Mutah University
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Nutrition and Food cultural beliefs in The Covid 19 Pandemic

Student Name
Hana Zahi Nassar

Supervisor
Prof. Saqer Herzallah

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Nutrition and food cultural beliefs in the COVID 19 Pandemic

والموسومة بـ:

استكمالا لمتطلبات الحصول على درجة الماجستير في علم الغذاء والتغذية

التخصص: علم الغذاء والتغذية في تاريخ 2022/08/31

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د. لمياء صالح محمد الهواري		عضوا
د. نزيه إبراهيم سليمان الخلايله		عضوا
د.مصطفى ابراهيم احمد والي	أ.د. مصطفى	عضو خارجي

عميد كلية الدراسات العليا

أ.د مخلد سليمان الطراونة

Dedication

This thesis work is dedicated to my parents, who have been a constant source of support and encouragement during the challenges of graduate school and life, they did not only raise an+d nurture me but also taxed themself dearly over the years for my education and intellectual development. my best friend Maria Halasa, my sisters Zainah and Zahra, and my brother Zaid I am truly thankful for having them in my life. This work is also dedicated to my husband, who has always loved me unconditionally and taught me to work hard for the things that I aspire to achieve. I am forever indebted to my educational supervisor and all persons who helped me to be who I am now

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List of Abbreviations

Covid-19	Coronavirus disease -19
RNA	Ribonucleic acid
ORFS	Open reading frame finder
SARS	Severe acute respiratory syndrome
MERS	Middle east respiratory syndrome
SARS-COV-2	Severe acute respiratory syndrome coronavirus 2
CDC	Center for disease control and prevention
G OR IGG	Immunoglobulin
RBD	receptor binding domain
ACE-2	Angiotensin-converting enzyme-2
RSV	Respiratory Syncytial Virus
HIV	Human immunodeficiency virus
PCR	polymerase chain reaction
RT-PCR	reverse transcription polymerase chain reaction
NAAT	Nucleic acid amplification test
LAMP	Loop-mediated isothermal amplification
IGM	Immunoglobulin
ELISA	Enzyme-Linked Immunosorbent Assay
MRNA	Messenger Ribonucleic acid
RDRP	RNA-dependent RNA polymerase of the virus
CPMA	(China international exchange and promotive association for medical and health care
GI	gastrointestinal diseases
IFNs	interferon's
NK cells	Natural Killer cells
ROS	Reactive oxygen species
WBC	White Blood Cell
TNFα	Tumor necrosis factor alpha
IL1, IL6, IL10	Interleukin 1, 6 , 10
CMA	Complementary and Alternative Medicines
HBV	Hepatitis B virus
HIV	human immunodeficiency virus
HCV	Hepatitis C virus
ADR	Average Daily Rate
IUPAC	the International Union of Pure and Applied Chemistry
PD-ACE2	peptidase domain of Angiotensin Converting Enzyme 2
FDA	Food and drug administration
IL-2	Interleukin (IL)-2
IFN-γ	Interferon-γ
IL-12	Interleukin (IL)-12
TQ	Thymoquinone
RDA	recommended daily allowance)

Th1	T helper cells type 1
Th2	T helper cells type 2
CD4	cluster of differentiation 4
CVB	infection with group B Coxsackie virus
IV	Intravenous
GR	Glycyrrhizin
GA	glycyrrhizic acid
FAO	Food and Agriculture Organization
WHO	World Health Organization
JECFA	Joint Expert Committee for Food Additives
NAIs	Neuraminidase inhibitor
SPSS	Statistical Package for the Social Sciences
ANOVA	Analysis of variance

List of herbs common and scientific names

Ginger	*Zingiber officinale*
anis	*Pimpinella anisum*
Green tea	*Camellia sinensis*
cinnamon	*Cinnamomum verum*
turmeric	*Curcuma longa*
Liquorice	*Glycyrrhiza glabra*
Black cumin seeds	*Nigella sativa*
thyme	*Thymus vulgaris*
wormwood	*Artemisia*
Yarrows	*Achillea millefolium*
Hedge mustard	*Sisymbrium officinale*
rosemary	*Rosmarinus officnalis*
Black pepper seeds	*Piper nigrum*
Common sega	*Salvia officinalis*
Costus	*Dolomiaea costus*
Sweet fennel	*Foeniculum vulgare*
felty germander	*Teucrium polium*
olive oil leaves soaked	*Olea europaea L. folium*
Mint	*Mentha*

Abstract

Nutrition and Food cultural beliefs in The Covid 19 Pandemic

Hana Zahi Nassar

Mutah University, 2022

The Corona pandemic has affected all aspects of economic, social and health life since its spread in 2019 until now, and due to the inability to reach an effective treatment for the Corona virus, societies have continued to search for an alternative treatment from food sources, herbal or nutritional supplements. This study was conducted to explore Jordanians' knowledge and beliefs about an alternative treatment that improves the immune system to prevent COVID19 infection or relieves its symptoms if a person becomes infected. an online cross-sectional study was conducted from January 2022 to May 2022. Data were collected using Google Forms Web Survey, the questionnaire was of five sections and 38 questions, to describe how are the Jordanian behaving during COVID-19 pandemic and developed beliefs about food portions, vitamins, minerals and herbs efficacy in protecting infected individual against COVID-19, and explore the main sources of the food cultural beliefs in fighting COVID-19 infections., At total of 1000 adult Jordanian individuals have participated in this study, 18 years old and above , the majority of them were female 692(69.2%), falling in age group 25-39 years . descriptive statistics were conducted to screen data to make sure free of missing and undefined values, additionally chi-square assumption were used to analyze the data. An alpha level set at 0.05 is considered statistically significant. about half of sample has used herbs / food complementary during COVID-19, approximately similar proportion of participants are preferring take herbs and food complementary over medications 645(64.5%) , 634(63.4%) to fight COVID-19,more than half of sample 542(54.2%) had a definitive answer regarding the herbs have an effect in treating diseases a similar proportion of respondents have been noted in preferences of having herbs and food complementary over medications .the most common vitamin used to protect against COVID-19 was Vitamin C 713(71.3%) followed by Vitamin D 442(44.2%), on other side the most common mineral used was Zinc 481(48.1%) followed by Iron 277(27.7%) . Regarding using Herbs using during COVID-19 pandemic, the Ginger takes the first place 452(45.2%) followed by Sega 396(39.6), Anis 383(38.3%) and Mint 380(38.0%), more than half of sample had carbohydrate, vegetables, fruits, milk products and vegetables oil between 1-2 times daily, where less than half of sample had the meat and fat between 1-2 times weekly. With 572(57.2%) of them had a fish portion between 1-2 times monthly.

الملخص

الممارسات والمعتقدات الثقافية الغذائية في ظل جائحة كوفيد 19

هناء زاهي عبد الجليل نصار

جامعة مؤتة، 2022

أثرت جائحة كورونا على جميع جوانب الحياة الاقتصادية والاجتماعية والصحية منذ انتشارها في 2019 حتى الآن، ونظراً لعدم القدرة على الوصول إلى علاج فعال لفيروس كورونا، واصلت المجتمعات البحث عن علاج بديل من المصادر الغذائية او العشبية. أجريت هذه الدراسة لاستكشاف معرفة الأردنيين حول العلاج البديل الذي يحسن جهاز المناعة للوقاية من الإصابة بعدوى كوفيد19 أو يخفف من أعراضه في حالة إصابة الشخص بالعدوى. تم إجراء دراسة مقطعية عبر الإنترنت من يناير 2022 إلى مايو 2022. تم جمع البيانات باستخدام Google Forms Web Survey، وكان الاستبيان من خمسة أقسام و 38 سؤالًا ، لوصف كيف يتصرف الأردنيون خلال جائحة **COVID-19** والمعتقدات المطورة حول فعالية الحصص الغذائية والفيتامينات والمعادن والأعشاب في حماية الفرد المصاب منCOVID-19، واستكشاف المصادر الرئيسية للمعتقدات الثقافية الغذائية في مكافحة عدوى COVID-19، شارك في هذه الدراسة 1000 فرد أردني بالغ، 18 سنة فأكثر، غالبيتهم من الإناث 692 (69.2٪)، يقعون في الفئة العمرية 25-39 سنة. تم إجراء إحصائيات وصفية لفحص البيانات للتأكد من خلوها من القيم المفقودة وغير المحددة، بالإضافة إلى استخدام افتراض مربع كاي لتحليل البيانات. يعتبر مستوى ألفا المحدد عند 0.05 ذو دلالة إحصائية. استخدم حوالي نصف العينة الأعشاب/المكملات الغذائية خلالCOVID-19، ونسبة مماثلة تقريبًا من المشاركين يفضلون تناول الأعشاب والمكملات الغذائية على الأدوية (64.5٪)، (63.4٪) لمحاربةCOVID-19، أكثر من نصف العينة 542 (54.2٪) لديها إجابة قاطعة فيما يتعلق بأن الأعشاب لها تأثير في علاج الأمراض، وقد لوحظت نسبة مماثلة من المستجيبين في تفضيل تناول الأعشاب والمكملات الغذائية على الأدوية. فيتامين ج (71.3٪) يليه فيتامين د (44.2٪)، وعلى الجانب الآخر كان المعدن الأكثر استخدامًا هو الزنك يليه الحديد فيما يتعلق باستخدام الأعشاب خلال جائحةCOVID-19، احتل الزنجبيل المركز الأول تليها الميرميه، أكثر من نصف العينة تناولت الكربوهيدرات والخضروات والفاكهة ومنتجات الألبان وزيت الخضروات ما بين 1-2 مرات يوميًا، حيث تناول أقل من نصف العينة اللحوم والدهون ما بين 1-2 مرات أسبوعياً مع 572 (57.2٪) من المستجيبين حصلوا على حصة سمك تتراوح ما بين مرة إلى مرتين شهريًا.

Chapter One
Introduction

1.1 Introduction

In the year 2019, December Covid-19 crises several patients in China, at Wuhan hospital were diagnosed with cough, fever, and headache symptoms. In addition to that, the Covid-19 infection transmission rate was noticed high with more than 5 million Covid-19 cases and 300,000 deaths (Rothan & Byrareddy 2020). COVID 19 pandemic has led most countries to impose lockdown to prevent the spread of the disease, and this led to a global economic crisis and affected all aspects of economic and social life. (Khan & Al-Balushi, 2021)

In March 2020, Jordan reported the first case of Covid-19 and the spread of the disease in the country started with limited cases at the beginning with a small transmission infection rate. The lack of proper treatment protocol and the increase in the spread of the disease raise the Population concern, which led to look for alternative treatments to prevent disease progression. The use of herbal extracts and food items to boost individual immunity and prevent the probability of infection (Salath et al., 2020).

Natural food products and herbs or herbal extracts intake found an important alternative option and playing a key role in human health and disease control. Food cultures and believes of various nations worldwide shows different patterns of diets which people believed in that foods could prevent and or treat diseases (Bayan et al., 2013). Historically, natural products were known as a method of choice in fight against many diseases and infections such as, fever, headache, diarrhea, colic, pain reliefs… etc. (Posadzki et al., 2013). Recently, using natural products as an alternate medicine are still preferred in some cases to promote the immune system and stop diseases progression (Alyami et al., 2020).

Food intake of balanced diets containing vegetables, fruits, and grains along meats and dairy products in addition to physical activity, can help in easing the complication of some Chronic diseases that need therapeutic diet and can boost the body immune system (Gombart et al., 2020; Wu et al. 2019; Rahman, Mosaddik, &Alam, 2021). The lack of information about the Jordanian in Covid-19 prevention and treatments, this study investigated the attitudes and knowledge of the Jordanian towards using foods and herbal medicine in Covid-19 pandemic.

1.2 Significance of the study and research questions

Research questions

1. What is the level of awareness that exists among the Jordanian population regarding alternative treatments to fight against the COVID-19?
2. How are the Jordanian behaving during COVID-19 pandemic and developed beliefs about food and herbs efficacy in protecting infected individual against COVID-19?
3. What are the main sources of the food cultural beliefs in fighting COVID-19 infections?

Significance of the study

Providing scientific information that supports the beliefs in using Herbs or Herb extracts as an alternate medicine to stop or limit the spread of COVID-19 among Jordanian community.

Chapter Tow
Literature Review

2.1 Virus definition, transmission and replication

Walter reed discovered the first human virus in 1901, virus is a submicroscopic infectious agent and it is very tiny it replicates only inside the living cells of an organism (Boopathi et al., 2020) . Viruses are able to infect animals, plants, microorganisms, including bacteria and archaea. (Gil et al., 2021), most scientist are accepting that viruses are not living, but a complex collection of organic matters that is able to self-replication (Moreira & López-García, 2009)

The most of viruses consist of protein shell which inside contain either DNA or RNA with enzymes for replication of their genetic materials. A virus genome is a piece or strand of genetic information usually DNA or RNA which can be single or double stranded (Gil et al., 2021),

These viruses use the molecular machines to replicate its self, because it cannot replicate themselves alone (Al Naggar et al., 2021)., it most infect some kinds of cells, viruses can infect healthy cells by using the outer coat of protein that covered in small molecular receptors, bind into the membrane of the host cell to enter and starts to replicate inside it. (Taylor, 2014).

this biological process is essential to determine which cells can the virus infect in order to force the cell either to accept its genetic material or take in the entire virus itself, then the virus begin integrate itself into the cell's DNA, the cells will then replicate its DNA and using it to manufacture proteins, this will be making copies of the viruses then these viruses spread and infect other organs in the host (Taylor, 2014).

2.1.1 Coronavirus Covid 19

Coronaviruses are a family of RNA viruses in the order of Nidoviruales, Coronaviruses are significant viral pathogens in the both of human and animals that can cause significant disease (Gu et al., 2004)

There are four classifications of coronaviruses alpha, beta, gamma and delta. alpha and beta coronaviruses can infect human. (Chen et al., 2021)

Coronaviruses is a medium size virus that envelop a non-segmented positive stranded RNA (Singh et al., 2021) in the coronaviruses themselves a very large viral RNA genome they have the one of largest RNA genome known. (Bermano et al., 2020)

Coronaviruses is a large group of viruses they consist of a core of genetic material surrounded by lipid envelop with protein spikes appearance of a crown (Devendra & Vishnu, 2021), crown in Latin is called corona and that's how these viruses get their name, Coronavirus received a name form the appearance in electron micrographs spike like

protrusions (Ali et al., 2020)

The genetic material inside coronavirus is RNA (Devendra & Vishnu, 2021) and the entire genome is almost 30 thousand bases long packed together (Boopathi et al., 2020) this base pair genome work to encode the viral proteins to about 14 Orfs (open reading frames) (Adhikari et al., 2020)

2.1.2. Sources and origin of COVID 19

Coronaviruses infect both birds and mammals (Boopathi et al., 2020) but bats are host to the largest number of viral genotypes of coronaviruses so they act more as host they don't necessarily become infected with these viruses, they become hosts to many numbers of viral genotype of coronaviruses, so their immune system able to suppress a lot of these viruses and they simply act as hosts but they can transmit these viruses to other birds and mammals (Patel et al., 2020)

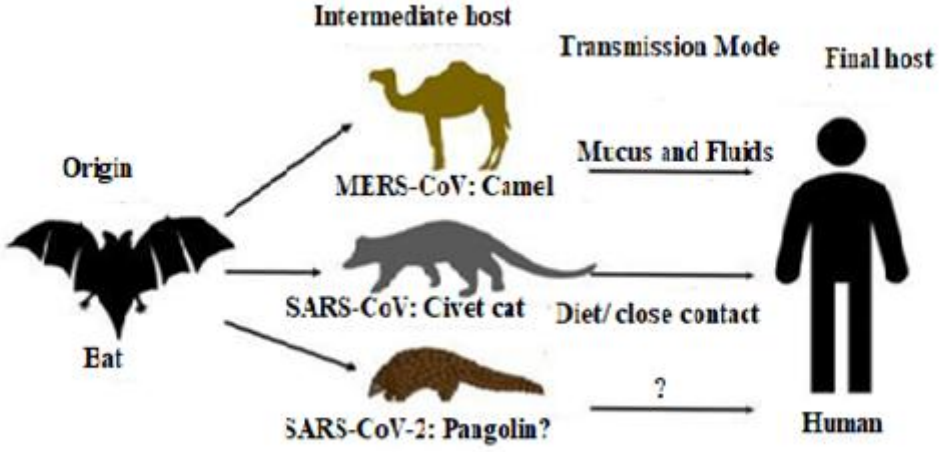

Figure 1: Covid transmission mode from animal to human (Ali et al., 2020)

It's known that corona viruses circulated in a range of animals some time these viruses can transmitted from animals to humans this is called a spillover and could be due to arrange of factors such as mutation in the viruses or increase contact between animal and humans (Ali et al., 2020)

The epidemic form coronaviruses generally occur when viruses are transmitted form one species to another and this is because the viruses can be acquired of develop mutation in protein on their envelop to allow then to bind to cells and infect other cells more easily (Ali et al., 2020)

Human coronaviruses are causes of both respiratory and gastrointestinal infections (Adhikari et al., 2020).

The recent outbreak of coronavirus :- the first one is SARS and this /occurred in the year 2001 to 2003(Boopathi et al., 2020) it started in Guangdong province of China and it is itself a beta coronavirus (Singh et al., 2021), the outbreak was

recorded as early as February and there were more than 8000 recorded total cases with a fatality rate of 10% (Patel et al., 2020) and 774

deaths in 2003(Boopathi et al., 2020) , those infected with SARS had symptoms such as fever ,cough, headache, pneumonia, and dyspnea(Devendra& Vishnu, 2021)

Another coronavirus outbreak was MERS which occurred in 2012 this started in Saudi Arabia and its quickly spread to several countries it itself is a beta coronaviruses as well and what seems to have occurred here is that the viruses was transmitted from bats to camels to human (Devendra & Vishnu, 2021) there are more than 2400 cases of MERS with 858 deaths between 2012 to 2019 (Boopathi et al., 2020) with fatality rate of approximately 34.4% until November of 2019 so high fatality rate of MERS infection(Devendra & Vishnu, 2021).those infected with MARS had symptoms such as fever ,cough, vomiting, chest pain and abdominal pain (Devendra & Vishnu, 2021)

The newest on is the 2019 novel coronavirus,SARS-COV-2 the virus that causes COVID-19, it started in Wuhan city a city of Hubei province of China(Singh et al., 2021) and it is the seventh coronaviruses found to cause illness in human, and it like SARS and MERS it is a beta coronaviruses and it has a lot of similarities to SARS(Singh et al., 2021), both of SARS-CoV-2 and SARS-CoV target alveolar epithelial cells in human(Celik et al., 2021) ,some early evidence suggesting that SARS-CoV-2 was transmitted form snakes to humans but now some evidence suggesting it more like to come from bats(Adhikari et al., 2020). there is a wet market where they keep live animal in wuhan that seemed to be the epicenter for this outbreak (Adhikari et al., 2020)

On the 30 January 2020 the World Health Organization declared the outbreak a public health emergency of international concern (Devendra & Vishnu, 2021).

SARS-COV-2 undergo to some mutations in its genome, this mutation divided to types A, B, C. Type A and C are found in europ and amrica while type B spread in asia. this type affects in mild to severe cases on upper respiratory track (Devendra & Vishnu, 2021).

2.1.3. Coronavirus symptoms and transmission

The symptoms can be range from very mild to severe, some people may not develop symptoms. the incubation period is about 2 to 7 days (Lou et al., 2020)

the symptoms start observed approximately after 5-6 days of infection (Devendra & Vishnu, 2021). The common symptoms are: difficulty breathing, cough, sore throat, fever, runny nose (Boopathi et al., 2020), chills, muscle pain and loss of taste or smell or both. some people may also experience vomiting, nausea, diarrhea, sneezing and tiredness (Devendra & Vishnu, 2021). In more severe cases there could be pneumonia, organ failure and sometimes death. (Adhikari et al., 2020)

The severity of the disease varies depending on different factors such as immunity, the health status of the patient, climatic conditions in the region and the virus itself (Al-Doori et al., 2021). WHO says that not everyone who gets covid 19 has symptoms, 80% of infections are mild or asymptomatic (Gil et al., 2021)

The recovery period from covid 19 depend on the severity of illness, if the case is mild the recovery period about 2 weeks (Adhikari et al., 2020). The incubation period is the time from exposure to the virus and development of symptoms is on average five to six days but can range from one to fourteen days ,About 80% of cases recover from the disease without needing special treatment , but there are some people who are at risk of serious illness they include older people or people with underlying medical problems such as chronic respiratory disease , obesity , diabetes , high blood pressure , heart disease or cancer need more time for recovery(Adhikari et al., 2020). COVID19 spread quickly in 194 country in different continents such as Asia , Africa , Europe , north America , middle east and Latin-American(Boopathi et al., 2020)the common ways to transmission of COVID-19 involves fecal-oral route, or by contact with person that infected with COVID19 (Devendra & Vishnu, 2021).The covid 19 spreads mainly between people in close contact with each other(Adhikari et al., 2020) , its spreads most easily in crowded settings , closed spaces with poor ventilation or through prolong contact with an infected person(Ali et al., 2020). The disease spread from person to person through liquid particles of various sizes are expelled to the air the larger particles are called droplets and smaller particles are called aerosols when an infected person releases those droplets through coughing talking or sneezing for example when you close to another person(Ali et al., 2020) it can also spread when infected droplet land on objects and when another person touches them and touches their eyes, nose or mouth (Adhikari et al., 2020). The preventing of transmission of the virus include covering the mouth and nose when coughing or sneezing with a flexed elbow or tissue and throwing the tissue in a closed bin immediately after use(Ali et al., 2020) , washing hands regularly with soap and water or by alcohol based hand rub , the appropriate use of masks and personal protective equipment especially in health settings , disinfecting frequently touched objects and surfaces (Khedmat, 2020) , maintaining at least one meter distance from people (“Corona Virus - Herbal Approach for Boosting Immunity and Influencing Viral Activity,” 2020), open a windows to improve ventilation , and get a vaccine (Paudyal et al., 2021). In some areas governments have implemented specific physical and social distancing measures to prevent the spread of the outbreak, it’s important to follow their advice, vaccines to prevent COVID 19 are currently used and under development and scientist around the world are working hard to make this happen The CDC says that

the best way to prevent illness is to avoid being exposed to these viruses, the agency recommended that people take every preventive action to help prevent the spread of respiratory disease (Ali et al., 2020). to identify who has immune response against the coronavirus it's important to detect an antibody called immunoglobulin G or IgG. (Jacofsky et al., 2020))

People who have been infected by the coronavirus produce distinct IgG antibodies regardless of whether have symptoms or not IgG antibodies bind to the surface of the coronavirus which has four types of viral structural proteins: spike proteins, envelop proteins, membrane proteins and nucleocapsid proteins (Adhikari et al., 2020). These structural proteins act as a cage that coats the genome to facilitate its entry into cells through special receptors (Adhikari et al., 2020).

The spike proteins is the major surface protein that the coronavirus uses to enter human cells(Singh et al., 2021) , RBD (receptor binding domain) of the spike protein binds strongly to a protein on the surface of human cells called angiotensin converting enzyme 2 or ACE 2 (Singh et al., 2021),Angiotensin-converting enzyme-2 (ACE-2) is molecule present on a surface of the cells lining the small respiratory tract and intestinal epithelium(Devendra & Vishnu, 2021), ACE2 is the entry receptor act as door knob to the human cell like those found on the lungs cells . (Boopathi et al., 2020)

Once the viral membrane fuses with human cell membrane by linking between N-protein and single strand RNA of the virus, the genome of the virus enters the cell and begins infection then convert the human cell to virus's factory. virus's replication occurs by covering the viral RNA genome by N- protein (Boopathi et al., 2020)

Due to the urgent need currently to develop treatment for SARS-COV-2 that saves cost and time needed to develop drugs , the WHO gives the authorization to doctors to conduct tests on a group of different drugs proposed to have effects in SARS-COV-2 treatment like some medicines that have been used to treat malaria ,sunburn and arthritis , which contain chloroquine and hydroxychloroquine , they are similar effect on the virus therefore they are suggested to be as a treatment to fight COVID19 (Boopathi et al., 2020), hydroxychloroquine considered as less toxic and more powerful than chloroquine, some experiment that were conducted in France and China confirmed the evidence of the effectiveness in fighting against COVID-19 (Devendra & Vishnu, 2021).

Also, remdesivir is considered one of the drugs that have antiviral effects, and currently it and chloroquine drugs have been used as a treatment for Covid 19, but the effectiveness of both is still under study and research (Celik et al., 2021). Ritonavir and lopinavir have been used alongside the suiTable interferons for Covid 19 treatment, after both ritonavir and lopinavir were commonly used as treatment for HIV. ribavirin

has been commonly used as a treatment for SARS, MERS and RSV and there is a possibility that it may be able to treat COVID-19 due to its antiviral activity (Celik et al., 2021).

2.1.4. Coronavirus tests and vaccines

There are three types of covid 19 tests: antigen tests, antibodies tests, and RT-PCR.

RT-PCR test: this test identifies the virus based on its genetic finger print, the sample taken from nasal cavity, throat or saliva to looking for virus's component in the sample. for high accuracy result is preferred to take the sample from nasopharynx, where it's the upper part of the throat behind the nose. Or for more accurate result, swab can be taken from nasal cavity and throat together (Devendra& Vishnu, 2021). This test can be called by several other names, including molecular test, NAAT test, viral test and LAMP test. this test looks for genetic material of the virus inside the human body (*Coronavirus Disease 2019 Testing Basics*, 2020U-10)

PCR test is the gold standard diagnostic test (Abdullah Alotiby & Naif Al-Harbi, 2021), the main disadvantages for this test, that it needs a special equipment, more expensive test, and require longer time but it is more sensitive for the use in COVID-19 diagnose (Deeks et al., 2020). The time required to obtain the result of the Molecular test varies according to the place of examination, some laboratories can give you the result within one day, and others range from one day to less than a week depending on the place of the examination (*Coronavirus Disease 2019 Testing Basics*, 2020U-10). Antigen test: An antigen test looks for a specific protein found in the virus inside the human body، both antigen test and molecular test are used to detect an active infection with the Coronavirus (*Coronavirus Disease 2019 Testing Basics*, 2020U-10), like a pregnancy test, you can do it at home, its fast only need about 15-30 minute and less expensive , but it is less sensitive because it give a positive result only in high concentration of the virus inside your body so only if the person is near the peak of the infection , this lead to an error in results and you maybe have an infection but the test says you don’t have the virus, this called the false negative result , the rate of false negative for this test is high, that's why you have to do another accurate tests such as molecular test. on the other hand, the positive result is highly accurate. (Deeks et al., 2020),

Antibodies test also called serological test, detect the antibodies that produced as a response to the infection, the result of this examination appear within 20 minutes. this examination carried out by blood draw or finger stick to detect antibodies (IgM and IgG) using ELISA tests (Devendra& Vishnu, 2021).

the positive result proves that the person has been exposed to the virus and can’t detect if there is an active infection or not, due to the presence of

antibodies that stay in the body for weeks or months after recovery. This means that this test cannot used to diagnose an active infection (*Coronavirus Disease 2019 Testing Basics*, 2020U-10)

Based on what was previously mentioned, the most accurate and sensitive testing method for the SARS-COV-2 is the molecular test, several reasons may affect on RT-PCR test sensitivity including:

1. contamination of an uninfected sample with an infected one
2. The materials used to conduct the test did not work well
3. The sample was not kept at an adequate temperature after taking it (*Coronavirus Disease 2019 Testing Basics*, 2020U-10)
4. sampling procedure, the taken swab can't catch the virus (Abdullah Alotiby & Naif Al-Harbi, 2021)
5. Based on the recommendations of the seventh edition of the COVID-19 Guidelines for the use of antibody testing as a supportive tool for RT-PCR testing in the diagnosis of COVID-19. (Abdullah Alotiby & Naif Al-Harbi, 2021)

2.2. Immune system

The function of innate and adaptive immune system is to protect against the attack of pathogens and cleaning the body form dead cells, and also to maintain the internal balance against different types of microorganisms (Moraes-Pinto et al., 2021). Pathogen means viruses, bacteria, fungi, parasites, worms, dust, and toxic chemicals (Tina Suksmasari, 2015). The immune system able to protect the host form pathogen by enhancing communication between cells and enhancing nerve signals with regulation mechanisms in host body to avoid any unwanted immune response. (Viana et al., 2021)

2.2.1. Immune system definition

The innate immune system can be defined as a system consisting of series of non-specialized biological process that contains phagocytic cells and proteins and its component are preserved. if the host attacked by pathogens this system works to identify the molecular pattern of the pathogen and work to remove it by phagocytosis, in addition to the presence of vital mediators called cytokines which activate the processes of cells destruction for cells that infected in the host and limit the spread of infection (Viana et al., 2021)

The role of adaptive immunity is protecting the host from pathogens in the event of attack to the same structural characteristics of previous pathogen that have been exposed (Viana et al., 2021). The first line of defenses (innate or non-specific defense system) is The physical and biochemical barriers include the internal surface and external surface of the body (skin, mucous membrane, and body hair), the mucous membrane like

the lining nose or GI tract that keep pathogens from getting inside the human body. The physical barriers can eliminate the forging substances the elimination occurs by producing fluids consist of chemicals like saliva, gastric acids, sweat, bile, and mucous that moves the foreign material out of the body by sneezing or coughing, some of these fluids have enzymes, antimicrobials and acids which able to destroy or inhibit the microorganism growth (Maggini, 2008).

If the pathogen or foreign molecules passes the physical barriers the second line of defenses (non-specific) will activate. This line of defenses includes phagocytes, substance in serum work as antimicrobial called interferon's (IFNs), and natural Keller cells (NK cells) that have roles in the process of inflammation (Gombart et al., 2020). When the pathogen passes the antimicrobial defenses the NK cells attack the cells whose plasma cell membrane is abnormal and kill them with cytotoxins. Then the microbe inside the infected cell that was killed is released and destroyed through phagocytosis by macrophages and neutrophils (Maggini, 2008). Phagocytosis consists of several steps; the first step is the phagocyte cells migration into areas that are infected and adhering the microbes. the second step is the digestion of microbes and producing ROS in the respiratory burst. A final step is a group of antimicrobial proteins and peptides, digestive enzymes, and oxidants work together to kill the microbe by phagosome (Gombart et al., 2020). The inflammatory response removes the microbes and other foreign materials from the site of infection and prevents the spread of infection to other tissues. the fever is one of the factors that inhibit the growth of some types of microbes in addition to the presence of mast cells (Gombart et al., 2020). The mast cells are filled with a substance that works with the allergic response and inflammatory response, one substance that these cells contain is histamine, histamine dilate or widen the blood vessels near the injury that makes it easier for many types of WBC to reach the area of injury e.g., macrophage cells are able to consume the pathogens (Gombart et al., 2020).

The third line of defenses (the specific line) that divided into adaptive immunity and self-destruct, the two bases of adaptive response is cell-mediated and humoral (Antibody-mediated) (Gombart et al., 2020)

Adaptive immunity: the process of defends against certain invading agents, which stimulate again by antigens, and this process is slow .the lymphocytes (T and B cells) development occur in the red bone marrow and mature in the same place (B cells) or in thymus (T cells) (Gombart et al., 2020)

Before the body begins to synthesize antibodies to a specific antigen (that is, before the first exposure), the number of lymphocytes that can identify it is small, and then differentiation and proliferation take place for that are able to recognize the same antigen (Maggini, 2008).

The mediation of adaptive immunity by B and T cells: effector cells which include (plasma cells, active cytotoxic T cells, and active Th cells) after completing the immune response these cells die, and memory cells (memory B cells, memory cytotoxic T cells, and memory Th cells) (Gombart et al., 2020), these cells have long term of lifespans to help in the activation of the immune system much faster in case of exposure to the same antigen in the future(Tina Suksmasari, 2015).
In cell-mediated response T cells kill host cells that appear on the surface of their outer membrane foreign antigens or stimulate other immune cells in the body to kill pathogens (Gombart et al., 2020)

In humoral response, B cells have the ability to make antibodies .antibody is a protein that has Y shape and it has antigen binding area that binds with specific antigen antibodies very specific, which specific antibody bind with specific antigen and can deactivate the pathogen by affecting the pathogen to move, reproduce or cause harm, this binding like a sign to tell the macrophage here is the pathogen, so the activation of B cells causes the formation of antibodies (Gombart et al., 2020) both humoral and cell-mediated are memory cells, this memory is important and this is also where vaccine comes in, vaccine can introduce in either inactivated or weakened pathogens, and the body has memory for a response if the pathogen is ever encountered in the future. (Gombart et al., 2020)

2.2.2. Immune system response and cytokine storm

A cytokine storm is a condition that occurs when infected with different types of infections, specifically viral infections, where the levels of cytokines in their bodies increase from the normal limit, and this condition is accompanied by a severe deterioration in their health status (Abdullah Alotiby & Naif Al-Harbi, 2021) such e.g., as bleeding, sudden hypotension and organ failure due to overexpression of particular cytokines such as tumor necrosis factor-α (TNFα), interleukin-1(IL1), IL6, IL10 (Celik et al., 2021)

2.3. Treatment and people beliefs

Complementary and Alternative Medicines (CAM) has been used as a treatment in different societies and civilizations throughout history, it includes a group of practices such as herbal medicine, relaxation exercises and yoga as part of the health care system, the 70% CAM spread to treat health problems in low and middle-income societies due to its low cost compared to medicines. (Paudyal et al., 2021)

It is noticeable nowadays that peoples are searching for information about alternative products such as herbs, herbal extracts and nutritional supplements due to the lack of access to the appropriate

pharmacotherapeutic for Covid 19 until now. The focus of health workers, especially pharmacists, has also increased on knowing which nutritional supplements work to enhance immunity and relieve symptoms of covid19. (Paudyal et al., 2021)

There is not enough scientific evidence about the information circulated about alternative medicine on social media, as most people believe that these products will protect them from disease when they start using them (Abdullah Alotiby & Naif Al-Harbi, 2021). Despite the health benefits of herbs on human health, it can lead to serious health problems such as herbal medicine interaction, a condition that occurs as a result of the interaction between herbs and natural products with active ingredients in some medicines. The most suspecTable people to this condition are the elderly and those with chronic diseases. (Posadzki et al., 2013).

Scientific evidence stated that natural products are able to enhance the immunity of individuals(by inhibiting the replication of the virus, preventing its spread, preventing its entry into the cells of the body, thus destroying the nucleotide of the viruses(Celik et al., 2021)) and maintain or improve their health condition as long as they are taken in the correct manner, but they are not considered able to prevent infections or being a definitive treatment for diseases(Abdullah Alotiby & Naif Al-Harbi, 2021)

this study will focus on herbs and food that have antiviral properties and it was used for therapeutic purposes, that can help in the invention of the proper medicine (Adhikari et al., 2020)

Scientists began the journey of producing and developing antiviral drugs in 1963 to treat influenza, HBV, HIV, HCV and other viruses, and they faced many problems during the development of treatments, such as increasing the antiviral drugs resistance (ADR), and this led to additional work on drugs, their composition and reformulation, and the study of the side effects of the materials used. in manufacturing, which increases its cost. Therefore, herbs and their extracts have become used as an alternative treatment for antiviral drugs. Herbs have proven their ability in inhibition the reproduction of viruses (Adhikari et al., 2020).

2.4. Alternative treatment, components and immune system

Alternative treatments such as herbs contain compounds with therapeutic properties that have an anti-viral effect as they act on the proteins of viruses (Al-Doori et al., 2021).

2.4.1 Turmeric *(Curcuma longa)*

Or as the International Union of Pure and Applied Chemistry (IUPAC) named it (1,7-bis (4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione). It is a molecule that has two parts, one hydrophilic and the other hydrophobic, the hydrophobic part is a piece of lipophilic methane

surrounding the polar center. (Al-Doori et al., 2021)

The original growing areas of turmeric are India and Southeast Asia, and it is classified in the ginger family (Singh et al., 2021)., It is a rhizome that has a yellow color (Figure 2) and has been known as one of the spices since ancient times in the world (Celik et al., 2021). It has multiple uses, whether therapeutic as it was known in the Greek civilization ("Corona Virus - Herbal Approach for Boosting Immunity and Influencing Viral Activity," 2020), as a kind of spice, dye, and cosmetics (Vaughn et al., 2016).

Figure 2: Turmeric (Curcuma longa) rhizome and powder

The first process of turmeric components separation done in 1910, the active ingredient of turmeric is Curcumin (diferuloylmethane) (Vaughn et al., 2016).

The main component of civilization (turmeric are hexahydrocrucumin , crucumin and dihydrocrucumin , and it contains other volatile substances such as zingiberine, alpha-phellandrene, borneol and other sesquiterpenes ("Corona Virus - Herbal Approach for Boosting Immunity and Influencing Viral Activity," 2020).

The common ways to use turmeric are either to use it in the form of a powder or by extracting it by boiling, and it can be taken in the form of capsules too. ("Corona Virus - Herbal Approach for Boosting Immunity and Influencing Viral Activity," 2020).

Curcuma longa fights against different types of pathogenic bacteria such as: helicobacter pylori, streptococcus, staphylococcus, vibrio cholera and bacillus subtilis. it has been widely used for its many medical benefits. Scientific evidence has proven this by means of research conducted on it and confirmed its effective role as an antioxidant, anti-bacterial, anti-cancer ("Corona Virus - Herbal Approach for Boosting Immunity and Influencing Viral Activity," 2020), and its important roles in immune modulation and improving mental functions (Vaughn et al., 2016).

It also has important roles in lowering blood lipid levels in diabetics, especially type II DM and those with cardiovascular diseases. It is also

effective as a safe treatment for depression disorders and some skin problems (Vaughn et al., 2016).

It has been observed that turmeric has activity against viruses such as hepatitis, SARS-CoV, dengue fever viruses, influenza, HIV and other viruses. Turmeric also works by blocking receptors that lead to infection such: spike glycoprotein RBD, SARS-CoV-2 protease, and PD-ACE2 receptors (Singh et al., 2021).

The recommended daily dose of turmeric is about 1-3 g ("Corona Virus - Herbal Approach for Boosting Immunity and Influencing Viral Activity," 2020), but reports have proven that even if the dose reaches 8 g per day for three months, it has no side effects (Singh et al., 2021), which makes turmeric a preferred alternative to using medicines, it has been classified as safe nutrients by FDA(Celik et al., 2021) , but one of its problems is the poor bioavailability of turmeric (Vaughn et al., 2016).

2.4.2 Nigella sativa (N. sativa)

The black seed or the nigella seed or Habbah Al-Sauda (Figure 3) in Arabic has many different names among different civilizations due to its presence in different parts of the world .It has been widely used in ancient times to treat patients with diabetes, asthma, high blood pressure, influenza and other health problems, N. sativa is an herbal plant whose main component is Thymoquinone (TQ) (Rahman, Mosaddik, &Alam, 2021).

Recent studies have indicated that TQ has effects in improving the immune response and enhancing humoral immunity, which helps in the process of getting rid of the virus early before it spreads. Also, TQ has proven effective in fighting both hepatitis C and bird flu (Rahman, Mosaddik, &Alam, 2021).

Nigella sativa seed oil also has a role in treating symptoms caused by COVID-19 congestion, fever, headache and shortness of breath (Sami et al., 2021).

Figure 3: Black cumin (*Nigella sativa*) plant and seeds

2.4.3 Ginger *(Zingiber officinale)*

The scientific name for ginger roots is *Zingiber officinale* (Figure 4) and it is classified under the Zingiberaceae family. The original home of Zingiber officinale is the southeastern regions of Asia (Singh et al., 2021).

roots of the ginger plant are widely used for food and natural medicine purposes around the world (Singh et al., 2021). studies found that ginger is rich in bioactive compounds and antioxidants that can reduce oxidative damage and provide many positive health benefits for the human body (Singh et al., 2021)

Figure 4: Ginger (*Zingiber officinale)* roots and flowering plant

This is especially true for those who are willing to incorporate ginger into their diet daily. one of the important benefits of ginger is reducing inflammation because it is packed with antioxidants and anti-inflammatory properties (Singh et al., 2021). studies found that ginger maybe help in treating certain types of inflammatory conditions such as osteoarthritis (Jafarzadeh et al., 2021)

Researchers found that the properties of ginger can help reduce the production of certain chemical compounds in our bodies that lead to inflammation such as leukotrienes (Jafarzadeh et al., 2021)

another benefit that we need to talk about it that ginger can enhance brain cognition. Some scientist believe that gingers anti-inflammatory effects may promote blood flow to the brain, which can help enhance cognitive functioning and improve ability to focus and ginger can improve blood sugar levels by facilitate the movement of glucose into our muscle without as high of insulin response and ginger can lowering cholesterol levels and reducing the possibility of CVDs and lowering risk of certain types of cancer (Abolaji et al., 2017).

we should also mention that ginger helps treat chronic indigestion after eating certain types of food. ginger have phenolic compounds if it is

used in regular protein, after one month your body could experience fewer gastric contraction that drive acid back into the esophagus. in addition to that previously mentioned anti-inflammatory properties ginger can boost immune system by its ability to help reduce inflammation mean to your immune system can continue functioning at an optimal level. this can potentially make it easier for your immune cells to protect your body form the viruses and bacteria that are found in our body every day. (Jafarzadeh et al., 2021)

2.4.4 Cinnamon (*Cinnamomum verum*)

Cinnamon is classified under the family Lauraceae .(Yakhchali et al., 2021) Cinnamon was widely used in various civilizations as a spice, and due to its health benefits, it was used to treat toothache, flatulence, high fever, diarrhea, menopause and other health problems (Singh et al., 2021).

Cinnamon, according to popular opinion, is useful in corona illness, just as it is in traditional treatment for lung ailments. Cinnamon, also known as genuine cinnamon, Ceylon cinnamon, and Darchini (Yakhchali et al., 2021).

Figure 5: Cinnamon (*Cinnamomum verum*) Dried strips, powder, flower and cinnamon tree

Cinnamon has been used for over 4000 years its referenced through Egyptian history. cinnamon has an amazing ability to preserve things and help heal the body and guard the body against dangerous bacteria and pathogens and even aging (Rahman, Mosaddik, & Alam, 2021).

The primary components of Cinnamon and its essential oil are cinnamaldehyde, β -caryophyllene, linalool, and eugenol. Cinnamon also contains essential components such as methyl cinnamate, and procyanidin-A, cinnamyl acetate.

Many studies show that cinnamon is useful therapeutic herb have antimicrobial, antiviral, antioxidant (Alizadeh Behbahani et al., 2020),

gastroprotective, antidiabetic, and immunomodulatory effects (Singh et al., 2021). also, it has anti-fungal, antihyperlipidemia, antihypertensive, and anti-Atherosclerotic properties (Yakhchali et al., 2021). cinnamon also used to prevent fungal growth, lowering high blood pressure and inhibiting the growth of tumors (Singh et al., 2021).

The one of uses of cinnamon is to heal skin because it has an antimicrobial property. also, cinnamon has been shown to be very beneficial for diabetes (Yakhchali et al., 2021). Also, cinnamon can help with weight loss (Yakhchali et al., 2021)

2.4.5 Licorice roots(*Glycyrrhiza glabra)*

Licorice was used therapeutically 4000 years ago for its ease of cultivation and for its therapeutic properties. It was used as treatments for a variety of diseases such as digestive disorders, respiratory and lung diseases, and cardiovascular diseases. The most important compound in the roots of licorice is Glycyrrhiza glabra (G.glabra) and its metabolites. (Fiore et al., 2005)

Attention has been focused during the COVID-19 pandemic on glycyrrhizic acid (Ga) or glycyrrhizin (GR) for its antimicrobial, anticancer, analgesic, antioxidant, and thrombin-inhibiting properties. (Diomede et al., 2021)

Licorice root (Figure 5) can be consumed either as it is or in the form of extracts, and an upper limit of the daily intake of GR has been set at 100 mg by The Joint FAO/WHO Expert Committee on Food Additives (JECFA) and has been described as safe and does not cause health damage in adults. (Diomede et al., 2021)

Figure 6: Licorice root and plant flower (***Glycyrrhiza glabra)***

2.4.6. Black pepper (*Piper nigrum)*

Black pepper is considered as "king of spices" in every kitchen in the world. it contains bioactive compounds, which have health beneficial and disease preventing properties such as antiviral, anti-inflammatory, immune, antipyretic, bioavailability and enhancing qualities (Rahman, Mosaddik, & Alam, 2021). Chinese herbal treatment includes mixing a group of herbs by a person who specializes in herbal treatment and has sufficient knowledge in each type of herbs and their benefits, the herbs that will be used are determined based on the patient health condition. This type of treatments was used to speed up the recovery process when infected with COVID-19 and to reduce the virus spread speed. Results that proved the success of Chinese herbal treatment were reached on 24 January of 2020, this success of treatments opened up areas for many studies in the fields of herbs and their impact on Covid 19. But despite this, there are still some questions about the efficiency of Chinese herbal treatment in treating Covid 19 (Al-Doori et al., 2021).

Herbal extracts such as polyphenols, saponins, flavonoids, proanthocyanins, and others have antiviral effects. The antiviral effect is obtained through interaction with haemagglutinin, as this interaction prevents the virus from entering cells (Adhikari et al., 2020).

Neuraminidase is a glycoprotein primarily responsible for the amplification of viruses by spreading infection. NAIs inhibit the enzyme neuraminidase, which prevents infected cells from spreading viruses to other uninfected cells. For example, the influenza virus, polyphenols reduce it (Adhikari et al., 2020).

Herbs showed effective therapeutic properties during the previous two pandemics, SARS and MERS, as their extracts were used in the manufacture of medicines with inhibitory effects on viruses such as influenza virus and dengue fever (Adhikari et al., 2020).

2.4.7 Honey

Historically, Honey has been used as a food source and medicine. In the Muslims holy book, "The Quran", honey mentioned in preventing a lot of diseases. It has a long history in the treatment of viral flu. (Cruz et al., 2019)

The main component of honey is sugar in which fructose and glucose. In addition to organic acid e.g., gluconic acid, and amino acids e.g., proline, which leads to various activities of honey (Cruz et al., 2019). Honey is a natural immune-stimulator for the human body. (Rahman, Mosaddik, & Alam, 2021).

2.4.8 Garlic

Garlic one of the most famous herbal treatments to be used in human history (Mehrbod et al., 2009, p. 21). Based on recommendations from Ancient Indian and Chinese medicine that garlic to aid digestion and respiration and treating leprosy and parasitic infestation. Garlic played an important role in treating different diseases in the medieval period (Bayan et al., 2013).

It has widespread usages as antiviral supplements in different parts of the world due to its a prophylactic and therapeutic properties. Garlic is the main source of organosulfur compounds, especially ajoene, allicin, quercetin and diallyltrisulfidewhich boost immunity (Rahman, Mosaddik, & Alam, 2021).

Previous studies prove that garlic extracts showed antiviral activity against rhinovirus, HIV, cytomegalovirus, herpes simplex virus, rotavirus and viral pneumonia (Rahman, Mosaddik, & Alam, 2021).

in addition to useful compounds in garlic which can used in treating of arthritis, toothache, constipation, parasitic infestation, chronic cough, snake and insect bites, gynecologic diseases, and as antibiotic in infectious diseases (Bayan et al., 2013).

2.5 vitamins and minerals

2.5.1. Vitamins

2.5.1.1. Vitamin C

Vitamin c is a water-soluble vitamin, vitamin c has antioxidant effects that is important in overall immune health (Arshad et al., 2020)

Vitamin c are also important for iron absorption and being deficient in iron can make you more possible to infections in general. but the RDA of vitamin c for adult from diet and supplement is 75 – 120 mg, this dose easy to get it from your diet also it found in kiwi, orange, papaya, guava. other good source of vitamin c is green vegetables such as spinach, bell peppers, broccoli and cauliflower in addition to eggplant, beetroots and mushrooms (Arshad et al., 2020).

Vitamin c is a universal antimicrobial that includes antiviruses, it had a lot of effects but we will focus here on antiviral effect of vitamin c. ascorbic acid has a lot of physiological functions, some of them are related to COVID-19. some active properties of vitamin c as antioxidant, antithrombotic, anti-inflammatory and immunomodulatory functions.in addition to vitamin c role in synthesis of vasopressin and norepinephrine, and roles in functioning of leukocyte and platelet, completeness of epithelial cell and endothelial cells and its integrity (Carr & Rowe, 2020). Epithelial cells represent as the first line to protect from attacks against any pathogen, vitamin c can enhance this epithelial barrier, it can be taken in high dose orally to keep the normal functioning of WBC'S specifically

leucocytes and boost activity of NK cells (Abobaker et al., 2020)

Vitamin C has important roles in collagen synthesis in epithelial tissue and lipid synthesis, proliferation and migration of fibroblast, free radical cause damage in the cell membrane, and vitamin C help in protecting cells membrane during metabolism and in case of exposure to toxins or pollutant (Gombart et al., 2020)

Many studies found that there is a large series of animal studies that has concluded that vit c play roles in preventing, shortening, and eliminating diverse viral infections, reports emerging that vitamin c has similar effect in humans, some studies show that taking 500 mg of vitamin C twice a day (Ministry of health Hashemite kingdom of Jordan).

The new reports shows that vitamin c alleviate and shorten the common cold flu and pneumonia, taking a moderate intake of vit c can possibly reduce the duration of the cold and possibly prevent a cold especially in high-risk group but it must be taken before the symptoms start (Bae & Kim, 2020).

Also, ascorbic acid has antioxidant effect on epithelial cells of lungs and protect from septic shock or any life-threatening conditions resulting from inflammation caused by pathogens (Arshad et al., 2020). Vitamin C can be administered at the same time with potential medications to treatment in acute conditions. (Nilashi et al., 2020)

2.5.1.2. Vitamin D

Vitamin D is a fat-soluble vitamin, the body stores the fat-soluble vitamins in the body more than water soluble vitamins, this is significant because storing in the body mean more potential for toxicity effects. (Meltzer et al., 2020)

The main source of vitamin D is sunlight, our body normally make vitamin D when we exposed to sunlight, vitamin D located under the skin in its inactive form then it converts to the active form or obtained orally from food supplements or food in the form of D3 Then it is converted in the liver to 25(OH)D and then in the kidneys to calcitriol (Arshad et al., 2020,) in winter we don't get enough sunlight to make enough vitamin D, but people who live in warmer climate are in exception, so if we don't get enough sunlight in winter months that's mean we have to get enough vitamin D from other sources, and if we don't do that, we will have low vitamin D levels. the recent studies show that Insufficient exposure to sunlight or low levels of vitamin D in humans have an inverse relationship with the mortality rate of Covid 19 (Bae & Kim, 2020)

Treatment with vitamin D has been suggested as a potential strategy for preventing or treating COVID-19. Treatment with vitamin D has been shown to reduce some viral respiratory infections, particularly in people

who are vitamin D deficient. Vitamin D deficiency are common among people with darker skin or less sun exposure, such as people who live in higher latitudes during the winter, and healthcare staff. (Meltzer et al., 2020)

Vitamin D roles is to regulate calcium levels and is important for bone and muscle health, is also play role in regulation our immune system, it doesn't exactly affect viruses its actually effect on the way of our immune system Handel infection such as viruses. As a result, enough vitamin D may help to prevent coronavirus infection by improving physical barriers (through controlling the development of proteins for adherens junctions, tight junctions, and gap junctions, all of which can be damaged by pathogens such as viruses) and increasing innate immune system by antiviral peptide synthesis (for example Cathelicidin and defensins, exhibit antibacterial properties against a variety of microbes) in the lung epithelium. (Bae & Kim, 2020)

In COVID-19 patients, vitamin D may help prevent cytokine storms (Ali, 2020). COVID-19 can cause cytokine storms and immunogenic endothelial and alveolar membrane damage, which may contribute to COVID-19 mortality. (Bae & Kim, 2020) Helper T cell responses are modulated by vitamin D. It suppresses T helper type 1 (Th1) immune responses while increasing Th2 responses (Ali, 2020). The study shows that there is a significant association between low level of vitamin D and developing in respiratory infection (Ali, 2020).

2.5.1.3. Vitamin B Complex

Due to the important roles that both vitamins C and D play and their role in improving immunity, they have been focused on during the covid19 pandemic as one of the strategies used for prevention and treatment. The importance of vitamin B, which is no less important than the previously mentioned vitamins for their important roles in energy metabolism, cells perform their functions and improve the immune response (Shakoor et al., 2021)

B vitamins build and regulate a healthy immune system, regulate immune response by down regulating proinflammatory cytokine and inflammation, enhances respiratory function, avoids hypercoagulability, preserves endothelium integrity, and can shorten hospital stays. there is a theory that this would be helpful with covid-19, because many of the complication from the infection is from excessive inflammation or that called cytokine storm (Shakoor et al., 2021).

B Vitamins include (B1 also known thiamine, B2 also known riboflavin, B3 also known niacin, B5 also known pantothenic acid, B6 also known pyridoxine, B9 also known folic acid and B12 also known cobalamin) (Shakoor et al., 2021). Thiamine insufficiency has been linked

to increased inflammation, and abnormal antibody responses. Because antibodies, particularly T-cells, are essential to eliminate the SARS-CoV-2 virus, deficiency of thiamin may result in improper antibody responses. (Shakoor et al., 2021)

2.5.2. Minerals:

2.5.2.1. Zinc and Zn-metalloenzyme

The most abundant mineral in the human body is iron, followed by zinc, due to its different roles in the human body that will be mentioned in this study. (Joachimiak, 2021) zinc is an essential mineral that acts as a cofactor, structural element and send signals to molecules (Skalny et al., 2020) both types of immune system require zinc (adaptive and innate immunity) (Arshad et al., 2020), low zinc status has been correlated with an increase susceptivity to infection with covid19 especially in developing countries zinc supplementation can reverse these adverse effects (Joachimiak, 2021). this occur because zinc have a different role in our immune system and work as antioxidant stabilizing membrane, zinc deficiency depresses the immune system function (Pal et al., 2020) on the other hand, Zn work as participant in the reproduction of NK cells, macrophages, neutrophils, and T and B lymphocytes in addition to some immune functions like production of cytokines (Karim et al., 2021)

zinc has been one of the most popular suggestions for helping with symptoms of cold and even COVID-19, Zinc has also been suggested as an effective immune booster for the treatment of swine flu (Skalny et al., 2020) Through studies that were conducted on people with Covid 19, it was noted that their zinc levels are lower than healthy individuals, and this increases the likelihood of complications more than five times (Joachimiak, 2021)

2.5.2.2. Copper and Cu metalloprotein

Copper (Cu) is a micronutrient necessary for almost all living cells that involved in healthy human bioprocess linked to an enzyme as a prosthetic group (Cu-metalloenzyme) and used as antimicrobial by Roman and Egyptian civilization (Morrison, 2020; Gaetke et al. 2014). During Covid 19 pandemic copper surfaces used to reduce infection and taken as one of the infection controls processes (Besold et al.2016) and considered in protecting and keeping immune system working effectively against Covid 19 (Percival, 1988; National Academies of Sciences, 2020).

2.5.2.3. Selenium

Selenium is a rare element that plays a vital role in diverse aspects of human physiology (Dumont et al., 2006). Although Selenium deficiency is uncommon, there is sufficient evidences that Se status in sub optimal

state in a significant percentage of the world's population. Among the foods with a high content of selenium are marine organisms such as fish and shellfish, most foods' Se content is determined by the level of Se in the soil; this geographical variance is influence in the Se status of various human populations (Bermano et al., 2020).

A study conducted in Germany demonstrated that there is a correlation between selenium levels and the recovery rates of those infected with Covid 19. deficiency of selenium increases the viral infection progress and may lead to organ failure and damage to body tissues (Bae & Kim, 2020)

The results of experiments conducted on mice showed that mice that did not have sufficient levels of selenium suffered from severe lung diseases when they were infected with influenza, compared to the other group that had sufficient levels of selenium, and this indicates the importance of the selenium element in activating the immune system and producing sufficient quantities of antibodies (Nelson et al., 2001)

the research of Keshan disease, a myocardiopathy related to heart failure and death in the people in China, provided the first indication that maybe there is a relationship between Se status and human opportunity to infect with viral infection .in disease-endemic areas the Se level in food and drinking water was low. The use of Se-containing fertilizers in the soil, and oral nutritional supplement, resulted in a significant decrease in the prevalence of the disease's acute phase (Loscalzo, 2014).

in addition, two studies show that low Se levels reduce the number of CD4 T cells and increase disease progression and death rates in infected patient with HIV (Bermano et al., 2020).

In conclusion, there is significant evidence that low Se level affects the innate and adaptive immune responses to a variety of RNA viruses in living organisms, low levels of Se lead to more severe symptoms of disease. Low Se status also contributes to the production of mutations (Broome et al., 2004) and enhanced virulence in CVB and IV infections. The critical role of Se and selenoproteins is responsible for the control of redox homeostasis, inflammatory response and stress response (Bermano et al., 2020).

2.5.3. Metalloprotein

2.5.3.1. Ferritin and Lactoferrin

Although the majority of COVID-19 patients have only minor symptoms of infection in the upper respiratory tract without pneumonia, a significant number of patients develop a serious condition or even die. recent studies were found that those infected with Covid 19 have increased levels of ferritin in the blood, and the level of ferritin in the blood circulation increases during viral infection. (Cheng et al., 2020)

Lactoferrin (Lf) is a pleiotropic glycoprotein of innate immunity exhibit concurrent respond against iron homeostasis disorders and inflammatory produced both viral and bacterial infection(Rosa et al., 2017) as will as on SARS-CoV-2 (Salaris, et al., 2021).

Chapter Three
Methodology

3.1. Study design and participants

An online cross-sectional survey through questionnaire prepared and distributed to participants in the period between January and may 2022. The questionnaire checked for validity by three expert researchers, whereas the reliability using *Cronbach's alpha* was completed and found to be 0.72 which indicate that questioner is reliable. The participants responses of the volunteers collected and analyzed using SSPS software ver 22.0.

3.2 Study population

Questionnaire circulated to individual of age >18 years old of both sexes male and female. The sample size calculated on 95 % confidence level of Z-score 1.96 and confidence interval of 3% and the population number based on 2020 department of statistics number of about 10806000. Therefore, the number of participants calculated to be > 1000.

3.3Questionnaire

The survey was designed to be circulated through emails, social media such as WhatsApp, Facebook, Instagram, twitter, snapchat and others then it is sent back to the researcher. The questionnaire involve social and demographic information in the first section, in the second section a question group about the history of chronic diseases at respondents and whether the respondents were infected or previously infected with the COVID 19 then followed by a group of questions if they use some of herbs and alternative treatments and their beliefs regarding it and the extent of their belief in their preventive role to avoid infection and its role in improving immunity in case of infection.an example of response are shown in appendix I.

3.4 Statistical Analysis:

Data reduced using SPSS software, version 22 (IBM Corp, Armonk, NY, USA). Continuous variables reported as mean (± standard deviation), while categorical variables presented as frequencies and percentages. descriptive statistics were conducted to screen data to make sure free of missing and undefined values, additionally chi-square assumption in term of expected cell more than 5 was checked and the fisher exact test was conducted as alternative test in case of chi- square assumption violation.

Chapter Four
Results and Discussion

4.1. Results

This study aimed to identify the level of awareness that exists among the Jordanian population regarding alternative treatments to fight against the COVID-19, describe how are the Jordanian behaving during COVID-19 pandemic and developed beliefs about food portions, vitamins, minerals and herbs efficacy in protecting infected individual against COVID-19, and explore the main sources of the food cultural beliefs in fighting COVID-19 infections.

Before running inferential statistics, descriptive statistics were conducted to screen data to make sure free of missing and undefined values, additionally chi-square assumption in term of expected cell more than 5 was checked and the fisher exact test was conducted as alternative test in case of chi- square assumption violation.

4.1.1 Socio-demographics characteristics

At total of 1000 adult Jordanian individuals have participated in this study, the majority of them were female 692(69.2%), falling in age group 25-39 years old 378(37.8%), the majority of sample are living in middle rejoin of Jordan 683(68.3%), having bachelor degree 727(72.7%), about half of participants are married 502(50.2%) moreover 402 (40.2%) of them having a non-medical job with 408(40.8%) of them have diagnosed with corona virus and the cardio-respiratory disorders were the dominant chronic diseases found in the sample 81(8.1%) and 105(10.5%) respectively. Table 1 summarize the study socio-demographics details.

Table 1 :
Study's socio-demographics characteristics[1]

Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	308	30.8
	Female	692	69.2
Age	18-24years	336	33.6
	25-39years	378	37.8
	40-59years	248	24.8
	60and above	38	3.8
Place of living	North region	167	16.7
	Middle region	683	68.3
	South region	150	15.0
Educational level	Diploma and less	145	14.5
	Bachelor	727	72.7
	Higher degree	128	12.8
Marital status	Single	453	45.3
	Married	502	50.2

	Divorced	25	2.5
	Widowed	20	2.0
Occupation status	Student	197	19.7
	Employee	402	40.2
	Medical employee	64	6.4
	No job	337	33.7
Had diagnosed with COVID-19	Yes	408	40.8
	No	538	53.8
	I don't know	54	5.4
Chronic diseases	No chronic diseases	722	72.2
	Cardiac	81	8.1
	Respiratory	105	10.5
	GI disease (gastrointestinal diseases)	75	7.5
	Secretory	47	4.7
	Renal	7	0.7
	Cancer	4	0.4
	Diabetes mellitus	66	6.6

[1]Values in the tables indicates number of participants or percentages, all values in the tables represent just itself

4.1.2 What is the level of awareness that exists among the Jordanian population regarding alternative treatments to fight against the COVID-19.

To measure the Jordanian population awareness level regarding alternative treatments to fight against COVID-19. Several questions have been asked to explore their frequency or demand on alternative treatments to fight against COVID-19 and the result in Table (2) showed that about half of sample has used herbs / food complementary during COVID-19, approximately similar proportion of participants are preferring take herbs and food complementary over medications 645(64.5%) , 634(63.4%) to fight COVID-19, while the participants' responses were fluctuated regarding if the herbs have more effect than vaccines the results have shown that nearly 71.2% answered no and I don't know ,on other side about more than half of sample 542(54.2%) had a definitive answer regarding the herbs have an effect in treating diseases and the majority of respondents evaluate their awareness level regarding alternative treatments to fight COVID-19.as a moderate 598(59.8%).

Table 2:
Participants' responses toward alternative treatments to fight COVID-19[1]

Variables	Category	Frequency	Percentage
Have you used herbs / complementary during COVID-19.	Yes	502	50.2
	No	498	49.8
Do you prefer take herbs over medications	Yes	645	64.5
	No	355	35.5
Do you prefer take food complementary over medications	Yes	634	63.4
	No	366	36.6
Do you think the herbs have more effect than vaccines	Yes	288	28.8
	No	358	35.8
	I don't know	354	35.4
Do you think the herbs have an effect in treating diseases	Yes	542	54.2
	No	239	23.9
	I don't know	219	21.9
Your awareness level regarding alternative treatment	High	80	8.0
	Moderate	598	59.8
	Low	269	26.9
	I don't know anything	53	5.3

[1]Values in the tables indicates number of participants or percentages, all values in the tables represent just itself

Since a similar proportion of respondents have been noted in preferences of having herbs and food complementary over medications, chi-square of independence was used to find if there an association between having herbs and food complementary over medications according to participant's gender, age and ever exposed to COVID-19. The result in Table 3 have shown that female participants' significantly have a higher proportion of taking food complementary over medications than male (65.8% vs58.1%), *p=0.021*,while no significant association was found with taking herbs over medications, additionally no significant association was detected between participants' age ,ever exposed to COVID-19 with using herbs and food over medications.

Table 3:
association between participants' characteristic and using herbs and food complementary over medications[1]

Variables		Taking herbs over medications		Taking food complementary over medications	
		Yes N(%)	No N(%)	Yes N(%)	No N(%)
Gender	Male	190 (61.7)	118 (38.3)	197 (58.1)	129(41.9)
	Female	455(65.8)	237(34.2)	455(65.8)	237(34.2)
	(X^2) p-value	*(1.537) 0.215*		*(5.354) 0.021*	
Age	18-24 years	213(63.4)	123(36.6)	219(65.2)	117(34.8)
	25-39 years	246(65.1)	132(34.9)	243(64.3)	135(35.7)
	40-59 years	160(64.5)	88(35.5)	151(60.9)	97(39.1)

	≥60 years	26(68.4)	12(31.6)	21(55.3)	17(44.7)
	(X^2) p-value	*(0.490) 0.921*		*(2.345) 0.504*	
Exposed to COVID-19	Yes	258(63.2)	150(36.8)	255(62.5)	153(37.5)
	No	348(64.7)	190(35.3%)	344(63.9)	194(36.1)
	I don't know	39(72.2)	15(27.8)	35(64.8)	19(35.2)
	(X^2) p-value	*(1.699) 0.428*		*(0.257) 0.880*	

[1] Values in the tables indicates number of participants or percentages, all values in the tables represent just itself

4.1.3 How are the Jordanian behaving during COVID-19 pandemic and developed beliefs about food portions, vitamins, minerals and herbs efficacy in protecting infected individual against COVID-19?

The respondents' have asked about their behavior in terms of using food portions, vitamins ,minerals and herbs during COVID-19pandemic ,the frequency of using these portions reflect their behavior and the results in Table 4 the most common vitamin used to protect against COVID-19 was Vitamin C 713(71.3%) followed by Vitamin D 442(44.2%),while around 189(18.9%) never used vitamins during COVID-19 pandemic, on other side the most common mineral used was Zinc 481(48.1%) followed by Iron 277(27.7%) while 210(21.0%) of sample never used minerals during COVID-19 pandemic.

Regarding Herbs using during COVID-19 pandemic, the Ginger takes the first place 452(45.2%) followed by Sega 396(39.6), Anis 383(38.3%) and Mint 380(38.0%), while low percentage of sample has used Licorice16(1.6%) and Hedge Mustard10 (1.0%). Additionally, the study results have shown more than half of sample had carbohydrate, vegetables, fruits, milk products and vegetables oil between 1-2 times daily, where less than half of sample had the meat and fat between 1-2 times weekly. With 572(57.2%) of them had a fish portion between 1-2times monthly.

Table 4 :

Participants' behavior of using vitamins, minerals, food portions, and herbs during COVID-19 pandemic[1]

Vitamins	**Frequency (%)**	**Herbs**	**Frequency (%)**	**Herbs**	**Frequency (%)**
Vitamin E	33(3.3)	Ginger *(Zingiber officinale*)	452(45.2)	Hedge Mustard (*Sisymbrium officinale)*	10(1.0)
Vitamin D	442(44.2)	Anis *(Pimpinella anisum*)	383(38.3)	Rosmary *(Rosmarinus officnalis)*	185(18.5)
Vitamin C	713(71.3)	Green tea (*Camellia sinensis)*	278(27.8)	Black pepper ***(Piper nigrum)***	75(7.5)
Vitamin B9	90(9.0)	Mint (*Mentha)*	380(38.0)	Sega (*Salvia officinalis)*	396(39.6)
Vitamin B12	246(24.6)	Cinnamon (*Cinnamomum verum*)	325(32.5)	**Food Portions**	
Vitamin B6	77(7.7)	Turmeric***(Curcuma longa)***	159(15.9)	Carbohydrate /daily	585(58.5)

Vitamin A	88(8.8)	Licorice (***Glycyrrhiza glabra)***	16(1.6)	Vegetables /daily	550(55.0)
Never used	189(18.9)	Sweet Fennel *(Foeniculum vulgare)*	108(108)	Fruits/daily	535(53.5)
Minerals		felty germander *(Teucrium polium)*	61(6.1)	Milk products/daily	524(52.4)
Magnesium	106(10.6)	Costus(*Dolomiaea costus)*	52(5.2)	Vegetables oil/daily	508(50.8)
Copper	21(2.1)	Yarrows (*Achillea millefolium)*	21(2.1)	Red Meat/weekly	424(42.4)
Selenium	17(1.7)	Black cumin (*Nigella sativa*)	107(10.7)	White Meat/ weekly	361(36.1)
Iron	277(27.7)	Thyme (*Thymus vulgaris)*	281(28.1)	Fat /weekly	215(21.5)
Zinc	481(48.1)	wormwood *(Artemisia*)	63(6.3)	Fish/ monthly	572(57.2)
Never used	210(21.0)				

[1]Values in the tables indicates number of participants or percentages, all values in the tables represent just itself

Furthermore the study tried to find if there is an association between participants' age and gender with frequent of taking herbs, vitamins, minerals and food portions, the significant associations factors were reported only and the Chi-square results in Table 5 showed that the male participants are significantly have a higher proportions of taking Anis than female participants during COVID-19 pandemic $p<0.001$. In contrary the female participants are significantly have a higher proportions of taking Mint , Sweet Fennel ,Turmeric and Black pepper than male participants. $p<0.05$ for all. Moreover participants' age has correlated as well and the result have shown that the older people (>60years) are significantly having a Ginger , Cinnamon and Turmeric during COVID-19 pandemic than other age groups $p<0.05$ for all , while the middle age group (40-59 years) are significantly having Licorice and Black cumin seeds during COVID-19 pandemic than other age groups $p=0.033$ .p<0.007 respectively , finally those in age (25-39years) were prefer having more Mint than other age groups. $p=0.021$. Regarding having vitamins and minerals during COVID-19 pandemic the result in Table (6) have shown that female participants are significantly having a higher proportions of taking vitamin B9, vitamin C, vitamin D and Iron than male participants. $p<0.05$ for all. Beside to this association the older people (>60years) are significantly having a vitamin B9 and vitamin B12 during COVID-19 pandemic than other age groups. $p<0.001$, $p=0.047$ respectively, However the middle age group (40-59 years) are significantly having a Zinc during COVID-19 pandemic than other age groups $p=0.010$ and those in youth age group (18-24years) were prefer having more Iron than other age groups .$p<0.001$.

In terms of food portions, the results of chi-square test in Table (7) have found that the female participants are still showing a significant higher proportions of taking fruits, and vegetables oil on daily bases and white meat on weekly basses during COVID-19 pandemic than male

participants p<*0.05* for all, in contrary the male participants are significantly have higher proportions of taking red meat on weekly basses and fish on monthly basses than female p=0.008 and p=*0.001*, respectively.

Beside to this association, the age group (25-39 & 40-59 years) are significantly a higher proportion of taking carbohydrates on daily bases than other age groups *p=0.006.* Moreover, the age group (45-59years) tend to have more white meat on weekly bases higher than other age groups *p=0.004* and finally the older people (≥60 years) tends to have red meat on weekly bases and yogurts products on daily bases higher than other age groups *p=0.049* and *p=0.019*, respectively.

Table 5:

Association between participants' characteristic and using herbs during COVID-19[1]

Herbs	Response	Gender		Herbs		Age groups/years			
		Male n(%)	Female n(%)			18-24 n(%)	25-39 n(%)	40-59 n(%)	≥60 n(%)
Anis	Yes	79(25.6)	304(4.9)	**Ginger**	Yes	128(38.1)	182(48.1)	118(47.6)	24(63.2)
	No	229(74.4)	388(43.9)		No	208(61.9)	196(51.9(	130(52.4)	14(36.8)
	(X^2) p-value	*(30.143) p<0.001*			*(X^2) p-value*		*(13.689),p=0.003*		
Mint	Yes	100(32.5)	280(40.5)	**Mint**	Yes	133(39.6)	159(42.1)	78(31.5)	10(6.3)
	No	208(67.5)	412(40.5)		No	203(60.4)	219(57.9)	170(68.5)	28(73.7)
	(X^2) p-value	*(5.782),p=0.016*			*(X^2) p-value*		*(9.723) ,p=0.021*		
Sweet Fennel	Yes	20(6.5)	88(12.7)	**Cinnamon**	Yes	105(31.3)	121(32.0)	77(31.0)	22(57.9)
	No	288(93.5)	604(87.3)		No	231(68.8)	257(68.0)	171(69.0)	16(42.1)
	(X^2) p-value	*(8.568) ,p=0.003*			*(X^2) p-value*		*(11.690),p=0.009*		

(Cont. Table 5)

Herbs	Response	Gender		Herbs	Response	Age (Year)			
		Male	Female			18-24	25-39	40-59	>60
Turmeric	Yes	37(12.0)	122(17.6)	**Turmeric**	Yes	29(8.6)	69(18.3)	52(21.0)	9(23.7)
	No	271(88.0)	570(82.4)		No	307(91.4)	309(81.7)	196(79.0)	29(76.3)
	(X^2) p-value	*(5.029) ,p=0.025*			*(X^2) p-value*		*(21.328) ,p<0.001*		
Black pepper	Yes	12(3.9)	63(9.1)	**Licorice**	Yes	0(0.0)	8(2.1)	7(2.8)	1(2.6)
	No	296(96.1)	629(90.9)		No	336(100)	370(97.9)	241(97.2)	37(97.4)
	(X^2) p-value	*(8.333),p=0.004*			*(X^2) p-value*		*(8.715) ,p=0.033*		
				Black cumin seeds	Yes	21(6.3)	44(11.6)	37(14.9)	5(13.2)
					No	315(93.8)	334(88.4)	211(85.1)	33(86.8)
					(X^2) p-value		*(12.174) ,p=0.007*		

1Values in the tables indicates number of participants or percentages, all values in the tables represent just itself

Table 6:
Association between participants' characteristic and using vitamins and minerals during COVID-19[1]

Vitamins and minerals		Gender		Vitamins and minerals		Age groups/years			
		Male n(%)	**Female n(%)**			**18-24 n(%)**	**25-39 n(%)**	**40-59 n(%)**	**≥60 n(%)**
Vitamin B9	Yes	18(5.8)	72(10.4)	Vitamin B9	Yes	26(7.7)	47(12.4)	10(4.0)	7(18.4)
	No	290(94.2)	620(89.6)		No	310(92.3)	331(87.6)	238(96.0)	31(81.6)
	(X^2) p-value	*(5.412),p=0.020*			*(X^2) p-value*		*(17.686),p<0.001*		
Vitamin C	Yes	205(66.6)	508(73.4)	Vitamin B12	Yes	73(21.7)	93(24.6)	64(25.8)	16(42.)
	No	103(33.4)	184(26.6)		No	263(78.3)	285(75.4)	184(74.2)	22(57.9)
	(X^2) p-value	*(4.890),p=0.027*			*(X^2) p-value*		*(7.969),p=0.047*		
Vitamin D	Yes	108(35.1)	334(48.3)	Zinc	Yes	138(41.1)	188(49.7)	135(54.4)	20(52.6)
	No	200(64.9)	358(51.7)		No	198(58.9)	190(50.3)	113(45.6)	18(47.4)
	(X^2) p-value	*(15.060),p<0.001*			*(X^2) p-value*		*(11.354),p=0.010*		
Iron	Yes	42(13.6)	235(34.0)	Iron	Yes	120(35.7)	101(26.7)	44(17.7)	12(31.6)
	No	266(86.4)	457(66.0)		No	216(64.3)	277(73.3)	204(82.3)	26(68.4)
	(X^2) p-value	*(15.060),p<0.001*			*(X^2) p-value*		*(23.522),p<0.001*		

[1]Values in the tables indicates number of participants or percentages, all values in the tables represent just itself

Table 7:
Association between participants' characteristic and food portions during COVID-191

Food portions		Gender		Food portions		Age groups/years			
		Male n(%)	**Female n(%)**			**18-24 n(%)**	**25-39 n(%)**	**40-59 n(%)**	**≥60 n(%)**
Fruits	Never	9(2.9)	18(2.8)	Carbohydrate	Never	11(3.3)	7(1.9)	2(0.8)	4(10.5)
	Daily	179(58.1)	465(67.2)		Daily	272(81.0)	318(84.1)	209(84.3)	27(71.1)
	Weekly	55(17.9)	109(15.8)		Weekly	32(9.5)	20(5.3)	19(7.7)	2(5.3)
	Monthly	65(21.1)	100(14.5)		Monthly	21(6.3)	33(8.7)	18(7.3)	5(13.2)
	(X^2) p-value	*(9.104),p=0.028*			*(X^2) p-value*		*(23.135),p=0.006*		
Red Meat	Never	14(4.5)	77(11.1)	Red Meat	Never	41(12.2)	35(9.3)	14(5.6)	1(2.6)
	Daily	70(22.7)	132(19.1)		Daily	66(19.6)	77(20.4)	47(19.0)	12(31.6)
	Weekly	135(43.8)	89(41.8)		Weekly	139(41.4)	157(41.5)	108(43.5)	20(52.6)
	Monthly	89(28.9)	194(28.0)		Monthly	90(26.8)	109(28.8)	79(31.9)	5(13.2)
	(X^2) p-value	*(11.824),p=0.008*			*(X^2) p-value*			*(16.912),p=0.049*	
White Meat	Never	4(1.3)	37(5.3)	White Meat	Never	22(6.5)	14(3.7)	4(1.6)	1(2.6)
	Daily	**106(34.4)**	**200(28.9)**		**Daily**	**107(31.8)**	**119(31.5)**	**64(25.8)**	**16(42.1)**
	Weekly	101(32.8)	260(37.6)		Weekly	119(35.4)	119(31.5)	109(44.0)	14(36.8)
	Monthly	97(31.5)	195(28.2)		Monthly	88(26.2)	126(33.3)	71(28.6)	7(18.4)
	(X^2) p-value	*(12.787),p=0.005*			*(X^2) p-value*		*(24.079),p=0.004*		
Fish	Never	37(12.0)	152(22.0)	Yogurts products	Never	27(8.0)	15(4.0)	10(4.0)	4(10.5)
	Daily	31(10.1)	46(6.6)		Daily	206(61.3)	228(60.3)	144(58.1)	26(68.4)
	Weekly	41(13.3)	96(13.9)		Weekly	58(17.3)	74(19.6)	41(16.5)	7(18.4)
	Monthly	199(64.6)	398(57.5)		Monthly	45(13.4)	61(16.5)	53(21.4)	1(2.6)
	(X^2) p-value	*(16.249),p=0.001*			*(X^2) p-value*		*(19.839)p=0.019*		
vegetables oil	Never	26(8.4)	32(4.6)						
	Daily	164(53.2)	441(63.7)						
	Weekly	49(15.9)	100(14.5)						
	Monthly	69(22.4)	119(17.2)						
	(X^2) p-value	*(12.602),p=0.006*							

The survey has included several questions regarding other foods to measure if the participants increase their taking of them during COVID-19 pandemic and the result in figure (1) shows that approximately half of study sample used an onion and Garlic as other foods to fight COVID-19 virus and the low percentage of them used Mushroom11.0%, additionally in this survey the participants asked about if using the vinegar and the Garlic with Lemon can protect the body from COVID-19 virus, surprisingly the participants' responses were closer to what has obtained in Figure 7 with 19.3% and 51.6% think that using vinegar and Garlic with lemon can protect human body from during COVID-19 virus respectively.

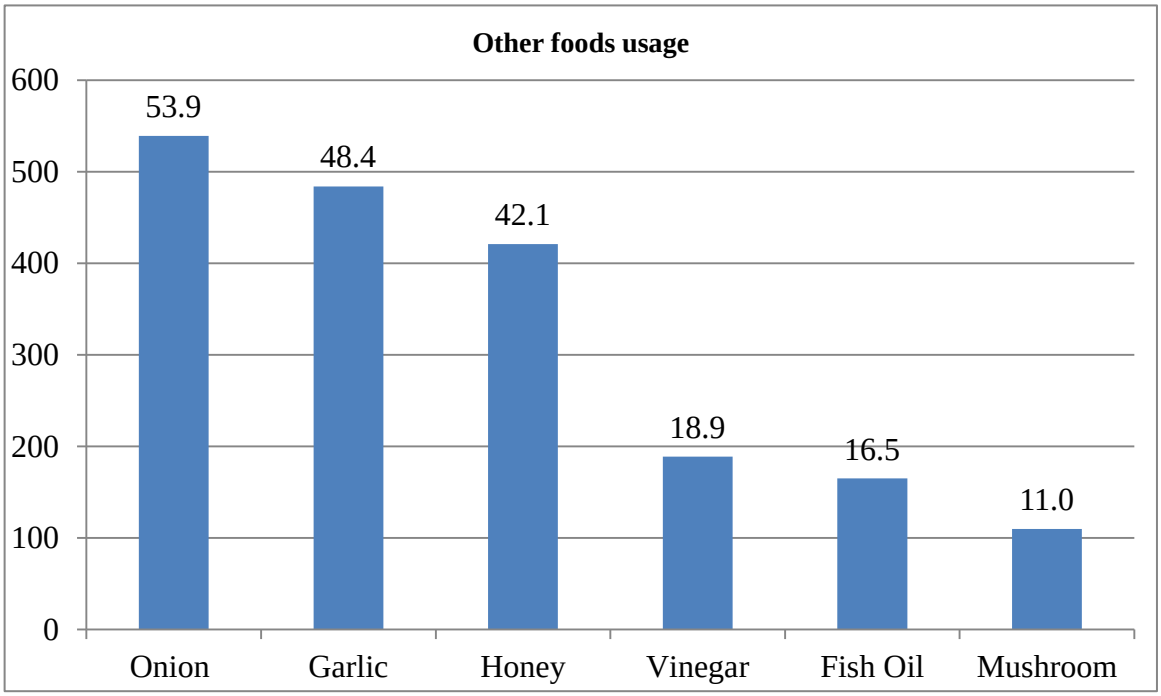

Figure 7: Participants' responses regarding other foods usage

4.1.4 what are the main sources of the food cultural beliefs in fighting COVID-19 infections?

Several questions have been asked in the survey to capture the source of food cultural beliefs regarding fighting COVID-19 infections, as long as the percipient is allowable to choice more than one source, a multiple response analysis was conducted and the results in Figure 7 showed that (68.5%) of cases obtained their foods beliefs from social media, followed by (56.4%) from visual media while the low percentage of responses represented by scientific forums (12.3%).

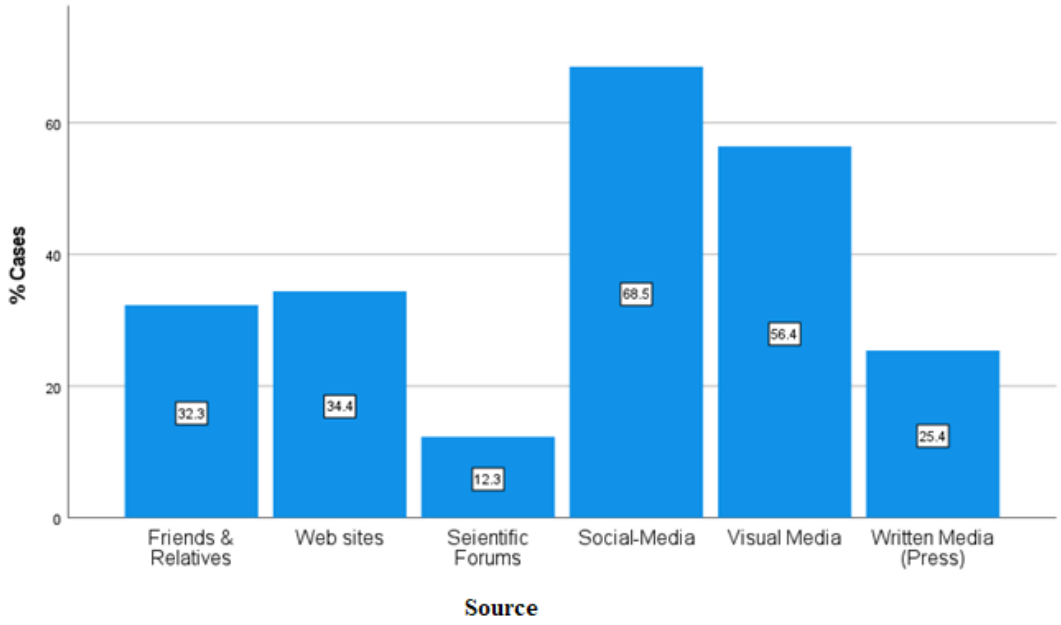

Figure 8: Main sources of the food cultural beliefs

4.2. Discussion

This study was conducted on Jordanian population form different age groups , males and females , From different Jordanian governorates ,and it included different social statuses and educational levels to reveal the level of awareness among Jordanian population about alternative treatments to treat SARS-COV-2 patient and to alleviate the symptoms in case of infection , to show how Jordanian population behave during COVID-19 pandamic ,the changes occurred in their intake of nutritional supplements of vitamins and minerals and the food portions that they were eating, the sources of information that Jordanians turn to for information about the Corona virus , and what are the herbs and foods that Jordanians believe have had an effective role in treating the corona virus?

The results of the research found that females are more likely to answer the questionnaire than males, and the most participating ages range between 25-39 years, about 50% of the participant was married, and more than half of the sample lives in the capital city of Jordan (Amman), 72.2% of participants have bachelor's degree

In view of the rapid spread of Covid 19 around the world and severity of its complications in addition to its impact on all aspects of health, social and economic life, and inability to reach an effective treatment for the virus, the World Health Organization has publish the prevention measures that can mitigate the spread of the epidemic from sterilizing hands and wearing the masks And social distancing, and the general public , in turn, began to search for foods that could improve immunity and relieve symptoms facing Covid-19 patients. It also included the tendency to use nutritional supplements that were part of the treatment, such as vitamin C

and vitamin D, and others went to the use of herbs as an alternative treatment as a means to raise immunity, as many herbs have been commonly used as a medical treatment since ancient times or even as a kind of spice that is added on our daily dishes and meals

According to the study that we conducted 50.2 of the study participants used herbs and nutritional supplements during the Corona pandemic, and the percentage of people who preferred to take herbs and nutritional supplements over taking medicines was about 64.5 and 63.4, respectively, meaning that the percentages were close , Another study conducted in the Kingdom of Saudi Arabia on age groups over 18 years, the number of participants who used natural products from herbs and others during the Corona pandemic was 997 participants out of 1054 people participating in the study, which represents 92.7% of the total number of participants from the study. Use natural products during the corona pandemic (Abdullah Alotiby & Naif Al-Harbi, 2021)

This was also demonstrated through a study conducted on a group of countries from the Middle East (Jordan, the United Arab Emirates, Lebanon, Palestine and the Kingdom of Saudi Arabia), and 46.6% of the participants in the research had used nutritional supplements during the Covid 19 pandemic, where the percentage of herbal intake varies from country to another according to its beliefs (Mukattash et al., 2022). A study conducted in 2017 in Jordan proved the prevalence of herbal consumption among Jordanians, about 80% of the Jordanian pubulation were use herbs as a treatment for diseases (El-Dahiyat et al., 2020). Through the study, it was noted that females prefer to use nutritional supplements over medicines compared to males.The percentage of participants who took vitamin C was 77.3%, which is the most used vitamin during the covid19 pandemic, followed by vitamin D, whose use was 44.2% of the participants. on other side the most common mineral used was Zinc 48.1%.

In the study that Khasawneh et al. (2022) conducted on Jordanians about their use of nutritional supplements during the Corona pandemic, the percentage of participants who believed that vitamin C and vitamin D had a role in preventing infection with Covid 19 was 69.1% and 57%, respectively, and as for zinc, about half of the participants They believed that there is a role of zinc in the prevention of Covid 19, and they constituted 48.8% of the total number of participants.

This is also corroborated by a study conducted at the University of Science and Technology and Zarqa University on over-the-counter nutritional supplements, and vitamin C, vitamin D and zinc were the most recommended over-the-counter nutritional supplements during the COVID-19 pandemic (Al-Shatnawi et al., 2022).

But the efficacy of both vitamin C and zinc requires more in-depth studies on their role in the prevention of Covid 19, as some studies have

shown that taking high doses of vitamin C or zinc has not proven effective in relieving the symptoms of corona compared to standard treatment (Al-Shatnawi et al., 2022).

In our study regarding Herbs using during COVID-19 pandemic, the Ginger takes the first place 452(45.2%) followed by Sega 396(39.6), Anis 383(38.3%) and Mint 380(38.0%) there is previous studies that report that ginger, honey, black seeds, garlic and lemons, ginger can help in strengthen human the immune system in general, not just linked to the COVID-19 infection (Abdullah Alotiby & Naif Al-Harbi, 2021). In another study that focused on health care providers, the participants focused on vitamins C and D, zinc and foods such as onions, garlic and ginger. (Al-Shatnawi et al., 2022). In the research from (Mukattash et al., 2022) it was mentioned that 37. 4% of the participants believe that honey is able to prevent the corona virus, as well as garlic, as 29.4% of the participants believe that garlic has similar roles as well.

In this research the participants' responses were fluctuated regarding if the herbs have more effect than vaccines the results have shown that nearly 71.2% answered no and I don't know. This is also what other studies have found, more than half of the respondents had conflicting opinions regarding the role of vaccination in preventing corona virus. When we ask the participants about where they take information about foods that can fight covid 19 about 68.5% of cases obtained their foods beliefs from social media, followed by (56.4%) from visual media while the low percentage of responses represented by scientific forums (12.3%).This is also what was observed in research from (Abdullah Alotiby & Naif Al-Harbi, 2021; Othman et al., 2022)almost all participant (98.9%) gained information about COVID-19 through social media and about (91.5%) from television media.

4.3 Recommendations.

1. Based on the results of this research, which was conducted on the Jordanian population, the researcher suggests the following recommendations to be considered and followed in pandemics such as Covid-19:
2. . Taking nutritional supplements such as vitamin C, D and zinc due to their ability to raise immunity and thus prevent various diseases and infections.
3. . Using diverse food sources throughout the day from carbohydrates and protein sources from meat, fish, vegetables, fruits and animal fats in moderate quantities and within the appropriate nutritional need for the individual.
4. . The use of different types of herbs due to their roles in raising immunity, taking into account taking them within the permissible

quantities to avoid herbal interactions

5. If you are taking any type of medication, you should consult your doctor before using any type of herbal medicine

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Appendices

APPENDIX I
Examples of the responses

Nutrition and Food cultural beliefs in the Covid-19 Pandemic

الممارسات والمعتقدات الثقافية الغذائية في ظل جائحة كوفيد 19)

يهدف هذا المسح التعذوى الى التعرف على الثقافات التغذوية و المعتقدات المنتشرة أثناء جائحة كورونا (COVID-19).الرجاء تعبئة هذه الاستبانة مع ملاحظة أنه لا يوجد إجابات صحيحة أو خاطئة.
تعتبر المشاركة في تعبئة هذه الاستبانة تطوعية وإذا لم ترغب الإجابة على أي من الأسئلة يمكنك تركه بدون إجابة وتأكد من كل سؤال قبل الإجابة.
نرجو منك تعبئة الاستبيان بدقة و شفافية تامة علماً بأنه لن يتم التعرف على هويتك وسيتم الاحتفاظ بسرية البيانات داخل الاستبيان و لن يترتب أثار على المشاركه في هذه الدراسة أو الانسحاب منها ،و يمكنك الاطلاع على نتائج الدراسة بمجرد تحليل نتائجها ، الاستبانة مكون من خمسة اقسام و38 سؤال.
شاكره لكم حسن تعاونكم

طالبة الدراسات العليا
ماجستير علم الغذاء والتغذية
الاسم: هداء راهي نصار

القسم الأول: البيانات الديموغرافية والشخصية:

الإسم

البريد الإلكتروني

Questioner

33. كم عدد الحصص المتداوله من الدهون (السمن الحيواني، الزبده الحيوانية)(علما بأن حجم الحصه هو معلقه صغيره من الزبده أو السمن) *

حدد دائرة واحدة فقط.

- لا اتداوله ابداً
- مره يوميا 1-2
- مرات يوميا 3-4
- مره اسبوعيا 1-2
- مرات اسبوعيا 3-4
- مره شهريا 1-2

34. كم عدد الحصص المتداوله من الزيوت النباتية (علما بأن حجم الحصه هو معلقه صغيره زيت الزيتون)*

حدد دائرة واحدة فقط.

- لا اتداوله ابدا
- مره يوميا 1-2
- مرات يوميا 3-4
- مره اسبوعيا 1-2
- مرات اسبوعيا 3-4
- مره شهريا 1-2

35. هل استخدمت أحد الأغذية التالية خلال جائحة كورونا (يمكن اختيار واحده أو أكثر) لانها ساعد على خفض أو الوقاية من الإصابة بالفيروس: *

حدد كل الإجابات الملائمة.

- [ ] منتجات الألبان
- [ ] البصل
- [ ] الثوم
- [ ] الخل
- [ ] القطر
- [ ] زيت السمك(المعروف ب أوميجا 3)
- [ ] العسل
- [ ] لم استخدم اى منها

المعلومات الشخصية

الاسم: هناء زاهي عبدالجليل نصار
العنوان:عمان
الكلية: الزراعة
التخصص: التغذية وعلوم الغذاء