

Short Communication

Oral rehydration solution (ORS) for fasting doping: Examining the Twitter data in Indonesia

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Abstract

Oral rehydration solution (ORS) or oralit is a sugar and salt-based solution that restores electrolyte balance, counters dehydration and mitigates metabolic acidosis. In Indonesia, particularly during the month of Ramadan, the use of ORS as a form of fasting doping has become increasingly prevalent. This study aimed to analyze the patterns of communication, key influencers, and sentiment within the Twitter network in Indonesia regarding the use of ORS as fasting doping. From March 15 to March 26, 2023, Twitter data was collected using NodeXL software. The dataset was then analyzed using NodeXL and Gephi software to identify key influencers and patterns within the network. To assess attitudes towards the use of ORS as fasting doping expressed in tweets, sentiment analysis was conducted using Azure Machine. The dataset consisted of 13,746 tweets, from which the analysis revealed that Twitter discourse concerning the use of ORS as fasting doping demonstrated a diverse range of individuals. The top five users with the highest betweenness centrality scores were medical doctors, mention and confess (menfess) accounts, and personal accounts. The sentiment analysis of the collected tweets unveiled a relatively high negative sentiment toward the use of ORS for fasting purposes. Notably, the proportion of positive and neutral sentiments were comparable. Our data indicate that ORS use as fasting doping is controversial in Indonesia. Most tweets express concerns about misuse and negative consequences, indicating a need for guidance and regulation from public health authorities. Further research and guidelines are necessary to ensure the safe and appropriate use.

Keywords: Oral rehydration solution, fasting, doping, social network analysis, sentiment

Introduction

Oral rehydration solution (ORS) is a balanced mixture of glucose and electrolytes that promotes fluid intake and counteracts dehydration and metabolic acidosis. The sodium/glucose cotransporter (SGLT1), found on the apical membrane of intestinal epithelial cells, facilitates the absorption of fluids in the body by transporting substances across membranes [1]. Originally proposed by the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO), the initial ORS formulation was based on a sugar-salt solution that addressed dehydration in patients with diarrhea, regardless of the etiology or age of patients [2]. This formula was specifically composed to resist diarrhea from cholera, which was a major cause of death [3]. The WHO ORS contains sodium (Na⁺), potassium (K⁺), and sodium bicarbonate (NaHCO₃) in respective concentrations of 90, 20, and 10 mEq/L, in addition to 110 mmol/L of



glucose [3]. During fasting or between meals, sodium chloride (NaCl) is transported from the lumen through exchange, while chloride (Cl⁻) excretion serves as the driving force for fluid secretion. The electroneutral Na⁺/K⁺/2Cl⁻ cotransporter accumulates chloride along the basolateral membrane of the epithelial cell, which results in its accumulation within the cell above its electrochemical equilibrium [4].

In Indonesia, ORS is widely known by the name "oralit" and is often used to treat dehydration caused by diarrhea, a common ailment in the country. ORS has gained popularity as a form of fasting doping during Ramadhan (an Islamic month where Muslims must perform fasting for a month), as it is assumed to be an effective way to prevent dehydration during fasting [5,6]. However, there is limited awareness and understanding of this practice among the general population in Indonesia. Moreover, the use of ORS for fasting is not officially recommended by the Indonesian government or any relevant health authority. The Indonesian Ministry of Health warns its people not to be credulous in the information spread stating that ORS is effective in suppressing thirst and weakness during fasting or is as a fasting doping [5]. Moreover, improper use of ORS carries a risk of hypernatremia in children, which led to the adoption of a reduced osmolarity ORS with lower sodium and glucose levels [7-9].

The social media platform Twitter, currently rebranding to X in 2023, has emerged as a valuable source of real-time information for health researchers to track public health trends, monitor disease outbreaks, identify risk factors, and study social determinants of health [10-12]. Indonesia had a reported 18.45 million Twitter users by January 2022, making it the fifth largest country in terms of Twitter users and carrying out valuable resources in studying the population's health behaviors and attitudes for health researchers [13]. The aim of this study was to investigate the patterns of communication, key influencers, topics, and sources within the network, as well as analyze the sentiment regarding the use of ORS as fasting doping on Twitter in Indonesia. The findings of this study impose practical implications for promoting the risks and benefits of using ORS as a fasting doping agent, as well as contributing to a better understanding of the social and cultural factors that influence the use of ORS for fasting doping in Indonesia.

Methods

Data collection and cleaning

Our study utilized the NodeXL professional version 1.0.1.508 software (Social Media Research Foundation, Redwood City, CA), a widely accepted tool for collecting and analyzing social media data, to collect data from Twitter [14]. The collection of data spanned a week-long period, March 15–26, 2023, which was when the topic of ORS fasting doping first went viral on social media, employing the keyword "oralit," which is the Indonesian term for ORS. The dataset gathered for analysis comprised 13,746 tweets, including associated metadata such as user information, tweet content, posting time and date. Data cleaning procedures were implemented by removing redundant and irrelevant tweets, and pre-processing methods were carried out to eliminate stop words, punctuation, and special characters present within the tweet contents. In this study, we refer to 'tweets' as any message posted to Twitter, which may contain photo(s), video(s), link(s), and text [15]. Clemente's approach [16] was employed to establish a user-tweet network using the user data and metadata. In this network, individuals were represented as nodes, while tweets, now called 'posts,' were represented as edges.

Data analysis

In this study, social network analysis (SNA) was utilized to examine the Twitter network concerning the use of ORS as fasting doping in Indonesia. The NodeXL tool was employed to gather and scrutinize the network data by detecting nodes (users) and edges (connections between users) within the network. Gephi software (Version 0.1.0.), a network visualization tool, was utilized to visually represent the network data and recognize critical nodes and clusters within the network [17]. Moreover, the identification of the most influential users was carried out based on betweenness centrality in the user-tweet network [18]. Additionally, the top Uniform Resource Locators (URLs) and domains were identified as the main sources of information related to ORS fasting doping in Indonesia.

The sentiments contained in tweets concerning ORS fasting doping were analyzed through the use of Natural Language Processing (NLP) techniques facilitated by Azure Machine from Microsoft [19]. The NLP process encompasses the utilization of a machine-learning algorithm to classify each tweet as either positive, negative, or neutral based on the language used. Positive sentiment indicated tweets expressing a favorable or optimistic view towards ORS use as fasting doping by portraying the benefits of using ORS or encouraging others to use ORS for fasting. Negative sentiment encompassed tweets conveying a critical or unfavorable viewpoint towards the use of ORS as fasting doping, highlighting concerns about the potential misuse of ORS for doping purposes or presenting the risks or drawbacks of using ORS for fasting negatively. Neutral sentiment corresponded to tweets that did not express a clear positive or negative view towards ORS use as fasting doping.

Results

Network graph

The Twitter discourse surrounding the use of ORS as fasting doping demonstrated a diverse range of individuals who participated in the discussion. The dataset analyzed in this study included 13,746 tweets and 9,915 Twitter users. Among these, 7,559 tweets were retweets, 1,730 were original tweets, 3,133 were replies, 1,057 were mentions, and 259 were retweeted mentions. The SNA of the user-tweet relationship successfully identified key nodes and clusters and Gephi software was utilized to visualize the network and calculate the betweenness centrality scores of the nodes, which indicates the degree of influence of a user in the network.

The top five most influential users were identified based on their betweenness centrality scores, represented by different colors and node sizes: @sdenta (red), @aan__ (blue), @foodfess2 (green), @aimrod (orange), and @tanyakanrl (pink) (**Figure 1**). A pediatrician, @Sdenta, was found to be the most influential user in shaping the conversation around ORS on Twitter. The identification of such influential users and clusters is critical for understanding the dynamics of online conversations and developing targeted strategies for engaging with influential users on social media platforms. **Figure 1** presents the user-tweet network and key nodes and clusters based on their betweenness centrality scores.

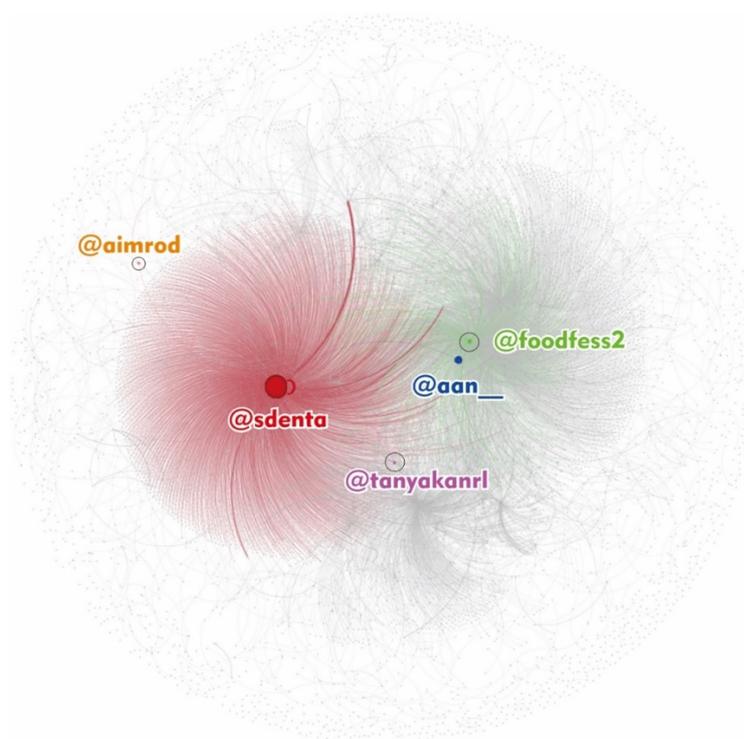


Figure 1. Social network graph of the tweets on oral rehydration solution (ORS) based on betweenness centrality score.

Top influencers

According to the SNA results, the most influential Twitter accounts with high betweenness centrality are presented in **Table 1**. The top influencer in this study was @sdenta, a pediatrician, followed by @aan__, a medical doctor. Other medical experts include @profesorzubairi, the Twitter account of an internal medicine professor also a specialist in hematology-oncology, and @tirta_cipeng, one of Indonesia's most popular medical influencers. The prominence of healthcare professionals among the top influential users indicates their significant impact in disseminating information related to ORS as fasting doping. Another most influential user was @foodfess2, a mention and confess (menfess) account catering to food enthusiasts, succeeded by @aimrod, a personal business account, and @tanyakanrl, a menfess account sharing real-life experiences. Other influential users were @HRDbacot, a Twitter account related to job vacancies, and @anzealty, a Twitter account providing daily thread recommendations.

Table 1. Most influential users on oral rehydration solution (ORS) based on betweenness centrality score

User	Betweenness centrality
sdenta	45689475.189
aan__	21651128.626
foodfess2	11430728.480
aimrod	8419777.172
tanyakanrl	8242957.815
profesorzubairi	1275228.222
hrdbacot	1142786.399
anzealty	1117550.000
tirta_cipeng	1114449.107
sas_frio	895917.060

Top topics

The six most frequently mentioned URLs on Twitter along with the number of tweets they were mentioned in are presented in **Table 2**. The first URL, mentioned by @nikardipin, received 3,197 mentions, and led to a podcast by @sdenta, a pediatrician, discussing the benefits of ORS in preventing thirst during fasting. The second URL, mentioned by @tanyakanrl with 2,298 mentions, pertained to the limited availability of ORS in pharmacies during fasting and the ensuing panic buying. The third URL, originating from @sdenta, received 282 mentions, and provided tips on fasting, suggesting that one should drink a glass of ORS and water during suhoor and iftar. The fourth URL, with 52 mentions, was shared by @foodfess2 to address the issue of panic buying and increased prices of ORS during fasting due to high demand. The fifth URL, mentioned by @aan__, with 45 mentions, focused on the trend of using ORS as doping for suhoor, but only if done accordingly with the terms and conditions. Finally, the sixth URL, with 38 mentions, was mentioned by @tubbirfess by describing a personal experience with drinking water and ORS during suhoor, which caused her to faint; thus, advises against it for those who have not tried it before.

Table 2. Top topics related to oral rehydration solution (ORS) use as fasting doping

Top URLs	n
https://twitter.com/nikardipin/status/1638195046808780800	3,197
https://twitter.com/tanyakanrl/status/1638763766669250560	2,298
https://twitter.com/sdenta/status/1638198362024599554	282
https://twitter.com/FOODFESS2/status/1638894791244275713	52
https://twitter.com/aan__/status/1639074428939280385	45
https://twitter.com/tubbirfess/status/1638820783190573057	38

Top sources

Upon analyzing the top sources of information related to ORS as fasting doping in Indonesia, Twitter emerges as the predominant platform, accounting for a majority of the tweet data (**Table 3**). Nevertheless, news media websites, including but not limited to detik.com, suarasurabaya.net, cnbcindonesia.com, and antaranews.com, also feature in the top domains list although with lower

counts. This observation indicates that news media may also have an impact in disseminating information concerning the use of ORS for fasting purposes in Indonesia.

Table 3. Top sources of information on oral rehydration solution (ORS) use as fasting doping

Top sources in tweet	n
twitter.com	6,542
detik.com	22
suarasurabaya.net	7
cnbcindonesia.com	7
antaranews.com	7

Sentiment analysis

The sentiment analysis results are presented in **Figure 2**. It is evident that the use of ORS as fasting doping in Indonesia was associated with a relatively high negative sentiment of 43%. Notably, neutral and positive sentiments account for 28% and 29% of the collected tweets, respectively. This distribution suggests that while some individuals view ORS positively and recognize its benefits, others may adopt a neutral stance and lack clear positive or negative attitudes toward this practice.

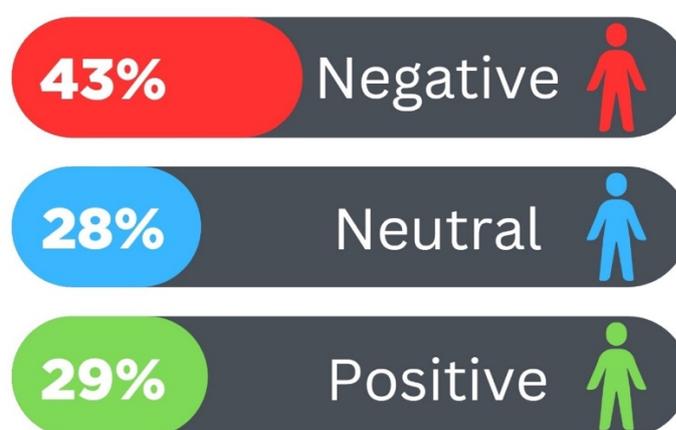


Figure 2. Sentiment analysis toward oral rehydration solution (ORS) as fasting doping based on Twitter data in Indonesia.

Discussion

In Indonesia, the use of ORS or oralit, as a performance-enhancing substance during the holy month of Ramadan has become a subject of controversy. Some believe that its use may violate the spirit of Ramadan, while others question its potential benefits and risks. Supposedly, no previous research has applied the SNA approach to investigate how information on the use of ORS as fasting doping was disseminated and received on Twitter by the general population in Indonesia. Given the significance of social media platforms like Twitter in providing and acquiring health-related information, it is crucial to comprehend the main narratives and public sentiments on this topic [20]. Developing a social media monitoring program is therefore essential to effectively address misinformation and provide accurate health information to the public [21]. Analyzing the most influential Twitter users driving the topic, and the social network graph's structure can provide insights into how the public perceives and receives information about the potential benefits and risks of using ORS as fasting doping during Ramadan.

The use of ORS as a means to alleviate thirst during fasting has been a subject of debate. Advocates of this practice suggest that it can effectively replace lost bodily fluids, particularly in individuals living in hot climates or engaging in physically demanding activities during the fasting period. However, opponents of ORS usage during fasting argue that it may lead to electrolyte and metabolic imbalances due to the excess levels of salts and sugars it introduces to the body [22]. Moreover, since ORS contains sodium and glucose [3], improper consumption of ORS may pose a risk to individuals with certain comorbidities, such as high blood pressure [23] or diabetes

mellitus [24], as it can exacerbate their conditions. It is therefore essential to provide comprehensive guidance and education on the appropriate use of ORS during fasting, particularly for individuals with pre-existing health concerns.

Furthermore, the notion of dehydration during fasting may not be entirely accurate, as the body can adapt to reduced fluid intake by conserving water and producing less urine [25,26]. The promotion of ORS as a form of "doping" during fasting may exacerbate the situation by contributing to an increase in demand, leading to scarcity and increased costs. This could potentially limit access to necessary medical supplies for individuals who require ORS. Therefore, there is a need for further research and regulation to ensure the safe and appropriate use of ORS during fasting, and to guarantee the medical resource availability for disease treatment.

Through analysis of the most influential users and top URLs related to ORS topics, it was possible to identify the initial tweet and user that sparked the debate. Specifically, the conversation began with a tweet from a menfess account that requested tips for fasting without experiencing hunger, thirst, and weakness. In response, a layperson with the username @nikardipin cited a pediatrician, @sdenta, who shared a personal experience that consuming ORS before and after fasting could effectively retain body water, reducing thirst during fasting, resulting in its viral spread and subsequent panic buying of ORS. It is worth noting, however, that neither side presented credible sources, such as peer-reviewed academic publications, to substantiate their arguments, instead relying on private opinions, experiences, and testimonials. Those who promoted the use of ORS included a pediatrician, a menfess account, and a personal business account, while those who opposed the tips and discouraged panic buying consisted of medical doctors, a professor, menfess accounts, and laypersons.

According to the findings of the sentiment analysis, negative sentiments overwhelmingly prevailed in the discourse related to ORS on Twitter, while the proportion of positive and neutral sentiments was roughly similar. This suggests that the majority of tweets conveyed a critical perspective on the utilization of ORS as fasting doping, expressed concerns regarding its potential misuse for doping purposes, or highlighted the negative consequences or limitations of ORS usage for fasting.

There are several limitations to this study that warrant consideration. Firstly, this study only examined data from a single social media platform, Twitter, which may not be representative of other popular platforms such as Instagram, Facebook, YouTube, or TikTok. As a result, the findings may not generalize the population to the broader social media landscape. Secondly, this study relied solely on publicly accessible Twitter accounts; tweets posted by users with private accounts were excluded from the analysis. Lastly, the study's findings may not represent populations with limited access to technology and social media, as only Twitter users with smartphones, sufficient internet connectivity, and a basic understanding of the platform were included in the study.

Conclusion

The use of ORS, or oralit, as a means to alleviate dehydration during fasting, has become a controversial topic in Indonesia, advocates suggested its benefits and opponents raised concerns over potential risks and misuse. Social media platforms such as Twitter played a significant role in disseminating information related to this topic, making it essential to understand the main narratives and public sentiments. This study reveals that Twitter discourse surrounding ORS demonstrated a diverse range of individuals, with both positive and negative sentiments expressed. The majority of tweets conveyed a critical perspective on the utilization of ORS as fasting doping, with concerns regarding its potential misuse for doping purposes, negative consequences, and limitations. It is essential to provide comprehensive guidance and education on the appropriate use of ORS during fasting, particularly for individuals with pre-existing health concerns, thus needing further research and regulations.

Ethics approval

This study followed ethical principles and Twitter's guidelines for data collection and analysis. Twitter announced allows third parties developer Twitter accounts to use APIs (Application

Programming Interfaces) such as NodeXL Pro, to retrieve and analyze public Twitter data [27]. No informed consent or ethical approval was required since publicly available tweets were analyzed using automated tools. No risks or ethical concerns were identified.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

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