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THE EFFECT OF BLOOD GROUPS AND DIETARY PLANS ON THE DISEASE CAUSED BY CORONAVIRUS 2019 (COVID-19) IN HYDERABAD SINDH, PAKISTAN, A CROSS SECTIONAL STUDY

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Abstract
In late December 2019, a cluster of pneumonia cases of unknown etiology was first reported in Wuhan, China. Later on, the disease was named as coronavirus disease 2019 (COVID-19). In a short time, the COVID-19 cases have been reported worldwide. The aim of the current study was to find out the prevalent blood group and dietary intake of COVID-19 patients. For this study data was collected hyderabad sindh at community level . A total of 206 individuals participated in this study, aged between 15 to 75 years old. The data were collected from January to April 2021. The blood and dietary intake of individuals were evaluated by using specially developed questionnaire. The result of this study shows that about 36.9% of people having B+ blood group and were the most affected blood group followed by O+ and A+ blood group 28.2% and 20.9% respectively. The prevalent blood group was O- and AB- blood group having 0% cases. 33.5% of individuals use Vitamin C, 29.1% use both Vitamin C and D and 24.8%use multivitamins. The most consumed fruit were apple, banana, orange, and guava 51.9%, 9.2%, 7.8% and 1.9% respectively. Food that mostly consumed were green leafy vegetables routine diet mixed fruits, vegetables soups, milkshakes and dry fruits 31%, 25%, 19% and 8% respectively. 44% of people recover within 2weeks,23.37 recover in 3weeks, 13.6% in one week while 17% people took 4weeks to recover. After recovery 78% people felt weakness 22% felt normal respectively. Conclusion of this study is that blood group B+ is more prone to COVID-19 as compare to other blood groups while O- and AB- are the prevalent blood groups. Most of the COVID-19 patients consume fruits and vegetables and supplements to boost their immunity and to recover easily from COVID-19. Studies with a larger sample size are required in order to obtain significant results.

Keywords: COVID-19, SARS-COV-2 blood groups,

Introduction

Large cases of unexplained pneumonia were observed in Wuhan city of Hubei Province, China in December 2019. In January 2020, a team of researchers led by Xu Jiangsu found the pathogen as a novel corona virus, although the virus was soon after named 2019-nCoV, and then renamed SARS-

CoV-2. Corona viruses take their name due to similarity with appearance of Sun atmosphere named as its corona. SARS- CoV-2 is one of many corona viruses and other members of corona virus family existed from long time. Coronaviruses has four major types as Gamma coronavirus, Delta coronavirus, Beta coronavirus and alpha coronavirus. The first two are found in birds and later ones are found in mammals. Severe acute respiratory syndrome coronavirus (SARS-COV) and MiddleEast respiratory syndrome coronavirus (MERS-COV) are beta coronaviruses and extremely pathogenic. It spreads from bats to civets or dromedary camels and eventually to humans(Fong *et al*., 2020).

Most people suffered from SARS-COV-2 had experienced mild to moderate gastrointestinal and respiratory illness and recover without any special treatments. Older people or people with underlying medical conditions like diabetes, cardiovascular disease, chronic respiratory illness and cancer were more likely to have serious illness and the mortality rate was also higher (Liu *et al.,* 2020). Large number of patients with SARS-COV-2had common symptoms including cough, fever, dyspnoea, musculoskeletal symptoms (myalgia, joint pain, Lethargy), gastrointestinal symptoms, and anosmia/dysgeusia. However symptoms that persist after recovery is weakness (Carfi *et al.,* 2020).

Recent clinical study suggests that patient age, gender and certain chronic medical conditions (e.g., cardiovascular disease, diabetes, COPD) are at higher risk for the infection of SARS-Cov-2 and have higher disease severity. Susceptibility of viral infection has been previously found to be related to ABO blood group (Zhao *et al.,* 2020).

Epidemiological examinations have reported that blood group is strongly related to get infected with SARS-CoV-2 and also with the survival following infection. However, there have been conflicting results due to multiple confounding effects compared blood groups between COVID-19 patients and the general population and found that the probability of COVID-19 positivity in blood group A and AB was increased compared with that in the general population, while the probability of COVID-19 positivity in blood group O was decreased (Liu *et al* 2020).

Some studies found a relation between the ABO blood group and COVID-19 morbidity and mortality. It is also reported that, ABO blood group is related to different infectious diseases and syndromes. Individuals with blood group O were reported to be more susceptible to Norwalk virus and also had a significantly higher prevalence of *Helicobacter pylori* infection, but they were less susceptible for SARS (pourali *et al*., 2020).

There is evidence suggesting the possible role of good nutrition in immune system enhancement. Many trace elements, such as iron, zinc, selenium, magnesium, and copper, as well as vitamins A, B complex, C, D, and E, have been found to have immune-boosting characteristics, and hence deficiency of these micronutrients could be harmful to immune function in viral infections.Similarly, micronutrient supplements and diets have been described as a means to increase or optimise immune response against viral infections and COVID-19 (Akhtar *et al.,* 2020).

Weak immunity is a risk factor for infection with respiratory viruses. A healthy diet and nutritional condition are considered essential for an optimum immune response and illness prevention. A poor diet and nutrient deficiencies will increase the disease burden on individual. Nutritional status is critical for excellent prognosis in people infected with SARS-CoV-2, and it can affect the clinical severity of COVID-19. Zhang and Liu recommended dietary supplementation with specific vitamins (A, B, C, and D), minerals (selenium, zinc, and iron), and omega-3 fatty acids as a treatment option for COVID-19 patients as well as a preventive therapy against COVID-19 infection (Hyoung *et al* 2020)..

Immunity refers to an organism's ability to defend itself against germs and harmful substances. Lack of balanced diet, poor socioeconomic status, health issues, lack of physical activities, and environmental pollution all contribute to a poor diet, which is followed by an impaired immune system, resulting in an increased risk of pathogen infection.As a result, maintaining a good diet, ensuring good nutrition, and maintaining social distance may be the most effective ways to combat the SARS CoV-2. The antiviral effects of nutrients from various food groups and their possible involvement in increasing defence against COVID-19. The potential role of nutrients of different food groups with their antiviral properties to increase immunity against viral infections including SARS CoV-2 and other RNA viruses by enabling people to make a right diet choice in pandemic as well as post pandemic situation(Alam *et al.,*2021).

Dietary supplementation with selected vitamins (e.g. A, B, C, and D), minerals (e.g. selenium, zinc, and iron), and omega-3 fatty acids is a treatment option for COVID-19 patients and as preventive therapy against lung infection and the optimization of nutrient intake through well-balanced meals and the use of good hygiene practices in food selection, preparation, and conservation is probably an effective approach for managing the continual risk of infection (de faria Coelho- Ravagnani*et al.,* 2020).

SARS-COV-2 may have long-term effects in individuals who recover, resulting to chronic medical disorders like dementia and neurodegenerative illness, which can be exacerbated by a poor diet. Wider access to healthy foods should be a primary goal today, and individuals should be cognizant of healthy eating habits to prevent susceptibility to COVID-19 and its long-term problems. (Butler *et al.,* 2020).

Material and Methods

This study was conducted in hyderabad sindh at community level from January to April -2021.The sample of the study consisted of 206 individuals who recovered from SARS-Cov-2 in which both male and female were included. The total number of male were 127 and female were 79 in number. The data was collected by using the Questionnaire. The Questionnaire consists of four parts. The first part of questionnaire consisted of personal information of individuals. The second part was composed of question about blood groups. The Third part consisted of questions related to symptoms during COVID-19. The fourth part was about dietary intake and recovery time of the individual during covid-19.

Statistical analysis

The statistical analysis was performed using the Microsoft excel software. Frequency distribution and percentages of individual scores were calculated. Pie charts and bar graphs were constructed based on the number and percentage of each score.

Results

Gender and marital status of study Cohort

Out of 206 samples, 127 were male affected by COVID-19 i.e. (61.7%) while 79(38.3%) females were infected by COVID-19 virus as shown in Figure 1A. Among 206 patients 55.3% were single while 44.7% were married as shown in Figure 1B.

Table 1: COVID-19 age wise prevalence in current study cohort

Age Group	Frequency (n=206)	Percentage (%)
11_20	14	6.8
21_30	114	55.3
31_40	46	22.3
41-50	18	8.7
51-60	8	3.9
61-70	6	2.9

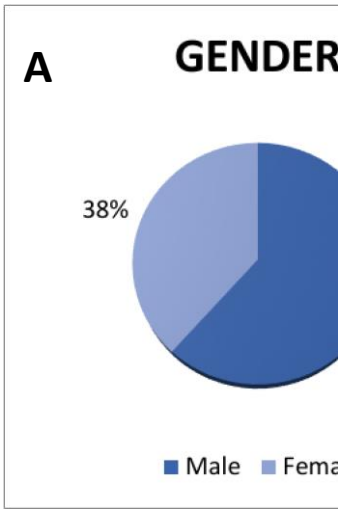

Figure 1: Gender and Martial status of the respondents in current study

Age wise prevalence of COVID in current study cohort

Age distribution among 206 patients were analyzed as 14(6.8%) patients were in age group of 11-20 years, 114 (55.3%) patients were in age group of 21-30 years, 46(22.3%) patients were in age group 31-40 years, 18(8.7%) patients were in age group of 41-50 years, 8(3.9%) patients were in age group 51-60 years, 6(2.9%) patients were in age group 61-70 years. As per data analysis the most affected age group by COVID-19 was 21-30 years as shown in Table 1.

Estimated risk differences of COVID-19 based on blood types

The blood group data was taken by the COVID-19 patient (n=206) in which the number of people affected with COVID-19 and having A+ blood group was 43(20.9%), the people having A- blood group was 4(1.9%), the people having B+ blood group was 76(36.9%), the people with B- blood group was 6(2.9%), the people with O+ blood group was 58(28.2%), the people with AB+ blood group was 19(9.2%). So according to this data the most effected blood group was B+ blood group followed by O+ and A+ blood groups

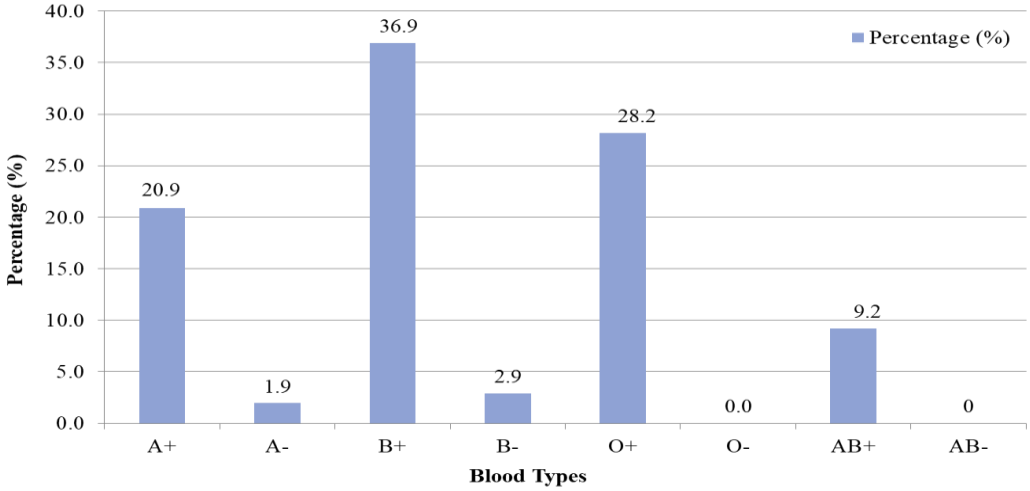

Figure 2: Distribution of COVID-19 in patients based on ABO blood group system.

COVID-19 association with other health factors

The patients were asked to answer some question related to their previous disease record. Among 206 patients 4(1.9%) patients had heart disease, 2(1.0%) had lung disease, 9(4.4%) were diabetic, 4(1.9%) had hypertension, 3(1.5%) had asthma, 2(1.0%) had obsessive-compulsive disorder, 1(0.5%) having stomach problem and 181(87.9%) people were in healthy state having no disease as shown in Table 3. According to this study most of the patients had no disease history.

Table 2: COVID-19 association with other health related problem

Diseases		
Disease	**Frequency (n=206)**	**Percentage (%)**
Heart Disease	4	1.9
Lung	2	1.0
Diabetes	9	4.4
Hypertension	4	1.9
Asthma	3	1.5
OCD	2	1.0
Stomach Problem	1	0.5
No Disease	181	87.9

Symptoms of COVID-19 experienced in current study cohort

According to the current study questionnaire design, all the included infected patients were asked to provide the symptoms they experienced throughout the infection.About 55.3% of people experienced to have symptoms of COVID-19 in first 3 days, 27.2% people observed symptoms in 5days, 11.2% people had in9days while 6.3% people experience the symptoms of COVID-19 within 14days. As per analysis most of individuals experienced symptoms very early when expose to virus as shown in figure 3. For sign and symptoms mostly experience by the COVID-19 95 of patients had fever, 38 had short breath, 20 had lack of taste, 11 had body ache, 2 had headache, 5 had cough and 7 were asymptomatic. Rest of the people having multiple symptoms in which 7 had both fever and short breath, 16 had fever and lack of taste. According to current study the most common sign and symptom experienced by the COVID patients was fever and short breath as shown in table 3. The question was asked from the patients that they have fever higher than 100.4 degrees or high. Among total 134 (65%) patients respond Yes while 72 (35%) answer was No.

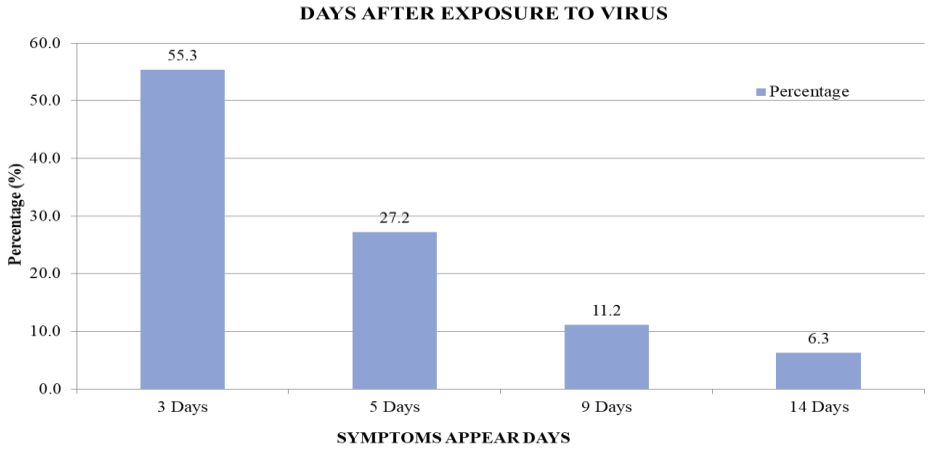

Figure 3: Symptoms appearance after exposure to Virus in current study cohort

Table 3: signs and symptoms of COVID-19 infection in current study cohort

Percentage & Frequency of S	**ymptoms**	
Symptoms	**Frequency (n=206)**	**Percentage (%)**
Fever	95	46.1
Short breath	38	18.4
Lack of Taste	20	9.7
Body ache	11	5.3
Headache	2	1.0
Cough	5	2.4
Asymptomatic	7	3.4
Multiple symptoms	28	13.7

Travel pattern of COVID-19 infected patients

The question was asked from the infected patients that before the symptom of COVID-19 start had they travel to crowded or effected area.Among 206 the answer of 160 (78%) patients was "Yes" and the answer of 46 (22%) patients was "No" as shown in Figure 4.

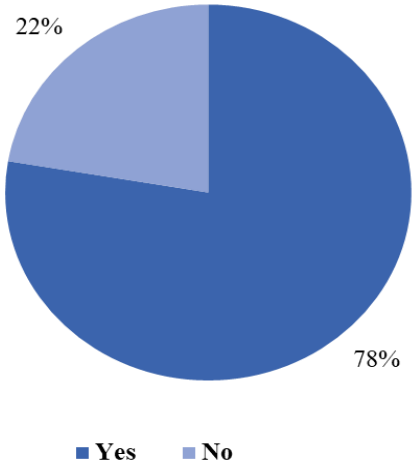

Figure 4: Travel pattern of COVID-19 infected patients in current study cohort

COVID-19 infection linked to family members

The question about how many family members of them were affected by COVID-19.Among the total, 56 respond "no member was affected", 30 respond "one member", 52 respond "two family members were affected", 43 respond "three members were affected", 13 respond "four family members were affected" as shown in Figure 5.

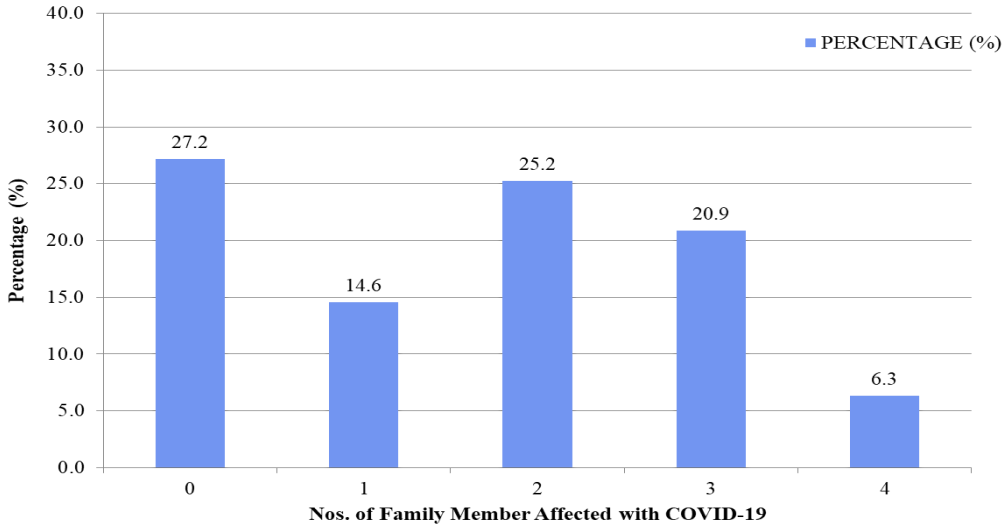

Figure 5: COVID-19 infection linked to family members in current study cohort

Dietary plan of COVID-19 infected patients in the study cohort

For dietary intake 36.9% patients took one cup of green tea per day,20.4% took two cups per day,10.7% took three cups per day,19% took four cups per day and 12.6% did not took green tea during COVID-19. Same as green tea some people took black tea in which 32.0% of people took black tea one cup per day,36.9% took two cups per day,11.7% took three cups per day, 8.7% four cups per day and 10.7% of people did not take black tea during COVID-19 as shown in Table 4.

Table 4: Frequency & Percentage of green and black tea intake

No. of Cups		1	2	3	4	0
Green Tea	**Frequency (n=206)**	76	42	22	40	26
	Percentage (%)	36.9	20.4	10.7	19.4	12.6
Black Tea	**Frequency (n=206)**	66	76	24	18	22
	Percentage (%)	32.0	36.9	11.7	8.7	10.7

Supplements intake by COVID-19 infected patients

During COVID-19 33.5% of people took vitamin C supplements,4.9% used vitamin D, 29.1% tookboth vitamin C and D, 24.8% took multivitamins or mixed vitamins and 7.8% did not used any supplements as shown in table 5. As per analysis most of the people were taking supplements to manage and recover quickly from the disease by boosting their immune response against virus.

Table 5: Percentage of Supplements intake by COVID-19 infected patients

Supplements Distribution	
Supplements Type	**Percentage (%)**
Vitamin C	33.5
Vitamin D	4.9
Vitamin C & D	29.1
Multi Vitamin	24.8
No Supplements	7.8

About fruit intake during COVID-19 patients was asked among most of them consumed apple, banana, orange, and guava. 51.9%, 9.2%, 7.8% and 1.9% respectively Table 6.

Table 6: Fruits Intake Distribution by COVID-19 infected patients

Fruit Intake Distribution	
Fruit Type	Percentage (%)
Apple	51.9
Orange	7.8
Guava	1.9
Banana	9.2

Foods related question was asked from the patients recovered from COVID-19.31% people consumed green leafy vegetables, 25% consumed routine diet, 22% consumed mixed fruits, vegetables, soups, milkshakes and dry fruits while 8% consumed dry fruits as shown in the Table 7.

Table 7: Other food Intake Distribution by COVID-19 infected patients

Food Intake Distribution		
Food Type	Frequency (n=206)	Percentage (%)
Green Leafy Vegetables	63	31
Routine Diet	52	25
Mixed Fruits, Vegetables, Soups, Milkshakes, Dry Fruits	46	22
Dry Fruits	16	8

As question was asked from recovered patients that the common cold, stuffy, runny nose, and sneezing was less common in COVID-19. The 57% answered Yes while 43% answered No. As per analysis the COVID-19 symptoms were not same as the common flu as shown in Figure 16.

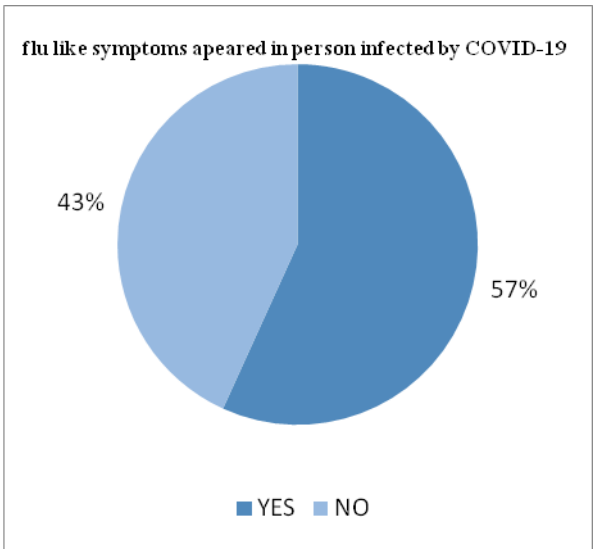

Figure 6: Common Flue versus COVID-19 in current study cohort

Most of the cases of COVID-19 were very serious some of the patients were on ventilator in which 91.3% were not on ventilator, 4.4% were for few days on ventilator, 3.4% were for few hours on ventilator while only 1% of people remain on ventilator for more than a week as shown in Table 8.

Table 8: Other food Intake Distribution by COVID-19 infected patients

Patient on ventilator		
Time	Frequency (n=206)	Percentage (%)
No ventilator	188	91.3
Few days on ventilator	9	4.4
Few hours on ventilator	7	3.4
More than a week	2	1.0

When asked about recovery time 44.2% recovers in two weeks, 23.3% recover in three weeks, 13.6% in one week while 17% recovered in four weeks as shown in Table 10. The individual was asked that after recovery from COVID-19 how do they feel, the 78% felt weakness and 22% felt normal as shown in table 9.

Table 9: Recovery Time after COVID-19in current study cohort

Recovery time	Frequency (n=206)	Percentage (%)
02 weeks	91	44.2
03 weeks	48	23.3
01 week	28	13.6
04 weeks	35	17
Asymptomatic	4	do not

Discussion

This study examined the most affected blood group and the prevalent blood group and dietary intake of COVID-19. According to this study blood group data was taken from the individuals who have recovered from COVID-19. However, in this study a significant difference was observed between blood groups the blood group B+ individuals were more affected by COVID-19 and the blood group O- and AB- were the prevalent blood groups. The COVID-19 patients with blood group A and AB are more affected by COVID-19 ascompared to the blood group O, the blood group O may be protective than other blood groups (solmaz and Arac *et al.,* 2020).

Result of disease data shows that majority were not having any disease history because of their young age. The second highest COVID Patients were having diabetes. The third group having hypertension and heart disease. As many researchers suggest that individuals having chronic medical conditions will be more susceptible to COVID-19(Zhao et al., 2020). There's a significant difference that it's not necessary that individual having a disease history will be more susceptible to corona as compared to others.

As per current data analysis, most of the people suffered from COVID-19 experienced fever, lack of taste, shortness of breath, body aches and cough. A large proportion of patient with COVID-19 presented with the common symptoms include cough, fever, musculoskeletal symptoms, gastrointestinal symptoms and dysgeusia. The current study shows that patients having COVID-19 used different supplements which include vitamin C, D, Multi vitamins. Most of the people use vitamin C and D to boost their immune system. As according to Grober and Holek several micronutrients like vitamin A, C, D and zinc are of special importance supporting both the adaptive and innate immune systems. Deficiencies in any of these micronutrients results in impair immune response and reduce the resistance to infections.

Good eating practices and healthy food choices fulfill the nutritional needs required for growth, maintenance and for proper immune functioning. As per analysis the people consume fruits in which most of the people eat apple, and some eat all type of seasonal fruits available in market. Like fruits the food they mostly used during COVID-19 was green vegetables, soups, broth but some people did not change their food choice they consume a normal routine diet when they were affected by the virus. (Ravagnani et al., 2020) says that the vitamins and minerals present in fruits and vegetables and whole grain maintain a well-functioning immune system. (Boubour et al., 2020) also suggest that the dietary habits and supplementation may be effective in improving the health status of patients with COVID-19 and other viral infections. Following a balanced diet and supplementation may play a vital role in prevention, management and treatment of COVID-19. After recovery from COVID-19 most of the people have long term weakness. According to carfi *et al.,* (2020) that the symptom that persists after recovery is weakness.

Conclusion

Male were more affected by corona as compared to female. Age group 21-30years of individuals are more affected as compared to other age groups. The most effected blood group by COVID-19 was B+ and the most prevalent blood group was O- and AB-. A large number of people have no disease and the some of the cases were diabetic, hypertensive and heart disease. Most of the people experience very early in 3days. The symptoms which were experienced by the patients were fever, short breath, lack of taste and body aches a very small number of cases were asymptomatic. Most of the patients used vitamin C and D supplements. A large number of people consume fruits the most common used fruit was apple. Most of the people used green vegetables, soups, broth, milkshakes, and some people have same routine diet as they have before the disease.

The large number of people recovers within 2weeks and after recovery most of the people experience weakness. The awareness must be given to the population about healthy eating habits. By choosing a healthy food and following a well-balanced diet any of the chronic disease can easily be manage and prevented. And supplementation must also be taken along with food to fulfill the body needs and to boost the immune system against COVID-19 and other viral infections.Studies with a larger sample size are required in order to obtain significant results.

Conflict of interest

The authors declare no conflict of interest.

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