WhatsApp and Health Communication:
Its Impact on Promoting Children's Oral Healthcare Among Parents

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ABSTRACT

Little is known about the use of WhatsApp in promoting oral health among parents or caregivers. Therefore, the survey examined the impact of social media in disseminating health infographic messages in supporting children's oral health from the parent's perspective. The group of respondents read or saw posts or messages related to health education through Facebook (n=85, 31.9%), WhatsApp (n=68, 25.2%), and YouTube (n=61, 22.6%). There was a significant difference before and after the infographics were sent to the respondent, and it was found to be statistically significant (P-value <0.001). As a social media platform for oral health education purposes, WhatsApp appeared to improve parents' knowledge and behaviors towards their children's oral health. Most respondents perceived WhatsApp to be beneficial. Knowing how people use social media now could help health communication efforts be more effective and equitable.

KEYWORDS

children, health communication, infographics, Malaysia, social media, WhatsApp

INTRODUCTION

Parents have various options and channels to improve their skills and knowledge of children's health, especially oral healthcare, in the age of media technology. Social media, often known as the "participative Internet," is a very popular platform or medium for seeking varied information, with more than 90% of users globally (Statista, 2020). In addition, numerous types of health information, such as health-related infographics, can be actively distributed and shared via the Internet. Although social media's early use was primarily for marketing purposes, the new medium has grown to give health practitioners or organizations a platform to communicate with their target groups. People of all ages and demographics use computers and mobile devices to adopt these technologies.

Social networking sites based on the Internet, wikis for collaborative content development, blogs, and two-way mobile messaging platforms that connect people via cell phones and personal digital assistants are examples of Web 2.0 social media technologies that increase interactivity and collaborative content sharing. Smartphones and associated mobile applications have been used to transmit health information, mainly information about children's dental health, owing to mobile

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devices' widespread availability and usefulness. Evidence suggests that persons who use self-management health apps have better outcomes (Castensoe et al., 2018), implying that integrating this technology in health promotion methods such as children's dental healthcare is feasible.

Oral health is important because it affects every aspect of life, but it is often overlooked, especially in childhood. According to the Global Burden of Disease Study 2017, oral disorders affect approximately 3.5 billion people worldwide, with caries of permanent teeth being the most common condition. Permanent tooth decay is estimated to affect 2.3 billion people worldwide, while primary tooth decay affects approximately 530 million children (GBD, 2017). Oral diseases are on the rise in most low- and middle-income countries as a result of urbanization and changing living conditions.

Health Education and the Use of WhatsApp

WhatsApp (WhatsApp Inc), a social media platform, stands out among the apps as one with the potential to be used in health education interventions (Giordano et al., 2017). Social media platforms are frequently used for a variety of objectives. This media may help to preserve social capital and provide access to resources. Because of their widespread use, social media can be a valuable source of information and social support during times of crisis. For example, government agencies use social media to gather and disseminate information to effectively handle disasters. Social media also provides a useful platform for citizens to post or receive information, seek social support, and express concerns about terrible events (Zade et al., 2018; Cumiskey, 2019). Users perceive social media as a source of social support and a cause of stress (Drouin et al., 2018). With the rise of digital technology, many institutions and organizations are turning to social media to elicit parental participation or engagement in their children's affairs. WhatsApp and WeChat, for example, have been used in numerous countries to improve home-school communication. According to Mayangsari and Aprianti (2017), WhatsApp has been used to supplement traditional media for teacher-parent communication. However, Dan and Simon (2021) found that the primary use of WhatsApp is to provide information or school experiences to parents.

The Internet and social media are becoming increasingly important as alternatives to traditional sources of guidance and support for parents. They are increasingly seeking health information for their children on the Internet (Bryan et al., 2020).

Social Media and Healthcare Applications

The public's growing adoption of social media, including messaging apps such as Telegram and WhatsApp, presents a productive ground for healthcare applications. According to previous research, a small percentage of them also followed their contacts' health experiences or updates, contributed health-related comments, collected health information, or joined a health-related group (Childs et al., 2012).

WhatsApp had a high level of acceptance among the participants as a medium for disseminating information because they regarded the technology as fascinating and intuitive. WhatsApp is widely considered a cost-effective two-way communication platform by various groups, including healthcare providers and the general public (Maitra, 2021). Even the World Health Organization (WHO) regards WhatsApp as a simple, effective worldwide communication tool because individuals may access information without filtering (Walwema, 2021).

Health literacy is a more significant predictor of a person's health than money, job status, education level, or racial or cultural group (Weiss, 2007). Although health promotion and WhatsApp reminders can increase self-efficacy (Dewi et al., 2019), users such as parents struggle to locate the "ideal" community, especially with so much health-related content broadcast via social media and so many virtual or online communities developed.

Health Professionals and the Use of Infographics

Professionals in the field of health promotion quickly recognized social media's ability to reach a large audience in social marketing efforts and their potential to enable and empower consumers in their interactions with health and health care. Because they provide a suitable platform for presenting information rationally using mechanisms such as storytelling, data visualizations, text, and appealing graphics, infographics have always been used as a tool in health promotion through this medium. Healthcare practitioners have also used it to disseminate public health messages. Using social media is an innovative and valuable mode of communication that has the potential to make medical information more accessible to the general public. Social media can assist audiences in understanding and making better decisions (Spiegelhalter & Short, 2011).

For summarizing medical information, the audience preferred infographics (Martin et al., 2019), especially in a digital setting, because they can boost engagement and facilitate information processing. An infographic can be used to clearly communicate vital messages, shift attitudes, and even challenge individuals to modify their habits or ways of thinking (Scott et al., 2016). Participants in the infographic condition demonstrated better confidence in their judgments than those in the control condition (Domgaard & Park, 2021).

Infographics have varying degrees of impact or efficacy. According to Scott et al. (2016), the most popular infographics have an average of 396 words and include a mix of data visualizations (bar graphs, line graphs, and pie charts) and images. To develop high-level public awareness about oral health and dental health services, supplementing social media content with reliable and high-quality online oral health-related information resources is necessary and crucial (Bahkali et al., 2016). Furthermore, the campaign includes a dissemination strategy, which states that if the material is shared and reshared frequently, such as on social media, the campaign will have a more significant impact and reach. The message's effectiveness is determined not just by the integrity of the information but also by how entertaining the information is presented. As a result, there is a need for collaboration between social media designers and health education specialists (Jahan et al., 2021).

Social Media: A Tool for Promotion

While social media has a lot of potential as a health promotion and education tool for changing people's habits, they must be used with caution. Social media may not always produce the desired outcomes, much like traditional health promotion media. According to Neiger et al. (2012), social media should not be considered a panacea for the difficulties of behavior change; therefore, health promotion organizations and practitioners must be able to match their program needs with realistic expectations for what social media can provide.

Widespread support for incorporating dental health into general health promotion creates a critical need to track oral health outcomes (Satur et al., 2010). Even though many dental offices use social media for marketing and communication, particularly among dentists younger than 45, many are confused about how to quantify the success of social media in their practice (Henry et al., 2012). Furthermore, despite having strong oral health information, the parents or caregivers did not reflect awareness of this information in their attitudes and procedures (Noorhazayti et al., 2018).

Several behavioral theories, such as the theory of reasoned action, social learning or social cognition theory, rational model, and health belief model, have found that information and attitudes influence behavioral changes. As a result, it is critical for adults, such as caregivers or parents, to possess the necessary information and demonstrate it in their attitudes and behaviors as role models for young children (Griffiths et al., 2004).

Individuals and groups are addressed using the rational model to encourage positive and prevent adverse health behavior choices. This is accomplished by providing unbiased information. The knowledge, attitudes, and practices paradigm is based on the notion that increasing one's understanding results in a behavior change. It assumes that the only thing preventing people from acting "responsibly" and logically is ignorance and that information alone may influence behavior

by "fixing" this ignorance. This model demonstrates that knowledge about attitudes and preventive actions can help improve the practice of public preventive behavior (Lee et al., 2021).

Almost 73% of Malaysian preschoolers have caries, with some having milk bottle caries, a more severe form of tooth decay. The proportion of parents who are concerned about their children's oral and dental health is decreasing (USM, 2018). Because parents play such an important role in their children's upbringing and development, mothers and their children need to interact closely. The role of the parent is critical in the child's comprehension and acceptance of attitudes, values, and behaviors. As a result, parental abilities were critical to success (Gray et al., 2015). Preventive oral health education programs, according to de Castilho et al. (2013), are essential for providing children with adequate oral health and a higher quality of life.

One way to support the implementation of health development is through community empowerment in the field of oral health, which can be accomplished by empowering health groups (Acharya et al., 2017). Consumers seeking health information online have increased dramatically over the last few decades. Mobile phones, particularly short message service (SMS) and the Internet (including social networking sites) provide health promoters with an exciting opportunity to personally engage with a large number of people at a low cost (Demirjian & David., 1995).

In Malaysia, there is scarce data available in this context in which parents' levels of care regarding the oral health of their children could be assessed and their perspective toward telehealth communication could be evaluated. Therefore, the study was conducted to observe the impact of WhatsApp as a health communication approach in promoting children's oral healthcare among parents.

METHOD

This paper used a health communication approach and was based on a cross-sectional survey that was conducted. The respondents were parents or caregivers from 11 preschools in Kampar, Perak. A social messaging application—namely, WhatsApp—was used as a medium of engagement and oral health education with parents. WhatsApp groups consisting of parents were created for each preschool specifically for this study. The study employed a purposive sampling technique, and parents or caregivers of preschool children were enrolled. A WHO sample size calculator was used to calculate the sample size. By referring to Makvandi et al (2015), the sample size used is 90; but in this study 123 samples were taken. Verbal health education intervention for the parents included the distribution of 20 infographics related to oral health—the infographics comprised 10 topics of messages. The messages were related to the following areas of children's oral health:

- Tooth structure and tooth eruption
- The importance of toothbrushing and fluoridated toothpaste
- Dental caries and the relation between caries and sugar
- Dental plaque and periodontal problems
- Fluoride varnish
- Fissure sealant
- Good oral health habits
- Habits that are detrimental to oral health
- Parents' role to maintain good oral health
- Sources for oral health-related information &and types of dental treatment

The infographics were sent fortnightly via a WhatsApp group for five months. All messages sent by WhatsApp were encrypted, and no participant's identifiable information was shared.

The authors developed a self-administered questionnaire based on previous studies (Arrow et al., 2013; Alhuwail & Abdulsalam, 2019), and the study population modified it. The authors also

carried out a pilot test for the questionnaire to check the questionnaire's reliability and make sure each question was clear and easily understood by the respondents. The result showed high reliability (α>0.7). The seven-part questionnaire consisted of part A, which solicited the respondents' profiles; parts B and Part C, both of which were related to the use of social media and social media for health promotion, respectively; part D, which contained questions about children's oral health; and parts E and F, both of which refer to the parents' levels of knowledge and oral care practices. The last part of the questionnaire focused on the advantages and disadvantages of WhatsApp as an oral health communication platform. The five-point Likert scale (1 = strongly disagree, 5 = strongly agree) was used for this part.

Teachers in each school or kindergarten received questionnaires, and they then distributed them to parents (or caretakers). The questionnaires were distributed to assess the parents' oral health knowledge and behaviors toward their children's oral health and their feedback on the use of WhatsApp as an oral health education and communication tool. The respondents returned the completed questionnaires to the teachers and collected them after three weeks. The institutional review board approved the study, and consent was taken from the participants.

The Statistical Package for Social Sciences (SPSS) was used for the data analysis. Frequency and percentages were calculated for categorical variables. The Shapiro-Wilk test for normality was performed, and the test determined that the data was normally distributed. Mean and standard deviation were computed for quantitative variables. A paired sample t-test was used to observe the difference before and after receiving the infographics. P-value <005 was considered to be statistically significant.

RESULTS

A total of 123 parents completed the questionnaire. The largest group of respondents was aged 30-39 (64.2%), followed by those aged 40-49 (28.5%), 20-29 (5.7%), and 50-59 (1.6%). Most were high school graduates (59.3%) and college/university (28.5%) graduates. Around 65% were working, and 74.7% had 2-4 children as shown in Table 1.

Table 1. Profile of respondents

No.	Criteria	Frequency	Percentage (%)
1.	Age		
	20–29	7	5.7
	30–39	79	64.2
	40–49	35	28.5
	50–59	2	1.6
2.	Level of Education		
	None	4	3.3
	Primary	11	8.9
	Secondary	73	59.3
	College/ University	35	28.5
3.	Occupation		
	Working	80	65
	Not working	43	35
4.	No. of children		
	1	16	13
	2	33	26.8
	3	34	27.6
	4	25	20.3
	5	9	7.3
	6	5	4.1
	7	1	0.8

Based on the survey, all respondents were reportedly familiar with social media. On average, 51.6% of respondents use social media for between 1 to 3 hours, followed by less than 1 hour (28.6%). The reported purposes of using social media were to get the latest news or general information (16.4%), read and send messages (27.9%), as well as seek educational details (13.2%).

Of the group of respondents, most of them read or saw posts or messages related to health education through Facebook (n = 85, 31.9%), WhatsApp (n = 68, 25.2%), and YouTube (n = 61, 22.6%). The messages were related to hygiene (n = 78, 22.9%), oral health (n = 73, 21.5%), nutrition (n = 72, 21.2%) and pregnancy care (n = 62, 18.2%). However, based on the survey, the respondents preferred to get health-related information through WhatsApp (44.1%) and Facebook (43.1%) compared with other platforms.

Besides social media, 94.3% have seen messages or advertisements related to children's oral health from various media such as television and via health practitioners. The respondents in this study received infographics in 10 types of messages. Out of the 10 topics or infographic messages received, respondents felt that the messages related to sources for oral health-related information and types of dental treatment (n = 72, 11.3%), the importance of toothbrushing and fluoridated toothpaste (n = 71, 11%), and the introduction to fissure sealant and the introduction to fluoride varnish (n = 67, 10.5%, respectively) gave them new knowledge regarding children oral healthcare.

To gauge the respondents' levels of understanding of children's oral healthcare, 14 questions were given to the respondents. As shown in Figure 1, the majority of the participants had good knowledge of children's oral care (n = 118, 95.9%), and none of the participants had a low level of knowledge.

Figure 1. Level of knowledge among respondents regarding children's oral health

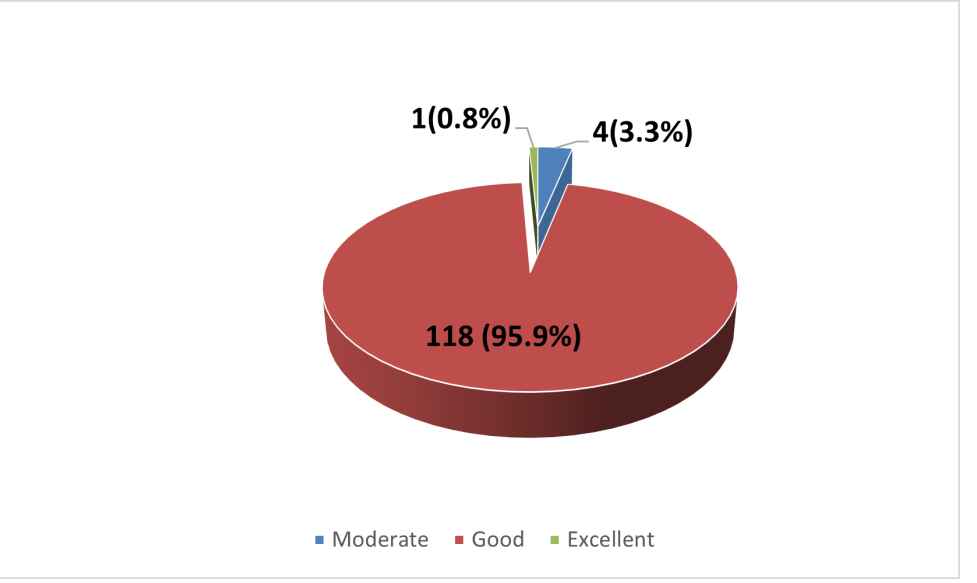

Table 2 shows the difference between the oral and dental care levels of children before and after their parents received the infographics. There was a significant difference before and after the infographics were sent to the respondents, and it was statistically significant (P-value <0.001).

Table 2. Level of oral and dental care of children before and after parents' receipt of infographics

	Mean	N	Std. deviation	Std. error mean	95% confidence interval	Sig.
Paired sample t-test (before and after infographic	0.836	123	0.205	0.0129	.047 to 0.120	<0.001

The perception of WhatsApp as a platform for health communication was observed, and the respondents' views are listed in Table 3. Note that respondents agreed that participation in this program had a positive effect on them.

Table 3. Impact of oral health promotion via WhatsApp on children's oral healthcare from parents' perspective

Item	Scale				
	1	2	3	4	5
Increased knowledge	1.6% (2)	1.6% (2)	3.3% (4)	60.2% (74)	33.3% (41)
Healthier lifestyle practices	1.6% 2	1.6% 2	2.4% 3	65.9% 81	28.5% 35
Involvement as a parent in a child's oral care is increasing	1.6% (2)	2.4% (3)	2.4% (4)	69.1% (85)	24.4% (30)
Changing attitudes towards oral care of children	1.6% (2)	4.1% (5)	8.9% (11)	72.4% (89)	13% (16)

The respondents' views on the advantages and disadvantages of WhatsApp are listed in Table 4. The majority agreed that the main weaknesses of this medium were "difficult to communicate with experts" ($n = 57$, 46.3%) and "time constraints" ($n = 50$, 40.7%).

Table 4. Advantages and disadvantages of WhatsApp as a platform for health promotion from parents' perspective

Item	Scale				
	1	2	3	4	5
Advantages					
Free	1.6% (2)	2.4% (3)	4.9% (6)	66.7% (82)	24.4% (30)
Suitable for all ages	1.6% (2)	2.4% (3)	5.7% (7)	65.0% (80)	25.2% (31)
Easy access	2.4% (3)	1.6% (2)	5.7% (7)	65.0% (80)	25.2% (31)
Professional interaction	1.6% (2)	1.6% (2)	13.8% (17)	61.8% (76)	21.1% (26)

Table 4 continued on next page

Table 4 continued

Item	Scale				
	1	2	3	4	5
Get enough information	1.6% (2)	4.1% (5)	12.2% (15)	57.7% (71)	24.4% (30)
Disadvantages					
Difficult to communicate with experts	1.6% (2)	26.0% (32)	22.8% (28)	46.3% (57)	3.3% (4)
Time constraints	4.9% (6)	35.8% (44)	16.3% (20)	40.7% (50)	2.4% (3)
Lack of trust	4.9% (6)	35.0% (43)	22.8% (28)	35.0% (43)	2.4% (3)
Lack of information	4.1% (5)	42.3% (52)	21.1% (26)	30.1% (37)	2.4% (3)
The image is less clear	4.1% (5)	44.7% (55)	20.3% (25)	27.6% (34)	3.3% (4)

DISCUSSION

Based on the survey, most parents or caretakers were familiar and comfortable with WhatsApp as a communication application to use in their daily lives. This finding is not surprising, given that 98.1% of Malaysia's 28.98 million smartphone users prefer to use this app over others such as Facebook Messenger, WeChat, or Telegram (Statista, 2020). Users rely on this Internet-based media for information and social interaction, as evidenced by the average 1–6 hours spent on it per day. As a result, the fact that parents who participated in this survey reported receiving or reading messages related to health education or information via various social media platforms was not a surprise.

WhatsApp is the most popular messaging app in 128 countries around the world, compared with 72 for Facebook Messenger, and it was chosen as the best vehicle and communication channel to target the intervention's content because it was also the primary tool declared by the target audience in the research (Balkac & Ergun, 2018; Fabene et al., 2020). Besides text and voice communications, WhatsApp, like many other messaging apps or messengers, allows users to transmit and exchange documents and a range of other multimedia (such as photos, video, audio clips, and music) via chat. This feature makes WhatsApp helpful for teleconsulting and empowers health education by allowing knowledge to be disseminated more quickly and easily.

Furthermore, creating groups allows the creation of protected groups for cooperative teleconsulting (Giansanti, 2020). A previous study showed that mobile devices' perceived usefulness moderates the direct effect of health literacy on attitudes about prescribed self-care significantly and positively (Rabiah et al., 2020).

As a result, this application, as well as other social media platforms, enabled physicians and other health professionals, such as dentists, to connect with the public and contribute to the advancement of telemedicine as an adjunctive health care tool and the application of health communication theory. In general, an increasing number of health professionals are using it as a communication interface and for image and video exchange (Giordano et al., 2017). Although the survey showed the disadvantages of this media at a moderate level, public health communicators may provide more consideration to make sure this media can be fully utilized. This media should not just be used for mass information dissemination; it should also include social media engagement and embrace the social nature of social media (Heldman et al., 2013).

This is a significant improvement in healthcare as a result of smartphones, tablets, and mobile apps, particularly social apps that allow busy health professionals to learn and collaborate while also providing peer-to-peer support and health education to the general public. The effective use of smartphones in the 21st century is an integral part of the interaction between health professionals and the general public. In this study, the interaction occurs when the dentist distributes infographics about children's oral health to the parents. The findings of this study revealed a discernible impact on children's oral health literacy among parents or respondents as a result of this interaction. There are changes in the level of knowledge and level of children's oral care among the parents involved. For instance, after receiving the infographic, 39% of respondents (form only 0.8%) are categorized as excellent, whereas 72 respondents (58.5%) are at a good level in terms of their children's oral care level. This supports the study by Wang et al. (2019) that stated that a practical and actionable strategy for health promotion could be made by building online communities or groups on social media.

Most of them agreed that the infographic messages that they received through WhatsApp increased their knowledge and led to healthier lifestyle practices to maintain their children's oral health. This finding showed that human behavior changes in three steps, as mentioned in the rational model: acquiring knowledge, generating attitudes/ beliefs, and forming practice/ behavior (Xie et al., 2017). Among the infographics received, most respondents said some topics gave them new information or knowledge, such as sources for oral health-related information and types of dental treatment, the importance of tooth brushing and fluoridated toothpaste, introduction to fissure sealant, and introduction to fluoride varnish. Although a study by Lyra et al. (2016) did not find any difference, in learning, between using graphics and text or infographics only, the theories of communication promote the use of infographics to help improve comprehension and help speed up the digestion of information through the flood of information online users receive daily, leading to more positive responses to visual content as opposed to text-based content. Therefore, infographics should have fewer texts and more images to be effective.

Although the parents or caretakers stated that they have seen or received information related to children's oral health through various media, including traditional media such as newspapers, magazines, and advertisements, the findings show that WhatsApp facilitates communication, enhances learning, influences awareness of public health behavioral changes, and improves patients' care—or in this case, children's oral healthcare as reported by Nardo et al. (2016) and Al-Dmour et al. (2020).

WhatsApp is free and easy to use. Members of the public can subscribe to receive WhatsApp alerts that are relevant to their needs. Lay users can also benefit from hosting relevant virtual peer-to-peer support groups on WhatsApp. The public health profession feels that this new medium could promote and influence various health-related behaviors and issues, particularly among parents, who increasingly use it to get health information for their children. The ubiquity, usability, and versatility of mobile devices and social media networks have made this combination an excellent tool for preparing, implementing, and reviewing health interventions, including children's oral health.

CONCLUSION

WhatsApp's use as a social media platform for oral health education increases parents' knowledge and habits regarding their children's dental health. WhatsApp was deemed favorable by the majority of responders. However, other respondents mentioned that WhatsApp has drawbacks, such as difficulty interacting with specialists and time limits. To improve the use of the WhatsApp method in oral health promotion, this constraint should be addressed in the future. Knowing how individuals are using social media could help health communication efforts become more effective and equitable.

COMPETING INTERESTS

The author declares no competing interest.

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REFERENCES

Ab Halim, N., Yusof, R. M., & Abdullah, S. N. (2018). The correlation between oral health knowledge & attitude towards practice of caretakers in day-care centres. *IIUM Medical Journal Malaysia, 17*(2).

Acharya, B., Maru, D., Schwarz, R., Citrin, D., Tenpa, J., Hirachan, S., Basnet, M., Thapa, P., Swar, S., Halliday, S., Kohrt, B., Luitel, N. P., Hung, E., Gauchan, B., Pokharel, R., & Ekstrand, M. (2017). Partnerships in mental healthcare service delivery in low-resource settings: Developing an innovative network in rural Nepal. *Globalization and Health*, *13*(1), 1–7. doi:10.1186/s12992-016-0226-0 PMID:28086925

Al-Dmour, H., Salman, A., Abuhashesh, M., & Al-Dmour, R. (2020). Influence of social media platforms on public health protection against the COVID-19 pandemic via the mediating effects of public health awareness and behavioral changes: Integrated model. *Journal of Medical Internet Research*, *22*(8), e19996. doi:10.2196/19996 PMID:32750004

Aviva, D., & Simon, E. (2021). WhatsApp: Communication between parents and kindergarten teachers in the digital era. *European Scientific Journal*, *17*(12), 1–14. doi:10.19044/esj.2021.v17n12p1

Bahkali, S., Almaiman, R., El-Awad, M., Almohanna, H., Al-Surimi, K., & Househ, M. (2016). Exploring the impact of information seeking behaviors of online health consumers in the Arab world. In Unifying the Applications and Foundations of Biomedical and Health Informatics, (pp. 279–282). IOS Press eBooks.

Balkac, M., & Ergun, E. (2018). Role of infographics in healthcare. *Chinese Medical Journal*, *131*(20), 2514–2517. doi:10.4103/0366-6999.243569 PMID:30334544

Bryan, M. A., Evans, Y., Morishita, C., Midamba, N., & Moreno, M. (2020). Parental perceptions of the internet and social media as a source of pediatric health information. *Academic Pediatrics*, *20*(1), 31–38. doi:10.1016/j.acap.2019.09.009 PMID:31648059

Castensøe-Seidenfaden, P., Husted, G. R., Jensen, A. K., Hommel, E., Olsen, B., Pedersen-Bjergaard, U., Kensing, F., & Teilmann, G. (2018). Testing a smartphone app (young with diabetes) to improve self-management of diabetes over 12 months: Randomized controlled trial. *JMIR mHealth and uHealth*, *6*(6), e141. doi:10.2196/mhealth.9487 PMID:29945861

Castilho, A. R. F. D., Mialhe, F. L., Barbosa, T. D. S., & Puppin-Rontani, R. M. (2013). Influence of family environment on children's oral health: A systematic review. *Jornal de Pediatria*, *89*(2), 116–123. doi:10.1016/j.jped.2013.03.014 PMID:23642420

Childs-Kean, L. M., & Martin, C. Y. (2012). Social media profiles: Striking the right balance. *American Journal of Health-System Pharmacy*, *69*(23), 2044–2050. doi:10.2146/ajhp120115 PMID:23172261

Cumiskey, K. M., & Hjorth, L. (2018). "I wish they could have answered their phones": Mobile communication in mass shootings. *Death Studies*, *43*(7), 414–425. doi:10.1080/07481187.2018.1541940 PMID:30596358

Demirjian, A., & David, B. (1995). Learning medical and dental sciences through interactive multi-media. *Medinfo*, *8*(Pt 2), 1705. PMID:8591560

Dewi, D. T. K., Kusumawati, W., & Ismarwati, I. (2019). Effect of health promotion and WhatsApp reminder to self-efficacy of the consumption of Fe tablets adherence among pregnant women. *Journal of Health Technology Assessment in Midwifery*, *2*(1), 23–32. doi:10.31101/jhtam.683

Domgaard, S., & Park, M. (2021). Combating misinformation: The effects of infographics in verifying false vaccine news. *Health Education Journal*, *80*(8), 974–986. doi:10.1177/00178969211038750

Drouin, M., Reining, L., Flanagan, M., Carpenter, M., & Toscos, T. (2018). College students in distress: Can social media be a source of social support? *College Student Journal*, *52*(4), 494–504.

Fabene, M. R., Voltareli, L. C., de Andrade, G. R., Lucena, T. F. R., & Yamaguchi, M. U. (2020). Ação de Comunicação em Saúde no WhatsApp com base no Perfil Digital de Portadores de Hipertensão e Diabetes. *O. Mundo da Saude*, *44*(01), 12–22. doi:10.15343/0104-7809.201944012022

GBD. (2017). Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: A systematic analysis for the Global Burden of Diseases Study 2017. *Lancet*, *392*(10159), 1789–1858. doi:10.1016/S0140-6736(18)32279-7

Giansanti, D. (2020). WhatsApp in mHealth: An overview on the potentialities and the opportunities in medical imaging. *mHealth*, *6*(19), 19. doi:10.21037/mhealth.2019.11.01 PMID:32270011

Giordano, V., Koch, H., Godoy-Santos, A., Belangero, W. D., Pires, R. E. S., & Labronici, P. (2017). WhatsApp messenger as an adjunctive tool for telemedicine: An overview. *Interactive Journal of Medical Research*, *6*(2), e6214. doi:10.2196/ijmr.6214 PMID:28733273

Gray-Burrows, K. A., Day, P. F., Marshman, Z., Aliakbari, E., Prady, S. L., & McEachan, R. R. C. (2015). Using intervention mapping to develop a home-based parental-supervised toothbrushing intervention for young children. *Implementation Science; IS*, *11*(1), 1–14. doi:10.1186/s13012-016-0416-4 PMID:27153832

Griffiths, K. M., Christensen, H., Jorm, A. F., Evans, K., & Groves, C. (2004). Effect of web-based depression literacy and cognitive–behavioural therapy interventions on stigmatising attitudes to depression: Randomised controlled trial. *The British Journal of Psychiatry*, *185*(4), 342–349. doi:10.1192/bjp.185.4.342 PMID:15458995

Heldman, A. B., Schindelar, J., & Weaver, J. B. III. (2013). Social media engagement and public health communication: Implications for public health organizations being truly "social". *Public Health Reviews*, *35*(1), 1–18. doi:10.1007/BF03391698

Henry, R. K., Molnar, A., & Henry, J. C. (2012). A survey of US dental practices' use of social media. *The Journal of Contemporary Dental Practice*, *13*(2), 137–141. doi:10.5005/jp-journals-10024-1109 PMID:22665737

Jahan, S., Al-Saigul, A. M., & Alharbi, A. M. (2021). Assessment of health education infographics in Saudi Arabia. *Health Education Journal*, *80*(1), 3–15. doi:10.1177/0017896920949600

Lee, M., Kang, B. A., & You, M. (2021). Knowledge, attitudes, and practices (KAP) toward COVID-19: A cross-sectional study in South Korea. *BMC Public Health*, *21*(1), 1–10. doi:10.1186/s12889-021-10285-y PMID:33546644

Lyra, K. T., Isotani, S., Reis, R. C., Marques, L. B., Pedro, L. Z., Jaques, P. A., & Bitencourt, I. I. (2016,). Infographics or graphics+ text: Which material is best for robust learning? *2016 IEEE 16th International Conference on Advanced Learning Technologies (ICALT),* pp. 366–370. IEEE Xplore.

Maitra, C. (2021). *WhatsApp in health communication: The case of eye health in deprived settings in India* [Doctoral dissertation]. Manchester Metropolitan University, England.

Makvandi, Z., Karimi-Shahanjarini, A., Faradmal, J., & Bashirian, S. (2015). Evaluation of an oral health intervention among mothers of young children: A clustered randomized trial. *Journal of Research in Health Sciences*, *15*(2), 88–93. PMID:26175290

Martin, L. J., Turnquist, A., Groot, B., Huang, S. Y., Kok, E., Thoma, B., & van Merriënboer, J. J. (2019). Exploring the role of infographics for summarizing medical literature. *Health Profession Education*, *5*(1), 48–57. doi:10.1016/j.hpe.2018.03.005

Mayangsari, I. D., & Aprianti, A. (2017). Understanding communication among parents and teachers in WhatsApp. Case study in Bandung, Indonesia. [MJSSH]. *Malaysian Journal of Social Sciences and Humanities*, *2*(2), 18–23.

Nardo, B., Cannistrà, M., Diaco, V., Naso, A., Novello, M., Zullo, A., Ruggiero, M., Grande, R., & Sacco, R. (2016). Optimizing patient surgical management using WhatsApp application in the Italian healthcare system. *Telemedicine Journal and e-Health*, *22*(9), 718–725. doi:10.1089/tmj.2015.0219 PMID:27027211

Neiger, B. L., Thackeray, R., Van Wagenen, S. A., Hanson, C. L., West, J. H., Barnes, M. D., & Fagen, M. C. (2012). Use of social media in health promotion: Purposes, key performance indicators, and evaluation metrics. *Health Promotion Practice*, *13*(2), 159–164. doi:10.1177/1524839911433467 PMID:22382491

Satur, J. G., Gussy, M. G., Morgan, M. V., Calache, H., & Wright, C. (2010). Review of the evidence for oral health promotion effectiveness. *Health Education Journal*, *69*(3), 257–266. doi:10.1177/0017896909349240

Scott, H., Fawkner, S., Oliver, C., & Murray, A. (2016). Why healthcare professionals should know a little about infographics. *British Journal of Sports Medicine*, *50*(18), 1104–1105. doi:10.1136/bjsports-2016-096133 PMID:27317791

Seman, R. A. A., Syed, M. A. M., Aziz, A. A., Zuhdi, A. S. M., & Zamin, R. M. (2020). Fixing the communication gap through MHealth: The effects of attitude, perceived usefulness, and risks of MHealth on prescribed self-care among coronary heart disease patients in Malaysia. *SEARCH Journal of Media and Communication Research*, *12*, 37–69.

Spiegelhalter, D., Pearson, M., & Short, I. (2011). Visualizing uncertainty about the future. *Science*, *333*(6048), 1393–1400. doi:10.1126/science.1191181 PMID:21903802

Statista. (2020). [Bar chart]. Share of internet users using communication applications in Malaysia as of August 2018, by app. *Statista*. https://www.statista.com/statistics/973428/malaysia-internet-users-using-communication-apps/

USM. (2018). Penjagaan gigi kanak-kanak: Ibu bapa perlu main peranan [Children's oral care: Parents need to play role]. *Kampus Kesihatan*. http://www.quality.kck.usm.my/index.php/arkib-berita/868-penjagaan-gigi-kanak-kanak-ibu-bapa-perlu-main-peranan

Walwema, J. (2021). The WHO health alert: Communicating a global pandemic with WhatsApp. *Journal of Business and Technical Communication*, *35*(1), 35–40. doi:10.1177/1050651920958507

Wang, H., Xu, W., Saxton, G. D., & Singhal, A. (2019). Social media fandom for health promotion? Insights from East Los High, a transmedia edutainment initiative.

Weiss, B. D. (2007). *Health literacy and patient safety: Help patients understand. Manual for clinicians*. American Medical Association Foundation.

Xie, Z. F., Wei, Q. F., & Zheng, X. L. (2017). Development of health education evaluation system for patients with colostomy based on KAP model. *Chinese Journal of Health Education*, *33*, 544–547.

Zade, H., Shah, K., Rangarajan, V., Kshirsagar, P., Imran, M., & Starbird, K. (2018). From situational awareness to actionability: Towards improving the utility of social media data for crisis response. In *Proceedings of the ACM on Human-Computer Interaction, 2*(CSCW), 1–18, doi:10.1145/3274464