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# Evaluating the Effects of Common Health Instructions and Proceedings on COVID-19 Prevention

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**Abstract**

**Introduction**: Some health instructions and proceedings were widely broadcasted and advised by scientific centers and social media concerning coronavirus disease 2019 (COVID-19) prevention, in the early days of the epidemic. Almost all of them had been sourced from narrative statements or non-evidence based sciences. Herein, we intended to deeply investigate the usefulness and efficiency of such recommendation on COVID-19 prevention.

**Materials and Methods**: Ninety-seven reverse transcription polymerase chain reaction (RT-PCR) confirmed positive COVID-19 individuals as case and 103 suffering from other diseases as control group were enrolled. To collect the data, an expert validated questionnaire encompassed demographic information, past medical history and pre-infection preventive proceedings (consumption of vitamin D3, C, and zinc supplement, wearing face masks and gloves, hand washing, keeping at least 1.5 m distance with other people and staying at home) was used. The data between two groups were analyzed using SPSS software version 16.

**Results**: There were significant differences in vitamin C, D3 and zinc consumption between COVID-19 (case) and non-COVID-19 (control) groups. Control group had higher consumption of these nutrients than case group (66 (64%) vs 41 (42.2%), OR=0.62, P = 0.001 for vitamin D3, 69 (66.9%) vs 48 (49%), OR=0.73, P = 0.012 for vitamin C and 31 (30%) vs 14 (14.4%), OR=0.45, P = 0.021 for zinc consumption). Physical protective care was significantly higher in non-COVID-19 patients. So that, they used more face masks, gloves or did more hand washing (77 (79.3%) vs 96 (93.2%), OR=0.82, 95% CI=0.71-0.93, P = 0.026). Keeping home quarantine and social distance were also significantly higher in patients without COVID-19 (OR=0.4, 95% CI=0.21-0.59, P = 0.001 and OR=0.41, 95% CI=0.19-0.63, P = 0.001 respectively).

**Conclusions**: General protective proceedings have significant protective roles against COVID-19.

**Keywords:** SARS-CoV-2, COVID-19, Vitamin D3, Vitamin C, Zinc, Prevention

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## Introduction

The viruses of Coronaviridae family are a group of viruses which its members are seen in both humans and animals. This family has caused 3 epidemics of acute respiratory diseases during last twenty years. The first epidemic caused by SARS-CoV was started in 2002 in China and resulted in about 8000 confirmed cases and 774 confirmed deaths. The next epidemic – caused by MERS-COV – started in 2012 in South Korea and Saudi Arabia resulted in about 2500 confirmed cases and 866 deaths. The last epidemic caused by SARS-COV-2 started in December 2019 in Wuhan, China and while writing this paper more than 5 million cases and 325 000 deaths are confirmed worldwide.

The main transmission route for these viruses is human to human transmission through respiratory droplets containing viruses and specifically for SARS-COV-2, each infected individual is capable of infecting 4 others on average, which is a high number in comparison with other responsible viruses for two previous epidemics. Despite using several drugs for this disease, none of them are completely effective on this virus. So, the best-known way to compete this virus is preventive measures. Several different preventive ways are introduced by now including wearing face masks and gloves, hand washing, not to touch mouth, nose and eyes, maintaining at least 1.5 meters distance with other people, keeping social distances and staying at home. There are also some medical choices for prevention of this disease including vitamin C, vitamin D3 and zinc. It is noteworthy that there are several debates

on using vitamin C, D3 and zinc as preventive measures and although some researches give no preventive importance to these medications, there are evidences that support using these medications as preventive tools. Liang et al and Petric found that vitamin D3 and E increase body's resistance against viral respiratory diseases in patients with underlying diseases such as hypertension, diabetes and cardiovascular diseases.[1,2] Another study by Zhang et al showed that using vitamin C and D3 in COVID-19 patients improve the prognosis of these patients.[3]

This primary research is aimed to assess the preventive importance of vitamin C, D3, Zinc and physical protective care (including wearing face masks, gloves and handwashing, not to touch mouth, nose and eyes), maintaining at least 1.5 m distance with other people (keeping social distances) and staying at home.

## Materials and Methods

This is a case-control study designed to assess the preventive effects of commonly recommended measures which are thought to be preventive against COVID-19. This study was designed and performed in Baqiyatallah hospital, Baqiyatallah University of Medical Sciences, Tehran, Iran. Case group was the confirmed COVID-19 patients referred to and hospitalized in Baqiyatallah hospital from May 2020 to June 2020. Diagnosis of the disease was confirmed by a positive reverse transcription polymerase chain reaction (RT-PCR) test for SARC-COV-2. Control group for this study was selected from the non-COVID-19 patients hospitalized in other wards of the hospital. Case and control groups were matched for basic variables (Table 1) and patients with confounding comorbidities were excluded in order to control the confounders and increase the statistical power of the study.

**Table 1.** Basic Variables and Comparison of Them Between Case and Control Group

| Variables | Case Group | Control Group | *P* Value |
|---|---|---|---|
| Age | 48.4±16.3 | 46.27±15.9 | 0.11 |
| Sex | | | 0.44 |
| Male | 50 (51.5%) | 55 (53.3%) | |
| Female | 47 (48.5) | 48 (46.7%) | |
| Marital status | | | 0.33 |
| Married | 86 (88.7%) | 81 (78.6%) | |
| Single | 11 (11.3%) | 22 (21.4%) | |
| Educational level | | | 0.23 |
| Under diploma | 16 (15.5%) | 19 (18.4%) | |
| Diploma and higher | 81 (84.5%) | 84 (81.6%) | |
| Job | | | 0.88 |
| Freelance | 14 (14.4%) | 15 (14.5%) | |
| Official | 83 (85.6%) | 88 (85.5%) | |
| BMI | 24.9±3.1 | 24.7±2.9 | 0.72 |
| Underlying disease (positive) | 38(39.1%) | 37 (35.9%) | 0.24 |
| Positive exposure history | 40 (41.2%) | 44 (42.7%) | 0.75 |
| Positive cigarette/hookah consumption | 31 (31.9%) | 29 (28.1%) | 0.21 |

Abbreviation: BMI, body mass index.

The exclusion criteria for the study were: patients refusal from fulfilling the questionnaire, infection with other respiratory diseases such as influenza and common cold, patients with respiratory diseases including chronic obstructive pulmonary disease and asthma, chronic kidney disease and and patients who need dialysis, hepatic diseases including autoimmune hepatitis, decompensated cirrhosis, alcohol abuse >40 g/d in men and > 20 g/d in women, Hb< 10 g/dL, PLT< 100 000/mm$^3$, WBC < 4000/mm$^3$, diabetes and poorly controlled hypertension.

Sample size for this case-control study, based on the study of Goodall et al,[4] taking into account the estimated effect size of 0.54 for two comparison groups, the first type error of 0.05, the power of 80% and at 95% confidence interval was calculated 152 patients (76 patients for each group). G Power software version 3 was used for the sample size calculation.

A questionnaire was used to collect the data. Validity and reliability of the questionnaire were assessed by an expert panel and confirmed. The questionnaire had two sections. First section consisted of basic information of the participants including demographic information, education level, body mass index and past medical history of individuals, the next section consisted of the implementation of pre-infection preventive proceedings including consumption of vitamin D3, C and zinc supplements, physical preventive care (wearing face masks, gloves and hand washing), keeping home quarantine and keeping social distances.

Collected data was analyzed using SPSS software version 16. Because the case and control groups were independent in this study, parametric tests such as *t* test were used for variables with normal distribution and non-parametric Mann-Whitney test was used for variables without normal tests to compare the variables in two groups. Chi-square test was used to compare the qualitative variables. Multivariable analytic tests (conditional logistic regression test) were used to evaluate the relationship between the variables. A *P* value <0.05 was considered significant.

This study was approved by Baqiyatallah University of Medical Sciences Ethics Committee by code of IR.BMSU.REC.1397.315 (https://ethics.research.ac.ir/).

## Results

Although the sample size was computationally 76 patients for each case and control groups, 97 patients with confirmed COVID-19 for case group and 103 patients without COVID-19 for control group entered the study. Case and control groups were compared together for basic variables including age, sex, marital status,educational level, job category, BMI, underlying diseases,exposure history to COVID-19 patients, cigarette or hookah consumption. There were not any significant and meaningful differences in case and control groups for these variables and case and control groups were matched together and therefore the effect of confounding factors were neutralized. The mean (standard deviation) for the age was 48.4±16.3 for case and 46.27±15.9 years for control group ($P=0.11$). 50 (51.5%) were men in case group and 55 (53.3%) in control

group ($P = 0.44$). complete comparison of basic variables between case and control group has been shown in Table 1.

In the next step, the variables which were believed to be effective in the prevention of COVID-19 according to the literature including consumption of vitamin C, D3 and zinc supplements, physical preventive care (including wearing face masks, gloves or handwash), keeping home quarantine and keeping social distance were compared in case and control group. To compare the vitamin C, D3 and zinc consumption between COVID-19 and non-COVID-19 patients, first we defined the consumption of these nutrients. Patients consuming these nutrients in any manner including regular or irregular, orally or by injection were defined as consumer. Patients who did not have any consumption of these nutrients were defined as non-consumer. There was a significant difference in vitamin C, D3 and zinc consumption between COVID-19 (case) and non-COVID-19 (control) groups. Control group had higher consumption of these nutrients than case group (66 (64%) vs 41 (42.2%), OR=0.62, P = 0.001 for vitamin D3, 69 (66.9%) vs 48 (49%), OR=0.73, P = 0.012 for vitamin C and 31 (30%) vs 14 (14.4%), OR=0.45, P = 0.021 for zinc consumption). Physical protective care (including wearing face masks, gloves or handwashing) was significantly higher in non-COVID-19 patients, so that they used more face masks, gloves or did more hand washing (77 (79.3%) vs 96 (93.2%), OR=0.82, 95% CI=0.71-0.93). Keeping home quarantine was significantly higher in patients without COVID-19 and these patients were more bound to stay at home (26 (27.8%) vs 64 (62.1%), OR=0.4, 95% CI=0.21-0.59). Keeping social distance was also significantly more prevalent in patients without COVID-19. These patients were more likely to keep the social distance. (27 (27.8%) vs 65 (63.1%), OR=0.41, 95% CI=0.19-0.63). Full comparisons of the variables has been shown in Table 2. The entire results of this study are summarized in Figure 1.

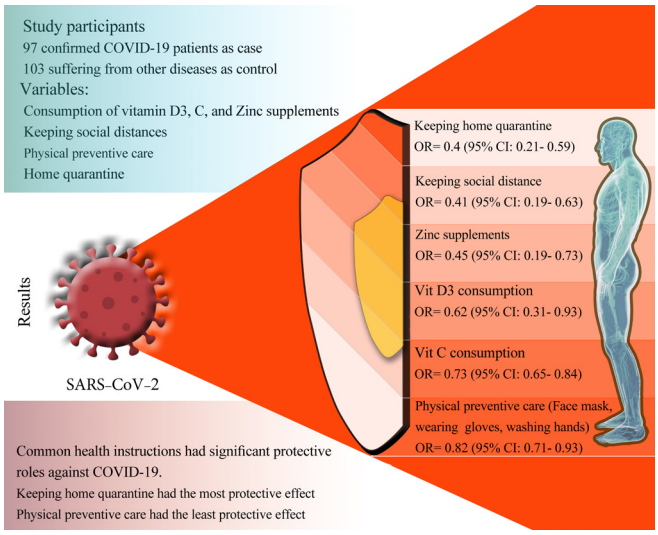


**Figure 1.** An overview of the results obtained in the present study.

## Discussion

In this case-control study, we found that patients without COVID-19 had significantly higher vitamin C, D and zinc supplements consumption and these nutrients had a protective role against COVID-19.

In the literature review, most of the papers have focused on the role of vitamin C in the treatment of COVID-19 and there are a few studies concerning the role of vitamin D3 in the prevention of COVID-19. In a meta-analysis of 29 randomized controlled trials with 11 306 participants regular vitamin C intake did not prevent upper respiratory tract infection (URTI).[5] But the same meta-analysis found that vitamin C alleviated and shortened the period of URTIs. The duration of disease was decreased by 8% in adults and by 14% in children.[5] High dose vitamin C had been used in the treatment of 50 moderate to severe COVID-19 patients. The oxygenation index was improved and all the patients eventually cured and were discharged.[6]

In a study by Ilie et al, there was a negative correlation between mean levels of vitamin D in each European country and the number of COVID-19 cases and its mortality per one million population.[7] There is some evidence which shows that vitamin D3 deficiency may increase the risk of developing COVID-19 and vitamin D3 supplementation could decrease the risk of COVID-19 infection and mortality.[8,9]

Zinc deficiency is associated with H1N1 influenza through decreasing the cell mediated immunity against viruses.[10] Low zinc level is associated with increased risk of infection with SARS-COV-2.[11] In a systematic review and meta-analysis consisted of 43 studies, zinc and selenium had favorable effects on immune system in viral respiratory infections.[12]

In this study, we found that physical preventive care (including wearing face masks, gloves and handwashing), keeping home quarantine and keeping social distances have a protective role against COVID-19. These measures are advised in other papers too.[13,14]

Keeping home quarantine and keeping social distances

**Table 2.** Comparison of the Variables Between Case and Control Groups

| Variables | Case Group (%) | Control Group (%) | OR | 95% CI | *P* Value |
|---|---|---|---|---|---|
| Vitamin D3 consumption | 41 (42.2%) | 66 (64%) | 0.62 | 0.31-0.93 | 0.001 |
| Vitamin C consumption | 48 (49%) | 69 (66.9%) | 0.73 | 0.65-0.84 | 0.012 |
| Zinc supplement Consumption | 14 (14.4%) | 31 (30%) | 0.45 | 0.19-0.73 | 0.021 |
| Physical preventive care (wearing face masks, gloves, hand washing) | 77 (79.3%) | 96 (93.2%) | 0.82 | 0.71-0.93 | 0.026 |
| Keeping home quarantine | 26 (26.8%) | 64 (62.1%) | 0.4 | 0.21-0.59 | 0.001 |
| Keeping social distance | 27 (27.8%) | 65 (63.1%) | 0.41 | 0.19-0.63 | 0.001 |

were two most effective and important factors to prevent from COVID-19. Each of these two factors reduces the risk of infection with the OR of about 0.4. This is simply attributable to avoiding from exposure to virus. On the other hand, these factors do not completely prevent from COVID-19 because even individuals who stay at home and keep social distances still can get the virus from their family members or their close contacts who break the home quarantine completely, get out of home and don't observe the social distances. These findings prove the efficacy of two simple but greatly preventive measures against COVID-19 which can be retained in any circumstances.

Consumption of zinc supplements was shown to have protective effects against COVID-19 and consuming this supplement lowered the risk of infection by more than 2 times. This can be due to the enhancement of the antiviral immunity of the body mediated by zinc. Vitamin D supplement had also a protective effect against COVID-19 which is attributable to reducing the concentration of pro-inflammatory cytokines and increasing the concentration of anti-inflammatory cytokines. Vitamin D supplement had also a slight protective role against COVID-19 which is attributable to anti-oxidant effects of this nutrient.

Physical protective care (including wearing face masks, gloves or handwashing) had a slight protective effect against COVID-19. In a logical interpretation, the main reasons for the low impact of physical preventive care can be attributed to the lack of perfect training, inaccurate observance, erratic usage due to the abrupt cost growth (especially for masks and gloves) and the tediousness of constantly observing these proceedings.

## Conclusions

The results of the present study imply that the common suggested proceedings could significantly prevent COVID-19 with different efficacy. Interestingly, it was revealed that in addition to the proven effects of keeping home quarantine and social distance, the consumption of zinc and vitamin D3 supplementation could respectively play a meaningful role in preventing infection. Also, physical preventive care (including wearing face masks, gloves and handwashing) measures have the least effect due to their specific restriction conditions.

### Authors' Contributions

All authors contributed equally to this study.

### Confilict of Interest Disclosure

There is nothing to disclose for any author.

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