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# Comparison of Food Intakes of Diabetes, Hypertension and Heart Disease Patients with Clinical Symptoms of COVID-19 and Asymptomatic Controls.

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**Short report**

**Keywords:** food intakes, symptoms, COVID-19, metabolic syndrome, nutritional supplements

**Posted Date:** October 2nd, 2020

**DOI:** https://doi.org/10.21203/rs.3.rs-84142/v1

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# Abstract

**Background:** In recent months, Coronavirus Disease 2019 (COVID-19) is a global health challenge. Nutrition is a key determining factor of health. In the present research, we assess and compare dietary food groups and nutrient supplements intake of diabetic, hypertensive and heart disease patients with clinical symptoms of COVID-19 and asymptomatic controls.

**Methods:** This retrospective case-control research was conducted on 98 patients with diabetes, hypertension, and/or heart disease that 37 of them were COVID-19 positive with clinical symptoms. Dietary intakes of participants were recorded using a food frequency questionnaire (FFQ), which was designed and validated for the Iranian population.

**Results:** 54% of all subjects had nutritional supplements consumption in the last 6 months, and there was no significant difference in the type of nutritional supplements between cases and controls. There was no significant difference in the median intake of food groups, in the last year, in metabolic syndrome patients with clinical symptoms of COVID-19 compared to controls. Crud OR shown, adequate consumption of any food groups was not associated with the occurrence of COVID-19.

**Conclusion:** While dietary intake and nutritional supplements may be excellent promise for preventing clinical symptoms of COVID-19, however, up to now, researches are not enough for recommending these supplements above the Recommended Dietary Allowances (RDA) for prevention and/or treatment of COVID-19.


# Background

Recent months, Coronavirus Disease 2019 (COVID-19) is a global health challenge which leads to acute respiratory distress syndrome, respiratory and multiorgan failure, and increases mortality rate in metabolic syndrome (MetS) patients [1, 2]. Nutrition is a key determining factor of health [3]. A recent study suggested that malnutrition can impact on immune cell metabolism and function [4]. Nearly 33.6% of adults population in Iran are suffering from MetS which is possibly caused by increased intake of the Western diet (WD) containing high amounts of saturated fat (HFD), refined carbohydrates and sugars, and low levels of fiber, unsaturated fats, and antioxidants [5, 6] Modern diet seems an important factor influencing the severity symptoms of COVID-19, through damaging the immune system [7, 8].

A recent systematic review proposed nutrients with probable antivirus properties [9]. However, up to now, no research has evaluated the history of food intake and incidence of COVID-19 infection. Patients with history of diabetes, hypertension, and heart disease have a worse prognosis and are at greater risk for more severe symptoms and mortality from COVID-19.

# Methods

# Study design and participants

We conducted a retrospective case-control research on 98 patients with diabetes, hypertension, and/or heart disease that 37 of them were COVID-19 positive with clinical symptoms. A total of 37 COVID-19 positive patients that recurred, had laboratory-confirmed SARS-CoV-2 (Severe acute respiratory syndrome coronavirus 2) infection diagnosis by RTePCR (Reverse Transcriptase Polymerase Chain Reaction) of nasopharyngeal swabs, and hospitalized and/or referring to the outpatient clinic of Khatam Al-Anbia Hospital, in Shoushtar city, Khuzestan province, in Iran, between June and Aug 2020. We compared the case group with 61 MetS patients exposed to SARS-CoV-2 and asymptotic (control group).

Control group were selected from physicians, nurses, and staff working in hospitals, and medical centers and also, near family members of infected patients with SARS-CoV-2 that encountered the virus but no observed clinical symptoms of COVID-19.

The Medical Ethics Committee at the Shoushtar faculty of medical science approved the research protocol according to the guidelines of the 2013 Helsinki Declaration (Registration No: IR.SHOUSHTAR.REC.1399.015).

Dietary intakes of participants were recorded using a food frequency questionnaire (FFQ), which was designed and validated for the Iranian population [10]. The frequency of food groups (based on the food pyramid) that consumed, in the last year, asked in forms of daily, weekly, monthly, yearly, or never and then converted and reported to the unit per day.

# Statistical analyses

The datasets used and analyzed during the current study are available from the corresponding author upon the reasonable request. Categorical variables were reported as frequency rates and percentages (%). Categorical variables compared using chi-squared test. Continuous data with normal or non-normal distribution were described using mean ± standard deviation (mean ± SD) or median (25th, and 75th percentile), respectively. Mann-Whitney U Test and Independent t-test used to compare continuous variables. Logistic regression was used to estimate the strength of the association between daily food groups and the odds ratios (ORs) of COVID-19. All statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) version 17.0 (SPSS Inc, Chicago, IL, USA). Two-sided P-values with $P < 0.05$ were considered statistically significant.

## Results

In our study, case and control groups were matched in terms of body mass index (BMI), gender, and age. There was no significant difference in the characteristics of participants between the two groups. The median BMI of all participants was 26. 46. 54% of all subjects had a consumption of nutritional supplements in the last 6 months, and there was no significant difference in the type of nutritional supplements between cases and controls. Table 1 demonstrates a comparison of daily food groups intake between two groups. Unexpectedly, we observed no significant difference in the median intake of

food groups, in the last year, in MetS patients with clinical symptoms of COVID-19 compared to controls. The results of the logistic regression models about the relation between daily food groups intake and the occurrence of COVID-19, with OR and 95% confidence intervals (CI), illustrated in Table 2. Crud OR shown, adequate consumption of any food group was not associated with the occurrence of COVID-19.

Table 1
Comparison of basic characteristics, anthropometric measures and daily food groups intake (per unit) between cases and controls.

| Characteristics | Asymptotic group (Controls) n = 61 | COVID-19 positive with clinical symptoms (Cases) n = 37 | *P*-value |
|---|---|---|---|
| **Age (years)**[£] | 33.62(22,59) | 32.86(17,51) | 0.60 |
| **Weight (kg)** [£] | 73.43(43.5,110.5) | 69.78(50.5,95.0) | 0.20 |
| **Height (cm)** [€] | 166.97 ± 9.29 | 164.47 ± 8.27 | 0.17 |
| **BMI (kg/m$^2$)**[£] | 26.27(16.94,39.06) | 26.05(15.40, 34.89) | 0.80 |
| **Gender** [#] | | | 0.59 |
| Female, (n (% | 38(62.3) | 25(67.6) | |
| Male, (n (% | 23(37.7) | 12(32.4) | |
| **Physical activity**[#] | | | 0.82 |
| Active | 6(9.8) | 3(8.1) | |
| Minimally active | 34(55.8) | 23(62.2) | |
| Inactive | 21(34.4) | 11(29.7) | |
| **Educational level n (%)** [#] | | | 0.17 |
| Elementary | 8(13.1) | 10(27) | |
| Diploma | 16(26.2) | 6(16.2) | |
| College | 37(60.7) | 21(56.8) | |
| **Income (n, %)** [#] | | | 0.24 |
| Upper-middle | 15(24.6) | 4(10.8) | |
| Middle | 26(42.6) | 18(48.6) | |

[€] Data are illustrated as mean ± standard deviation (mean ± SD), and analyzed by *Independent t*-test.

[£]Data are illustrated as median (25th, 75th percentiles) and analyzed by *Mann-Whitney U* test.

[#] Data are illustrated as n (%), and analyzed by *chi-square*.

*P*-value < 0.05 was considered significant. BMI: body mass index

| Characteristics | Asymptotic group (Controls) n = 61 | COVID-19 positive with clinical symptoms (Cases) n = 37 | *P*-value |
|---|---|---|---|
| Lower-middle | 20(32.8) | 15(40.6) | |
| **Marital status**[#] | | | 0.59 |
| Married | 54(88.5) | 34(91.9) | |
| Single | 7(11.5) | 3(8.1) | |
| **History of smoking**[#] | | | 0.09 |
| No | 46(75.41) | 33(89.2) | |
| Yes | 15(24.59) | 4(10.8) | |
| **Nutritional supplement consumption in last 6 month**[#] | | | 0.28 |
| No | 29(47.5) | 17(45.9) | |
| Yes | | | |
| Vitamin C | 3(4.9) | 4(10.8) | |
| Iron | 2(3.3) | 4(10.8) | |
| Vitamin D3 | 21(34.4) | 11(29.7) | |
| Multivitamin | 6(9.9) | 1(2.8) | |
| **Daily food intake (per unit)** [£] | | | |
| Bread | 2.84(1.0, 7.0) | 2.50(1.0,7.0) | 0.24 |
| Rice | 1.54(0.14, 4.6) | 1.59(0.14, 4.50) | 0.76 |
| Pasta | 0.21(0.01, 0.90) | 0.11(0.01, 0.40) | 0.07 |
| Cheese | 1.3(0.0, 4.5) | 1.00(0.07,3.0) | 0.15 |
| Yogurt | 0.50(0.0, 2.0) | 0.56(0.0,3.0) | 0.61 |

[€] Data are illustrated as mean ± standard deviation (mean ± SD), and analyzed by *Independent t*-test.

[£]Data are illustrated as median (25th, 75th percentiles) and analyzed by *Mann-Whitney U* test.

[#] Data are illustrated as n (%), and analyzed by *chi-square*.

*P*-value < 0.05 was considered significant. BMI: body mass index

| Characteristics | Asymptotic group (Controls) n = 61 | COVID-19 positive with clinical symptoms (Cases) n = 37 | *P*-value |
|---|---|---|---|
| Dough | 0.39(0.0, 2.0) | 0.34(0.0,2.0) | 0.60 |
| Milk | 1.26(0.0, 3.0) | 1.40(0.0,2.0) | 0.23 |
| Ice cream | 0.20(0.0, 3.0) | 0.23(0.0,3.0) | 0.74 |
| Chicken | 0.60(0.0,2.0) | 0.54(0.0,2.0) | 0.44 |
| Fish | 0.23(0.0, 0.85) | 0.33(0.0,0.85) | 0.10 |
| Red Meat | 0.67(0.0, 4.0) | 0.54(0.0,4.0) | 0.30 |
| legumes | 0.28(0.0,2.0) | 0.27(0.0,1.0) | 0.81 |
| Egg | 0.44(0.0,2.0) | 0.45(0.0,2.0) | 0.89 |
| Fruit | 1.85(0.0,4.0) | 1.7(0.07,4.0) | 0.71 |
| Vegetables | 1.40(0.0, 5.50) | 1.12(0.00,5.50) | 0.38 |
| [€] Data are illustrated as mean ± standard deviation (mean ± SD), and analyzed by *Independent t*- test. | | | |
| [£]Data are illustrated as median (25th, 75th percentiles) and analyzed by *Mann-Whitney U* test. | | | |
| [#] Data are illustrated as n (%), and analyzed by *chi-square.* | | | |
| *P*-value < 0.05 was considered significant. BMI: body mass index | | | |

Table 2

Occurrence clinical symptoms of COVID19 by intakes of food groups, using Odds ratios (ORs) [§] and 95% confidence intervals (CIs).

| Daily food intake | Crude OR | P-value | Adjusted OR Model 1 | P-value |
|---|---|---|---|---|
| Bread | 0.82(0.60, 1.13) | 0.24 | 0.82(0.59, 1.12) | 0.22 |
| Rice | 1.05(0.73, 1.53) | 0.76 | 1.10(0.75, 1.59) | 0.61 |
| Pasta | 0.01 (0.0, 1.40) | 0.08 | 0.01 (0.0, 1.37) | 0.09 |
| Cheese | 1.59(0.73, 3.43) | 0.23 | 1.50(0.69, 3.26) | 0.30 |
| Yogurt | 1.20(0.58, 2.50) | 0.60 | 1.08(50, 2.37) | 0.83 |
| Dough | 0.80(0.34, 1.86) | 0.61 | 0.80(0.34, 1.89) | 0.62 |
| Milk | 0.74(0.49, 1.23) | 0.16 | 0.73(0.48, 1.12) | 0.15 |
| Ice cream | 1.14(0.50, 2.61) | 0.74 | 1.14(0.50, 2.62) | 0.74 |
| Chicken | 0.65(0.22, 1.89) | 0.43 | 0.62(0.21, 1.82) | 0.38 |
| Fish | 3.23(0.79, 13.23) | 0.10 | 2.91(0.70, 12.05) | 0.13 |
| Red Meat | 0.66(0.30, 1.46) | 0.31 | 076(0.30, 1.88) | 0.55 |
| legumes | 0.84(0.21, 3.27) | 0.81 | 0.83(0.21, 1.32) | 0.80 |
| Egg | 1.07(0.37, 3.07) | 0.89 | 1.31(0.40, 4.22) | 0.64 |
| Fruit | 0.94(0.69, 1.28) | 0.70 | 0.91(0.95, 1.26) | 0.57 |
| Vegetables | 0.88(0.65, 1.17) | 0.38 | 0.87(0.65, 1.16) | 0.36 |

[§]OR calculated by *logistic regression* model. Model 1 Adjusted for energy intake, BMI and consumption of nutritional supplements.

# Discussion

Our study is the first case-control research to compare dietary food intakes in MetS patients with clinical symptoms of COVID-19 and controls. The present data support that no specific food groups or nutritional supplement have an effect on the occurrence of COVID-19. However, a previously published opinion suggested mechanisms involved in the potential role of diet and nutrients in the prevention of COVID-19 via the strengthening of the immune system and reducing inflammation and oxidative stress [11, 12]. The mechanisms likely underlie such beneficial roles are not completely understood and other unknown factors may have interfered.

# Conclusion

While dietary intake and nutritional supplements may offer excellent promise for preventing clinical symptoms of COVID-19, however, up to now, researches are not enough for recommending these supplements above the Recommended Dietary Allowances (RDA) for prevention and/or treatment of COVID-19. SARS-CoV-2 is a new virus with unknown function, hence strong researches are required to confirm these suggestions and provide hypothesis and opinions.

# List Of Abbrivation

COVID-19: Coronavirus Disease 2019

FFQ: food frequency questionnaire

MetS: metabolic syndrome

WD: Western Diet

HFD: High Fat Diet

SARS-CoV-2

RTePCR: Reverse Transcriptase Polymerase Chain Reaction

ORs: odds ratios

RDA: Recommended Dietary Allowances

# Declarations

### Ethics approval

Medical Research Ethics Committee at the Shoushtar Faculty of Medical Sciences approved the study (Registration No: IR.SHOUSHTAR.REC.1399.015).

### Consent to participate

All participate signed a consent form

### Availability of data and material

The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on a reasonable request.

### Competing interests

The authors declare no conflict of interest.

## Funding

This research financially supported by the Vice-Chancellor for Research Affairs of Shoushtar faculty of Medical Sciences, Shoushtar, Iran. (Grant number: 99000020).

### Authors'contributions

H Mohseni and S Amini contributed in the conception and design, analysis of data and interpretation of the research, also, in the writing and revision of the manuscript. B Abiri and M Kalantar contributed to the critical revision of the manuscript. All authors approved the final version of the manuscript before submitting it.

### Acknowledgements

The authors wish to thank all participants and the personnel of Khatam Al-Anbia Hospital. Special thanks to Vice-Chancellor for Research Affairs of Shoushtar faculty of Medical Sciences which financially supported the project.

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