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Original Article

TikTok content on measles-rubella vaccine in Jordan: A cross-sectional study highlighting the spread of vaccine misinformation

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Abstract

Social media platforms, including TikTok, have become influential sources of health information. However, they also present as potential sources for the spread of vaccine misinformation. The aim of this study was to assess the quality of measles-rubella (MR) vaccine-related contents on TikTok in Jordan and to analyze factors associated with vaccine misinformation. A systematic search for MR vaccine-related TikTok contents in Jordan was conducted using pre-defined keywords and a specified time range. Content metrics (likes, comments, shares, and saves) were collected while the content quality of health information was evaluated using a modified version of the DISCERN, a validated instrument by two expert raters. The average modified DISCERN score ranged from 1, denoting poor content, to 5, indicating excellent content. A total of 50 videos from 34 unique content creators formed the final study sample. The majority of MR vaccine-related content was created by lay individuals (61.8%), followed by TV/news websites/journalists (23.5%), and healthcare professionals (HCPs) (14.7%). The Cohen κ per modified DISCERN item was in the range of 0.579–0.808, $p<0.001$), indicating good to excellent agreement. The overall average modified DISCERN score was 2±1.2, while it was only 1.3±0.52 for lay individuals' content, which indicated poor content quality. For the normalized per number of followers for each source, content by lay individuals had a significantly higher number of likes, saves, and shares with $p=0.009$, 0.012, and 0.004, respectively. Vaccine misinformation was detected in 58.8% of the videos as follows: lay individuals (85.7%), TV/news websites/journalists (25.0%), and HCPs content had none ($p<0.001$). Normalized per the number of followers for each source, videos flagged as having MR vaccine misinformation reached a higher number of likes, saves, and shares ($p=0.012$, 0.016, and 0.003, respectively). In conclusion, substantial dissemination of TikTok MR vaccine-related misinformation in Jordan was detected. Rigorous fact-checking is warranted by the platform to address misinformation on TikTok, which is vital to improve trust in MR vaccination and ultimately protect public health.

Keywords: Vaccine misinformation, social media, public health, health communication, vaccine hesitancy

Introduction

The profound negative impact of the coronavirus disease 2019 (COVID-19) pandemic on health, economy, psychology, and society has been widely recognized [1-3]. Specifically, the pandemic has

https://narraj.org/

Received: May 18, 2024 - Accepted: July 11, 2024 - Published online: July 26, 2024

been accompanied by a decline in vaccination coverage for various types of vaccines [4-6]. Subsequently, the issue of children missing out on one or more vaccine doses was recognized worldwide, rendering many to be susceptible to vaccine-preventable diseases (VPDs) with the potential for infectious disease outbreaks due to low population immunity [7,8].

The Middle East region was one of the most severely impacted regions by disruptions to routine childhood vaccine coverage during the COVID-19 pandemic [9]. This disruption in vaccination coverage was experienced in Jordan, one of the Middle Eastern countries, including a concerning decline in measles vaccination rates [10]. According to the World Health Organization Regional Office for the Eastern Mediterranean (WHO EMRO) and United Nations Children's Fund (UNICEF), over 112,000 children under the age of 5 in Jordan, comprising over 60% of this age group, have missed their scheduled measles vaccination [11]. This substantial number of unvaccinated children could have contributed to a measles outbreak in Jordan since April 2023, with 163 cases have been reported in the country so far [11-13]. On top of that, an earlier study indicated that the seroprevalence of measles antibodies among physicians and nurses in Jordan was slightly more than 75%, which is far below the level needed to reach the population immunity [14]. To address this situation and to prevent further outbreaks, it is crucial to restore population immunity against measles in Jordan through regular immunization programs and supplementary catch-up vaccination campaigns [15].

The measles-rubella (MR) live attenuated vaccine is available globally from the Serum Institute of India (SII), prequalified by the WHO to manufacture and distribute this vaccine. Globally, 81 WHO member countries utilize the SII MR vaccine [16-18]. The MR vaccine from SSI was procured by the Jordanian Ministry of Health in response to the measles outbreak to boost catch-up immunization. The measles vaccination campaign by the Jordanian government is set to begin in mid-October, targeting all students in government and private schools, in addition to kindergartens, nurseries, shelters, orphanages, and events [19]. However, this MR vaccination campaign in Jordan has been accompanied by a controversy within the Jordanian community regarding the announcement of the introduction of the MR vaccine in schools. Recordings with inaccurate information regarding the MR vaccine, discouraging its use, circulated in the country [20]. The Jordanian Ministry of Health has recently declared that the videos circulating about the MR vaccine in Jordan were untrue [19]. Additionally, the Ministry of Health declared that it would take legal action against the spread of such recordings with misinformation [19]. Additionally, the ministry emphasized that the MR vaccine has been proven effective and has undergone the necessary procedures for approval and distribution in Jordan [19].

TikTok is currently one of the most popular mobile applications worldwide, with over one billion monthly active users [21]. This popular application reported ongoing negotiations with the Jordanian government following a temporary ban imposed in December 2022 [22]. The Jordanian Anti-Cyber Crimes Unit cited TikTok's failure to address user misconduct, including promoting violence, chaos, and fake videos to manipulate citizens' emotions [22]. With the government ban on TikTok, 4.43 million users in Jordan lost access to TikTok, making Jordan the first Arab country to enforce a complete ban on the platform. Nevertheless, it is reported that users in Jordan employ virtual private networks (VPNs) to bypass this ban [23].

Recent observations indicated that TikTok, characterized by short and catchy video content, has gained recognition as an important source of health information, especially among the younger demographics [24-26]. However, valid concerns accompanied the use of TikTok regarding the potential of spreading misinformation and inaccurate content [24]. Additionally, several recent studies indicated that TikTok could not meet the required accuracy of health information for the patients [27-29]. Therefore, the aim of this study was to provide a rapid descriptive evaluation of TikTok content regarding MR vaccination in Jordan, with a particular focus on the possible spread of misinformation regarding MR vaccination in the country.

Methods

Study design and TikTok search strategy

To retrieve the TikTok content related to the MR vaccination within the context of Jordan, a systematic approach was employed. The Jordanian dialect of Arabic was used to formulate the

following keywords: (MR vaccine) AND (Measles). These keywords were used sequentially in the TikTok platform search bar.

The search results were refined by selecting the "Videos" option on TikTok to ensure the display of the most relevant content. From these results, the top 50 videos, as determined by the metric of "Likes" were incorporated into the study. Exclusion criteria were applied to eliminate videos that were not in Arabic or not relevant to the subject of MR vaccination in Jordan.

Several parameters were extracted from each of the selected relevant videos, including the following: "Likes", "Comments", "Saves", and "Shares". Additionally, the "channel" features (number of followers and background of the content creator) were recorded to provide context for the analysis. Content creators were subsequently classified into (1) TV/news websites/journalists; (2) self-proclaimed healthcare professionals (HPCs) that included physicians, pharmacists, and doctors of pharmacy; and (3) lay individuals, content creators whose backgrounds were either unidentified or who did not fall within the first two aforementioned categories. To reduce the possibility of bias, the metrics of the videos retrieved from the same content creator were averaged to provide a balanced view of the content. The search started at 15:00 and concluded at 17:30 on October 4, 2023.

Assessment of the content quality

The assessment of TikTok content quality was conducted using a modified version of the "DISCERN," a short instrument to assess the quality of health information, based on the original validated 16-item "DISCERN" instrument [30]. The selection of this approach was based on the pursuit of a comprehensive approach to evaluating health information quality. This approach has previously been employed in the evaluation of TikTok content in diverse health-related topics such as monkeypox, diabetes, inflammatory bowel disease, and gallbladder stones [27-29,31]. The modified DISCERN 11 items were scored as follows: 1=poor quality to 5=excellent quality. The 11 items were as follows: (1) is it clear what sources of information were used to create the video? (2) Is it clear when the information used or reported in the video was produced? (3) Is the video balanced and unbiased? (4) Does the video provide details of additional sources of support and information? (5) Does the video refer to areas of uncertainty? (6) Does the video describe how the vaccine works? (7) Does the video describe the benefits of the vaccine? (8) Does the video describe the risks of the vaccine? (9) Does the video describe what would happen if the vaccine is not used? (10) Does the video describe how the vaccine attitude affects the overall quality of life? and (11) Does the video contain clear misinformation regarding the vaccine?

The definition of vaccine misinformation encompassed any inaccuracies, false claims, or misleading statements related to the MR vaccine found in the TikTok content [32]. This included misinformation regarding any aspect of MR vaccination, including vaccine adverse events, efficacy, affordability, vaccination campaigns, or any combination thereof [32]. Assessment of the extent/severity of misinformation was based on a 5-point Likert scale, with 1=clear misinformation to 5=complete lack of misinformation.

The evaluation of content quality for each video was conducted by two expert raters, an Associate Professor in Clinical Pharmacy and Therapeutics (MB) and a Consultant in Clinical Virology (MS). This approach was selected to ensure the inter-rater reliability of the modified DISCERN instrument. The Cohen kappa (κ) statistic was employed to measure the extent of consensus between the two independent raters concerning the quality of content.

Statistical analysis

Cohen κ was used to assess inter-rater reliability. The categorization of κ values was as follows: less than 0.20=poor agreement, 0.21–0.40=fair agreement, 0.41–0.60=good agreement, 0.61–0.80=very good agreement, and 0.81–1.00=excellent agreement. The Kruskal-Wallis (K-W) and Mann-Whitney U tests (M-W) were used to analyze the association between categorical independent variables (source of TikTok content and the presence/absence of misinformation in the video) and scale-dependent variables (TikTok video metrics and the modified DISCERN score). The level of statistical significance was $p<0.05$. Further analysis was performed on the retrieved TikTok video metrics, where normalization was conducted based on the content creator's number of followers to render the likes, comments, saves, shares, and modified DISCERN are directly

comparable irrespective of the number of content creator followers. The statistical analysis was performed using IBM SPSS Statistics for Windows (V26.0. Armonk, NY, USA: IBM Corp).

Results

Description of the retrieved TikTok videos

A total of 50 videos from 34 unique TikTok channels were included for final analysis. A majority of these channels belonged to lay individuals (n=21, 61.8%), followed by channels in the TV/news websites/journalist category (n=8, 23.5%), and channels belonging to healthcare professionals (HCPs) (n=5, 14.7%).

The TV/news website/journalist content creator category comprised 19 videos in total from eight unique channels. These channels represented TV talk shows (n=8, 42.1%), radio stations (n=5, 26.3%), news anchors/journalists (n=3, 15.8%), and news websites (n=2, 10.5%).

The HCPs videos were contributed by five distinct individuals, among whom two were physicians (40%), while the remaining three were pharmacists or doctors of pharmacy (60%). For the lay individuals, there were three content creators who contributed multiple videos (14.3%): two of them had two videos each, and one channel had three videos. One of the lay individuals identified as a lawyer, while another identified as an engineer based on their self-proclaimed profiles. The full TikTok metrics of the included videos are presented in (**Table 1**).

Table 1. Metrics of measles-rubella (MR) vaccine-related contents on TikTok stratified by unique sources (n=34)

TikTok channel classification	TV/news website/journalist	Healthcare professional	Lay individual	*p*-value [a]
	Mean±SD	Mean±SD	Mean±SD	
Likes	1637.7±2355.4	4194.6±4536.6	3692.1±5659.6	0.935
Comments	232.4±202.9	327.2±328.5	471.7±689.8	0.884
Saves	359.8±586.3	554±543.3	824.1±1325.7	0.870
Shares	481.6±807.7	692.6±656.9	2321.1±3909.1	0.470
Creator followers	196297.8±314976.6	646620±502540.3	37449.1±75936	0.004
mDISCERN	2.97±1.19	3.44±1.07	1.29±0.52	<0.001

mDISCERN: modified DISCERN score
[a] Analyzed using the Kruskal-Wallis test

Upon metric normalization per the number of followers for content creators, a statistically significant higher number of all metrics, with the exception of comments, were detected among the videos created by lay individuals (**Table 2**). For example, the average number of likes normalized per number of followers for the videos created by lay individuals was 0.3801 compared to a mean of 0.0208 for videos created by TV/news websites/journalists and a mean of 0.0047 for videos created by HCPs (p=0.009).

Table 2. Follower number-based normalized metrics of measles-rubella (MR) vaccine content on TikTok stratified by unique sources (n=34)

Source	Normalized likes	Normalized comments	Normalized saves	Normalized shares
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
TV/news website/journalist	0.0208±0.0234	0.0051±0.0045	0.0045±0.0063	0.0055±0.0084
Healthcare professional	0.0047±0.0042	0.0009±0.0011	0.0006±0.0005	0.0007±0.0006
Lay individual	0.3801±0.6582	0.0451±0.0713	0.0903±0.1798	0.3167±0.6144
p-value [a]	0.009	0.071	0.012	0.004

[a] Analyzed using the Kruskal-Wallis test

Our data also indicated that the average number of shares normalized per number of followers for the videos created by lay individuals was 0.3167 compared to a mean of 0.0055 for videos created by TV/news websites/journalists and a mean of 0.0007 for videos created by HCPs (p=0.004). Moreover, the same pattern was observed for the average number of saves, which was 0.0903, 0.0045, and 0.0006 for lay individuals, TV/news websites/journalists, and HCPs, respectively (**Table 2**).

Overall evaluation of the quality of measles-rubella (MR) vaccine-related videos on TikTok in Jordan

The overall mean modified DISCERN score was 2±1.2. Classified per source, the highest average modified DISCERN score was noted for the HCP contents, followed by TV/news website/journalist group, while the lay individual content averaged only 1.3±0.52, indicating poor content (**Table 1**). Per item, the Cohen κ interrater reliability ranged from 0.579 to 0.880, indicating good to excellent agreement (**Table 3**).

Table 3. Inter-rater reliability per modified DISCERN item

Modified DISCERN item	Cohen κ	Asymptotic standard error	Approximate T	*p*-value [a]
1	0.805	0.078	10.14	<0.001
2	0.639	0.097	8.07	<0.001
3	0.666	0.098	7.12	<0.001
4	0.808	0.086	8.41	<0.001
5	0.579	0.095	6.71	<0.001
6	0.708	0.110	7.36	<0.001
7	0.762	0.093	9.25	<0.001
8	0.855	0.076	9.57	<0.001
9	0.759	0.088	8.65	<0.001
10	0.759	0.089	8.58	<0.001
11	0.880	0.079	5.40	<0.001
Sum of modified DISCERN score	0.339	0.080	7.04	<0.001

[a] Calculated from the Z-score using the normal distribution

Misinformation was flagged on 20 out of the 34 videos (58.8%), with a majority of lay individual' content labeled as having misinformation (18/21, 85.7%), in comparison to TV/news website/journalist group (2/8, 25.0%), while HCPs content (n=5) did not have a content labeled as misinformation ($p<0.001$, $\chi^2=17.191$). Upon comparing the normalized metrics, the content labeled as having misinformation was more frequently liked, shared, and saved (**Table 4**).

Table 4. Metrics of measles-rubella (MR) vaccine content on TikTok stratified by unique sources (n=34)

Source	Normalized likes	Normalized comments	Normalized saves	Normalized shares
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Misinformation detected	0.3820±0.6763	0.0467±0.0753	0.0905±0.1847	0.3277±0.6282
No misinformation detected	0.0379±0.0768	0.0073±0.0121	0.0087±0.0189	0.0102±0.0223
p-value [a]	0.012	0.104	0.016	0.003

[a] Analyzed with Mann-Whitney U test

Discussion

The major finding of this study was the notable prevalence of misinformation in TikTok content regarding the MR vaccine in Jordan, which had a remarkable impact on video engagement metrics. Additionally, the content quality was found to vary across different video sources, with videos created by HCPs having the highest DISCERN scores, highlighting the important role of credible sources in combating misinformation on social media.

In this study, the presence of MR vaccine misinformation in the retrieved videos was concerning, with a significant proportion of videos containing scientific inaccuracies. Notably, most videos flagged with misinformation belonged to content created by lay individuals. Another interesting observation was the higher engagement with videos created by lay individuals, as illustrated by the higher number of normalized likes, shares, and saves. These insights could have implications for public health efforts aiming to combat MR vaccine misinformation in Jordan and improve the quality of health-related content on social media platforms.

In this study, a majority of TikTok content in the context of MR vaccination in Jordan was created by lay individuals. However, the quality of information provided by these individuals, as indicated by the low modified DISCERN scores, raises a concern, with lower scores suggesting poor content quality. Additionally, a majority of these MR-related TikTok videos created by lay individuals had discernible vaccine misinformation. This observation was worrisome given that the

higher engagement with such content manifested in higher likes, shares, and saves following normalization based on the number of content creator followers.

Like many social media platforms, TikTok has the potential to spread misinformation and content of unsatisfactory quality, including those related to vaccination [31,33-35]. This concern could be attributed to various reasons as follows. First, the success and high reach of TikTok content can be related to the rapid sharing of brief, visually appealing videos that attract viewers and prompt them to engage with such content [36-38]. Thus, TikTok content is presented in an attention-grabbing style, increasing its likelihood of widespread circulation of misinformation [39,40]. Additionally, the TikTok platform employs algorithms that analyze user behavior and preferences to keep them engaged; hence, more time is spent on this application [41,42]. Social media platforms, including TikTok, often create so-called "echo chambers" where users are exposed to content that aligns with their pre-existing beliefs and interests [43,44]. Therefore, the use of TikTok among other social media platforms, can reinforce the pre-existing biases hindering the critical evaluation of information, including vaccine-related content [45]. This renders the vaccine misinformation compatible with the pre-existing biases more likely to be accepted by the user without scrutiny [34,46].

Second, the TikTok application offers a user-friendly interface for content creation and interaction, allowing lay individuals to easily create and share videos [47]. While the liberty of content creation can be viewed positively, it can also allow individuals without healthcare or scientific expertise to create and share misleading vaccine-related content [48,49]. Subsequently, this could facilitate the spread of misinformation that propagates the vaccine conspiracy beliefs. Additionally, the format of TikTok videos with short and catchy content could match the limited attention span of many users. Therefore, the delivery of complex medical content about vaccines could be unappealing. Thus, vaccine misinformation, which is often simplified and sensationalized, may appear more accessible and appealing to users. This was highlighted in a recent study by Yang *et al.,* who demonstrated that anti-vaccination TikTok videos that blended humor with frustration tended to engage more viewers [50]. This finding was in line with our finding of more engagement with TikTok videos containing vaccine misinformation analyzed in this study.

Third, TikTok, among many other social media platforms, does not have a comprehensive system for fact-checking content prior to its sharing [51,52]. Thus, misinformation can spread unchecked until it is reported by users or flagged by the platform itself. By that time, misinformation can reach a large audience. While there are TikTok community guidelines and reporting mechanisms, misinformation could go unnoticed given the extremely high volume of content uploaded daily, which can overwhelm moderation efforts by the application [53].

In interpreting the present study results, it is important to consider the context of time following the COVID-19 pandemic and its place in terms of the high prevalence of vaccination hesitancy in the Middle East. During the COVID-19 pandemic, the prevalence of conspiracy theories regarding vaccines was strikingly high in Jordan among other Arab countries [54-56]. Therefore, a spillover of these conspiratorial ideas from COVID-19 to other infectious diseases appears as an expected outcome if no countermeasures are implemented [57]. For example, a previous study that was conducted in 2020 among a large sample of the public in Jordan showed that 48% believed that COVID-19 is part of a global conspiracy, and 57% thought that the pandemic origin was related to biological warfare [55]. In the context of vaccination hesitancy, Jordan was listed among the top world countries in terms of high prevalence of COVID-19 vaccine hesitancy/rejection [54,58,59]. Additionally, parental hesitancy to vaccinate their children against COVID-19 was notable in Jordan, with concerns about vaccine safety and mistrust in the healthcare system as the significant determinants of vaccination hesitancy [60].

Thus, it is conceivable that the aforementioned high prevalence of COVID-19 conspiracy theories and the lack of confidence in the safety and efficacy of vaccines in Jordan could have influenced the entire landscape of vaccine-related perception in the country. Subsequently, the mistrust, fear, and uncertainty could negatively impact the social media content, as well as the audience engagement and perception of vaccination in Jordan among other Middle Eastern Arab countries [61]. Conspiracy theories can be particularly dangerous in the context of vaccination, with subsequent negative impacts on public health [62-64]. Vaccine hesitancy is a major reason for low vaccination coverage and this phenomenon has real-world consequences, as it can lead to outbreaks of VPDs, as demonstrated by the measles outbreaks in the US and Europe [65,66].

In the context of the measles outbreak in Jordan, studies indicated the pervasive nature of parental MR vaccination hesitancy. For example, a study by Barakat *et al.* during the 2023 measles outbreak in Jordan found that a significant number of parents were either hesitant (43.0%) or resistant (43.2%) to MR vaccination [67]. Another recent study by Abu-Farha *et al.* highlighted the shift in parental attitude towards vaccination in Jordan following the COVID-19 pandemic with a decreased level of trust regarding childhood vaccination [68]. Taken together, the results of our study, along with recent research from Jordan, highlighted the necessity of initiatives to rebuild trust in vaccination [69-71]. This can be achieved by dissemination of reliable information via social media platforms like TikTok, and via involving the local communities through educational initiatives [69].

A noteworthy finding in this study was the absence of misinformation from the TikTok videos created by HCPs. Despite the minority presence of HCPs in content production, confounded by the limited number of TikTok videos analyzed in this study, this particular result further supports the previous evidence showing that HCPs represent key sources of accurate information on social media [72]. This result was further supported by the significantly higher modified DISCERN scores and substantial numbers of followers for HCPs channels, highlighting their potential role in countering vaccine misinformation and promoting trust in vaccines.

Therefore, addressing the issues of confidence and conspiracy theories on TikTok requires proactive measures from public health authorities, HCPs, and social media platforms. Public health campaigns should aim to counteract the misleading TikTok content by providing accurate information about vaccines in general and MR vaccination in particular and addressing the concerns about vaccine safety and efficacy. Additionally, governmental involvement may be crucial in disseminating reassuring content and promoting citizens' positive engagement to challenge MR vaccine misinformation [73,74].

Limitations

It is mandatory to highlight the limitations of the current study, which could hinder the generalizability of the results in a broader context. The limited sample size of TikTok videos analyzed in this study could be related to the official ban on TikTok in Jordan. The included sample of videos may not fully represent all vaccine-related content on TikTok in Jordan, as it relied on a limited set of 50 videos from 34 unique creators; therefore, it is important to consider that some relevant content may have been missed. The cross-sectional design limits the ability to decipher the temporal trends regarding the prevalence of TikTok videos with vaccine misinformation. Therefore, longitudinal studies should be considered in the future to offer insights into trends of vaccine misinformation emergence and spread over time. The present study was limited by the time frame of data collection; however, this approach has been chosen to enable the controlled retrieval of TikTok video metrics. It is important to emphasize that social media content and trends can change rapidly; thus, the study findings may not reflect the ongoing TikTok landscape on MR vaccination in Jordan. Categorizing the TikTok video sources into three groups in this study could be viewed as an oversimplification of the complexity of content creators on TikTok, potentially missing more detailed distinctions.

It is important to note that the modified DISCERN tool, while useful, is subjective and relies on the judgment of the raters, with inter-rater variability in scoring affecting the accuracy of quality assessments despite the high level of agreement observed in the study. This issue should particularly be considered for the single modified DISCERN item used to assess MR vaccine misinformation, which may be considered an oversimplification, warranting further exploration in future studies. It is imperative to note that this study specifically examined TikTok content, but vaccine-related discussions occur on various social media platforms commonly used in Jordan (e.g., Facebook, WhatsApp); thus, the study findings may not be generalizable to other social media and instant messaging platforms.

It is important to emphasize that the study focused on content creators but completely lacked data on how the viewers engaged with and interpreted the TikTok content, which is essential for understanding the broader impact of the study results. Finally, it is important to reiterate that the current study focused on MR vaccine-related content in Jordan, and the findings are not directly applicable to other countries or cultural contexts, as vaccine hesitancy is a time-, place-, and context-specific phenomenon [75]. Therefore, future studies are needed to confirm the current

study findings, which can benefit from a refined approach (e.g., including comment content analysis and refining the approach to evaluate misinformation).

Conclusion

In the present study, the analysis of MR vaccine-related content on TikTok in Jordan revealed variable quality of content and engagement by the viewers/users based on the source of TikTok videos. A majority of TikTok content on MR vaccination analyzed in this study was generated by lay persons. These videos received lower DISCERN scores, indicating poor quality, with a majority of content having MR vaccine misinformation. This result highlighted the need for strategies to improve the quality of MR vaccine-related information on social media platforms, with particular importance on engaging HCPs as well as the official media sources to ensure the delivery of accurate and evidence-based content. Additionally, the TikTok platform is encouraged to implement rigorous fact-checking measures. The TikTok application has a crucial role in moderating the content, removing false, inaccurate, or harmful information, and promoting fact-checking resources to users.

Ethics approval

This study was approved by the Institutional Review Board (IRB) at the School of Pharmacy, Applied Science Private University (ASU), with the approval number 2023-PHA-39 granted on October 3, 2023.

Acknowledgments

None.

Competing interests

All the authors declare that there are no conflicts of interest.

Funding

This research received no external funding.

Underlying data

The data presented in this study are available on request from the corresponding author.

How to cite

Abdaljaleel M, Barakat M, Mahafzah A, *et al*. TikTok content on measles-rubella vaccine in Jordan: A cross-sectional study highlighting the spread of vaccine misinformation. Narra J 2024; 4 (2): e877 - http://doi.org/10.52225/narra.v4i2.877.

References

1. Nelson R. COVID-19 disrupts vaccine delivery. Lancet Infect Dis 2020;20(5):546.
2. Saladino V, Algeri D, Auriemma V. The psychological and social impact of COVID-19: New perspectives of well-being. Front Psychol 2020;11:577684.
3. Nundy S, Ghosh A, Mesloub A, *et al*. Impact of COVID-19 pandemic on socio-economic, energy-environment and transport sector globally and sustainable development goal (SDG). J Clean Prod 2021;312:127705.
4. Lassi ZS, Naseem R, Salam RA, *et al*. The impact of the COVID-19 pandemic on immunization campaigns and programs: A systematic review. Int J Environ Res Public Health 2021;18(3):988.
5. Hamson E, Forbes C, Wittkopf P, *et al*. Impact of pandemics and disruptions to vaccination on infectious diseases epidemiology past and present. Hum Vaccin Immunother 2023;19(2):2219577.
6. Fahriani M, Anwar S, Yufika A, *et al*. Disruption of childhood vaccination during the COVID-19 pandemic in Indonesia. Narra J 2021;1(1):e7.
7. World Health Organization. Immunization coverage. Available from: https://www.who.int/news-room/fact-sheets/detail/immunization-coverage. Accessed: 7 October 2023.

8. Abbasi J. Amid Ohio measles outbreak, new global report warns of decreased vaccination during COVID-19 pandemic. JAMA 2023;329(1):9-11.
9. Causey K, Fullman N, Sorensen RJD, *et al*. Estimating global and regional disruptions to routine childhood vaccine coverage during the COVID-19 pandemic in 2020: A modelling study. Lancet 2021;398(10299):522-534.
10. Abu-Rish EY, Bustanji Y, Abusal K. Nationwide routine childhood vaccination coverage during the COVID-19 pandemic in Jordan: Current situation, reasons, and predictors of vaccination. Int J Clin Pract 2022;2022:7918604.
11. World Health Organization Regional Office for the Eastern Mediterranean. Measles-rubella vaccine in Jordan is safe and effective at saving children's lives - WHO and UNICEF. Available from: https://www.emro.who.int/jor/jordan-news/measles-rubella-vaccine-in-jordan-is-safe-and-effective-at-saving-childrens-lives-who-and-unicef.html. Accessed: 1 October 2023.
12. Jordan News Agency. Ministry of Health: Measles infections affect non-vaccinated recipients] in Arabic. Available from: https://petra.gov.jo/Include/InnerPage.jsp?ID=249229&lang=ar&name=news&cat=news. Accessed: 7 October 2023.
13. Das M. Measles-rubella vaccination and disease outbreaks. Lancet Infect Dis 2024;24(1):e16.
14. Bakri FG, Abdelrahim ZM, Alkalbani AS, *et al*. Seroprevalence of measles, mumps, rubella, and varicella among physicians and nurses in Jordan. Turk J Med Sci 2016;46:614-619.
15. Auzenbergs M, Fu H, Abbas K, *et al*. Health effects of routine measles vaccination and supplementary immunisation activities in 14 high-burden countries: A dynamic measles immunization calculation engine (DynaMICE) modelling study. Lancet Glob Health 2023;11(8):e1194-e1204.
16. Serum Institute of India. Measles and rubella vaccine, live, attenuated (freeze-dried). Available from: https://www.seruminstitute.com/product_viral_measles-rubella.php. Accessed: 1 October 2023.
17. Kaufmann SHE. Highly affordable vaccines are critical for our continued efforts to reduce global childhood mortality. Hum Vaccin Immunother 2019;15:2660-2665.
18. Somasundaram V, Soukas P, Patel J, *et al*. Considerations for potential global expansion of serum institute of India. J Commer Biotechnol 2021;26(4):10.5912/jcb1006.
19. Roya News. Jordan's Health Minister refutes false claims regarding MR vaccine. Available from: https://en.royanews.tv/news/44837/Jordan's%20Health%20Minister%20refutes%20false%20claims%20regarding%20MR%20vaccine. Accessed: 1 October 2023.
20. Jordan News. Conflicting views on vaccines: MoH responds. Available from: https://www.jordannews.jo/Section-109/News/Conflicting-views-on-vaccines-MoH-responds-31125. Accessed: 7 October 2023).
21. Statista. TikTok - Statistics and facts. Available from: https://www.statista.com/topics/6077/tiktok/#dossier-chapter7. Accessed: 1 October 2023.
22. The Hashemite Kingdom of Jordan - Public Security Directorate. Suspending the TikTok platform from working temporarily inside the Kingdom, after misusing it and not dealing with publications that incite violence and calls for chaos. Available from: https://psd.gov.jo/en-us/content/news/suspending-the-tiktok-platform-from-working-temporarily-inside-the-kingdom-after-misusing-it-and-not-dealing-with-publications-that-incite-violence-and-calls-for-chaos/. Accessed: 7 October 2023.
23. Datareportal. Digital 2023: Jordan. Available from: https://datareportal.com/reports/digital-2023-jordan#:~:text=Jordan%20was%20home%20to%206.61,percent%20of%20the%20total%20population. Acessed: 1 October 2023.
24. Pedrouzo SB, Krynski L. Hyperconnected: Children and adolescents on social media. The TikTok phenomenon. Arch Argent Pediatr 2023;121:e202202674.
25. MacKinnon KR, Kia H, Lacombe-Duncan A. Examining TikTok's potential for community-engaged digital knowledge mobilization with equity-seeking groups. J Med Internet Res 2021;23:e30315.
26. Basch CH, Fera J, Pierce I, *et al*. Promoting mask use on TikTok: Descriptive, cross-sectional study. JMIR Public Health Surveill 2021;7:e26392.
27. Kong W, Song S, Zhao YC, *et al*. TikTok as a health information source: Assessment of the quality of information in diabetes-related videos. J Med Internet Res 2021;23:e30409.
28. Ji-Xu A, Htet KZ, Leslie KS. Monkeypox content on TikTok: Cross-sectional analysis. J Med Internet Res 2023;25:e44697.
29. Sun F, Zheng S, Wu J. Quality of information in gallstone disease videos on TikTok: Cross-sectional study. J Med Internet Res 2023;25:e39162.
30. Charnock D, Shepperd S, Needham G, *et al*. DISCERN: An instrument for judging the quality of written consumer health information on treatment choices. J Epidemiol Community Health 1999;53:105-111.
31. He Z, Wang Z, Song Y, *et al*. The reliability and quality of short videos as a source of dietary guidance for inflammatory bowel disease: Cross-sectional study. J Med Internet Res 2023;25:e41518.

32. Geoghegan S, O'Callaghan KP, Offit PA. Vaccine safety: Myths and misinformation. Front Microbiol 2020;11:372.
33. Skafle I, Nordahl-Hansen A, Quintana DS, *et al*. Misinformation about COVID-19 vaccines on social media: Rapid review. J Med Internet Res 2022;24:e37367.
34. Ngai CSB, Singh RG, Yao L. Impact of COVID-19 vaccine misinformation on social media virality: Content analysis of message themes and writing strategies. J Med Internet Res 2022;24:e37806.
35. Lorenzo-Luaces L, Dierckman C, Adams S. Attitudes and (mis)information about cognitive behavioral therapy on TikTok: An analysis of video content. J Med Internet Res 2023;25:e45571.
36. Ling C, Blackburn J, Cristofaro ED, *et al*. Slapping cats, bopping heads, and oreo shakes: Understanding indicators of virality in TikTok short videos. In: Proceedings of the Proceedings of the 14th ACM Web Science Conference 2022: Barcelona, Spain; 2022.
37. Montag C, Yang H, Elhai JD. On the psychology of TikTok Use: A first glimpse from empirical findings. Front Public Health 2021;9:641673.
38. Vukušić Rukavina T, Viskić J, Machala Poplašen L, *et al*. Dangers and benefits of social media on e-professionalism of health care professionals: Scoping review. J Med Internet Res 2021;23:e25770.
39. Aragon-Guevara D, Castle G, Sheridan E, *et al*. The reach and accuracy of information on autism on TikTok. J Autism Dev Disord 2023.
40. van Kampen K, Laski J, Herman G, *et al*. Investigating COVID-19 vaccine communication and misinformation on TikTok: Cross-sectional study. JMIR Infodemiology 2022;2:e38316.
41. Wang Y. Humor and camera view on mobile short-form video apps influence user experience and technology-adoption intent, an example of TikTok (DouYin). Comput Human Behav 2020;110:106373.
42. Qin Y, Omar B, Musetti A. The addiction behavior of short-form video app TikTok: The information quality and system quality perspective. Front Psychol 2022;13:932805.
43. Cinelli M, De Francisci Morales G, Galeazzi A, *et al*. The echo chamber effect on social media. Proc Natl Acad Sci USA 2021;118(9):e2023301118.
44. Gao Y, Liu F, Gao L. Echo chamber effects on short video platforms. Sci Rep 2023;13:6282.
45. Van Poucke M. COVID-19 vaccine hesitancy and shaming on TikTok: A multimodal appraisal analysis. Multimodality and Society 2023;3(2):97-129.
46. Institute for Strategic Dialogue. How TikTok sounds are used to fuel anti-vaccine fears. Available from: https://www.isdglobal.org/digital_dispatches/how-tiktok-sounds-are-used-to-fuel-anti-vaccine-fears/. Accessed: 7 October 2023.
47. Goli M, Khan M. Behavioural intention to use social networking mobile apps: The case of TikTok. Int J Bus Innov Res 2022;29(1):16-31.
48. DeNardis L, Hackl AM. Internet governance by social media platforms. Telecommunications Policy 2015;39(9):761-70.
49. Puri N, Coomes EA, Haghbayan H, *et al*. Social media and vaccine hesitancy: New updates for the era of COVID-19 and globalized infectious diseases. Hum Vaccin Immunother 2020;16:2586-2593.
50. Yang EF, Kriss LA, Sun Y. Fun with frustration? TikTok influencers' emotional expression predicts user engagement with COVID-19 vaccination messages. Health Commun 2023;9:1-16.
51. Alonso-López N, Sidorenko Bautista P, Giacomelli F. Beyond challenges and viral dance moves: TikTok as a vehicle for disinformation and fact-checking in Spain, Portugal, Brazil, and the USA. Anàlisi 2021;64:65-84.
52. Sidorenko Bautista P, Alonso López N, Giacomelli F. Fact-checking in TikTok. Communication and narrative forms to combat misinformation. Revista Latina de Comunicación Social 2021;79:87-113.
53. TikTok. Community Guidelines - TikTok. Available from: https://www.tiktok.com/community-guidelines. Accessed: 7 October 2023.
54. Sallam M, Dababseh D, Eid H, *et al*. High rates of COVID-19 vaccine hesitancy and its association with conspiracy beliefs: A study in Jordan and Kuwait among other Arab Countries. Vaccines (Basel) 2021;9:42.
55. Sallam M, Dababseh D, Yaseen A, *et al*. COVID-19 misinformation: Mere harmless delusions or much more? A knowledge and attitude cross-sectional study among the general public residing in Jordan. PLoS One 2020;15:e0243264.
56. Sallam M, Kareem N, Alkurtas M. The negative impact of misinformation and vaccine conspiracy on COVID-19 vaccine uptake and attitudes among the general public in Iraq. Prev Med Rep 2024;43:102791.
57. Sallam M, Eid H, Awamleh N, *et al*. Conspiratorial attitude of the general public in Jordan towards emerging virus infections: A cross-sectional study amid the 2022 monkeypox outbreak. Trop Med Infect Dis 2022;7:411.
58. Sallam M, Al-Sanafi M, Sallam M. A global map of COVID-19 vaccine acceptance rates per country: An updated concise narrative review. J Multidiscip Healthc 2022;15:21-45.

59. Sallam M. COVID-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. Vaccines 2021;9:160.
60. Alsulaiman JW, Mazin M, Al-Shatanawi TN, *et al*. Parental willingness to vaccinate their children against SARS-CoV-2 in Jordan: An explanatory cross-sectional study. Risk Manag Healthc Policy 2022;15:955-967.
61. Cristea F, Weishaar H, Geurts B, *et al*. A comparative analysis of experienced uncertainties in relation to risk communication during COVID-19: A four-country study. Global Health 2022;18:66.
62. van Mulukom V, Pummerer LJ, Alper S, *et al*. Antecedents and consequences of COVID-19 conspiracy beliefs: A systematic review. Soc Sci Med 2022;301:114912.
63. Mousoulidou M, Christodoulou A, Siakalli M, *et al*. The role of conspiracy theories, perceived risk, and trust in science on COVID-19 vaccination decisiveness: Evidence from Cyprus. Int J Environ Res Public Health 2023;20:2898.
64. Camargo EL, Ribeiro CJ, Santos GR, *et al*. Belief in conspiracy theories about COVID-19 vaccines among Brazilians: A national cross-sectional study. COVID 2024;4:518-530.
65. Dubé E, Laberge C, Guay M, *et al*. Vaccine hesitancy: An overview. Hum Vaccin Immunother 2013;9:1763-1773.
66. Wilder-Smith AB, Qureshi K. Resurgence of measles in Europe: A systematic review on parental attitudes and beliefs of measles vaccine. J Epidemiol Glob Health 2020;10:46-58.
67. Barakat M, Abdaljaleel M, Atawneh N, *et al*. Pervasive parental hesitancy and resistance towards measles rubella vaccination in Jordan. Vaccines 2023;11:1672.
68. Abu-Farha RK, Khabour OF, Gharaibeh L, *et al*. Navigating parental attitudes on childhood vaccination in Jordan: A cross-sectional study. Int J Environ Health Res 2024;4:1-13.
69. Al-Maghaireh D, Alsaqer K, Kawafha M, *et al*. Predictors on parent's attitudes toward the measles-rubella (MR) vaccine in Jordan: An education program. Am J Infect Control 2024.
70. Al-Jafari M, Jaradat JH. Vaccine hesitancy and resistance following COVID-19 vaccinations: Measles and rubella outbreak in Jordan. JAP Academy Journal 2024;2(2).
71. Mahameed H, Al-Mahzoum K, AlRaie LA, *et al*. Previous vaccination history and psychological factors as significant predictors of willingness to receive mpox vaccination and a favorable attitude towards compulsory vaccination. Vaccines (Basel) 2023;11(5):897.
72. Parisi L, Mulargia S, Comunello F, *et al*. Exploring the vaccine conversation on TikTok in Italy: Beyond classic vaccine stances. BMC Public Health 2023;23:880.
73. Chen Q, Min C, Zhang W, *et al*. Factors driving citizen engagement with government TikTok accounts during the COVID-19 pandemic: Model development and analysis. J Med Internet Res 2021;23(2):e21463.
74. Handayani PW, Zagatti GA, Kefi H, *et al*. Impact of social media usage on users' COVID-19 protective behavior: Survey study in Indonesia. JMIR Form Res 2023;7:e46661.
75. MacDonald NE. Vaccine hesitancy: Definition, scope and determinants. Vaccine 2015;33(34):4161-4164.