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CHARACTERIZATION AND CONTENT ANALYSIS OF INSTAGRAM POSTS ABOUT SPORTS SUPPLEMENTATION

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ABSTRACT

Supplementation in sports has become popular and social media plays an important role in facilitating access and speeding up the dissemination of health information to society. However, at the same time, supplements represent a significant exposure source to health misinformation, which can directly impact the health of individuals who consume this information. The objective of the study was to characterize and analyze the quality of content published on Instagram on the subject of sports supplementation. Thus, the top 10 posts on Instagram were collected from the search for key hashtags on the subject over 5 weeks, 2 times a week, and content analysis was quantitatively and qualitatively performed from the Descending Hierarchical Classification, word cloud and the DISCERN instrument. As a result, 112 posts composed the analyzed textual corpus, with mentions of 154 supplements; moreover, 39.4% of the authors were nutritionists, followed by content creators (23.2%) and nutrition students (16.9%), with greater female representation (66.9%), and the hashtag “supplementation” was responsible for 60.5% of the analyzed posts. The main themes present in the posts involve aspects of creatine supplementation, predetermining factors for supplementation, benefits and characteristics of protein supplementation. The average DISCERN score was 2.77, representing a low reliability of the posts; however, professionals and students in the nutrition area had higher averages. The results show that publications on the subject of sports supplementation have low quality of scientific reliability, but that quality may vary depending on the education level of the author of the publication.

Key words: Food Supplements. Social Media. Internet.

RESUMO

Caracterização e análise de conteúdo de posts do Instagram sobre suplementação esportiva

A suplementação no esporte vem se popularizando e as mídias sociais tem papel importante na facilitação do acesso e na velocidade da disseminação de informações em saúde para a sociedade. O objetivo do estudo foi caracterizar e analisar a qualidade dos conteúdos publicados no Instagram acerca da temática de suplementação esportiva. Ao longo de 5 semanas, 2 vezes por semana foram coletadas as dez principais postagens no Instagram a partir da busca por hashtags chaves sobre a temática e a análise do conteúdo foi realizada de forma quanti-qualitativa a partir da Classificação Hierárquica Descendente, nuvem de palavras e o instrumento DISCERN. Cento e doze postagens compuseram o corpus textual analisado, com menções a 154 suplementos, 39,4% dos autores eram nutricionistas, seguido de criadores de conteúdo (23,2%) e estudantes de nutrição (16,9%), com maior representação feminina (66,9%) e da hashtag “suplementação”, responsável por 60,5% das postagens analisadas. As principais temáticas nas postagens envolvem a suplementação da creatina, fatores predeterminantes para a suplementação, benefícios e características da suplementação de proteínas. A pontuação média do DISCERN foi de 2.77, representando uma baixa confiabilidade das postagens, porém, profissionais e estudantes da área de nutrição tiveram médias superiores. Os resultados evidenciam que as publicações sobre suplementação esportiva apresentam baixa qualidade de confiabilidade científica, mas que, essa qualidade pode sofrer variações a depender do grau de instrução do autor da publicação.

Palavras-chave: Suplementos Alimentares. Mídias Sociais. Internet.

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INTRODUCTION

Sports supplementation has become increasingly popular, being widely studied and well-founded with levels of evidence and scientific proof about its use and effectiveness in various sports modalities and special conditions (DT, KA and LM, 2016; Kerksick et al., 2018; Maughan et al., 2018).

Sports supplements are considered as those intended to ergogenically help improve athletic performance and physical recovery, with the objective of increasing muscle mass, reduce body weight and increase resistance to the duration of exercise practice (Burke and Cato, 2015).

However, the trend of consuming sports supplements is increasing, with widespread use and prescription for the entire population being influenced by social media which has a decisive role in the prevalence of its use (Arenas-Jal et al., 2020; Mettler et al., 2020; Quaidoo, Ohemeng and Amankwah-Poku, 2018; Schmidt et al., 2018; Whitehouse and Lawlis, 2017).

Social media is an important resource for health information, but at the same time it represents a significant exposure source to misinformation (Chou, Oh and Klein, 2018; Pulido et al., 2020; Wang et al., 2019) and constituting a factor which is aggravated by the low health literacy of the population (Lynn et al., 2020), (Diviani et al., 2015).

The quality of the information shared is fundamental for awareness, adherence and facilitation of communication between professionals-patients (Bourke, Baker and Braakhuis, 2018; Corritore et al., 2012; Moorhead et al., 2013).

However, considering that people are increasingly influenced by inferences/indications from people who do not have a professional association to be able to prescribe the use of supplements, it is seen that the lower the quality of information, the greater the impact on health and performance of consumers (Quaidoo, Ohemeng and Amankwah-Poku, 2018), (Mettler et al., 2020), (Bourke, Baker and Braakhuis, 2018), (Bailey et al., 2013).

Evidence has shown that the volume of posts and information about health topics is increasing, but that the quality of information available on the internet can be low without evidence of reliable sources, leading to misinformation being consumed by individuals (Chou, Oh and Klein, 2018), (Fung et al., 2020; Massey et al., 2020; Okagbue et al., 2020).

In the study by Bourke, Baker and Braakhuis (2018), it was shown that athletes have greater concern about obtaining information via social media due to fear of the unreliability of information.

But, the largest portion of the population is not so judicious in their search for reliable information sources (Chou, Oh and Klein, 2018), (Wang et al., 2019), (Lynn et al., 2020), (Diviani et al., 2015).

Instagram is a social network which is on the rise today with around 1 billion users, with Brazil being the third country with the highest participation, with around 100 million users (Tankovska, 2021). This social media platform is responsible for creating/dictating food and beauty standards, causing positive social changes and habits, but is also responsible for negatively influencing cases of eating disorders, anorexia, orthorexia nervosa and misinformation (Haman et al., 2015; Lup, Trub and Rosenthal, 2015; Murray, Maras and Goldfield, 2016; Reece and Danforth, 2017; Santarossa et al., 2019; Turner and Lefevre, 2017).

Social networks have become a great information source about sports supplementation for the population, so it is necessary to know the quality and reliability of the content posted, to ensure that the information received by the reader is reliable.

Therefore, the objective of this study was to characterize and evaluate the quality of content published on Instagram on the subject of sports supplementation.

MATERIALS AND METHODS

Sample

This is an exploratory-descriptive study implementing a quantitative-qualitative approach based on an analysis of posts published on the social network “Instagram®” in Brazil, looking for the posts present in the “most relevant” tab from popular hashtags which contained a large number of posts and relevance to the subject in question; very specific supplement hashtags with a low number of publications shared daily (less than 500 thousand publications) and/or with a high number of publications in foreign language were not considered, aiming to analyze publications that were not repeated between collections, in

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addition to identify the most popular supplements and with greatest content production on the subject.

The hashtags "supplements", "supplementation", "exerciciofisico" and "nutricaoesportiva" were previously selected. The collection was carried out twice a week for 5 weeks between March and April 2021 on fixed days, one weekday and one weekend, totaling 10 collection sections.

Publications shared in photo and video formats were evaluated. Publications that were in Portuguese, which had content and addressed the theme "sports supplementation" with the purpose of improving performance were screened (Figure 1).

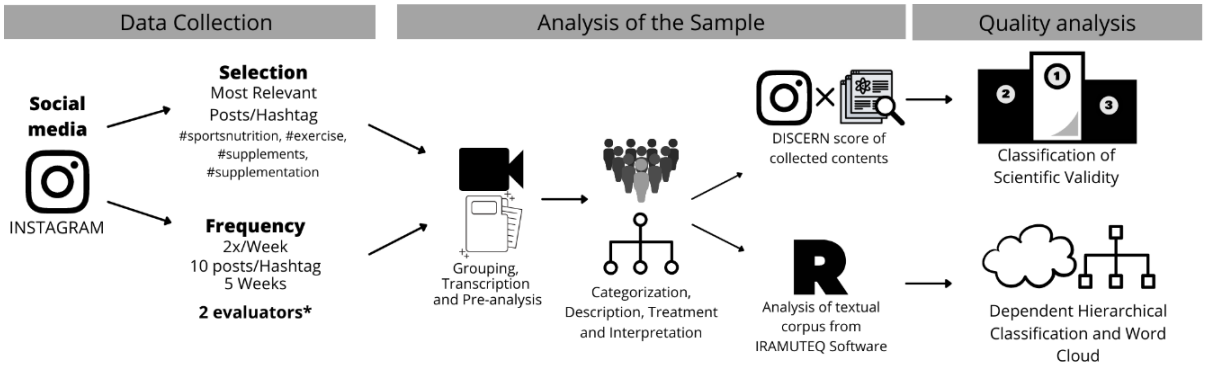

Figure 1 - Study design. No author, user or brand was displayed in order to make any kind of identification impossible. All collected posts came from public profiles (not private).

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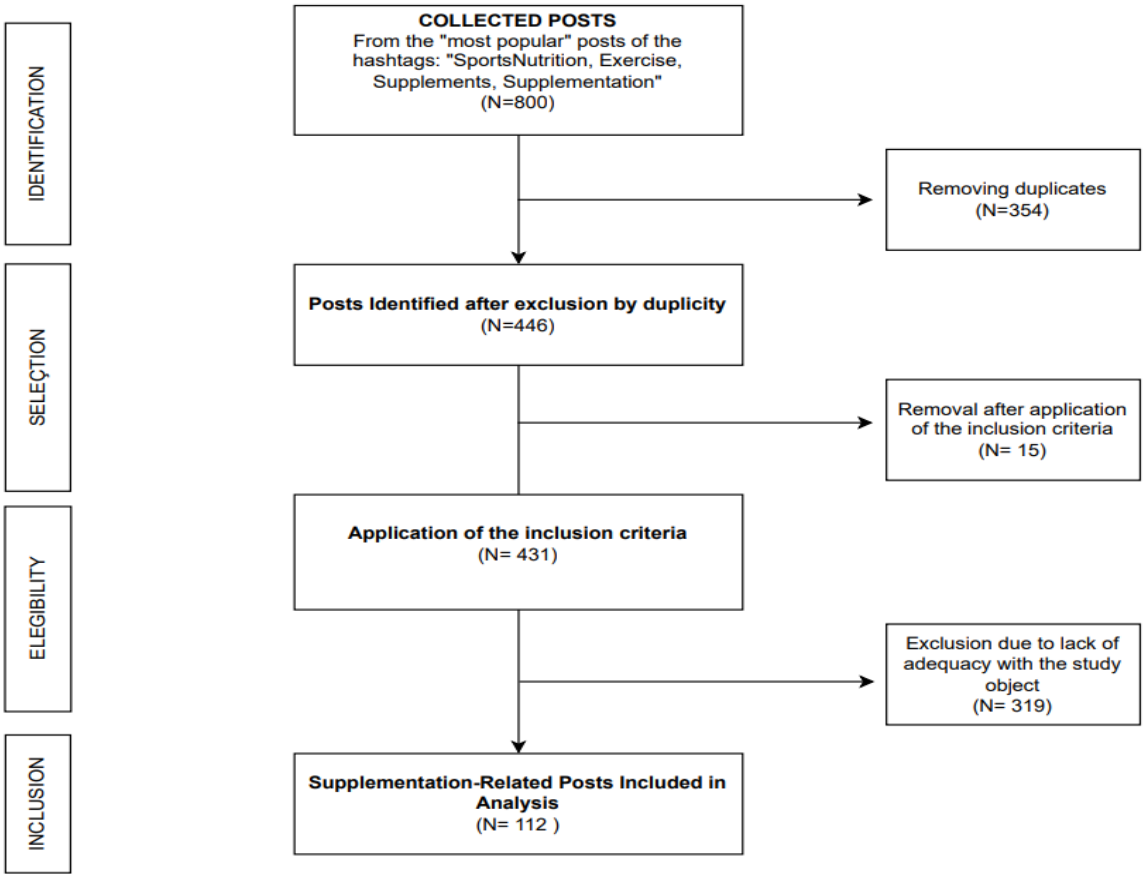

Figure 2 - Data screening flowchart.

Data collection

The ten most relevant posts per hashtag/day were collected by two different evaluators, seeking to unlink any relevance that the Instagram platform algorithm could have on the sample viewed and collected by each of the evaluators. At the end of each day, 80 posts were collected, totaling 800 posts after ten sessions.

All content present in the posts, whether in images or videos, and their respective captions, posting dates and the biography of each of the authors were tabulated and transcribed in order to outline the profile of the sample collected.

Duplicate posts and posts that, despite being within the selected hashtag, were not suited to the theme of sports supplementation were subsequently removed from the sample. In the end, 112 posts were part of the analysis (Figure 2).

Qualitative data analysis

The verbal material, as well as the respective subtitles present in the posts, photos and/or videos were transcribed in full, reviewed and organized into a single textual corpus for data analysis, with all the texts corresponding to the posts collected which were relevant to the study object.

The IRAMUTEQ® (Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires) version 0.7 alpha 2 software program was used to explore the main information contained in the texts through processing and statistical analysis.

The textual corpus was reviewed to standardize terms and correct typos by the authors, exclude text props (icons and emojis), names and brands, and then the appropriate coding was performed for analysis.

The Descending Hierarchical Classification (DHC) and Word Cloud analyses were performed in this study in order to identify the general context of the themes addressed in

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the posts. DHC is a method which aims to obtain word classes from the single textual corpus which have similar vocabulary to each other, and differences in the text segments of the other classes. IRAMUTEQ® organizes the data analysis in a dendrogram, which then graphically presents the relationships between the classes (Camargo, 2013; Souza et al., 2018; Tavares, 2019). The Word Cloud was applied from the textual corpus to complemente the analysis.

The processed data were submitted to Content Analysis (Bardin, 2016), following three phases: pre-analysis; exploration of the material, and finally, treatment and interpretation of the results.

Text segments were retrieved from the results processed by IRAMUTEQ®, and then coded to identify key themes. The list of topics was revised, modified and refined until all data were accommodated to finalize the analysis and interpretation of results.

All steps were repeated by a second researcher and differences were discussed until reaching consensus to ensure the validity and reliability of the results.

Posting Quality Analysis

The DISCERN instrument in the version translated and validated for Brazilian Portuguese was used to assess the scientific quality of health information available on the internet (Logullo et al., 2019).

The DISCERN instrument consists of 16 questions, distributed in 3 sections. The first section (the first 8 questions) assesses the reliability of the information or the reliability of the information source.

The second (the next 7 questions) assesses the quality of information about treatment choices. Each question in sections 1 and 2 has a score from 1 to 5 (1 = means it did not meet the item, 3 = it partially met, and 5 = it fully met the item). Section 3 consists of 1 last question (the 16th) which rates the overall quality of the text based on an average of the answers from the previous sections (1 - serious flaws and low quality, 3 - potentially important flaws and moderate quality, and 5 - Minimal flaws and high quality). Only the 1st and 3rd sections of DISCERN were used for the present study; the first section to assess the quality and reliability of the information presented, and the third to assess and score the general quality of the text, then presenting the data in medians and interquartile range.

The 2nd section is not included due to the topics presente in it, as it deals with the purpose of information for health treatments, which was not the focus of the present study.

The result of the obtained score was according to the average of the answers of the 1st Section of the document, which was later classified in section 3 of the same.

Statistical Analysis

The tabulation and statistical procedures were performed with the support of the SPSS Statistics v.22 program. The results were presented as median and interquartile range.

The Kolmogorov-Smirnov normality test was applied, and the non-parametric Mann-Whitney and Kruskal-Whallis tests were used in order to compare the data of the average DISCERN score between the groups adopting a significance level of 5%. The chi-squared test was automatically generated from the IRAMUTEQ software program to evaluate the traction force of the terms present with the category.

RESULTS

A total of 154 supplements were cited in the 112 posts analyzed, of which 88.3% were in the format of still photos and only 11.7% in video. Regarding authorship of the publications, 39.4% were nutritionists, followed by content creators (23.2%) and nutrition students (16.9%), with a higher representation of female authors (66.9%). “Supplements” had the highest participation in the posts on the subject among the hashtags collected, accounting for 60.5% of the final sample. In total, the average number of likes for the publications was 494.37, with 30.3 comments and 6,202.67 video views (Figure 3).

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	Number (%) TOTAL = 112	Scoring DISCERN
Profession		
Nutritionist	41 (39,4%)	3,00 (2,13-4,63)[a]
Creators of Content/Influencers	29 (23,2%)	2,50 (1,75-4,13)[ab]
Nutrition student	18 (16,9%)	3,00 (1,75-3,50)[b]
Commercial pages	10 (8,3%)	2,56 (2,00-3,25)
Doctor	7 (6,4%)	3,00 (1,75-3,50)
Physical Education	5 (4,2%)	2,75 (1,63-3,50)
Physiotherapist	2 (1,7%)	2,56 (2,38-2,75)
Gender		
Feminine	75 (66,9%)	2,75 (1,75-4,63)
Masculine	27 (25,4%)	3,00 (1,63-4,63)
Without designation of Gender	10 (7,7%)	2,56 (2,00-3,25)
Hashtag		
#Suplementos	70 (60,5%)	2,75 (1,63-4,63)
#Suplementação	24 (22,7%)	3,00 (1,88-4,63)
#Nutricaoesportiva	15 (14,2%)	3,00 (2,13-3,50)
#ExercicioFisico	3 (2,6%)	2,63 (2,25-3,25)
Format		
Photo	99 (88,3%)	2,88 (1,63-4,63)
Vídeo	13 (11,7%)	3,00 (2,00-3,25)
Average of likes	494,37	NA
Average of Comments	30,30	NA
Video Views*	6202,67	NA

Figure 3 - Characteristics of the 112 most popular posts by hashtag published on Instagram about sports supplementation.

A total of 18,885 occurrences of words were observed in the textual corpus analysis constituted by all posts, with 3,420 different forms. Of these, the DHC processed 548 Text Segments (TS) with a rate of 85.4%, resulting in 4 word classes, defined as the following categories: (1) Aspects of creatine supplementation; (2) Predetermining factors for supplementation; (3) Benefits of supplementation; (4) Characteristics of protein supplementation. The frequency of occurrences by category, the relationship between the categories, and the active words from the analyzed posts are shown in Figure 3.

Each category is described by the most significant words and their respective associations. The relationships between the categories indicate two main groupings. Complementary between classes 1 and 3, which are associated with class 2, was evidenced in the firts grouping, indicating proximity and cohérence of the semantic

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content between them. The second grouping evidences class 4 (Figure 4).

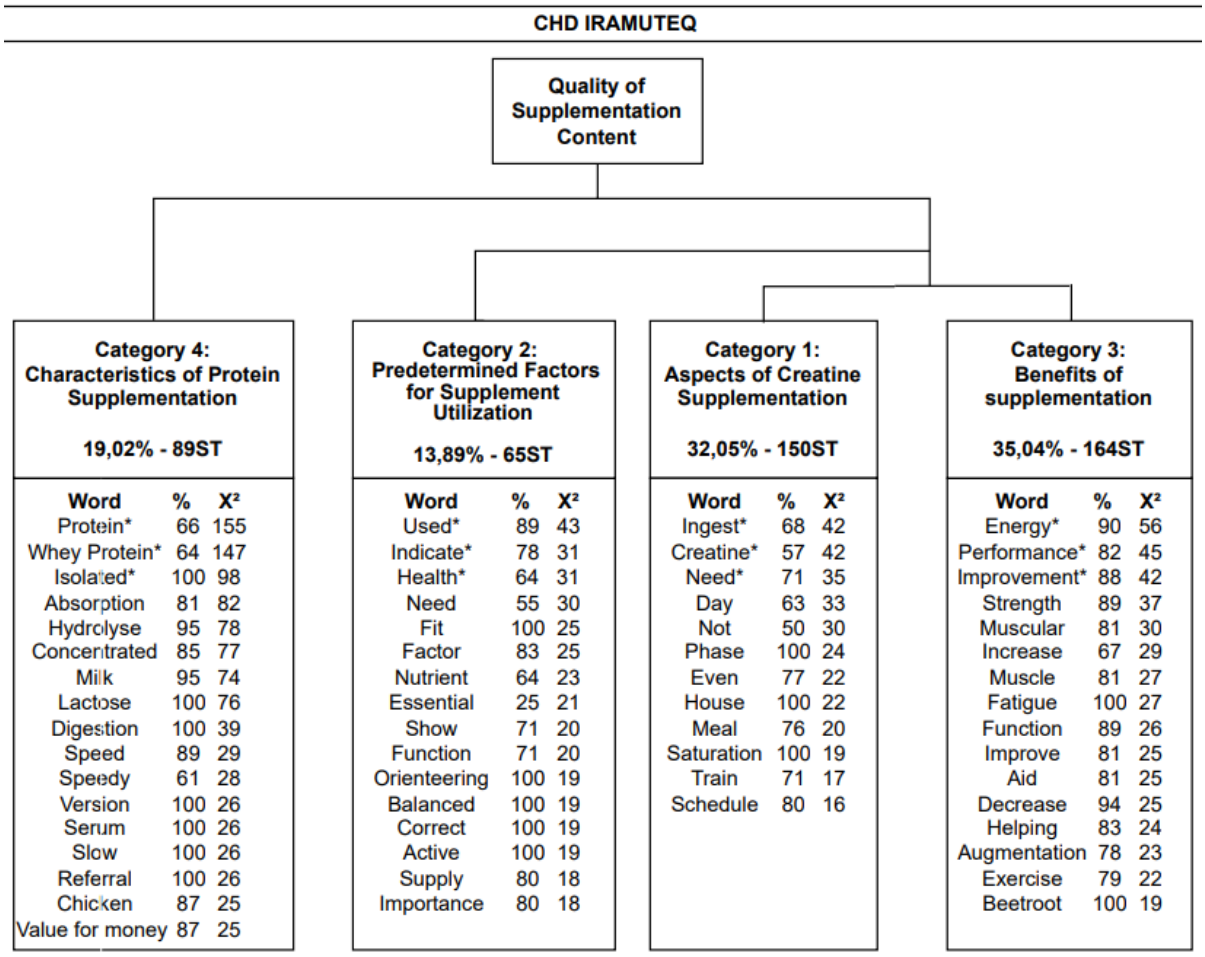

Figure 4 - Descending Hierarchical Classification (DHC) dendrogram of posts about sports supplementation.

Category 1 is characterized by the words: “take”, “creatine” and “need”, and the benefits, safety and need for creatine supplementation are highlighted, relating to its absorption and use metabolism and the purpose of its use, as in the excerpts analyzed below: “Creatine? What is the best time to take it? Before during or after? Creatine is one of the only food supplements in the world that you don’t need to use close to your training, it gets saturated inside your cell (...)”.

(Posting 27)

“Creatine is a safe supplement, it doesn’t make you fat, it doesn’t retain fluid, you don’t need to drink more water because you’re taking creatine, water is always important, with or without creatine you need to hydrate (...)”.

(Posting 79)

Category 2 is characterized by the words: “used”, “indicate” and “health”, with a concern for the need and purpose of using food supplements being highlighted, emphasizing the health purposes that supplements can add: “It can be used early in the morning or before bed as it still increases IGF1, which are our body’s repair factors during the night’s sleep. This also leads to better entire muscle recovery of our metabolism (...)”.

(Posting 52)

“The use of these elements is very common among sports athletes who need constant replacement of nutrients to improve performance. Food supplements are indicated

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for all individuals concerned about health along with the biological physiological functions of the body (...)".

(Posting 89)

Category 3 is characterized by the words: "energy", "performance" and "improvement", in which the benefits of sports supplementation stand out, aiming at improving physical performance mainly associated with optimizations in energy metabolism, as mentioned in the excerpts below:
"It helps to maintain your muscle cells, ensures that you can perform well in your activities. In addition, its use is associated with an increase in muscle mass and prevention of catabolism, meaning it prevents loss of lean mass (...)".

(Posting 2)

"It is an amino acid that assists in the formation of ATP (energy) acting as an energy support for your muscles during high intensity explosive strength exercises, such as bodybuilding and crossfit, one of the most studied, ensuring effectiveness and safety (...)".

(Posting 23)

Category 4 is characterized by the words: "protein", "whey protein" and "isolated", in which the concern with the characteristics and benefits of using dietary proteins was highlighted, emphasizing whey, and differentiating them by their type of formulation, as quoted in the excerpts below:

"It gathers smaller protein fractions and is digested more quickly by the body. Indication: Because it is a pre-digested protein, it is indicated for individuals who have digestion problems. Is there superiority between them in terms of increasing muscle mass? No! All are efficient when it comes to hypertrophy (...)".

(Posting 5)

"The isolated lactose-free version is the best option to avoid the adverse effects caused by lactase enzyme deficiency. Digestion Issues: Thinking of individuals with digestion issues, the hydrolyzed version may be the best option as it features pre- digested proteins (...)".

(Posting 8)

The words were then grouped and graphically organized using the word cloud method according to their frequency, and the information contained in the posts about sports supplementation was analyzed. It can be seen in Figure 4 that the larger words are the most frequent, demonstrating their prominence in the textual corpus. A complementary analyzes to the dendrogram will be presented from the word clouds below, highlighting the main results in relation to the information contained in the analyzed posts.

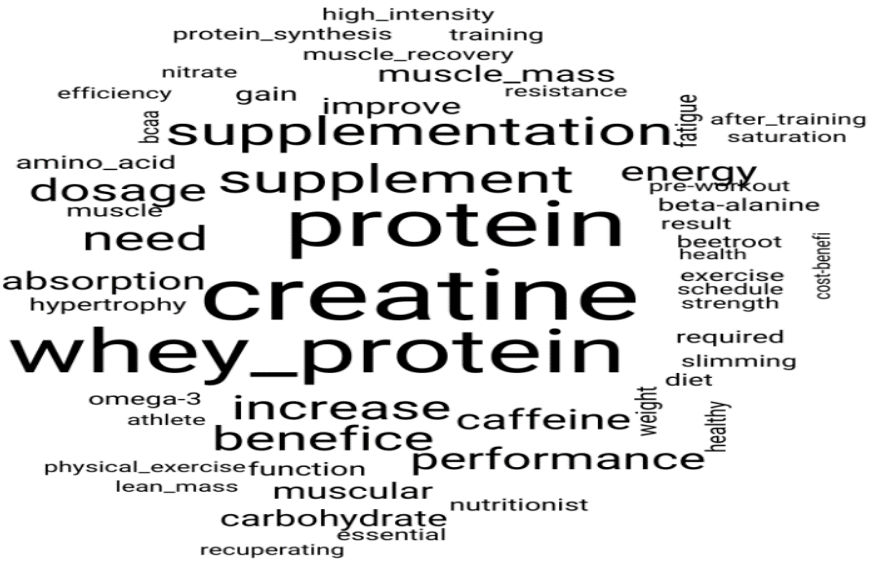

Figure 5 - Word clouds with the most frequent t erms in the sample of posts about sports supplementation.

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The most frequent word in the word cloud was “whey protein”, followed by “creatine”, “protein”, “supplement” and “supplementation”, demonstrating the most popular supplements with the highest content production.

The following words (less cited) give meaning to the purpose of the motivation for the use of supplements such as “muscle mass”, “increase”, “energy”, “performance”, “muscle recovery” and “protein synthesis”, attributing the ergogenic goal of improving performance, strength and recovery to the use of these supplements.

The classification of the content quality of each post was performed by type of supplement using the DISCERN instrument and obtained an overall median of 2.88. From the obtained score, it was observed that the posts were mostly between scores 1 and 3, classified as low to moderate quality, indicating serious or potentially important flaws in the analyzed publications, also not indicating statistical difference between them (Figure 6).

The volume of posts about whey protein, creatine, caffeine and omega 3 supplements stands out, which were the most frequently cited in the collected publications.

Along with the analysis of the score by types of supplements, the posts were scored by occupation, genre and content format.

The score by occupation was higher in health professionals, especially nutritionists and nutrition students (score obtained by DISCERN), who had higher scores compared to influencers/content producers (score obtained by DISCERN), and statistically significant. Men had a higher median (3.00) when analyzed by gender, and the hashtags that had higher scores were #supplementation and #sportsnutrition (average score obtained). However, there was no statistical difference in content quality between genres and hashtags. Still, there were also no differences between the scores when the analyzed factor of contente format was video (score) and photo (score).

Categories	Number (%)	DISCERN MEDIAN (IIQ)
All Supplements	**154 (100%)**	**2,88 (1,63-4,63)**
Whey Protein	37 (24,0%)	2,75 (1,88-4,13)
Creatine	29 (18,8%)	3,00 (2,13-4,63)0
Caffeine	10 (6,5%)	2,94 (2,13-3,50)
Omega 3	10 (6,5%)	2,69 (1,75-3,00)
BCAA	8 (5,2%)	2,44 (1,88-3,00)
Pre-workout	6 (3,9%)	2,62 (1,75-3,00)
Nitrates	5 (3,2%)	3,00 (2,25-3,00)
Supplements Alimentary	5 (3,2%)	2,63 (1,63-3,00)
Glutamine	4 (2,6%)	2,87 (2,63-3,50)
Thermogenic	4 (2,6%)	2,81 (2,38-3,00)
Beta-Alanine	3 (1,9%)	3,25 (2,13-3,25)
Carbohydrate Gels	3 (1,9%)	2,75 (2,00-3,00)
L-carnitine	3 (1,9%)	2,75 (2,38-3,50)
Chromium picolinate	3 (1,9%)	3,00 (2,75-3,50)
Coenzyme Q10	2 (1,3%)	3,06 (2,63-3,50)
Multivitamin	2 (1,3%)	2,62 (2,25-3,00)
Other	20 (13,0%)	2,94 (1,75-3,50)

Figure 6 - DISCERN score of the 154 supplements present in the collected posts.

DISCUSSION

The present study showed that the main publications on sports supplementation were related to supplements based on proteins (whey protein) and creatine, and presented an unsatisfactory level of quality, with nutritionists and nutrition students obtaining better quality of information in their posts.

The low grades were influenced by four DISCERN items, which were not present in most of the analyzed posts, with questions that

seek to identify whether the author made the source clear and its actuality, in addition to secondary sources of information present in the posts, as well as the fact that most posts do not refer to the scientific basis of the information shared.

These same questions were those which most favored the highest score obtained by professionals and nutrition students, emphasizing the relevance of academic training in the knowledge construction.

It is essential to emphasize that from the DHC, word cloud and the DISCERN instrument analysis, it was possible to notice that the lack of quality does not lead to affirming that the published posts have a false sense, but that the publications do not provide readers with sufficient confidence to give credibility to the information presented as true.

The information had clear objectives, with cohesive texts that served their purpose; however, from the moment they do not present the justification for the basis of the information, explaining the source and/or complementary materials to assure readers about the present content, it is not it is possible to identify whether the information has scientific validity or whether it is just the author's narrative on a topic of interest.

The freedom to produce content generated by social networks allows authors to create their own informal narrative, with or without referencing, using their credibility/popularity/ virtual authority as support for trusting the quality of the content presented, which can be a danger (Corritore et al., 2012),(Sbaffi and Rowley, 2017).

Health information on social media is not subject to the same degree of filtering and quality control by professional researchers as are common in public or commercial sources, and is more likely to be outdated, incomplete and inaccurate (Wang et al., 2019), (Matias, 2012).

According to the annual survey by PricewaterhouseCoopers Brasil (2015) on the consumption behavior of the Brazilian population, it was found that 77% of Brazilians are influenced by social networks in their purchasing decisions, surpassing the world average of 66%.

Assigning social media not only the role of disseminating information, but also its commercial and "inspirational" role, and the lack of clarity and information brings out biases of personal interests in publications made on social networks, which must be mitigated through the study sources on the information published (Easton et al., 2018; Matias, 2012; Raggatt et al., 2018; Sinapuelas e Ho, 2019).

The supplements which had the highest volume of mentions in the publications, such as whey protein, creatine, caffeine and omega 3, have extensive literature that point out the benefits of their use in increasing sports performance, recovery and muscle synthesis, decreased perception of effort, increase in ATP phosphate resynthesis, among other uses, clarifying their due care and for whom each one is really intended (DT, KA and LM, 2016; Kerksick et al., 2018; Maughan et al., 2018). However, still having basis and reasoning, these were not properly presented in most of the posts collected.

The results found in the current study are in line with other studies that used similar analysis methodologies, demonstrating that health information present in social media tends to have a low quality (Aguirre et al., 2017; Barajas-Gamboa et al., 2020; Batar et al., 2020; Fode et al., 2020; Giglio, Del et al., 2012; Kaicker, Dang e Mondal, 2016; Loeb et al., 2021; Passos et al., 2020; Xiao et al., 2014; Zheng et al., 2021).

The results obtained indicate that the quality of information present in social networks needs greater care and attention when being transmitted and read. In the studies by Fode et al., (2020) and Loeb et al., (2021), who used DISCERN as an instrument to assess the quality of health information, it was noted that 67% of the scores were between scores 1 and 3 in the first study, and 80.4% were below 3 with median 2 in the second study.

With the high volume of posts made every minute, it is difficult to have control over the quality and veracity of what is published.

A study by Okagbue et al., (2020) analyzed the medical content produced and published on Youtube, currently the 2nd largest search engine, behind Google, and came to the conclusion that only 59% of the videos contained scientifically useful content, leaving 41% with misleading information.

Batar et al., (2020) in their study on content about bariatric surgeries found that content created by doctors and nutritionists had higher DISCERN scores than content produced by laypeople. However, patients preferred to consume more materials that had lower quality of information.

Thus, it becomes evident that acquiring accurate and adequate nutritional information is important, mainly to positively influence nutritional choices and promote the maintenance and promotion of healthy nutritional status.

Therefore, it is increasingly necessary to use methodologies for analyzing the content broadcast in digital media (Quaidoo, Ohemeng and Amankwah-Poku, 2018).

The present study has as a limitation the fact that it is based on the evaluation of the most recent posts made in a single time interval on the Instagram platform, since they are data which continuously change on the platform and may not represent for all the content generated on the subject.

This was the first study that sought to analyze the quality of content disseminated from Instagram about sports supplementation, revealing information that can be useful in raising public awareness on the quality and reliability of the content read, as well as increasing concern on the part of content producers in mitigating any sharing of unsubstantiate information, leading to an increase in the rigor and quality of the posted posts.

CONCLUSION

The results show that the publications on the subject of sports supplementation present unsatisfactory quality, with potentially important flaws, with moderate to low scientific reliability, but that this quality may vary depending on the education level of the authors of the publications.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest on any aspect.

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