



The Preciseness of Nutrition Recommendation and Information Published in Twitter Accounts

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Abstract

False nutrition-related information poses a significant threat to public health. The increasing use of social media platforms as sources of knowledge introduces the need to investigate their preciseness. To investigate the proportion of incorrect nutrition-related online information posted in Arabic by the most followed Twitter accounts. A specific search strategy was conducted on Twitter to locate the most relevant sources of nutritional knowledge. Tweets were collected over one month and classified according to their subjects, popularity, and specialty, as well as the nationality of tweeters. Subsequently, the tweets were reviewed by a nutrition consultant and labeled as “true” or “false” based on their content. A total of 509 tweets posted by 33 different accounts were identified (38.3% of unknown specialty, 44.8% Saudi, and 24.8% with 100,000–200,000 followers). Of these, 183 tweets (36.0%) were false. Tweets published by accounts with a greater number of followers (> 100,000) were significantly more precise than those with fewer followers ($P = 0.001$). Saudi and medical tweeters as well as those of unknown identities posted significantly higher proportions of correct tweets than other nationalities and nutritionist tweeters ($P = 0.002$ and $P = 0.001$, respectively). Tweets about allergy, anemia, maternal health, and diabetes were more accurate than those about orthopedics and obesity ($P = 0.011$). About one-third of posted tweets were incorrect and the role of dietitians was negligible. Targeted intervention programs with the aid of personal and institutional nutrition accounts are warranted on all social media platforms to protect individuals/patients.



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Introduction


In recent years, the internet has become a significant source of health information. While an early report by the Pew Internet & American Life Project,

published in 2013, showed that 59% of internet users seek health-related information,¹ online health services significantly affected medical decisions and consultations among 46% to 76% of internet

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users in Europe.^{2,4} Indeed, information seekers no longer rely on health providers exclusively, but are rather shifting to new and readily available online sources. Multiple web-based health consultation services have emerged. Nonetheless, direct health professional–patient interaction has often been affected by the insufficient information offered by providers.⁵

This has been compounded by the active engagement of internet users in social media, which constitutes specific platforms that facilitate communication and information sharing among individuals.⁶ Millions of users actively contribute to these platforms every day, creating a large archive of data for various sectors, including health. Social media, such as Facebook, Twitter, Snapchat, and YouTube, empowers people to promote their daily lifestyles and to manage their personal health. More specifically, the distribution of health information about common illnesses, such as obesity, cancer, and cardiovascular disease, seems to be cost-effective via this means. This is particularly important in countries with high rates of such conditions, such as Saudi Arabia, whose burdens could be alleviated by targeting their modifiable nutritional risk factors.^{7,8}

It is necessary to promote lifestyle improvement and diet modification among vulnerable populations. In this context, the roles of registered dietitians and relevant physicians should be acknowledged on social media, where such professionals can share valuable and instant messages to their followers. However, there is considerable risk in providing health-related claims that are inherently false or that are not based on scientific evidence, but may be associated with personal attitudes, beliefs, or knowledge.⁹ Little is known about the best way for clinicians and dietitians to respond to nutritional misperceptions or misbeliefs. Similarly, when a diet-related topic is substantially misdirected via multiple falsehoods, clinicians are usually unable to intervene to control the spread of misconception.

It is therefore plausible to determine the prevalence and trends of nutrition-related misinformation shared by different accounts through social media platforms, because the proliferation of such attitudes may have devastating consequences for recipients. The assessment of the reach of these faulty messages at the local level as well as their unique

health consequences might be helpful for estimating when and how to respond. Recent studies have indicated that Twitter is the most popular social media platform for sharing health-related information in Saudi Arabia.^{10, 11} As such, it is important and crucial to investigate the preciseness of nutrition recommendations that have been posted by famous and effective Twitter accounts.

Methods

This is a descriptive and analytical study of online tweets. A manual search of Twitter was implemented to locate the most active and common accounts that consistently post nutrition-related content in Saudi Arabia and other Gulf countries. The selected accounts had posted for at least three years prior to the data collection date and the content of the tweets was in Arabic. No ethical approval was obtained since the study did not recruit human subjects.

The search process was performed during the period from January to April 2020. The following search terms were utilized through the search engine of the platform: “nutrition,” “your health,” “diet,” “regimen,” “healthy diet,” “diseases,” “medical information,” “doctors,” “nutrition,” “medical accounts,” “health accounts,” “doctor accounts,” and “nutrition accounts.” Search results were screened meticulously and the content of the tweets, as well as on the posting tweeters, was collected.

A total of 509 tweets posted by 33 accounts were identified. The numbers of followers for each account were recorded and categorized into successive groups, from less than 30,000 to more than 1,000,000 followers. Tweets were then categorized based on their subjects into 12 different domains, including public health, obesity, maternal health, and cancer. The nationality and specialty of each tweeter were also identified during the manual search.

The content of all tweets was then copied into a plain Microsoft Word file. An expert nutritionist (nutrition consultant) reviewed the content of these tweets while blinded to the characteristics of the tweeters. Each tweet was assigned a “true” or “false” label based on the correlation of its content with scientific evidence.

The Statistical Package for Social Sciences software version 19.0 was used for the statistical analysis.

Categorical variables, including the precision of answers, the speciality of tweets, and the categories of followers, were presented as frequencies and percentages, whereas continuous variables were presented as means \pm standard deviations (SDs). A chi-square test was applied to test the association between variables. The statistics were considered significant at $P < 0.05$.

Results

General Characteristics of the Accounts and the Tweets

Of the total number of posted tweets ($N = 509$), 228 (44.8%) were posted by Saudi accounts, followed

by those published by accounts of unknown country (33.4%). The speciality of the accounts was unknown in approximately one-third of tweets (38.3%) and almost this many again (31.2%) were made by personal nutritionists. Regarding subjects, less than half of the tweets (47.3%) were concerned with public health topics, while other domains, such as cardiovascular health, the digestive system, and obesity, were less frequently mentioned (13.0%, 7.9%, and 7.1%, respectively). The mean number of followers for all accounts was $1,231,300 \pm 244,000$. The most frequent ranges of followers were 100,000–200,000 (24.8%) and 300,000–1,000,000 (19.1%, Table 1).

Table 1: The general characteristics of Twitter accounts, the number of followers, and the subjects of tweets

Parameter	Category	Frequency	Percentage
Nationality	Saudi	228	44.8
	Unknown	170	33.4
	Kuwait	65	12.8
	Egypt	46	9.0
Specialty of the tweeters	Medicine (personal account)	144	28.3
	Nutrition (personal account)	159	31.2
	Nutrition (general account)	11	2.2
	Unknown (general account)	195	38.3
Subjects	Public health	241	47.3
	Heart diseases	66	13.0
	Digestive system	40	7.9
	Obesity	36	7.1
	Orthopedic health	21	4.1
	Cancer	23	4.5
	Diabetes	19	3.7
	Liver disease	14	2.8
	Maternal health	14	2.8
	Anemia	14	2.8
	Others (allergy 5, psychiatry 4, and respiratory 3)	10	2.0
Number of followers	Renal health	9	1.8
	< 30,000	85	16.7
	30,000–100,000	45	8.8
	100,000–200,000	126	24.8
	200,000–300,000	64	12.6
	300,000–1,000,000	97	19.1
	> 1,000,000	92	18.1

In general, information published in 183 (35.95%) tweets was labeled as “false” by the reviewer (Figure 1).

The Association Between Information Precision and Account Characteristics

Preciseness of information was significantly associated with all characteristics of Twitter accounts

included in the present study (Table 2). Tweets published by Egyptian accounts were significantly less precise (21.7%) than those published by accounts of unknown countries (74.7%), Saudi accounts (66.7%), and Kuwaiti accounts (56.9%, $P = 0.002$).

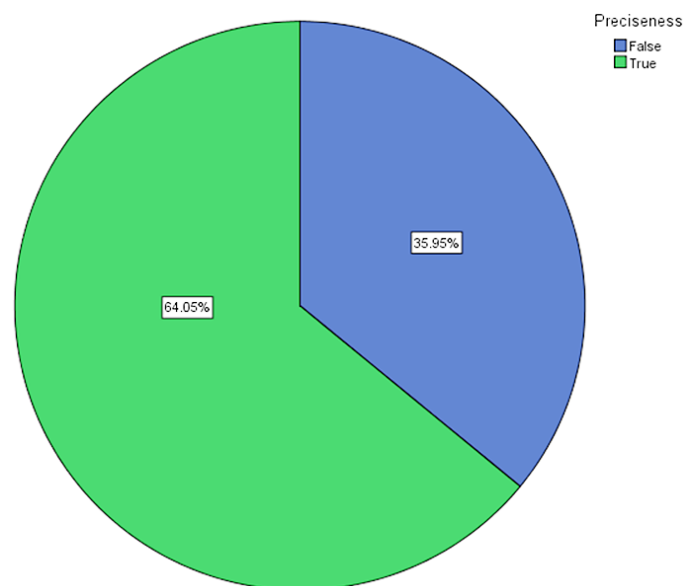


Fig.1: The percentage of correct and incorrect information mentioned in all tweets

Table 2: The association between the precision of the information and the characteristics of the accounts

Parameter	Category	Total	Precise		Not precise		P value
			N	%	N	%	
Nationality	Egypt	46	10	21.74	36	78.26	0.002
	Kuwait	65	37	56.92	28	43.08	
	Saudi	228	152	66.67	76	33.33	
	Unknown	170	127	74.71	43	25.29	
Specialty	Medicine (personal account)	144	107	74.31	37	25.69	0.001
	Nutrition (personal account)	159	84	52.83	75	47.17	
	Nutrition (general account)	11	5	45.45	6	54.55	
	Unknown (general account)	195	130	66.67	65	33.33	
No. of followers	< 30,000	85	37	43.53	48	56.47	0.001
	30,000–100,000	45	25	55.56	20	44.44	
	100,000–200,000	126	94	74.60	32	25.40	
	200,000–300,000	64	39	60.94	25	39.06	
	300,000–1,000,000	97	68	70.10	29	29.90	
	> 1,000,000	92	63	68.48	29	31.52	

Accounts operated by physicians and unknown operators were more likely to publish correct nutritional information (74.3% and 66.7%, respectively) than personal and general nutrition-related accounts (52.8% and 45.5%, respectively; $P = 0.001$). Interestingly, the percentage of correct information was higher in accounts with large numbers of followers ($> 100,000$). More specifically,

correct tweets in the accounts with followers ranging between 100,000–200,000 and 300,000–1,000,000 accounted for 74.6% and 70.1% of all tweets, respectively, while only 43.5% and 55.6% of tweets published by Twitter accounts with followers $< 30,000$ and ranging between 30,000–100,000, respectively, were correct ($P = 0.001$; Table 2).

Table 3: The association between the precision of information and subjects of the tweets

Category	Total	Precise		Not precise		P value
		N	%	N	%	
Public health	241	157	65.15	84	34.85	0.011
Heart diseases	66	45	68.18	21	31.82	
Digestive system	40	23	57.50	17	42.50	
Obesity	36	13	36.11	23	63.89	
Liver 14	8	57.14	6	42.86		
Maternal health	14	12	85.71	2	14.29	
Orthopedic health	21	6	28.57	15	71.43	
Others (allergy 5, psychiatry 4, and respiratory 3)	10	9	90.00	1	10.00	
Anemia	14	12	85.71	2	14.29	
Cancer	23	16	69.57	7	30.43	
Diabetes	19	16	84.21	3	15.79	
Renal health	9	7	77.78	2	22.22	

The Association Between Information Precision and Account Characteristics

Regarding the subjects of the tweets, correct information was more apparent in the tweets about other subjects—allergy, psychiatry (90%), anemia (85.7%), maternal health (85.7%), and diabetes (84.2%)—than for orthopedics (28.6%) and obesity (36.1%), and this difference was statistically significant ($P = 0.011$).

Discussion

There are several challenges in the use of social media in subjects related to nutritional health. These issues remain unsolved or incompletely solved. As with other health domains, there is a lack of empirical evidence concerning the impact on health outcomes of nutrition-related information posted on social media platforms. The limited findings in the literature are compounded by inconsistent, inconclusive, or contradictory outcomes. In the present study, we commenced the identification of the potential

benefits/challenges of the dissemination of such information on social media by addressing the sources of the posted information and investigating their preciseness on the widely used platform, Twitter. Based on expert review, we showed that more than one-third of the posted tweets regarding nutritional topics were not precise, while approximately two-thirds of them were posted by non-specialized accounts. Precise nutritional information was shared more frequently by accounts with greater numbers of followers and personal accounts owned by non-specialized physicians. The content of correctly presented posts was predominantly concerned with allergy, anemia, and diabetes, while those regarding obesity, cancer, and cardiovascular disease were less precise.

The outcomes of the present study are consistent with those of other investigations in the literature. Alnemer *et al.*¹² performed a data mining analysis of Arabic tweets posted over a one-month period.

The authors found that about half of the tweets (51.2%) contained false nutritional information, which was higher than the percentage reported in our study. This may be attributable to the reliance on three independent reviewers rather than the single reviewer used in our analysis. Interestingly, 68.1% of health-related tweets posted by nonofficial health institutes were rated "false," indicating the necessity of guiding and supervising these accounts. In our study, tweets posted by accounts of unknown specialties accounted for a considerable proportion (38.3%) of the posted content. However, surprisingly, these contributed to the majority of correct nutritional information.

Indeed, nutrition-related information represents the most common health-related topics posted on social media. In a cross-sectional investigation of social media usage in Greece, the results of a principal component analysis indicated that nutrition was the most important health subject for increasing communication between healthcare professionals and the general public.¹³ In another analysis of Twitter accounts owned by public health professionals, Hart *et al.*¹⁴ found that health and nutrition constituted the most frequently shared category on Twitter. The posted tweets contained primarily informative and educative material that was continually updated. This signifies the importance of Twitter and other popular platforms to share trusted and reliable data based on scientific evidence. Further, health professionals and dietitians can share their newly obtained health information at conferences and forums, review it in the literature, and finally, share it with the public. This way, patients can attain maximal benefits to improve their lifestyles and maintain a healthy diet.

From the perspective of the public, social media also represents a significant source of information. Recently, the percentage of people guided to nutrition-related information online has increased from 33.7% in 2012¹⁵ to as high as 93%, as revealed from cross-sectional studies and principal component analyses.^{13, 16} Actually, nutrition interventions through social media may have promising effects. A recent systematic review revealed 16 studies that addressed specific interventions targeting adolescents and young adults regarding tracking health, nutrition communication, education, and gamification.¹⁷ Despite the limited number of these

interventions, most had positive outcomes. Such observations were corroborated in subsequent studies.^{18, 19}

Nonetheless, an ideal pattern of communication between the public and healthcare professionals does not really exist. Factors related to information sources as well as to the recipient may be influential. For example, the credibility of the data provided has become doubtful in multiple instances where the provided information is incorrect. This is evident through the presence of unknown or irrelevant sources in the online world. Out of nine large Facebook pages that provide regular dietary advice in Australia, only two were fully compliant with the local guidelines of the "Australian Guide to Healthy Eating," while other pages provided contradictory information to these guidelines, restrictive recommendations, or misinformation.²⁰ In our investigation, it was surprising to find that personal and general nutrition-related Twitter accounts posted significantly less accurate information than medical and unknown accounts ($P = 0.001$).

Conversely, user-related factors are also significant. Quaidoo *et al.*¹⁶ found that healthcare professionals and dietitians were the least frequently used sources of information, despite being perceived as the most reliable by participants. Such attitudes may be common in low- and middle-income countries, such as Saudi Arabia, where the culture of self-care is dominant.²¹ More specifically, people may seek professional medical assistance only when they have severe illnesses. Otherwise, online users will obtain information directly from social media platforms, particularly in the presence of financial constraints.

Therefore, controlling misinformation is imperative to protect individuals/patients from unfavorable consequences. Implementing effective online interventions by trustworthy institutions/dietitians seems acceptable. A large, cross-sectional study among Saudi adults ($n = 1,045$) through Facebook and Twitter revealed that one-third of them had a background in food and nutrition, while only 19% were aware of basic nutritional guidelines.²² Individuals in the remaining proportion were either misled or lacked the relevant knowledge about a healthy diet. The knowledgeable proportion intended to change their diet-related behavior, and thus, were

more likely to be influenced by online interventions. Online-based programs must be well-designed to ensure maximal engagement and participation. A recent feasibility study among Saudi college students showed that a nutrition intervention program using Instagram was motivating and enjoyable, yet basic participation in it declined over time.²³ In addition, implementing visually attractive posts may be more effective when there is a significant focus on interesting topics. Such posts would also ensure high degrees of engagement.¹⁹

Collectively, the internet, social media tools, and media-sharing sites provide a significant chance for dietitians and nutrition practitioners to connect with the public in a convenient and direct way.²⁴ Dietetic professional associations, at the same time, strive to promote the use of social media by registered dietitians to enhance knowledge levels regarding correct nutritional facts.²⁵ However, little is known about the facilitators of and barriers to the use of social media among dietitians. There is limited data about the ability of dietitians to translate their evidence-based knowledge to lay users during interactions on these websites.

Evidently, resolving such challenges would ultimately raise the rates of precise information. One possible solution is to create groups of trusted bodies, including physicians, government institutes, and other relevant healthcare professionals who can deliver updated, easily accessible, comprehensive, and user-friendly messages/posts. Moreover, social media platforms are required to authenticate public pages, which have increasing numbers of followers.

Conclusion

In conclusion, approximately one in every three nutrition-related tweets posted by the identified Arabic accounts on Twitter were incorrect. Significantly higher proportions of precise and adequate information were provided by accounts with greater numbers of followers (> 100,000), and the accounts of physicians' and unknown owners. Additionally, nutritional tweets regarding maternal health, diabetes, and anemia were more precise than those related to obesity and orthopedic specialties. Multiple aspects of nutrition interventions via online platforms are still lacking, among which the barriers faced by dietitians are the most prominent. The use of web-based programs based on authentic sources and addressing the obstacles reported by dietitians to using social media platforms may significantly affect the outcomes of these interventions and improve health through diet.

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Conflict of Interest

The author declares no conflict of interest.

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