Healthcare Providers’ Perspectives Toward the Integration of over the Counter Supplements During COVID-19 Pandemic: A Cross-Sectional Study from Jordan

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Abstract
Objective: During COVID-19 pandemic, healthcare providers (HCPs) have been inundated with consultations related to over the counter (OTC) dietary supplements’ protective role. Thus, the present study focused on assessing HCPs’ perceptions toward OTC products integration during the COVID-19 outbreak. Methods: Pertinent data was collected using validated online survey comprising four sections: demographics, OTC supplementation perceptions, awareness related to safety of OTC supplements, confidence in recommending dosage and counseling to patients regarding OTC supplements’ safety, and some health-related behaviors. Quantified perception score represented by corrected confidence-concern ratio was used in assessing perceptions, and associations between demographics with perception and awareness were explored. Results: A total of 600 responses were included in the final analysis. Vitamin C, zinc, and vitamin D were the most popularly recommended OTC supplements. Most respondents indicated positive perceptions toward dietary supplementation while around 60% of respondents reported reluctance about the protective role of COVID-19 vaccination. Bachelor’s degree holders (AOR = 4.39, 95% CI = 2.25–10.33), pharmacists (AOR = 2.17, 95% CI = 1.5–9.5), and junior HCPs (<1 year experience) had improved perceptions compared to college graduates, physicians, and senior practitioners (AOR = .17, 95% CI = .04–.78 and AOR = .15, 95% CI = .02–.93), respectively. Conclusion: Suboptimal knowledge among HCPs toward the safety and hazards associated with integration of different OTC supplements during the COVID-19 pandemic dictates further education to ensure the safe integration of OTC supplements.

Keywords
perceptions, COVID-19 pandemic, Jordan, dietary supplementation, healthcare providers, over the counter drugs, vitamin C, zinc, vitamin D

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Introduction

Coronavirus disease-19 (COVID-19) is a global health crisis challenging healthcare systems worldwide.1 COVID-19 is caused by a novel human coronavirus, severe acute respiratory syndrome coronavirus (SARS-COV-2).2 The hallmark in severe COVID-19 is the aggravated flow of inflammatory mediators along with respiratory failure.3 Risk factors for such potentially life-threatening manifestations include advanced age and the coexistence of chronic diseases.3

Around the COVID-19 pandemic declaration’s anniversary, unprecedented variants were detected in different countries (CDC).4 Given the lack of definitive treatment and alarmingly high recorded death rate, people still explore shielding therapies besides standard preventative measures, such as social distancing and hand hygiene.5,6 Self-medication with several over the counter (OTC) products claimed to improve immune function has spread.7 The rationale of using such preventive supplements lies in their immune fortifying properties.7 Ease of access and assumed efficacy are major causes of increased popularity. Vitamin C, vitamin D, and zinc were among the most OTC advertised products as immunity-boosting aids.8-12 However, there is a lack of consolidated scientific evidence to refute or accept such assumed roles in the COVID-19 pandemic.13

People always turn to healthcare providers (HCPs) as trustworthy consultants to solve their general health uncertainties. HCPs from different disciplines are frontliners in battling the COVID-19 pandemic.14-16 In a recently published guide, WHO highlighted the importance of building competence by the health workforce in response to the COVID-19 pandemic.17 Although the deployment of several vaccines later in 2020 flowered some hope to curb the spread of the pandemic, vaccination hesitancy poses a counteracting health threat.18-20 It is expected that OTC supplementation’s popularity continues to peak until sufficient trust is built to convince reluctant people to get the vaccine to tackle the COVID-19 pandemic.

As such and responding to the increased demands and inquiries related to such products, it is crucial to assess HCP perceptions toward popular OTC products. Thus, the present study aimed to evaluate HCP perceptions toward popular OTC dietary supplements and the level of familiarity with safety concerns related to the increased consumption of such products.

Methods

A cross-sectional study was conducted over six months (October 2020 to March 2021). An online questionnaire was posted through different social media portals, including Facebook and WhatsApp, to recruit a convenient sample of HCPs in Jordan. At first, consent information was provided to potential respondents; per their agreement, they were directed to research instrument on Google forms.

In regards to sample size calculation, the estimated population size in Jordan is 10 million, and the facts reported by Nazer et al.21 about workforce in Jordan indicated that it consists mainly of physicians, pharmacists, dentists, and nurses with nurses representing (44%), followed by physicians (25%), pharmacists (16%), and dentists (15%). Accordingly, the estimated total number of healthcare force in Jordan is around 101,600 (including physicians, dentists, pharmacists, and nurses). Based on the Raosoft online calculator, it was anticipated that a sample of 383 respondents would enable us to achieve the study objectives.22

Our research instrument consisted of four main sections:

1. Demographic characteristics and general attitudes toward popular OTC products (e.g., age, gender, marital status, place of residence, educational level, profession, practice sector, income, and self or relative status of infection with COVID-19).

2. HCP levels of agreement with the use of popular OTC supplements, which comprised 18 items (9 items focused on vitamins and minerals, eight items on herbal and natural products, and the last item asking about the overall agreement in general) were assessed using a five-point Likert-type scale of agreement.

3. Respondents concerns about the safety of OTC products in users which comprised eight items with a three-point Likert-type scale.

4. Respondents’ confidence about recommending dose regimens and educating patients about side effects of these products, comprising 16 items with a five-point Likert-type scale.

Finally, few items on their
main sources of information and their beliefs about other health-related behaviors (e.g., vaccination, smoking cessation, stress management, and sleeping and eating well) were included.

The survey instrument was constructed after a thorough review of the literature. Close-ended structured items were developed and modified (in English) by researchers. Several academic experts from healthcare professions assessed the research tool to ensure its content and face validity. Obtained feedbacks and comments were reviewed and applied to refine the questionnaire accordingly. The Institutional Review Board approved the protocol of this study at Jordan University of Science and Technology (no. 20210025).

In order to quantify the perception of HCPs toward OTC supplementary use, the confidence to concerns ratio (CCR) was calculated. Since the confidence scale contained 16 items while the concerns scale contained eight items, the confidence to concern ratio was adjusted. A correction factor, $K$, was computed by dividing the number of concern items (8) over the number of confidence items (16). Hence, the confidence to concerns ratio was calculated using the equation below

$$CCR = K \frac{Total\ confidence\ score}{Total\ concern\ score}$$

CCR can be interpreted with respondents scoring 1.0 and higher to have positive perceptions of OTC supplements’ benefits. On the other hand, respondents scoring less than 1.0 generally perceive these products with more concerns than benefits.

Following data collection, data was extracted into Excel and then imported for coding, cleaning, and analyses into the Statistical Package for Social Sciences (SPSS) version 25 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to summarize data for the total sample using numbers and percentages and means ($\pm$SD) as appropriate. Further, the reliability of scales was assessed and reported using Cronbach alpha as applicable.

Total scores were calculated, and comparisons of perceptions between different groups were conducted by non-parametric tests (Wilcoxon–Mann–Whitney and Kruskal Wallis tests). Associations between categorical variables were assessed using the chi-square test, while the Spearman correlation test was used to test the association between continuous variables. The multivariate logistic regression model was performed to assess the impact of different factors on obtained perception scores. A 5% level of significance was considered statistically significant.

**Results**

A total of 600 responses were obtained and included for statistical analysis. Collected responses constituted professionals with major of medicine (26.2%), pharmacy (35.2%), nursing (23.8%), dentistry (8.7%), and others (6.2%) (e.g., applied healthcare sciences and nutrition) with 1–4 years of experience (32.7%). The highest proportion of respondents lied in the age group of 26–35 years (56.5%), and more than half of the respondents were females (60.3%). Only 28.3% of them indicated being infected with COVID-19, and 35.8% of them used dietary supplements to boost their self-immunity against COVID-19. On the other hand, almost two-thirds of them recommended using dietary supplements for their relatives as 89.5% of them reported having infected relatives with COVID-19. Notably, 35.5% of respondents indicated always to have high inquiries about the use of dietary supplements within the past six months, where more than one-third of them always recommended the use of such products. Detailed demographic characteristics and general attitudes toward dietary supplements are presented in Table 1.

As showed in Table 2, Vitamin C, zinc, and vitamin D were mostly recommended as dietary supplements in the past 6 months, followed by garlic, ginger, and onions, with more than 40% of them recommending the use of these supplements on a daily basis (Figure 1). Nearly half of participating healthcare providers reported recommendations of healthcare practitioners, price, and patients’ medical history as factors that most influenced their recommended choice. Interestingly, medical guidelines, healthcare experts, and scientific research were reported as the main sources of information about dietary supplement use during COVID-19 that 65.8%, 52.7%, and 40% of study respondents, respectively, relied on within their practice. Regarding dietary supplement use-related side effects that need special considerations, nearly 62% of study respondents reported kidney stones and gastrointestinal adverse effects. On the other hand, 11.3% of them considered these supplements as free from any side effects.

Worth mentioning, the majority of respondents emphasized the protective role of health-related behaviors such as a healthy diet (93.7%), getting enough rest/sleep at night (93%), stress management (92.3%), and smoking cessation (84.7%) against COVID-19. However, 59% of them were against the role of vaccination against COVID-19, 24.2% were not sure about it, and only 16.8% of them supported its protective role.

In assessing agreement with the use of different dietary supplements during the outbreak, presented in a supplementary table, Cronbach’s alpha indicated excellent internal consistency (0.95). However, from the last item, “Recommending vitamins and herbal supplements would treat/reduce the incidence of COVID-19,” less than half of respondents generally agreed with recommending vitamins and minerals and natural products for treating or reducing the chance of developing COVID-19. Regarding vitamins and minerals supplement use, a mean score of 27.4 was reported, indicating that respondents were either neutral or generally showing agreement with the role of vitamins and minerals (Table 3).
Similarly, a mean score of 22.8 was reported for the agreement with the role of natural supplements. In assessing healthcare professionals’ concerns about the overall use of dietary supplements during the COVID-19 outbreak, Cronbach’s alpha indicated good internal consistency (.83). In addition, a high average score of 18.1 was indicated as related to the scoring range of 8-24 (Table 3). Regardless, while assessing their confidence in recommending different dietary supplements during the outbreak, Cronbach’s alpha indicated excellent internal consistency (.96). Furthermore, a mean score of 58.4 was relatively high when referring to the scale-midpoint of 40. Last, according to quantified perception score represented by corrected confidence-concern ratio, most of study respondents indicated positive perceptions toward the benefits of dietary supplements. On the other hand, only 7% of them perceived these supplements with more concerns than benefits.

Regarding factors influencing positive perceptions toward dietary supplement use during COVID-19, as represented in Table 4, multivariate logistic regression analysis showed that bachelor’s degree holders, professional pharmacists, and those with higher agreement scores on the use of natural supplements tend to have more positive perceptions toward dietary supplements use. In contrast, those with longer professional experience tend to have negative perceptions of dietary supplements use compared to junior healthcare professionals.

**Discussion**

COVID-19 is a pandemic disease with a considerable threat to public health. Despite the availability of vaccines, the

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**Table 1.** Demographic Characteristics and General Attitudes Toward Dietary Supplements Among Study Respondents (N = 600). (continued)

| Characteristic                                      | N (%) |
|----------------------------------------------------|-------|
| In the past 6 months, frequency of receiving questions and requests about OTC supplementary use for preventing or treating COVID-19 |
| Always                                             | 213 (35.5) |
| Often                                              | 157 (26.2) |
| Sometimes                                          | 154 (25.7) |
| Rarely                                             | 50 (8.3)   |
| Never                                              | 26 (4.3)   |

OTC = over the counter.

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COVID-19 is a pandemic disease with a considerable threat to public health. Despite the availability of vaccines, the
COVID-19 situation is still complex considering the significance of public awareness and adherence to the preventive and treatment measures. Noteworthy, healthcare providers can play major role in reducing infection rates and controlling the transmission of COVID-19. One study from Jordan reported that the majority of pharmacists believed that they have sufficient education and a significant role to play during the COVID-19 pandemic disease. Another Jordanian study reported that the public positively endorsed the significant educational role and services the pharmacist can provide during the COVID-19 pandemic. However, this study focused on evaluating the HCP’s perceptions about the OTC dietary supplements and the level of familiarity with safety concerns related to the increased consumption of such products.

In this study, two-thirds of respondents recommended using OTC dietary supplements for their relatives, among which the vast majority were infected with COVID-19. Also, about one-third of the respondents used OTC dietary supplements to boost self-immunity against COVID-19. This was consistent with the results of other studies. Another recent study that evaluated the use of dietary supplements and herbal medicines by dieticians reported that almost all (i.e., 94.5%) of dieticians used dietary supplements to avoid COVID-19; however, the result is expected as it includes only dieticians. However, and up to the author’s knowledge, this is the first Jordanian study that focused on the perceptions of HCP about the potential safe and effective use of OTC dietary supplements to boost self-immunity against COVID-19.

The dietary supplements mostly recommended in this study by HCP were vitamin C, zinc, and vitamin D, followed by garlic, ginger, and onions. Around half of the HCP recommended the use of dietary supplements daily. The HCP were using guidelines, healthcare experts, and scientific research were reported as the primary sources of information about dietary supplement use during COVID-19, with price and patients’ medical history being the major factors that influenced their choices. It is mandatory to highlight that the use of OTC dietary supplements to mitigate COVID-19 infection has not been supported by well-established scientific evidence to sufficiently recommend effective agents, dosage, and duration.

To clarify this more, a potential immunomodulatory effect of zinc and vitamin C in reducing infection signs and symptoms and length of hospital stay has been proposed in many studies. Particularly with COVID-19 patients, findings from a case series of four patients reported

| Table 2. Recommended Use of Dietary Supplements During the Past 6 Months. |
|---------------------------------------------------------------|
| Recommended Dietary Supplements | n (%) |
| Vitamin C | 532 (88.7) |
| Vitamin D | 411 (68.5) |
| Vitamin B-complex | 138 (23) |
| Zinc | 482 (80.3) |
| Echinacea | 43 (7.2) |
| Hedera helix | 19 (3.2) |
| Costus | 67 (11.2) |
| Royal jelly | 35 (5.8) |
| Onion | 187 (31.2) |
| Garlic | 202 (33.7) |
| Ginger | 189 (31.5) |
| Ginseng | 51 (8.5) |
| Turmeric | 58 (9.7) |
| Vinegar | 49 (8.2) |
| Sesame oil | 28 (4.7) |
| Others (liquorice, clove, etc) | 36 (6.0) |
| None (I am against OTC supplements) | 26 (4.3) |

| Table 2. (continued) |
|-----------------------------------------------|
| Recommended Dietary Supplements | n (%) |
| Mood changes | 125 (20.8) |
| Bleeding tendency | 140 (23.3) |
| Cancer | 73 (12.2) |
| None | 68 (11.3) |

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that high doses of zinc were linked with improved oxygenation and recovery of shortness of breath after one day of treatment. However, more robust evidence from a prospective study of 242 patients failed to report a considerable correlation between zinc supplementation and reduced COVID-19 associated mortality.

Regarding Vitamin C, a case series study of 17 patients showed a reduction of anti-inflammatory markers such as ferritin and d-dimers after using 1 g of I.V vitamin C. However, this effect was not determined to be a result of vitamin C alone as patients were receiving other medications. In addition, findings from a recent randomized clinical trial of 214 patients infected with COVID-19 showed that treatment with high-dose zinc, ascorbic acid, in solo or combined, did not significantly decrease the duration of symptoms compared to standard of care. Although vitamin C and zinc are safe and available at a low cost, the clinical evidence about the effect of vitamin C and zinc in COVID-19 patients has not been yet established and requires further research.

Figure 1. Percentage of recommended over the counter supplements.

Table 3. Reported Scores of All Measurement Scales.

| Score                                      | Mean (SD) | Score Range |
|--------------------------------------------|-----------|-------------|
| Overall agreement with dietary supplement use | 53.4 (14.2) | 18-90      |
| Agreement with vitamins and minerals supplement use | 27.4 (7.6) | 9-45       |
| Agreement with herbal and natural supplement use | 22.8 (6.6) | 8-40       |
| Confidence score                           | 58.4 (13.2) | 16-80      |
| Concern score                              | 18.1 (4.1) | 8-24       |
| Confidence/Concern ratio                   | 1.7 (.6)   | .4-.5      |
| Quantified perception score (cCCR value)   |            |            |
| cCCR <1                                    | n (%)     |            |
| cCCR ≥ 1                                   | 42 (7.0%) |            |
| cCCR >1                                    | 11 (1.8%) |            |
| cCCR >1                                    | 547 (91.2%) |        |
In the present study, more than half of the respondents expressed opposing views on the protective role of COVID-19 vaccination. This finding contradicts the results reported by several other studies where healthcare professionals were primarily envisioned to resolve vaccine hesitancy among the general population. Pharmacists, for example, are easily accessible to the community. Thus, Ciliberti et al. study highlighted the potential implementation of the healthcare professional’s role of community pharmacists in building scientifically grounded trust toward COVID-19 vaccines to promote acceptance by the general population.

Switching gears to the safety domain of the OTC dietary supplement use and the related side effects that need special considerations, kidney stones and gastrointestinal adverse effects were reported by more than half of the respondents. However, only a small number of respondents (11%) considered the dietary supplements to be free from any side effects. Evidence about the safety of using OTC dietary supplement for COVID-19 patients is still lacking. For example, the safety of vitamin C and zinc may be a concern at higher doses. Therefore, the awareness of both public and healthcare professionals about the potential safety of using OTC dietary supplement is significant.

A higher educational degree was associated with better perceptions toward OTC supplementary use during COVID-19. Holders of higher degrees are expected to understand information about contemporary immune system enhancing claims to accept or refute such assumptions. This finding goes in line with what has been reported by Cho and Lee in a study conducted among the general public population, where more educated respondents had higher odds of using OTC products for nutritional purposes. However, respondents with longer professional experience tend to have negative perceptions toward dietary supplement use as compared to junior healthcare professionals. The reasons behind the negative perceptions of experienced HCP were not explored; this could be a limitation to this study.

In summary, there was an overall higher interest and potential to recommendation of vitamin C, zinc, and vitamin D. Those three elements play integral part in proper immune response rendering deficient people prone to different infections including COVID-19. In regards to safety of such products, they are considered generally safe if administered under medical supervision. Administration of very high doses of vitamin C, zinc, and vitamin D can lead to decreased effectiveness of some medications, gastrointestinal disturbances, and renal failure induced by nephrolithiasis, respectively. Up to the authors’ knowledge, this is the first Jordanian study that reported HCP perceptions about the use and safety of dietary supplements for COVID-19. In addition, the balanced number of males and females with different age bands, medical professions, and from different areas in Jordan was included, which

| Table 4. Factors Affecting Positive Perceptions Toward Dietary Supplements During COVID-19. |
| --- | --- | --- | --- |
| Gender | .28 |  |  |
| Age | .44 |  |  |
| Marital status | .32 |  |  |
| Residence | .35 |  |  |
| Income | .09 |  |  |
| Sector of practice | .90 |  |  |
| Educational degree | .056 |  |  |
| Post grad | .055 | 4.42 | 2.97-10.17 |
| Bachelor | .021 | 4.39 | 2.25-10.33 |
| College (ref) |  |  |  |
| Profession | <.001 |  |  |
| Medicine (ref) |  |  |  |
| Pharmacy | .03 | 2.17 | 1.5-9.5 |
| Nursing | .69 | .78 | 2.3-2.71 |
| Dentistry | .001 | .06 | .02-23 |
| Others | .58 | .52 | .05-5.37 |
| Years of experience | .054 |  |  |
| <1 year (ref) |  |  |  |
| 1–4 years | .62 | .70 | 1.8-2.78 |
| 5–10 years | .022 | .17 | .04-78 |
| >10 years | .042 | .15 | .02-93 |
| Vitamin and mineral supplement agreement score | .056 | .92 | .85-1.00 |
| Herb and natural supplement agreement score | .004 | 1.16 | 1.05-1.28 |

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adds to the generalizability of the findings that can be drawn from this study. However, and given the limited number of studies addressing factors affecting OTC dietary supplement use during the COVID-19 pandemic, the comparison of our results to those of close ones was difficult. Also, data were collected online based on authors’ networks and through self-reporting, which could be another limitation to this study.

Finding from this study described the perceptions of HCPs toward the potential benefit and safety issues of using OTC dietary supplements for COVID-19 patients. Thus, this study provides a scheme to examine the perception of the HCPs toward the safe and effective use of OTC dietary supplements in pandemic diseases. Also, results from this study would help policymakers in Jordan, as well as comparable global countries, gain more insight into the perceptions of HCP toward the potential benefit and safety issues of using OTC dietary supplements for COVID-19 patients. This in turn allows policymakers to react by developing and updating the policies regarding the potential use of OTC dietary supplements in pandemic diseases.

Conclusion

The interest and the use of OTC dietary supplements that boost the immune response, such as vitamins C and D, zinc, garlic, and ginger, increased dramatically during the COVID-19 pandemic. However, there is a lack of studies that evaluate or support OTC dietary supplements safe and effective use in the treatment and prevention of COVID-19. Findings from this study indicate that the HCP positively endorsed the potential benefits of OTC dietary supplements, considering the added risks of increasingly taking these supplements in treatments and prevention of COVID-19 patients. Also, this research should establish a framework to influence future regulatory interventions related to OTC products’ use to promote patient safety, especially during pandemic diseases. Future research is required to extensively and qualitatively assess the reasons that influence the HCP’s decisions of recommending OTC dietary supplements for COVID-19 patients.

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References

1. Ferrer R. COVID-19 Pandemic: The greatest challenge in the history of critical care. *Med Intensiva*. 2020;44(6):323-324.
2. Atzrodt CL, Maknojia I, McCarthy RDP, et al. A guide to COVID-19: A global pandemic caused by the novel coronavirus SARS-CoV-2. *FEBS J*. 2020;287(17):3633-3650. doi:10.1111/febs.15375.
3. Hu J, Wang Y. The clinical characteristics and risk factors of severe COVID-19. *Gerontology*. 2021;67(3):255-266.
4. Cucinotta D, Vanelli M. World Health Organization (WHO) declares COVID-19 a pandemic. *Acta Bio Med*. 2020;91(1):157-160.
5. Cunningham AC, Goh HP, Koh D. *Treatment of COVID-19: Old Tricks for New Challenges*. Berlin, Germany: Springer; 2020.
6. Galvin CJ, Li Y-CJ, Malwade S, Syed-Abdul S. COVID-19 preventive measures showing an unintended decline in infectious diseases in Taiwan. *Int J Infect Dis*. 2020;98:18-20.
7. Mrityunjaya M, Pavithra V, Neelam R, Janhavi P, Halami PM, Ravindra PV. Immune-boosting, antioxidant and anti-inflammatory food supplements targeting pathogenesis of COVID-19. *Front Immunol*. 2020;11:570122.
8. Shakoor H, Feehan J, Al Dhaheri AS, et al. Immune-boosting role of vitamins D, C, E, zinc, selenium and omega-3 fatty acids: Could they help against COVID-19? *Maturitas*. 2020;143:1-9.
9. Aucoin M, Cooley K, Saunders PR, et al. The effect of *Hedera* spp. on the prevention or treatment of COVID-19 and other respiratory tract infections in humans: A rapid review. *Adv Integr Med*. 2020;7(4):203-217.
10. Wessels I, Rolles B, Rink L. The potential impact of zinc supplementation on COVID-19 pathogenesis. *Front Immunol*. 2020;11:1712.
11. Barnes LAJ, Leach M, Anheyer D, et al. The effects of *Hedera* helix on viral respiratory infections in humans: A rapid review. *Adv Integr Med*. 2020;7(4):222-226.
12. Hamulka J, Jeruszka-Bielak M, Górnicka M, Drywień ME, Zielinska-Pukos MA. Dietary supplements during COVID-19 outbreak. Results of google trends analysis supported by PLifeCOVID-19 online studies. *Nutrients*. 2021;13(1):54.
13. National Institutes of Health (NIH). *Dietary Supplements in the Time of COVID-19 - Health Professional Fact Sheet (nih.gov)*. Washington, DC: U.S. Department of Health & Human Services; 2022.
14. Al Thobaity A, Alshammarri F. Nurses on the frontline against the COVID-19 pandemic: An integrative review. *Dubai Med J*. 2020;3(3):87-92.
15. Mukattash TL, Jarab AS, Mukattash I, et al. Pharmacists’ perception of their role during COVID-19: A qualitative content analysis of posts on Facebook pharmacy groups in Jordan. Pharm Pract. 2020;18(3):1900.

16. Pandey SK, Sharma V. A tribute to frontline corona warriors—Doctors who sacrificed their life while saving patients during the ongoing COVID-19 pandemic. Indian J Ophthalmol. 2020;68(5):939.

17. World Health Organisation. Health Workforce Policy and Management in the Context of the COVID-19 Pandemic Response: Interim Guidance, 3 December 2020. Geneva, Switzerland: World Health Organization; 2020.

18. MacPherson A, Hutchinson N, Schneider O, et al. Probability of success and timelines for the development of vaccines for emerging and reemerged viral infectious diseases. Ann Intern Med. 2021;174(3):326-334.

19. Darby AC, Hiscox JA. Covid-19: Variants and Vaccination. London, UK: British Medical Journal Publishing Group; 2021.

20. Schwarzinger M, Watson V, Arwidson P, Alla F, Luchini S. Health Workforce Policy and Management in the Context of the COVID-19 Pandemic Response: Interim Guidance, 3 December 2020. Geneva, Switzerland: World Health Organization; 2020.

21. Nazer LH, Tuffaha H. Health care and pharmacy practice in Jordan. Can J Hosp Pharm. 2017;70(2):150-155. doi:10.4212/cjhp.v70i2.1649.

22. Raosoft Incorporation. Raosoft sample size online calculator. http://www.raosoft.com/samplesize.html. Published 2004. Accessed May 1, 2021.

23. Alhamad H, Abu-Farha R, Albahar F, Jaber D. Public perceptions about pharmacists’ role in prescribing, providing education and delivering medications during COVID-19 pandemic era. Int J Clin Pract. 2021;75(4):e13890.

24. Jovićić-Bata J, Pavlović N, Milošević N, et al. Coping with the burden of the COVID-19 pandemic: a cross-sectional study of community pharmacists from Serbia. BMC Health Serv Res. 2021;21(1):304.

25. Altun HK, Ermumcu MSK, Kurklu NS. Evaluation of dietary supplement, functional food and herbal medicine use by dietitians during the COVID-19 pandemic. Public Health Nutr. 2021;24(5):861-869.

26. Michienzi SM, Badowski ME. Can vitamins and/or supplements provide hope against coronavirus? Drugs Context. 2020;9:5-7.

27. Souza ACR, Vazconcelos AR, Prado PS, Pereira CPM. Zinc, Vitamin D and Vitamin C: Perspectives for COVID-19 with a focus on physical tissue barrier integrity. Front Nutr. 2020;7:295.

28. Brewer J, Marti JLG, Brufsky A. Potential interventions for SARS-CoV-2 infections: Zinc showing promise. J Med Virol. 2020;93(3):1201-1203.

29. Hoang BX, Han B. A possible application of hinokitiol as a natural zinc ionophore and anti-infective agent for the prevention and treatment of COVID-19 and viral infections. Med Hypotheses. 2020;145:110333.

30. Gombart AF, Pierre A, Maggini S. A review of micronutrients and the immune system—working in harmony to reduce the risk of infection. Nutrients. 2020;12(1):236.

31. Maggini S, Wenzlaff S, Hornig D. Essential role of vitamin C and zinc in child immunity and health. J Int Med Res. 2010;38(2):386-414.

32. Hemilä H, Chalker E. Vitamin C can shorten the length of stay in the ICU: A meta-analysis. Nutrients. 2019;11(4):708.

33. Finzi E. Treatment of SARS-CoV-2 with high dose oral zinc salts: A report on four patients. Int J Infect Dis. 2020;99:307-309.

34. Yao JS, Paguejo JA, Dee EC, et al. The minimal effect of zinc on the survival of hospitalized patients with Covid-19: An observational study. Chest. 2021;159(1):108-111.

35. Hiedra R, Lo KB, Elbashabsheh M, et al. The use of IV vitamin C for patients with COVID-19: A case series. Expert Rev Anti Infect Ther. 2020;18(12):1259-1261.

36. Thomas S, Patel D, Bittel B, et al. Effect of high-dose zinc and ascorbic acid supplementation vs usual care on symptom length and reduction among ambulatory patients with SARS-CoV-2 infection: The COVID A to Z randomized clinical trial. JAMA Netw Open. 2021;4(2):e210369.

37. Shen SC, Dubey V. Addressing vaccine hesitancy: Clinical guidance for primary care physicians working with parents. Can Fam Physician. 2019;65(3):175-181.

38. Jacobson RM, Sauver SJL, Griffin JM, MacLaughlin KL, Finney Rutten LJ. How health care providers should address vaccine hesitancy in the clinical setting: Evidence for prescriptive language in making a strong recommendation. Hum Vaccines Immunother. 2020;16(9):2131-2135.

39. Ciliberti R, Bragazzi NL, Bonsignore A. The implementation of the professional role of the community pharmacist in the immunization practices in Italy to counteract vaccine hesitancy. Pharmacy. 2020;8(3):155.

40. Adams KK, Baker WL, Sobieraj DM. Myth Busters: Dietary supplements and COVID-19. Ann Pharmacother. 2020;54(8):820-826.

41. Basheer HA, Elsalem L, Jaber D, Ibraheem SM, Alhamad H. Knowledge, awareness and practices regarding dietary supplements in Jordan. Trop J Pharmaceut Res. 2021;20(3):HC10-HC13.

42. Cho J-H, Lee T-J. The factors contributing to expenditures on over-the-counter drugs in South Korea. Value Health Reg Issues. 2013;2(1):147-151.