

Covid-19 and diet: an evaluation of information available on internet in Italy

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Abstract

Background and aim: during the Coronavirus disease 2019, Italy experienced deep lockdown with closure of almost all activities, with the exception for food shops and few others. During this quarantine, alteration of dietary habits occurred, due to the changes in food availability and mandatory meal house-consumption. The change in dietary habits could somehow be directed by freely accessible information available on internet. Thus, we evaluated the type and the scientific quality of the information provided to the Italian population by the most visible web sites found on Google, relating diet in Covid-19 time. *Methods:* we systematically performed a reliability and content analysis of Italian language websites using Google as search engine and a combination of diet/nutrition/Covid-19 as search terms. *Results:* 88 webpages were included in the study, the great part representing newspaper webpages. Institutional webpages, despite having high scientific quality, did not have high visibility. Generally, all the other webpages reported information of medium-quality scientific level. *Conclusion:* finding appropriate solutions to redirect the population's attention to more reliable and accessible information is mandatory (www.actabiomedica.it).

Key words: COVID-19, diet, nutrition, internet, information

1. Introduction

Coronavirus disease 2019 (Covid-19), has dramatically expanded across the world since its first detection in Wuhan, China (1), with a major outbreak in Italy. In fact, as of August 5th 2020, the number of COVID-19 cases in Italy reached 248,672 cases with 35,599 total deaths.

On 9 March 2020, two days before WHO's declaration of pandemic, as cases and deaths were respectively 9,172 and 463, and a dozen municipalities of Lombardy and Veneto already experienced 17 days of limited lockdowns, the Italian Government decided to put the whole country on quarantine. Schools, universities, bars, hotels, and shops, except for those selling food, drugs, electronics, and warehouses, were closed, and the National Health System tried to cope with the

increasing number of patients needing intensive care. The national lockdown has been extended several times and finally terminated on 18 of May. While we were writing this work, Italy has experienced the second pandemic wave, new confinement measure has been taken, and the Government extended the state of emergency (previously set by law for October) to 31 January 2021.

During the quarantine people have experienced a deep alteration of the usual patterns of daily living such as timing of sleeping and timing and composition of meals (2). During lockdown people reduced physical activity and, spending more time at home, increased the time spent eating (3). Accordingly, by means of a cross-sectional online survey on 2900 adults performed during Covid-19 quarantine in Italy, an increase in both sweets and wine consumption as well as an increase of weight was declared in a part

of the sample (44%, 16% and 44%, respectively for sweets, wine and weight), together with a higher consumption of vegetables (33%), fruit (29%) and legumes (26%) and a lower level of physical activity (55%) (4).

The interests, the desire for more information and the fear of contagion have determined a sharp increase in the search for information on Covid-19 on Google during the lockdown periods in Italy [5]. Due to the forced change of habits and diet, many sites have published articles containing suggestions and advices for the optimal diet to be held during quarantine.

The paper aim was to systematically perform a reliability and content analysis of Italian language websites containing information related to diet and Covid-19. This snapshot evaluation could be useful for both consumer and nutritionists, helping to improve the quality of information and develop ad hoc dietary education program for the pandemic period

2. Materials and Methods

As Google is the most widely used search engine in Italy with a market share of approximately 96% [6], we used this search engine to locate webpages. We looked for combinations of the following terms: “Covid-19 OR Coronavirus” AND “dieta OR nutrizione OR alimentazione” (the Italian words respectively for diet, nutrition and alimentation). Searches of the resulting 6 combinations were performed manually without the use of the Boolean operator “OR”. For each query the first 30 results (the first 3 pages) were consulted; since most users do not go beyond the third page (7) we could be sure to have a good representation of all potential searches. In total, 180 search results were screened. The search lasted 4 days from 17 to 20 May 2020.

Once duplicates were removed, the selected webpages were screened in order to identify those potentially eligible for analysis. The following inclusion criteria were applied: (i) page availability on the search day; (ii) pages written in Italian; (iii) Covid-19 and food/diet/nutrition one of the main topics of the webpage (e.g. articles concerning nutritional advices to the general population). The exclusion criteria were: (i) lack of textual information (e.g. presence of only

Table 1. Search strategy adopted in the current study for selecting relevant Covid-19 and diet-related website pages

item	detail
Search engine	Google
Used keywords	Covid, Coronavirus, Dieta, Nutrizione, Alimentazione
Time	May 2020
Language filter	Italian
Inclusion criteria	Pertinence to the topic
Exclusion criteria	Lack of textual information; information related to Covid-19 hospitalized patients; forums, chatrooms

links to other webpages, pictures or video without explanations); (ii) information related to Covid-19 hospitalized patients; (iii) forums, chatrooms and similar. Details related to the search strategy adopted are listed in Table 1.

Then, pages were ranked based on their visibility. In order to calculate a visualization probability score (VS), a formula considering the number of citations and the position within Google’s results was obtained. Individual VSs were calculated on the basis of Google’s search engine page in which the link appears (1st, 2nd or 3rd page), the position of the link in each page (highest score for the first 3 positions; medium for positions 4 to 5; lowest for position 6 to 10, at the end of the page) and the number of times a website was eventually repeated. On this basis, a webpage that appears the first time in the first Google’s page gets a score of 10 if the citation appears in the first three positions, 8 if it appears in the position 4 or 5, and 6 in later positions. The scores are halved if the link appears on the second page of Google’s and further halved on the third page (Table 2). Finally, assuming that a webpage that is mentioned twice does not have exactly twice the visibility of the first quote, for every repeated match, the additional score was reduced by one third for each subsequent citation (Table 2).

Once identified, webpages were classified in 7 Categories based on the typology of their owner: Commercial, Health care provider, Person (Blog), Institutional, News, No profit organization, Other. Then, webpages were classified for the type of Contribution

Table 2. Visibility Score calculation. The score was assigned considering: 1) the position within Google's results page and 2) the number of citations obtained in the different searches.

	Position in the page	Score 1st citation	Score 2nd citation	Score 3rd citation
Page 1	1 to 3	10	6.6	4.4
	4 to 5	8	5.3	3.5
	6 to end	6	4.0	2.6
Page 2	1 to 3	5	3.3	2.2
	4 to 5	4	2.6	1.7
	6 to end	3	2.0	1.3
Page 3	1 to 3	2.5	1.7	1.1
	4 to 5	2	1.3	0.9
	6 to end	1.5	1.0	0.7

(Article/Interview or Video/Podcast) and for the presumable Target (Technical, Medical and General Population). Finally, webpages' General and Scientific Qualities (GQ and SQ) were evaluated and scored independently by 3 researchers specialized in nutrition. Individual GQ elements (Ownership, Purpose,

Authorship, Objectivity, Accuracy, Currency, Interactivity and Navigability) were scored on a scale from 0 to 2, using the method of Sandvik with slight modification (8) (Table 3).

Ownership and Purpose were evaluated at the website level, while all other criteria were evaluated at the webpage level. Eventual discrepancies within GQ scores were subsequently checked and agreed. On the other hand, SQ scores ranged from 0 (very bad) to 5 (excellent) and were subsequently averaged. Moreover, the presence of specific statements correlating directly diet/nutrient effects on Covid-19 was carefully looked for: 1) maintaining health and weight, 2) stimulating immune system and 3) defeating virus.

Finally, webpages Readability was evaluated both by direct word count and by using the Italian language-tailored Gulpease readability index (9). The index is obtained using a formula that considers the number of sentences, letters and words. The more the index is high (up to 100) the more the text is readable and understandable. Three scales are available for three different school levels, i.e. higher than 81, 61 and 41

Table 3. General Quality evaluation criteria

		Score 2	Score 1	Score 0
Websites	<i>Ownership</i>	Name and type of provider clearly stated	All other indications of ownership	No indication of ownership
	<i>Purpose</i>	Distinction is made as to whether the information provided is for commercial purposes or educational purposes, or both	Purpose stated as educational but the financial profit from use of the site exists	No statement of purpose
Webpages	<i>Authorship</i>	Author's name and qualification clearly stated	All other indications of authorship	No indication of authorship
	<i>Objectivity</i>	Balanced information	Biased in favour of own products or services	Only promoting own products or services
	<i>Accuracy</i>	Specific scientific references	Relevant source	Unrelated source
	<i>Currency</i>	Date of publication or update clearly stated on all pages	All other indications of currency	No indication of currency
	<i>Interactivity</i>	Clear invitation to comment or ask questions through email address or link	Any other email address indication	No interactivity
	<i>Navigability</i>	Information easily found by following links from home page	Information found only with difficulty by following links, search engine provided if information widely scattered on site	Information scattered around, no search engine

indices indicate easy to read content respectively for elementary, middle/secondary and high-level school diplomas

3. Results

Of 180 webpages screened, 67 were removed as duplicates. Of the remaining 113 webpages, 19 records were joined as they belonged to the same website and evaluated overall. Resulting 94 records (some containing multiple pages) were assessed for eligibility and 23 records (25 pages) were excluded as they did not fit the inclusion criteria. 71 records (for a total of 88 webpages) were included in the study (Figure 1).

First, webpages were ranked basing on their Google visibility, dividing on three tertiles based on high, medium and low visibility (see methods).

Webpages were classified in 7 categories: Commercial, Health care provider, Person (Blog), Institutional, News, No profit organization, Other. As shown in figure 2, 62% of webpages came from the newspapers category (44 out of 71), and the remaining ones

were equally distributed over all other categories except for the Personal Blog one that had only one entry.

The visibility of newspapers webpages was shaped along the whole range, as the three visibility tertiles

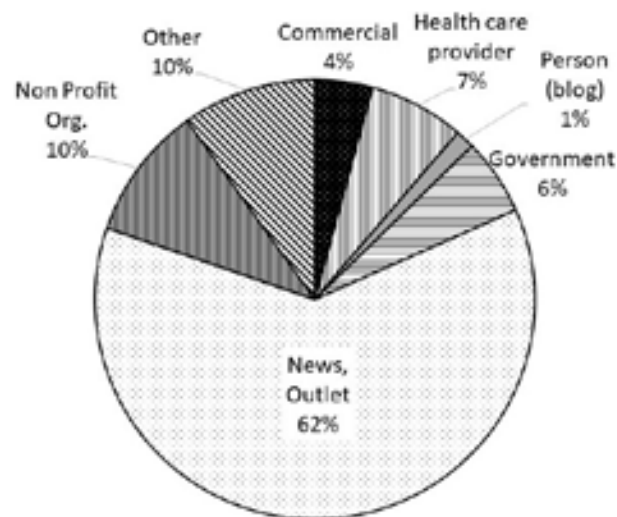


Figure 2. Distribution of the webpages according to the category they belong to

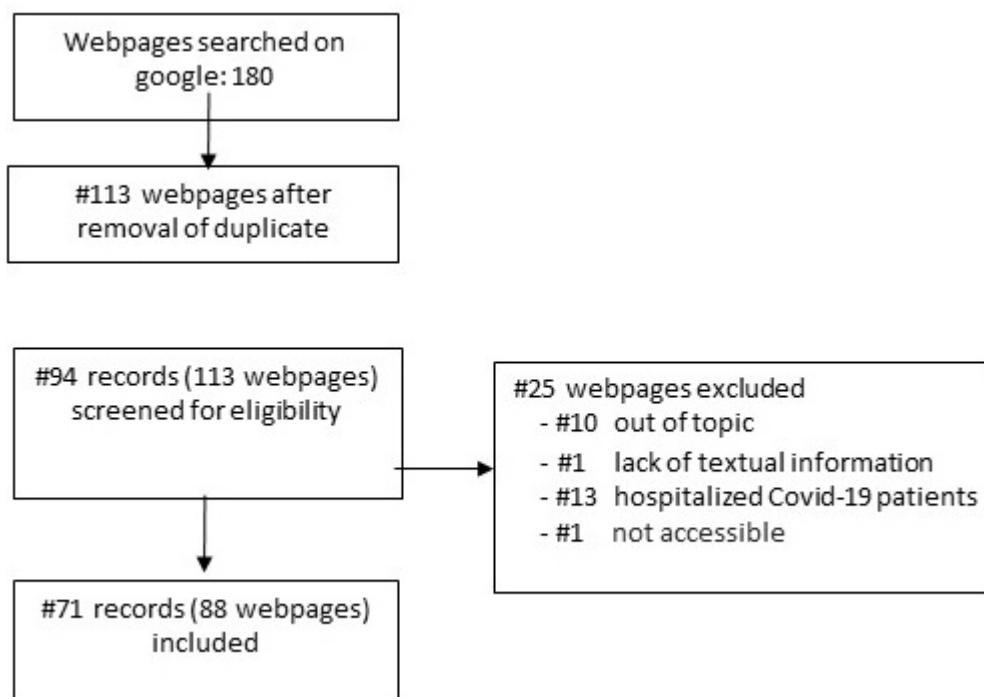


Figure 1. PRISMA Flow-chart webpages search

had similar numerosity (respectively 13, 18 and 13, from more to less visible tertile). Notably, non-profit organization had in proportion the highest visibility (4, 3 and 0, respectively in the three tertiles), differently from health care providers that had similar numbers of high visibility (3) and low visibility (2) webpages. Institutional webpages were only 4 (5,6%) and only 2 were present in the first tertile of visibility (Figure 3), namely from the “Istituto Superiore di Sanità” (ISS) and from the Ministry of Health.

Following elimination of webpages dedicated to Covid-19 hospitalized patients (13 webpages), we found that the vast majority (94%) of entries were articles (67, including one interview), while only 3 videos and one podcast were found, which indicates that the main communicative method used in Italy through Internet is represented by text rather than multimedia content. With this respect, we found that a significant part of webpages (27 out of 69, excluded two videos) had a number of words higher than one thousand and

a very small number of webpages were concise (19 out of 69 had less than 500 words). Consistently we found a low overall readability index, evaluated using the Gulpease (9). In fact, most webpages (63 out of 69) had an index lower than 60, which is considered difficult to read even for the middle/secondary school diploma (Figure 4). None of the webpages were adequate, in terms of reading simplicity, for the elementary school level and only 6 achieved this requirement for middle/secondary and high-level school diploma.

General Quality (GQ) of webpages, evaluated using the method from Sandvik (8), was in overall good. Most webpages stated both the Ownership (93.0 %) and the Purpose (88.7 %) and for both parameters, those pages not stating were low in the visibility rank (figure 5A and 5B). Authorship was clearly stated in a smaller but still high number of webpages (63,9%) (figure 5C). Notably, unclear indications of Authorship were mostly in less visible sites (figure 5C). On the other hand, even if near all (93.0%) webpages stated clearly the Currency (the date of publication and/or the last update), almost all webpages with no date indication (4 out of 5) were within the highest visibility tertile (figure 5D).

As regard to Objectivity, we considered unbalanced those webpages promoting, more or less

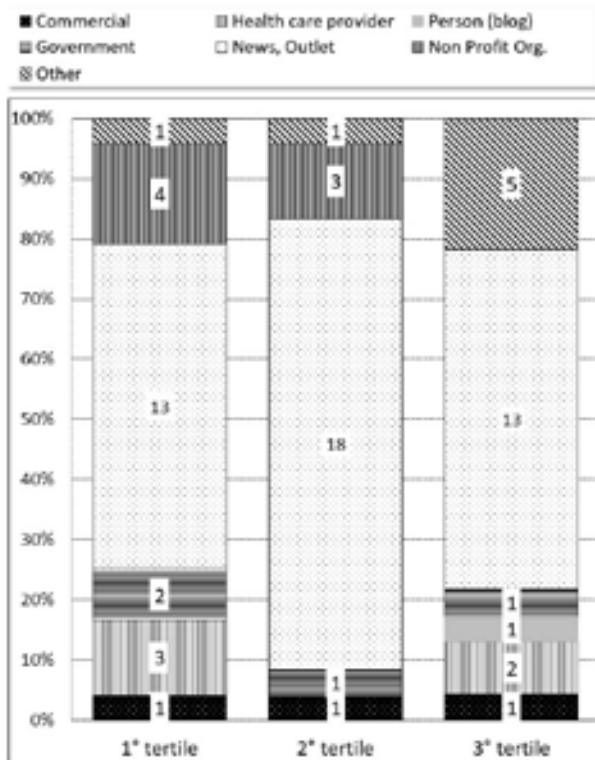


Figure 3. Distribution of the webpages according to the category they belong to in the three visibility score tertiles

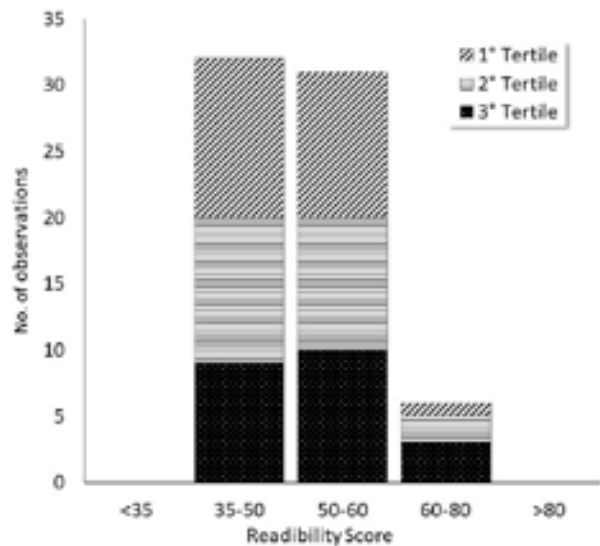


Figure 4. Gulpease readability index of the webpages in the three tertiles of visibility score

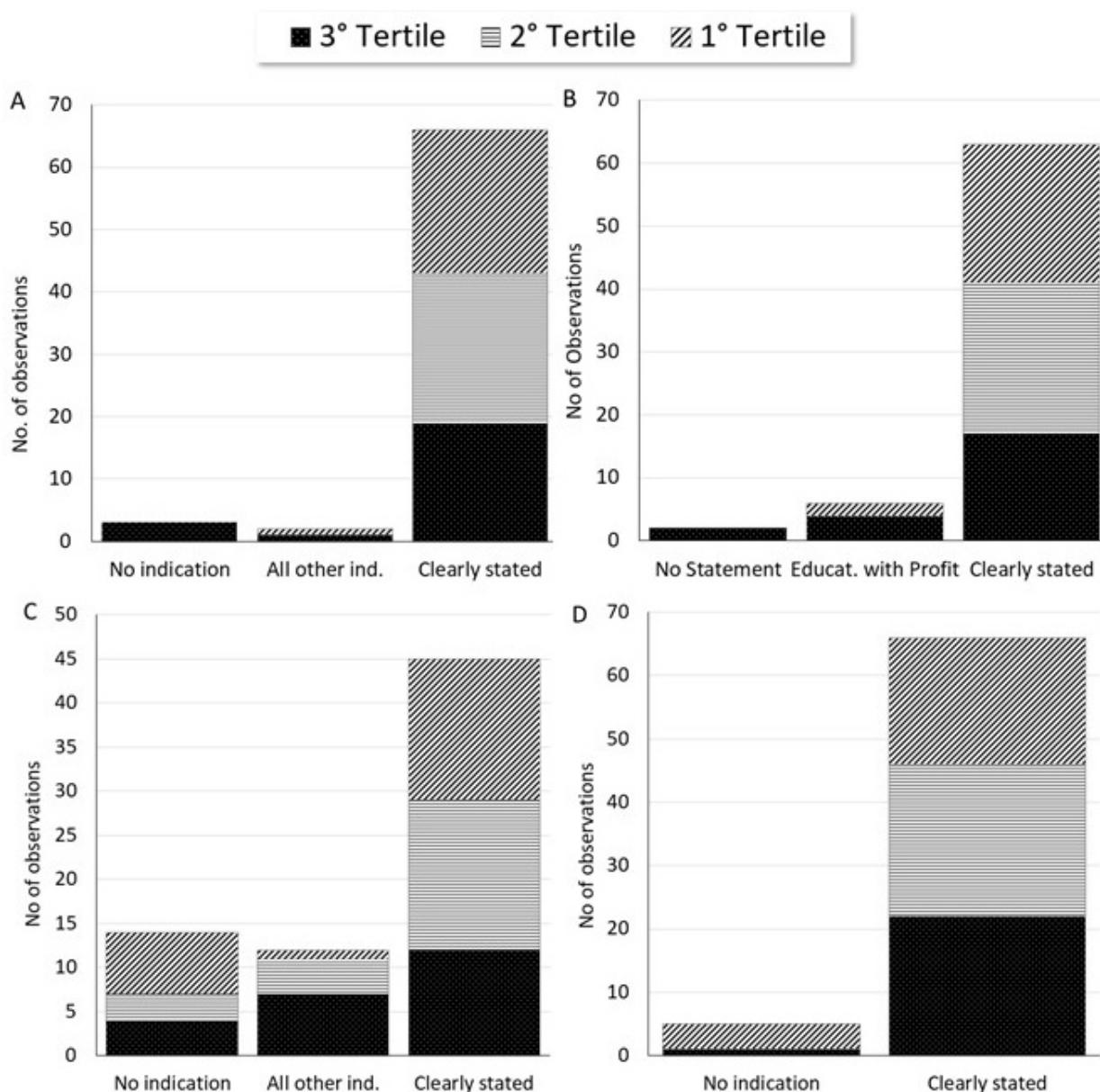


Figure 5. General Quality of the webpages in the three tertiles of visibility score (A): Ownership. (B): Purpose. (C): Authorship. (D): Currency.

explicitly, own products. We found that almost all webpages (91.5%) behave honestly with respect of the information that was expected (Figure 6A). Nonetheless, some webpages were found promoting own products (3 entries) or were biased in favor of own products (3 entries) (figure 6A). Fortunately, these pages were generally very low in the visibility rank. The parameter that most strongly lowered the overall GQ was Source.

In fact, source was indicated using exact scientific references only in 28.2% of webpages. 64,8% of webpages were less accurate, but some reference could be found. Finally, 7% (5 out of 71) reported completely unrelated references (figure 6B). Fortunately, accurate referencing increased with visibility, as 46% of well-referenced webpages were in the first visibility tertile. The preferred mode of interactivity was by e-mail address

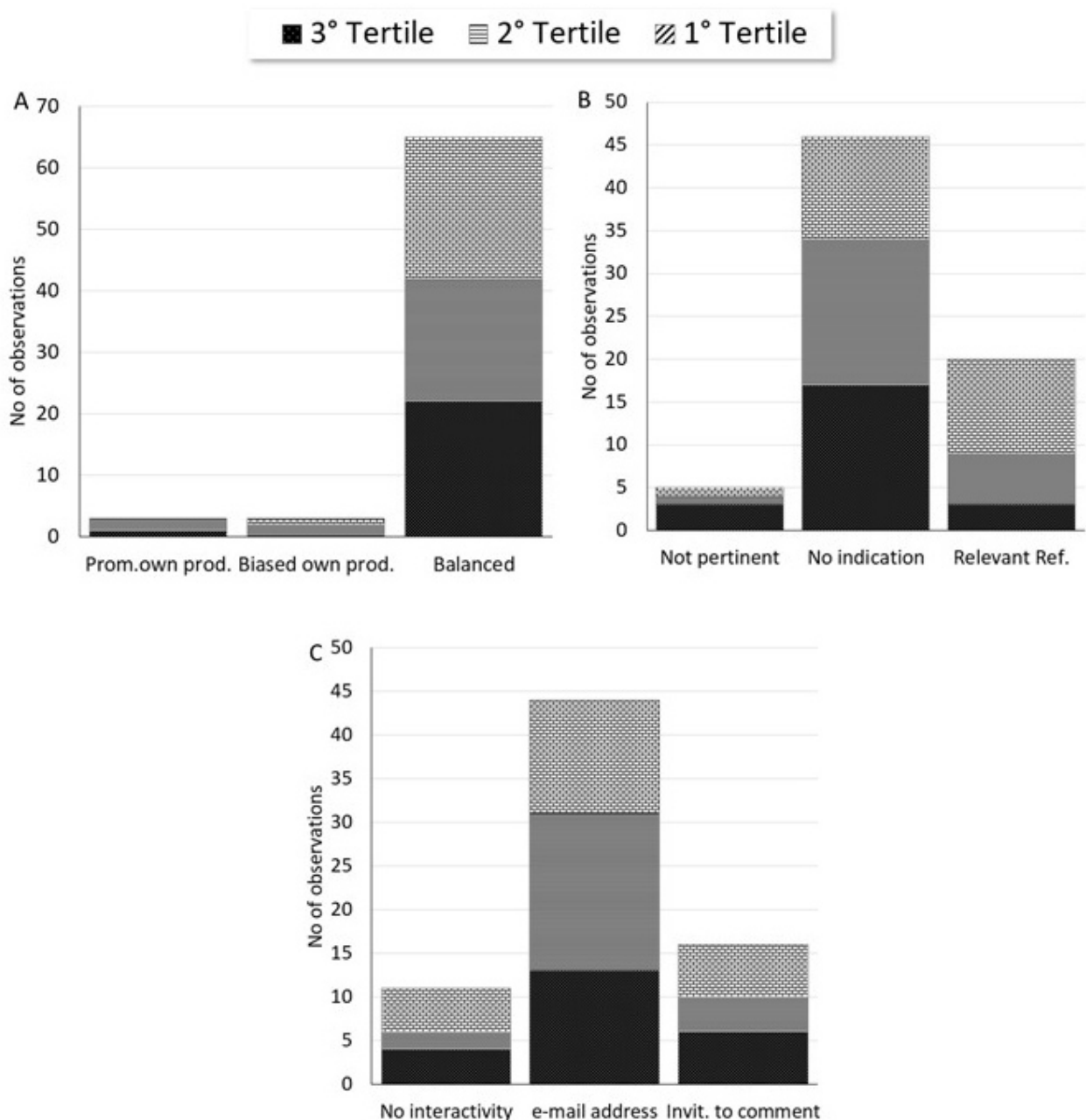


Figure 6. General Quality of the webpages in the three tertiles of visibility score (A): Objectivity. (B): Sources. (C): Interactivity

(62,5%) and no significant differences were found with page visibility. Finally, with respect to Navigability, we found that pages with lower visibility had lower navigability and that navigability increased with visibility, which appears consistent with a better webpage design (Figure 6C).

Scientific quality (SQ) was obtained averaging scores from 0 (very bad) to 5 (excellent) attributed

independently by three independent researchers. Applying a middle (2.5) threshold, 49.3% of webpages had a score higher than or equal to sufficiency (i.e. 35 adequate and 36 inadequate), with a similar amount of lowest (11.3%) a highest (12.7%) score webpages (Figure 7). With respect to visibility, it unexpectedly well correlated with SC. In fact, the most of adequate webpages were in the more visible tertile (15 vs 9),

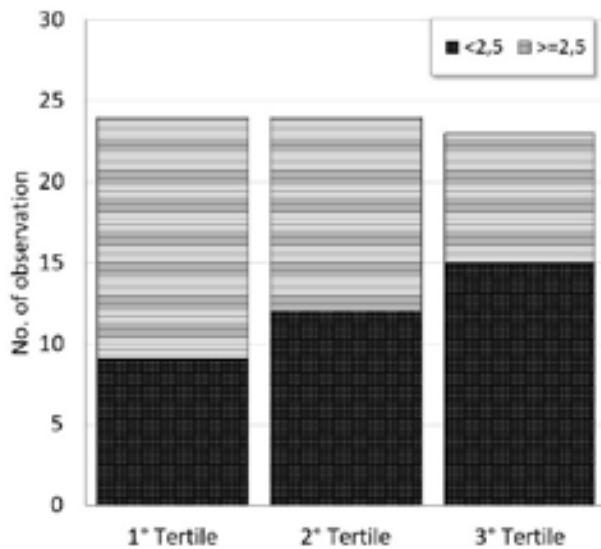


Figure 7. Scientific quality of the webpages in the three tertiles of visibility score

and identical number was in the intermediate tertile (12 vs 12), while a lower number was in the less visible ones (8 vs 16). Such correlation between visibility and SC is promising as it implies a better report of accurate information.

The diet and Covid-19 specific statements “maintaining health and weight”, “stimulating immune system” and “defeating virus” were present respectively in 79,2%, 34,7% and 12,5% of webpages and distribution within visibility tertiles was homogenous, excluded for immune-stimulating statements, that showed an inversed trend with visibility (Figure 8).

4. Discussion

The present study addressed the scientific quality of Italian webpages that, during the lockdown, linked diet to Covid-19. Our interest came from the observation that information freely accessible from the Internet during the Italian quarantine contained some erroneous information from a nutritional point of view. For this reason, we decided to analyze thoroughly the content of these webpages, both for their General (GQ) and Scientific (SQ) Quality.

Overall, we found only 49.3% of websites gave accurate information in terms of nutritional indications

to the general population. Generally, websites gave information about healthy nutrition, mentioning the importance in the diet of fruit and vegetables, legumes, whole grains, water, and to beware of fatty foods, sugar-rich foods and sweetened drinks, salt and alcohols. Attention was often given to limit energy intake accordingly with the decreased physical activity. Many websites gave specific indications for children’s involvement in food preparation and a healthy diet for them were often provided. On the contrary, rarely information was given specific for the elderly. Notably, a significant number of pages (32.2%) contained extended information on vitamins and micronutrients that could “help” the function of the immune system (often stating “to reinforce the immune system”). Vitamin D was the main mentioned one, as it was cited by 47.9% of pages. Notably, only 21.1% of pages reported the importance of the solar exposition, whilst a similar number of pages suggested integration by food (21,1%) or supplements (7%). One webpage with high visibility even recommended to exceed the maximum concentrations of vitamin and proposed that Italy should authorize the sale of supplements at higher concentrations. The increase in internet messages on the use of supplements, together with that coming from similar TV spots, could be the cause of the huge increase of the sales of nutritional supplements observed during the lockdown in Italy (10).

Overall, 9 out of 71 webpages (12.7%) reported unlikely nutrient/diet-related solutions to cope with the virus and, regrettably, 3 out of the 9 were in the first tertile of visibility, with headlines and claims like “the ten foods for preventing Covid-19”, specific natural substances to “fight the current coronavirus” or “the right diet to protect yourself from viral and bacterial infections and not gain weight”. Moreover, two others suggested to fight the virus drinking a specific wine brand, because of its high resveratrol content. Even if none of the pages substantiated it, the hypothesis comes from a review (11) speculating on evidences obtained in animal (12-13) and corsivo? models (14), showing that the polyphenol modulates the cellular receptor angiotensin converting enzyme-2 (ACE2), which is actually SARS-CoV-2’s receptor (15).

Noteworthy are two webpages containing videos. The first one repeats a local TV newscast during which

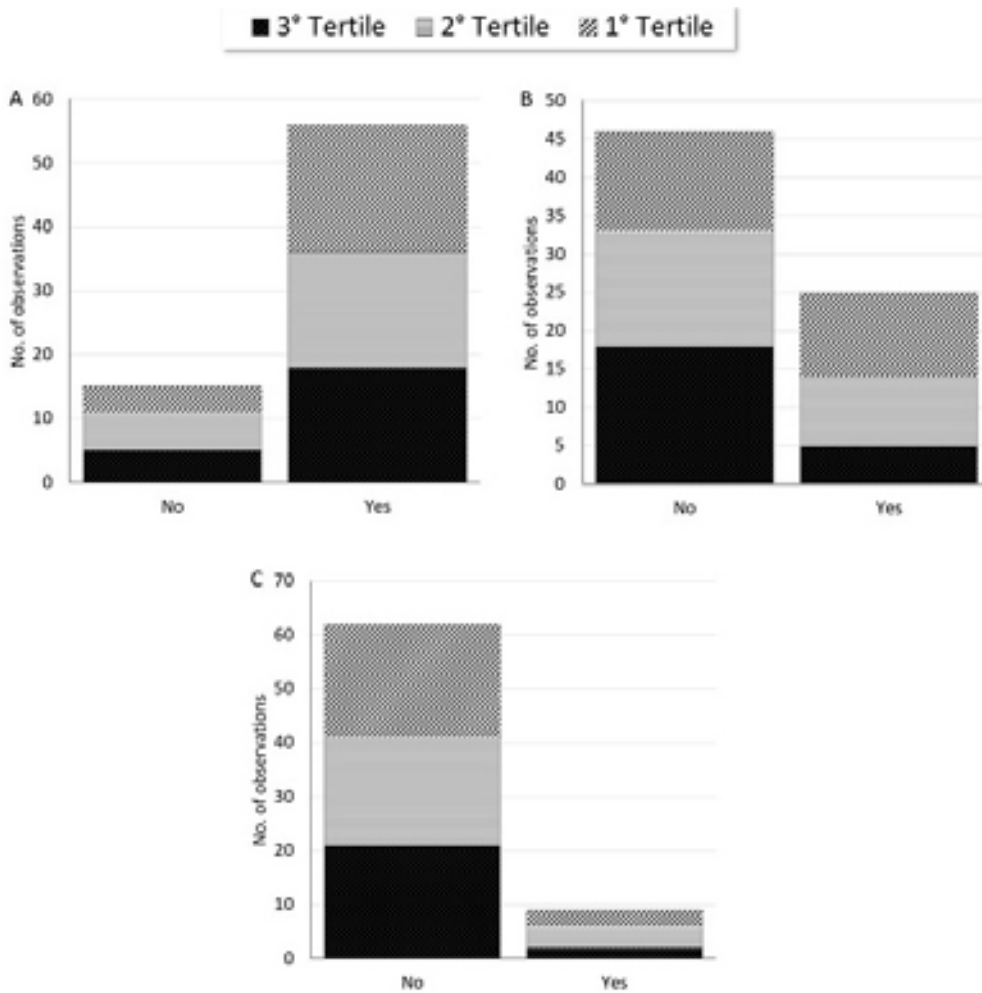


Figure 8. Diet and Covid-19 specific statements (A): “maintaining health and weight”, (B): “stimulating immune system”, (C): “defeating virus”

it is told that inhibition of infection, reduction of disease gravity and faster healing, can all be obtained through the consumption, among others, of ricotta cheese (because of the antioxidant amino acids glutamine and cysteine) and fish (because of the immunosuppressive omega-3 fatty acids). The rationale states on a supposed need of inducing a “pre-immunosuppressed and anti-inflammatory state”. Messages that are scientifically questionable and completely unsuitable for the general population, as they can induce excessive and unbalanced eating behaviors. The other one links to a video with almost one hundred thousand views at the time we are writing this manuscript, from a very famous Italian naturopath who gives indications

to the limit of “conspiracy”. Example of claims for coping with SARS-CoV-2 are: avoid consumption of cereals with gluten, corn and fruits, especially oranges, and eat, based on own blood type, Rosehip and green vegetables like savoy cabbage.

Three webpages speculate on unproven, anti-inflammatory and anti-infection, properties of the ketogenic diet on SARS-CoV-2. In the webpages, the ketogenic diet is depicted as a preventive remedy for SARS-CoV-2 infection and induced-inflammation basing on a unique, unreferenced, scientific evidence “that the diet could facilitate mucus production and trapping of the virus in airway cells following regulation of a subset of lungs T cells” (16). Again, we believe

that such information is not suitable for the general population because it could lead to eating habits that can be unsafe for some individuals.

In conclusion, even if a good proportion of webpages gave adequate and balanced nutritional advices, a significant number of pages based their claims on fragmented and unconfirmed scientific literature, speculating on roles of micronutrients, vitamins or bioactive molecules in fighting viruses and “stimulating” the immune system response. The problem with such information is that it could deceive the reader from keeping protected from the virus, possibly distracting from physical distancing rules and hygiene precautions needed to cope with SARS-Cov-2 infection (17).

A quite important result of our study is that institutional webpages had higher SQ scores but not a high visibility, as even if the ISS website was the first in rank, the website of Ministry of Health was only fifth in the visibility score. Moreover, the webpage of CREA, the institute where authors of this work are employed, had the lowest visibility and could not be evaluated as it contained exclusively a link to other Institutional information. Finally, low readability, mainly due to an excessive length of articles that are mainly suitable for high school users, could induce a substantial misinformation of lower school level population.

Thus, it's our opinion that finding appropriate solutions to redirect the population's attention to more reliable and accessible information is mandatory. Ensuring a good quality dietary information should be a challenge for the scientific nutritionist community.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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