiac efficacy (%)	NCGS mention (%)	NCGS diagnosis (%)	NCGS treatment (%)	NCGS efficacy (%)	Gluten-free diet (%)
Chiropractor	100	12	2	8	1	14	3	7	1	15
Homeopath	100	20	7	13	10	14	9	12	7	21
Naturopath	100	40	12	23	10	37	19	27	13	28
Acupuncture	100	14	4	9	6	10	5	6	2	12
Integrative medicine	100	36	22	27	11	45	25	31	15	33
Total	500	24.4	9.4	16.0	7.6	24.0	12.2	16.6	7.6	21.8

CAM, complementary and alternative medicine; NCGS, nonceliac gluten sensitivity.

naturopaths, homeopaths, acupuncturists, and chiropractors among those providers that advertise diagnosis or treatment of celiac disease and NCGS.

When comparing metropolitan regions, we found that search results from Dallas, Texas, were most likely to advertise diagnosis or treatment for celiac disease (36%), whereas sites in Atlanta, Georgia, were most likely to advertise at least one of these claims for NCGS (38%, Figure 2). Results from Philadelphia, Pennsylvania, and Miami, Florida, were least likely to make claims regarding celiac disease and NCGS (12% and 8%, respectively). There were no obvious regional differences seen beyond the city level (i.e., western vs eastern cities, northern vs southern, costal vs inland).

Claims about a gluten-free diet, independent of a celiac disease or NCGS context, were made most frequently by integrative medicine practices (33%), followed by naturopaths (28%), homeopaths (21%), chiropractors (15%), and acupuncturists (12%). Clinics and practitioners in Dallas, Texas, (32%) were most likely to make claims about a gluten-free diet, independent of a celiac disease or NCGS context. Clinics and practitioners in Miami, Florida, were the least likely to make these claims (8%).

Of the 178 clinic websites that made a health claim related to celiac disease, NCGS, or gluten, 172 (96.6%) of these claims were authored by the clinics themselves and the remainder (3.4%) were made by patients' testimonials. It was also found that 41% of these

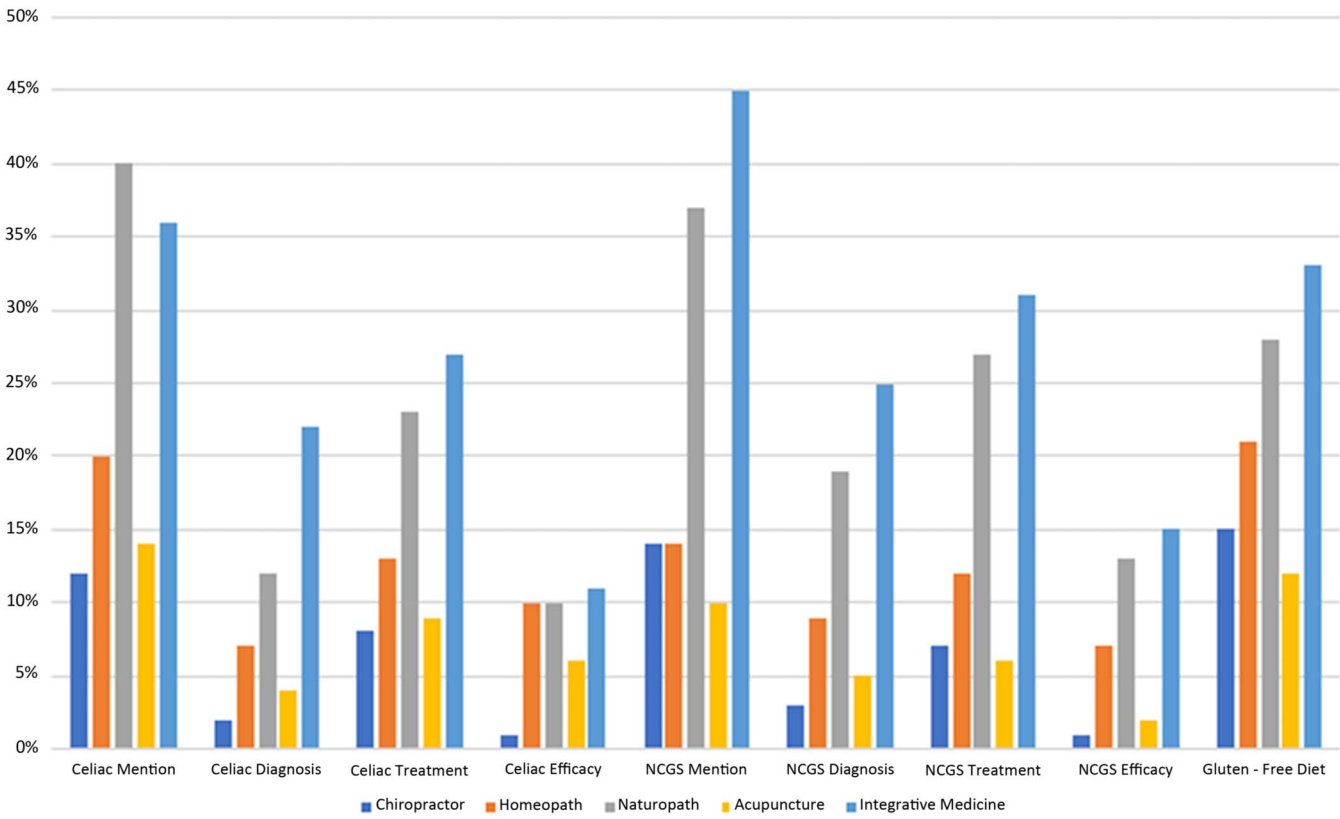

Figure 1. Percentage of clinic websites making specific mentions or claims. CAM, complementary and alternative medicine; NCGS, nonceliac gluten sensitivity.

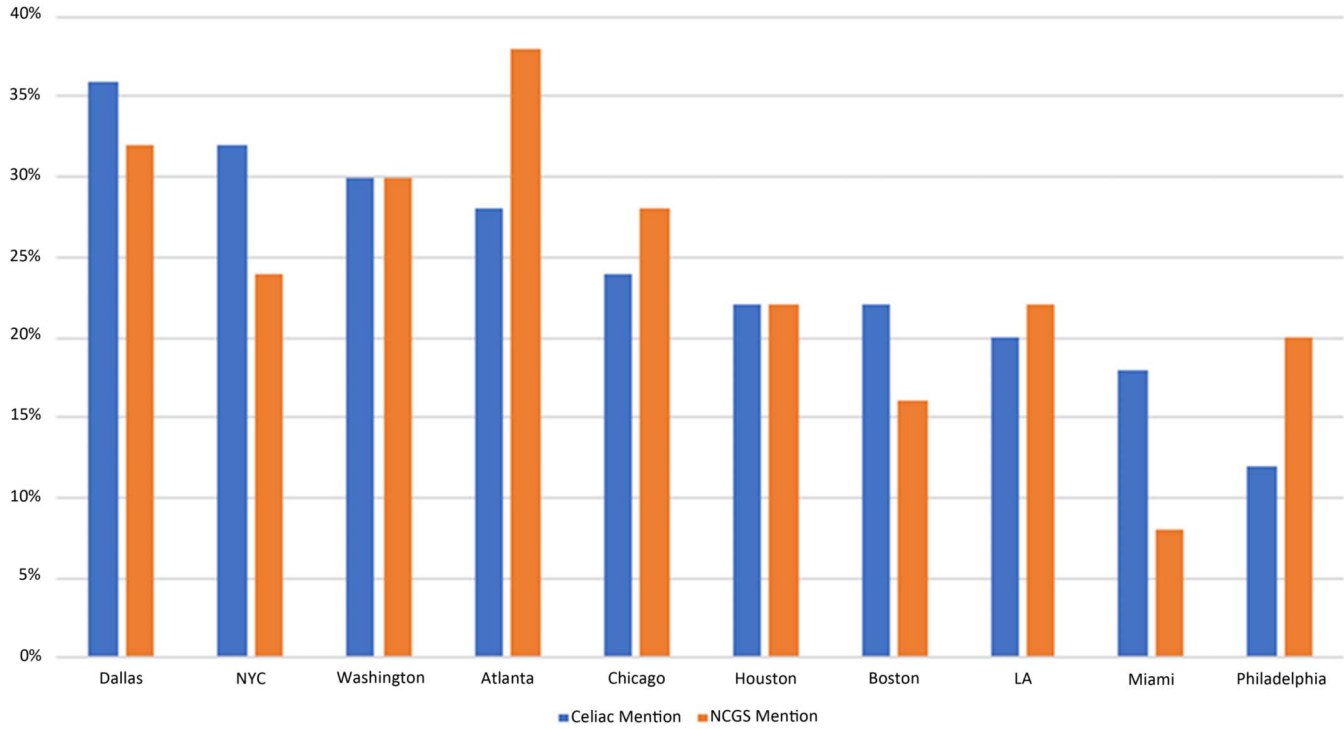

Figure 2. Percentage of clinics mentioning celiac disease and NCGS, by search city. NCGS, nonceliac gluten sensitivity.

clinic websites included a medical disclaimer that stated that the information on the site should not be used as medical advice or diagnosis. A breakdown by clinic type shows that chiropractors (57.9%) were most likely to include a disclaimer, followed by integrative medicine clinics (50.9%), homeopaths (41.9%), naturopaths (39.2%), and acupuncturists (8.3%). Geographically, clinics in Philadelphia (58.8%) were most likely to include a disclaimer and Boston (20%) clinics were least likely (Table 2).

The health claims made on clinic websites were diverse and ranged from speculation about the cause of the increased incidence of celiac disease and NCGS to claims of over-the-counter digestive enzymes that would allow for normal digestive functioning for those with celiac disease and NCGS. Examples of claims of diagnosis, treatment, and efficacy are excerpted in Table 3.

We identified 232 claims from 114 clinic websites. The 2 independent assessors (P.H.R.G. and B.L.) who analyzed these claims were in agreement on 88% of their classifications of the claims as true/mostly true or unproven/false. Of the 232 claims, 138 (59.5%) were judged as unproven or false. A comparison of clinic type showed that claims by integrative medicine practices were the most accurate, with 60.3% of claims evaluated as true or mostly true; chiropractors followed with 50% of their claims determined as accurate. Homeopaths (34.6%), naturopaths (30.3%), and acupuncturists (26.7%) followed with lower rates of accurate claims (Figure 3).

Table 2. Percentage of clinic websites that included a medical disclaimer, by clinic type

Clinic type	Disclaimer (%)
Chiropractor	57.9
Homeopath	41.9
Naturopath	39.2
Acupuncture	8.3
Integrative medicine	50.9

DISCUSSION

Celiac disease is a condition associated with increased morbidity and mortality and requires a life-long therapy of a gluten-free diet. Both the disease and the treatment affect the quality of life of individuals diagnosed. In this analysis of CAM practitioners in 10 metropolitan regions in the United States, we found that nearly one quarter of sites mentioned celiac disease or NCGS. Of particular concern was the fact that nearly 60% of claims regarding celiac disease or gluten were considered by us to be false or unproven. The true proportion of clinics that offer services pertaining to celiac disease or NCGS is potentially higher considering the simplicity of many websites that offered little detail about the clinics' services. This poses a significant health challenge to those with undiagnosed celiac disease and those without celiac disease who may start a gluten-free diet without first undergoing proper testing for celiac disease. Guidelines issued by authoritative associations provide strict criteria for the diagnosis of celiac disease that require serological testing, specialist referral followed by biopsy of the duodenum at endoscopy (12–14). In addition, misdiagnosis or an inappropriate/incorrect diagnosis of either celiac disease or NCGS may impose a restrictive and expensive diet and lifestyle unnecessarily, and delay diagnosis of underlying conditions.

The scope of conditions claimed to be treatable by CAM providers can be broad, and may be expanding. The study on which this study is based revealed that CAM practitioners in

Table 3. Examples of claims of diagnosis, treatment, and efficacy

Claim type	Claim	Clinic website
Diagnosis	"We recommend Diagnos-techs Food Sensitivity Panel, a non-invasive saliva test, which checks response to proteins for dairy, soy, egg, and gluten"	acuatlanta.com (acupuncturist)
Diagnosis	"…the 2 tests for NCGS are elimination diets or IgG antibody testing"	modaycenter.com (integrative medicine)
Diagnosis	"…celiac is diagnosed with a blood test or intestinal biopsy"	drmaura.com (naturopath)
Treatment	"RESTORE develop(s) the best treatment plan for you if you have celiac disease"	therestorecenter.com (integrative medicine)
Treatment	"Homeopathic remedy for: celiac disease"	danielahomeopathy.com (homeopathy)
Treatment	"If you have been newly diagnosed with celiac disease, you may be struggling to navigate the gluten-free world as you try to improve your condition and health … At Holistic Wellness, we frequently work with individuals on how to transition into a gluten-free diet and lifestyle"	naumesnd.com (homeopath/naturopath)
Efficacy	"Homeopathy has successfully treated uncountable people suffering from celiac disease"	homeopathydallas.com (homeopath)
Efficacy	"NAET (Nambudripad Allergy Elimination Technique) [is] an extremely effective technique that can successfully desensitize allergies [including gluten]"	integratedcenterfororientalmedicine.com (integrated medicine)
Efficacy	"I can eliminate food allergies so you don't have to avoid them"	plastikos.com (homeopath)

Canada make claims about their ability to treat allergies and asthma at significantly higher rates than were found in the present study (7). Another example of the expansion of CAM in the United States is the lobbying by the American Association of Naturopathic Physicians for licensing naturopathic doctors (NDs) to be recognized as licensed medical professionals. They argue that NDs should have the ability to work as primary care physicians, prescribe medication, diagnose disease, and accept insurance payments. In 20 states and the District of Columbia, licensed NDs are generally allowed to perform these roles and 15 other states are considering legislation to expand or clarify the scope of what licensed NDs can do (15). In other states without such legislation, naturopathic providers' practices are limited to health advice and nonprescription treatments. This movement is

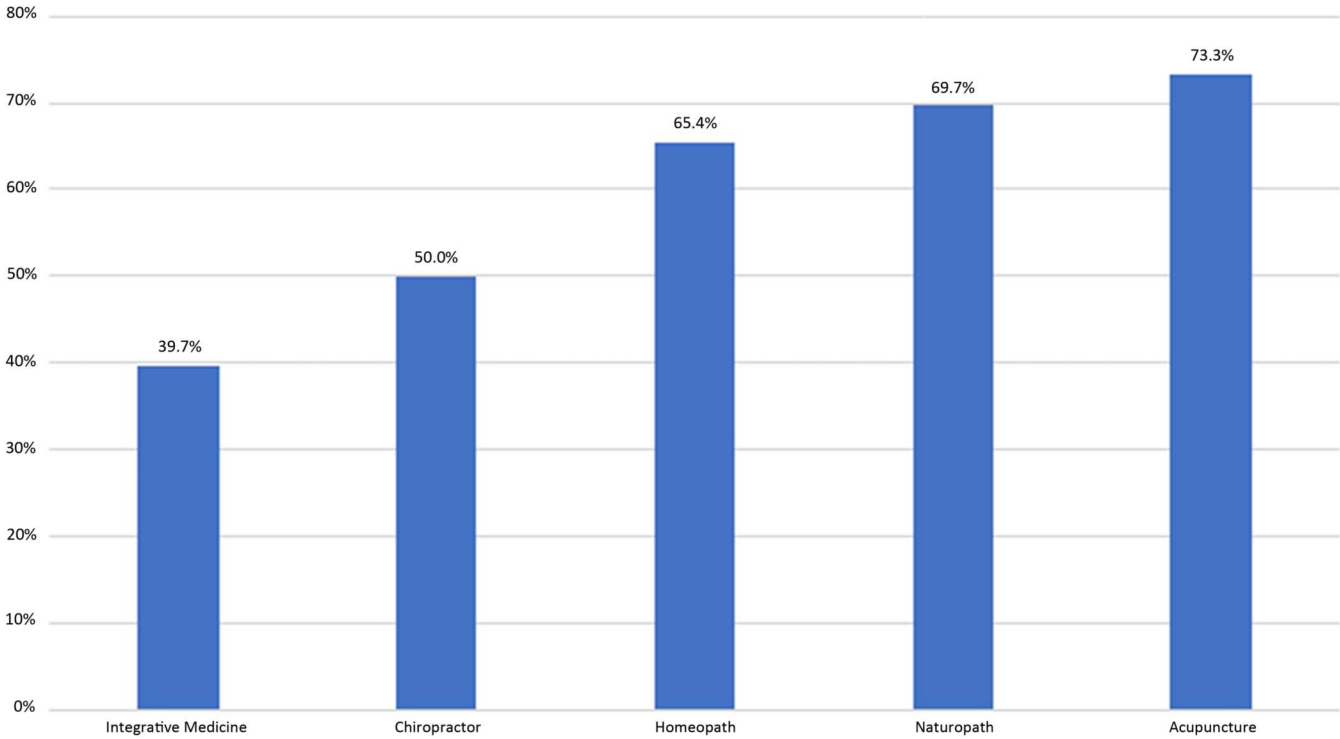

Figure 3. Percentage of claims taken from complementary and alternative medicine clinic websites that were either false or unproven, by clinic type.

opposed by organizations such as the American Academy of Family Physicians, which argues that because NDs are not as rigorously trained as MDs, granting NDs these privileges would harm consumers. The abundance of false or unproven claims regarding celiac disease and NCGS in 70% of naturopathic providers' websites suggests that further expansion of this movement could pose harm to those with celiac disease and other gluten-related disorders as well as those incorrectly given these diagnoses.

The difference in the rates of false or unproven claims by integrative medicine clinics is noticeably large. We posit that this is because integrative medicine clinics tend closer to more evidence-based medicine, perhaps due to the presence of at least one MD on staff. But even in these clinics, there is a large portion of unproven claims, highlighting the challenges posed by the adoption of an integrative approach.

Misleading advertising presents a challenge in the United States, considering the prevalence of celiac disease and NCGS. Adults diagnosed with celiac disease report having symptoms for a mean of 4–11 years before finally receiving the diagnosis (16–18). A substantial proportion of claims (40.5%) involving celiac disease and NCGS were deemed accurate, and it is possible that a patient seeking a CAM specialist can be identified as having possible celiac disease, leading to appropriate serologies and referral for intestinal biopsy. However, it is particularly concerning that some clinics advertised treatments that pose potential harm. For example, some clinics advertised the sale of digestive enzymes that effectively digest gluten, which purport to allow the person with celiac disease or NCGS to consume gluten safely. This is a baseless claim that could lead to serious harm if the consumer indeed consumes gluten (19). Other clinics falsely claimed that everyone should be on a gluten-free diet regardless of a diagnosis of celiac disease or NCGS. Misinformation and harmful treatments put the patient at risk of serious harm. The abundance of false claims regarding celiac disease or gluten may be in part responsible for beliefs in untrue propositions reported by a substantial proportion of patients with NCGS, such as the notion that vaccines contain gluten and may therefore be unsafe (20).

This study has a number of limitations. The exclusion of Spanish and Chinese language websites is significant because it limits the ability to truly represent what Americans across the country are exposed to online when they seek CAM clinics. The terms "wheat" and "allergy" were not included in the search tool used for data collection. Although less commonly used when discussing celiac disease and NCGS, there is a possibility that the exclusion of the 2 terms excluded relevant data. Our analysis that found that nearly 60% of claims regarding gluten or celiac disease were false or unproven was not compared with mainstream medical websites; it is possible that misconceptions about celiac disease prevalence and common symptoms may be contributing to the long delay in diagnosis reported by many patients (17). Another limitation is the inability of the search tool to search text embedded in image form, thus resulting in possible exclusion of claims made in images on websites. Further analysis is necessary to understand how CAM clinics affect public health pertaining to celiac disease and NCGS beyond market claims. Furthermore, the popularity and regulation of these CAM disciplines vary outside the United States and more research on this topic outside of the United States is necessary.

CONCLUSION

We found that mentions of celiac disease and NCGS were common in marketing materials among CAM practitioners in the United States. The growing popularity of CAM poses potential risk to public health related to celiac disease and NCGS because many CAM practitioners advertise treatments and diagnostic techniques that lack supporting evidence. The significant percentage of clinic websites that made claims, many of which were false or unproven, suggest the need for increased regulation of CAM marketing to prevent medical misinformation that can lead to harmful consequences. Efforts are warranted to increase awareness of celiac disease and NCGS with a specific emphasis on countering widespread misinformation.

CONFLICTS OF INTEREST

Guarantor of the article: Benjamin Lebwohl, MD, MS.
Specific author contributions: G.B., T.C., P.H.R.G., and B.L.: study concept and design. G.B.: acquisition of data. G.B., T.C., P.H.R.G., and B.L.: analysis and interpretation of data. G.B. and B.L.: drafting of the manuscript. G.B., T.C., P.H.R.G., and B.L.: critical revision of the manuscript for important intellectual content. B.L.: study supervision.
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