Effect of Electronic Gadgets on Nutritional Status, Dietary Pattern and Lifestyle Modification of the Young Adults (19-25 years) Before and During Covid Pandemic Situation and Standardization of Immune Boosters Rich Soup mix

By

KALAIARASI. R

20PFN009

Thesis submitted to the

Avinashilingam Institute for Home Science and Higher Education for Women,

Coimbatore-641043

In Partial Fulfilment of the Requirement for the

DEGREE OF MASTER OF SCIENCE IN FOOD SCIENCE AND NUTRITION

May, 2022

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Signature of the supervisor

25.5.22

Signature of the Head of the Department

CERTIFICATE

This is to certify that the thesis entitled, **"EFFECT OF ELECTRONIC GADGETS ON NUTRITIONAL STATUS, DIETARY PATTERN AND LIFESTYLE MODIFICATION OF THE YOUNG ADULTS (19-25 YEARS) BEFORE AND DURING COVID PANDEMIC SITUATION AND STANDARDIZATION OF IMMUNE BOOSTERS RICH SOUP MIX"** submitted to Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore in partial fulfilment of the requirements for the award of the degree of Master of Science in **Food Science and Nutrition**, is a record of original research work done by **Kalaiarasi.R** with Register Number **20PFN009** during the period of this study under the Supervision and Guidance of Dr (Mrs.) A. Thirumani Devi M.sc (Madras), M.Phil., (Bharathiyar), Ph.D., Professor and Former HOD, Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore – 641043, Tamil Nadu, India.

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DECLARATION

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25.5.2022

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I. INTRODUCTION

COVID-19 is a global burden which continues to redefine daily lifestyle-related habits in a significant manner as the pandemic progresses through its different phases. Public health recommendations and government measures taken to abate infection have indirectly impacted food availability, dietary quality, normal daily activities, access to recreational public settings, social activities, work and financial security. (Chopra *et al*, 2020). Basically, nutrition and health are interrelated and interlinked process of learning that influence the knowledge, beliefs, attitude, behaviours and practices of an individual or a community and allow them to make more intelligent decisions regarding dietary and lifestyle choices to promote health status and reduce the risk of developing chronic diet related disorders like obesity, diabetes, CVD, cancer and so on. In the life style approach for promoting nutrition, each stage of lifecycle especially young adults is often seen as a crucial phase for nutrition development. Imparting nutrition education and the necessary nutritional skills in this phase cam form the basis for lifelong habits. A WHO report in improvement to nutritional status of young adults mentions recommended measures of the holistic approach towards improvement in nutritional status and also Prevention of disease conditions of young adult population.

This approach endorses Behaviour change through communication (BCC). BCC is a multilevel tool for promoting and sustaining the desired behaviour in individuals and communities by using a variety of communication channel and creating demand for information and service. Multimedia approaches that combine face to face and mass media are appropriate for nutrition education. The role of mass mediated entertainment education programme in focusing on observed first order camps, i.e small shifts in KAP without any major changes in primary value system.

In present modern, COVID 19 Scenario digital technology has lead to the global revolution, the world is becoming increasingly more connected and is able to solve more and more social health problems through increased collaboration and information sharing. Digital ‘e’-mass media like Facebook, Instagram, what's app, messenger are free wares, cross platform and end to end to encrypted instant messaging application for smart phones. It uses the internet to make voice calls, one to one video calls, send text messages, images, GIF, Videos, documents, auto files, phone contacts and so on to other users using standard cellular mobile numbers. A tailor made, self-monitoring and intervention delivery applications performed especially in smart phones with an emphasis on maximum simplicity, speed and convenience in their operation. What’s app, Facebook and Instagram have more users and the priority of the youngsters among the social media is found to be high. It also has an option of creating our own group as well as community web pages and it is common and can be seen by all users and accesses it. It also has options for comment, Share and like the post. So that they can like, share the post. So, it is an effective method of imparting knowledge among huge section of population as well as the community. Hence, it is more interactive and helps to create rapport betwee n the individuals. Continuous nutrition education with digital technology is recommended as long-term strategies for enhancing their knowledge of mass media especially

vulnerable groups of populations particularly adolescents and young adults for promoting their health status. People who are well nourished and well educated are more productive and improve their own potentials as well as their contributions to the national economy. Moreover, the interplay of the severity of COVID-19 infection with different social, economic and cultural constructs in determining the extent of changes in lifestyle-related behaviours might vary from country to country. (Renzo, 2020). The society has entered the era of the Industrial Revolution 4.0 which is marked by the increasingly dominant role of information technology, including the role of electronic gadgets. As a means of exchanging information and communication, gadgets are inseparable from the daily life of the younger generation. Apart from the positive effects of using gadgets (Mobile, Laptop, Desktop, Tablet and Television), several studies have found the negative effects of excessive use of these electronic gadgets. These factors compound over time to radically change lifestyle-related behaviours, especially daily eating, physical activity and sleep behaviours that are known to be independent risk factors for metabolic complications such as obesity, diabetes and cardiovascular disorders in the younger generations. These problems occur in their social life and mindset. Mostly adolescents are especially prone to these problems. Adolescence is a transitional developmental period from childhood to early adulthood. When a person enters the stage of adolescent development, he/she will experience physical, cognitive, psychosocial development and lifestyle modifications. Adolescents experience cognitive development in the form of the ability to think abstractly and using scientific reasoning. Thought in adolescence becomes more abstract, idealistic and logical. However, adolescents are still immature in terms of attitudes and behaviours.

Gadgets are widely used by children, adolescents and younger generations who generally show high level of competence in using technology. Gadgets are used as a means to access the internet. Gadget use among them is a common phenomenon. One of the main usage of gadgets is to access social media, which happens to be one of the most common activities they get engaged today. These social media sites provide entertainment and offer a means of communication for them. Social media sites allow teens to stay connected with friends and family, make new friends, and share ideas. The reason why adolescents use gadgets is because adolescents like to explore, and they spend more time with friends than parents in this developmental stage. (Beng, 2020). Adolescents use gadgets for various purposes, from playing games, listening to music, watching videos, accessing information and social media through the Internet. In addition to social media, many people use expensive and luxurious gadgets as a form of social appearance, in addition to reducing uncomfortable feelings during social contact with other people. Other reasons for excessive use of gadgets have to do with external control, material, social interaction anxiety and the need for attention. (Dienlin, 2020). As a result, individuals lack self-control in using gadgets, leading to internet dependence, and excessive usage of all kinds of electronic gadgets which is more attractive, time consuming most importantly not worthy for spending their precious time. Furthermore, one reason why adolescents use gadgets is to play games. Excessive use of gadgets causes a number of adverse effects on a person's mental health, physical health and social health. (Appel, 2020) However, the COVID-19 pandemic has resulted in a number of major changes in everyday life. The COVID-19 pandemic has dire implications for the health, emotional and social functioning of

individuals and collective health (Pfeffer *et al.,* Apr. 2020). COVID19 increases the risk for mental illness and changes in the physical behaviour which are caused by emotional distress resulting from a variety of factors. This emergency public health condition can affect the health, safety, and well-being of both individuals and communities, one of which is the closure of schools, colleges etc. (Singh,2020). This can lead to: Various emotional reactions, unhealthy behaviour and Non-compliance with public health directives. Moreover, some groups may be more vulnerable than others to the psychosocial effects of the pandemic. In addition to the stresses that come with the disease itself, there are directions for mass confinement at home, including stay-at-home orders, quarantine and isolation. In the current pandemic, directions to stay at home for a large proportion of the population for an indefinite period is likely to increase stress, changes in eating pattern and physical behaviour.

The COVID-19 pandemic also affects education. While the COVID-19 pandemic continues to spread around the world, many countries have decided to close schools, colleges, universities, workplaces as a part of physical distancing policies to slow transmission and ease the burden on health systems. (C Yang, 2021). UNESCO (United Nations Educational, Scientific and Cultural Organization) estimated that 138 countries have closed schools, colleges, universities nationwide, and several other countries have implemented regional or local closings. This school, colleges, universities closure affects the education of 80% of children worldwide. (https://en.unesco.org/covid19/educationresponse). Recommended measures to forestall viral infection includes washing hands frequently for at least 20 seconds at a time with warm water and soap. Other measures emphasized on are - not to touch face, eyes, nose, or mouth when the hands are dirty, not going out if feeling sick or have any cold or flu symptoms, staying at least 3 feet from source away from anyone who is coughing or sneezing, covering mouth with the inside of the elbow when sneezing or coughing, and throwing away any tissues used right away. Cleaning of surfaces or objects touched frequently and use of disinfectants on objects like phones, computers, utensils, dishware and doorknobs has also been emphasized on as precautionary measure. Apart from all the precautionary measures mentioned, a strong immune system is essential to safeguard individuals from getting infected easily during Pandemic. (https://www.who.int/southeastasia/news/detail/15-10-2020-handwashing-an-effective-tool-to-prevent-covid-19-other-diseases)

Good nutrition is a key for strong immune system and health. Balanced intake of food is essential to maintain health. Another factor to be monitored during lock-down for healthy individuals is food cravings, as it is extremely common. It is essential to curb the temptation of eating in between meals when not hungry. Limited access to fresh foods may lead to an increased intake of highly processed foods, which tend to be high in fats, sugars and salt. Such changes in the eating behaviour may have a negative impact on the immune system and the overall well-being of the individuals globally. *(Ministry of Family Health and Welfare. [https://www.mohfw.gov.in/])*. Thus, during self-quarantine at home during lock-down, it is very important to keep a watch on eating habits and physical activity pattern in order to achieve optimum nutritional status and maintain a robust immune system.

Life style is nothing but the way of life of an individual or a group of individuals or the society as a whole. Somebody's attitudes, values, world views etc are reflected by his/ her life

style. So, life style means making some sense of the self and creating some cultural symbols which will reflect the identity of a person. All the aspects of life style may not be voluntary in nature because one is associated with the society and that surrounding plays an important role in shaping the choices of an individual's life style. *(*Spaargaren*, et al.,* 2000*)*. Life style is dependent upon both seen and unseen factors. The former includes the demographic profile of the individual and the latter includes the psychological status of an individual. The life style is always a changeable concept because the choices of human beings and also the natural environments are changeable. Depending upon the changing mood individuals select their activities and fix their timing to those. *(*Giuffrae *et al.,* 2009). Currently, the use of gadgets like mobile phones and computer/ laptops has increased and the screen time of majority working and learning from has also increased. The present situation of lock down has altered the routine of majority of people across the globe and it might have an impact on the general health of the people if they are not aware of ways in which they can keep themselves fit by including a balanced diet and staying active throughout the day. Emphasis on nutritional education is also important at this time.

A modern lifestyle of many Indian people today, especially living in big cities, needs fast paced and practical things almost in all aspects, including preparation, processing and presentation of food. It creates a society who loves instant food products such as food that are ready to cook and ready to eat. One of the potential products that can be developed into an instant food is functional soup (Upadhyay *et al.,* 2017). Soup is probably one of man's oldest foods, since it must have developed about the time when boiling was found to be a way of cooking food. It is a very fast form of cookery. Soups can be of poultry, meat or sea food, or of vegetables or combination of all in hot/boiling water until the flavour is extracted, forming a broth. However different in styles, but technically all the soup preparation involves the processes of boiling for flavour extraction and heat induced composition interaction. The word "soup" is originated from the teutonic word, suppa, which describes a medieval dish consisting of a thick stew poured on slices of bread, called sop, used to soak up the liquid. Soup is the one of the traditional foods which can be classified as an appetizer, warm food during cold and sick. In this modern era homemade soup is replaced by commercially prepared instant soup such as canned, dehydrated, and frozen soups as soup preparation is a time-consuming process. Instant mixes can become an alternative food for breakfast because of its high energy and nutrient content, ease of preparation and minimum serving time (Gokulakrishnan, 2014). A dehydrated instant soup mix with millets, dehydrates pulses and natural herbs prepared as a dry product, instant mixes can be stored for a longer period. Apart from good storage stability of these products, the products with nutritional/therapeutic properties will be well received all over the world because of the increasing health consciousness amongst the population during this pandemic period. Medicinal herbs are 'Gifted Gods' for healing, supporting and rehabilitating patients. Even though, no substantiation is present, but different studies on herbal plants are being conducted that have the ability to strengthen immune system and cope up with this situation. To expedite, certain phyto-compounds are being recognised to characterise the herbs in mitigating the incidence of infection. Since decades, herbal plants have been utilised in aboriginal health services as well as conventional medicines to combat diseases. The natural products provide an ancillary steer to unlock different mysteries behind the sickness. The

exploitation of antiviral mechanisms of these natural compounds could shed light on their modes of action towards viral life-cycle, invasion, penetration, replication, assemblage and release. Moreover, customary acquaintance about plant sources and their usage is chiefly indispensable to employ it appropriately under right conditions. There have been more than 25,000 herbal formulations used in folk remedies in Ayurveda alone (Pundarikakshudu and Kanaki, 2019). Generally, these medications are disregarded and underrated in research and development due to contemporary medicines. Perhaps, they are ambiguous, but have broader demand nowadays in Western technology (Yuan *et al.,* 2016). One single herbal species comprises plentiful phyto-constituents that single-handedly or collectively generate a pharmacological effect (Parasurman *et al.,* 2014). Subsequently, these natural constituents are isolated and modulated as drug formulations against different diseases. Medicinal herbs are by far, are the life-saving drugs these days and research is being conducted on them to promote their potential of possessing anti-inflammatory, antioxidant and antiviral properties. Although, clinical trials are conducted to repurpose their value, for innovative treatment to defeat its transmission. During this period of global fretfulness, it is pertinent to locate long-lasting measures to avert the spread of this pandemic. Hence, its need of the hour to collaborate and counteract against COVID-19 by exercising social distancing along with maintaining hygienic surroundings (Balachander *et al.,* 2020). Therefore, herbal or medicinal plant formulations could be essential alternative strategy, a step ahead to battle these awful viruses.

The present study intends to answer the question of how much gadget usage can achieve healthy social and cognitive conditions for the younger generations before and during the COVID-19 pandemic and also assessed the changes in dietary and lifestyle pattern among selected healthy individuals (college students) who were at home during lock-down period and recommendations for health and well –being has been given by formulating products in the form of immune boosters during Pandemic for normal individuals without infection to get normalise with their regular lifestyle.

Objectives of the study:

- To elicit information related to food consumption and lifestyle pattern of the selected young adults.
- To examine the changes in food consumption and dietary pattern among the selected young adults due to usage of electronic gadgets
- To find out the effect of electronic gadgets on food consumption pattern and lifestyle modification among the selected young adults during the covid pandemic situation.
- To compare the time spent by the young adults with their electronic gadgets before and during covid pandemic situation.
- To study the effects of using electronic gadgets on physical health, mental health and lifestyle modification and
- Formulation and qualitative and quantitative nutritional analysis of the immune boosters rich product and to find out acceptability of the selected subjects.

II. REVIEW OF LITERATURE

The review of literature of the present study entitled **"Effect of Electronic Gadgets on Nutritional Status, Dietary pattern and lifestyle modification of the young adults (19-25 years) before and during covid pandemic situation and standardization of Immune Boosters rich soup mix"** is discussed under the following headings

1. Covid pandemic situation – An overview
2. Food consumption and lifestyle pattern of the young adults before and during covid pandemic situation
3. Usage of electronic gadgets before and during covid pandemic situation
4. Effect of electronic gadgets on food consumption pattern and lifestyle modification
5. Formulation of immune boosters to enhance immunity in this covid situation

1. COVID PANDEMIC SITUATION – AN OVERVIEW

COVID-19 (Coronavirus) has affected day to day life and is slowing down the global economy. This pandemic has affected thousands of peoples, who are either sick or are being killed due to the spread of this disease. The most common symptoms of this viral infection are fever, cold, cough, bone pain and breathing problems, and ultimately leading to pneumonia. Thus, the emphasis is on taking extensive precautions such as extensive hygiene protocol (e.g., regularly washing of hands, avoidance of face-to-face interaction etc.), social distancing, and wearing of masks, and so on. This virus is spreading exponentially region wise. Countries are banning gatherings of people to the spread and break the exponential curve. Many countries are locking their population and enforcing strict quarantine to control the spread of the havoc of this highly communicable disease. COVID-19 has rapidly affected our day-to-day life, businesses, disrupted the world trade and movements. Identification of the disease at an early stage is vital to control the spread of the virus because it very rapidly spreads from person to person. Most of the countries have slowed down their manufacturing of the products. The various industries and sectors are affected by the cause of this disease; these include the pharmaceuticals industry, solar power sector, tourism, Information and electronics industry. This virus creates significant knock-on effects on the daily life of citizens, as well as about the global economy (Chinazzi *et al.* 2020). Presently the impacts of COVID-19 in daily life are extensive and have far reaching consequences. These can be divided into various categories:

i) *Healthcare* - Challenges in the diagnosis, quarantine and treatment of suspected or confirmed cases. High burden of the functioning of the existing medical system. Patients with other disease and health problems are getting neglected. Overload on doctors and other healthcare professionals, who are at a very high risk. Requirement for high protection and Disruption of medical supply chain.

ii) *Economic* -Slowing of the manufacturing of essential goods. Disrupt the supply chain of products. Losses in national and international business. Poor cash flow in the market. Significant slowing down in the revenue growth.

iii) *Social* - Service sector is not being able to provide their proper service. Cancellation or postponement of large-scale sports and tournaments. Avoiding the national and international travelling and cancellation of services. Disruption of celebration of cultural, religious and festive events. Undue stress among the population. Social distancing with our peers and family members. Closure of the hotels, restaurants and religious places. Closure of places for entertainment such as movie and play theatres, sports clubs, gymnasiums, swimming pools, Postponement of examinations and so on.

This COVID-19 has affected the sources of supply and effects the global economy. There are restrictions of travelling from one country to another country. During travelling, numbers of cases are identified positive when tested, especially when they are taking international visits. All governments, health organisations and other authorities are continuously focussing on identifying the cases affected by the COVID-19. Healthcare professional face lot of difficulties in maintaining the quality of healthcare in these days. Meanwhile, recent research has revealed critical aspects of SARS-CoV-2 biology and disease pathogenesis; other studies have focused on epidemiology, clinical features, diagnosis, management, as well as drug and vaccine development (Abid *et al.*,2020). On living with coronavirus outbreak in India. This piece emphasizes on various policies adopted by the government of India to face the coronavirus crisis. It brings into perspective what financial strides the economy is going through, the mental health of the citizens, and the current situation of health care in the country. The current commentary reflects the learnings from COVID-19, the role of defined governmental policies, and support in surviving such an unforeseen situation. Some of the measures taken by the government are the limited number of passengers in public vehicles, mandatory use of masks, and sanitization at public places like ATMs or shops. Government-mandated Arogya Setu App has been designed and installed by all citizens to connect essential health services. This app helps to reach out and use information regarding COVID-19 risks, best practices, and advisories. Upgrading of health care services also remains a priority to accommodate the increased spike of patients post lockdown. Provision of public care, food protection, housing facilities, and initiatives to enhance human quality of life are catalysts to changes in behaviour and improvements in health. Positive mental health practices such as breaking the monotony, valuing the self, dealing with stress, and realistic goals can help citizens to cope efficiently post lockdown (Saha, 2020).

2. FOOD CONSUMPTION AND LIFESTYLE PATTERN OF YOUNG ADULTS BEFORE AND DUIRNG COVID PANDEMIC SITUATION

Food is key to personal health as well as to the health of the planet given that current patterns of food production and consumption have considerable environmental impacts. Conversely, disasters such as the COVID-19 pandemic can disrupt our food system and change our relationship with food. The interplay between food-related behaviours forms the core of framework i.e., the processes of consuming (what, where, with whom, how often), obtaining (where, how, how often), and preparing food (what, how). Food-related behaviours are influenced by the personal food system, i.e., food-related values and strategies, which in turn are influenced by personal factors, resources, and ideals. The introduction of dynamic perspective by recognizing that food consumption during the pandemic is related to food consumption before the pandemic (Janssen, 2021). The framework further recognizes that

individual-level (changes in) food consumption patterns are embedded in a complex system of multilevel factors, including the household level and the broader micro- and macro-context (Meika, 2021). Currently Covid-19 pandemic is a leading challenge across the globe. It is mandatory to attain and maintain good nutritional status to fight against virus. Nutritional status of individual is affected by several factors such as age, sex, health status, life style and medications. Nutritional status of individuals has been used as resilience towards destabilization during this COVID-19 pandemic (Aman, 2020). There are two major influences: staying at home (which includes digital-education, smart working, limitation of outdoors and in-gym physical activity) and stockpiling food, due to the restriction in grocery shopping. In addition, the interruption of the work routine caused by the quarantine could result in boredom, which in turn is associated with a greater energy intake. In addition to boredom, hearing or reading continuously about the COVID-19 from media can be stressful. Stress leads subjects toward overeating, especially 'comfort foods' rich in sugar, defined as "food craving". Those foods, mainly rich in simple carbohydrates, can reduce stress as they encourage serotonin production with a positive effect on mood. However, this food craving effect of carbohydrates is proportional to the glycemic index of foods that is associated with the increased risk of developing obesity and cardiovascular diseases, beyond a chronic state of inflammation, that has been demonstrated to increase the risk for more severe complications of COVID-19. This new condition may compromise maintaining a healthy and varied diet, as well as a regular physical activity. For example, limited access to daily grocery shopping may lead to reduce the consumption of fresh foods, especially fruit, vegetables and fish, in favour of highly processed ones, such as convenience foods, junk foods, snacks, and ready-to-eat cereals, which tend to be high in fats, sugars, and salt. Moreover, psychological and emotional responses to the COVID-19 outbreak may increase the risk of developing dysfunctional eating behaviours. It is well known how the experience of negative emotions can lead to overeating, the so-called "emotional eating". In order to contrast and respond to the negative experience of self-isolation, people are more prone to look for reward and gratification physiologically associated with food consumption, even overriding other signals of satiety and hunger. In addition, boredom feelings, which may arise from staying home for an extended period, are often related to overeating as a means to escape monotony (Cecchetto, 2021). On the other hand, negative experiences may lead to eating restriction, due to the physiological stress reactions that mimic the internal sensations associated with feeding-induced satiety. Finally, lifestyle may be substantially changed due to the containment measures, with the consequent risk of sedentary behaviours, modification in eating pattern and sleeping habits. Of interest, different studies reported an association between sleep disturbances and obesity due to increase the secretion of pro-inflammatory cytokines by the increased visceral adipose that could contribute to alter the sleep–wake rhythm. Low physical activity levels have been suggested to interact both with body fat and appetite dysregulation (Di Renzo, 2020).

COVID-19 has managed to paralyze the world for months, this paralysis has caused great changes in the habits, customs and routines of all people. Although science is directed to getting a vaccine to return to normality, these changes may remain in the population. For this reason, it is essential to identify them and observe what has improved or worsened. The IPAQ questionnaire (*international physical activity questionnaire*) was used to analyze physical

activity and regarding food consumption a questionnaire on eating habits. These were applied in a representative sample of adults between 18 and 65 years old in the city of Quito (n: 1022) to collect information before and during the forced quarantine in the city. These data were analyzed and compared along with daily routines and demographic variables of age, education and income. The working hypothesis was that enforced quarantine would have a significant impact on daily activities, including waking time, mealtimes, physical activity, and eating habits. Waking time went from 5 to 6 to 8–9 in the morning and the breakfast and lunch times changed. The physical activity of the entire population decreased while men proved to be more active than women before and during the health emergency. Our findings suggested that eating habits improved overall during the quarantine period; however, we found that a higher percentage of women reported very healthy eating habits compared to men. People from 18 to 41 years old, with a university education, regardless of their income, decreased their physical activity during quarantine, people with incomes of up to $ 400 per month changed their eating habits to unhealthy since the emergency began. The population in the city of Quito varied their daily routine of physical activity and their eating habits, this suggests that it should be analyzed what measures should be implemented to continue with what has been improved and change what has worsened, and thus avoid public health problems in the future (Roberto *et al*., 2020*)*.

The impact of measures taken to contain COVID-19 on lifestyle-related behaviour is undefined in Indian population. The current study was undertaken to assess the impact of COVID-19 on lifestyle-related behaviours: eating, physical activity and sleep behaviour. The study is a cross-sectional web-based survey. A validated questionnaire to assess the changes in lifestyle-related behaviour was administered on adults across India using a Google online survey platform. A total of 995 responses (58.5% male, mean age 33.3 years) were collected. An improvement in healthy meal consumption pattern and a restriction of unhealthy food items was observed, especially in the younger population (age <30 years). A reduction in physical activity coupled with an increase in daily screen time was found especially among men and in upper-socio-economic strata. Quarantine induced stress and anxiety showed an increase by a unit in nearly one-fourth of the participants. COVID-19 marginally improved the eating behaviour, yet one-third of participants gained weight as physical activity declined significantly coupled with an increase in screen and sitting time. Mental health was also adversely affected. A detailed understanding of these factors can help to develop interventions to mitigate the negative lifestyle behaviours that have manifested during COVID-19 (Chopa, 2020).

Due to the outbreak of coronavirus disease 2019 (COVID-19), the Chinese government implemented strict lockdown measures to control the spread of infection. The impact of the COVID-19 lockdown on eating habits and lifestyles in the general population is unclear. This cross-sectional study was conducted via an online survey to obtain an overview of the food access, food intake, and physical activity of Chinese residents during the initial stage of the COVID-19 lockdown, and to investigate the association between staying at home/working from home and changes in eating habits and lifestyles. A total of 2702 participants (70.7% women) were included. Most of the participants maintained their habitual diet, while 38.2% increased their snack intake, 54.3% reported reduced physical activity, and 45.5% had increased sleep duration. Most people (70.1%) reported no change in body weight, while 25.0%

reported an increase. Always staying at home/working from home was associated with an increase in animal product, vegetable, fruit, mushroom, nut, water, and snack intake, as well as sleep duration and frequency of skipping breakfast (odds ratio (OR) 1.54, 1.62, 1.58, 1.53, 1.57, 1.52, 1.77, 2.29, and 1.76 respectively). Suggestions should be made to encourage people to reduce their snack intake, maintain the daily consumption of breakfast, and increase physical activity during future lockdown periods (Guo-yi Yang, 2021).

Eating habits and lifestyle modification may threaten our health. Maintaining a correct nutrition status is crucial, especially in a period when the immune system might need to fight back. A healthy diet is important because gene expression levels of all the cytokines are influenced by food and are capable of modulating the processes of inflammation and oxidative stress. The healthy diet is a proper combination of quality foods, based on macro and micronutrient content, and the absence of contaminating substances. According to current knowledge, the Balanced diet is the key factor against immune-mediated inflammatory responses. In particular, their potential clinical applications are, on one side, low cholesterol levels and, on the other hand, high levels of antioxidants contained in fruits and vegetables, and monounsaturated fatty acid (MUFA), present in fish, nuts and olive oil. Notably, it is well known that the balanced diet, one of the healthiest dietetic patterns in the world, is linked to lower mortality and reduction in obesity, type 2 diabetes mellitus, low-grade inflammation, cancer, Alzheimer's disease, depression, and Crohn's disease (Laure *et.al.,*2020). Traditional Indian home-cooked meals have been supplanted by processed foods as a result of the nutrition transition. Fast-food culture has pervaded many aspects of society. Indian nutrition transition has been prompted by changes in food consumption patterns and lifestyles among young adults as a result of social, economic, and marketing strategies. Processed and fast foods are in high demand among all age groups due to their ease of preparation, accessibility, good taste, and low cost. Advertisements promoting these foods as convenient in stressful situations have enhanced their acceptability. This tendency has increased the risk of noncommunicable diseases such as insulin resistance, high blood pressure, diabetes, heart disease and obesity (Mohammad *et al,* 2018). Such health risks can be reduced by improving overall nutrition of urban adults by advocating dietary adjustment in everyday life. Trends in Eating Habits The article "Nobody wants to eat at home" which appeared on August 20, 2000 in Times of India, was very detailed and informative discussing about the eating disorders habits in the youth. The authors did a great job in putting, analyzing it together the why and wherefore of this new behavior and eating habits which is not yet sufficient as the final results of which are counted upon the social and cultural changes are also to be examined. Most adolescents fail to meet the dietary requirements by skipping regular meals, improper / imbalanced diet, and irregular food intake. It is very important for the youngsters to follow healthy eating habits which are vital for their health and well-being. "The minimum required nutritional needs of youths differ extremely from one to the other, but generally the food intake increases due to the rapid growth and changes in body composition occurring during puberty". Sufficient amount of nutrition is important for an overall balanced growth and development of youngsters - physical, emotional and biological. If the youths follow and adopt good and balanced eating habits it helps them to keep away the chronic illness in the future which including obesity, heart disease, cancer and diabetes. A low intake of essential nutrients including vitamin A, folic acid, fiber, iron and

calcium is prevalent among youth. “A low intake of iron and calcium in particular is common among female youngsters, which weakens the cognitive function and physical performance, as well as increase a female’s risk for osteoporosis later in life.” The below discussed are the main irregularities observed in the eating habits of youngsters:

- No care for nutritional content of food: Generally, the young’s follow on the line ‘thin is in’ and try and regulate their food intake for being conscious on the meals.

- Deteriorate of the traditional style of meal: Mostly the youth have started adopting eating habits which contains funky foods, fast foods with low calorie content from wherein they do not get the required number of calories and thus it spoils their health and make them anemic and invite infections and viruses.

- Skipping full meals and picking Snacks: The busy and irregular schedules, the whole day routines and day to day activities keep the youngsters away from having a regular and on time meals. More than 50% of youth skip breakfast at one point or another where breakfast is treated actually as the most important meal of the day. “Eating snacks in short time intervals is not a bad thing. It can help maintain energy levels particularly in active and growing teens because of the 'skipping meal' factor, many teens fail to eat three regular meals per day, thus eating snacks at short intervals can actually be beneficial to ensure adequate calorie intake”.

- Increase in demand for fast foods as a result of hectic lifestyles: Youths now days have started opting for fast food as it is counted as a status quotient, convenient, easily available and demanded as well as liked by all and at the same time it is a well reputed social affair. The fast food available in the market is often stuff packed, full of fat and zero in calories.

- Choosing Branded food: The food served at McDonald’s has become so universally accepted, may be due to the marketing strategy, the interiors, music, TV, movies, are tempting and increasing the representation among the youths. Marketing to youth the food companies have to have some credibility by having something chilly, exclusive and connected with matters for which the youths care about.

- Increase in intake of soft and tickle drinks: The easy availability, the impressive and attractive advertisement through the media tempts the youths to try and drink which ever soft and freezy drinks introduced in the market.

Identifying, observing minutely and analyzing youngsters eating habits are the first few steps toward encouraging healthy eating practices among the youths. Working with a youngster for encouraging and scheduling to recognize and follow a healthy lifestyle that incorporates and comprises of sound eating habits and regular exercise is a sincere responsibility to be strictly followed by the parents or the immediate guardians or care takers. “By understanding teen eating habits you will be better prepared to evaluate the nutritional adequacy of your teen's diet and ensure that they are meeting the minimum requirements to maintain their health and well-being”. Youngsters have started adopting and following short cuts and easy accessibilities in their living patterns. It is very easy to attract the youths in the present-day times by using

different media sources. Some of the short cuts and messages passed on through media may be relatively harmless—like peace signs and logos of expensive clothes and cars. “Other messages at times openly promote to youth the use and abuse of alcohol, tobacco, and illegal drugs, like marijuana leaves or malt liquor logos on caps and T-shirts”. The more the youngster knows about who he/she is as an individual and the better he/she will be able to identify his/her habits. The most important part is to easily make those necessary changes and commending to a lifelong plan of healthier eating and living well. (Asha, 2012). Life changing events, defined as "those occurrences, including social, psychological, and environmental, which require an adjustment or effect a change in an individual's pattern of living," are defined as "those occurrences, including social, psychological, and environmental, which require an adjustment or effect a change in an individual's pattern of living." Life-changing events can have a positive or negative impact on lifestyle choices. For example, Engberg et al. found that going to university, having a child, remarriage, and big urban disasters were all linked to lower levels of physical activity, whereas retirement was linked to higher levels of physical activity. Excessive alcohol intake, alcohol dependence, and emotional eating have all been linked to stressful life events. Maintaining a nutritious diet and getting enough exercise is critical, especially during a time when the immune system may be under attack. In fact, people with (severe) obesity (BMI 30 $kg/m)^2$ are among the people who are more likely to develop COVID-19 problems. As a result, lowering weight could be one of the measures for reducing the risk of severe COVID-19 sickness. Apart from taking appropriate hygiene measures, authorities and healthcare professionals' recommendations on how to stay healthy during the COVID-19 pandemic are linked to healthy life-style measures such as getting enough sleep, eating plenty of fresh fruits and vegetables, reducing stress and social isolation, and staying active (Martine, 2021). Optimal nutrition and dietary nutrient intake have some impact the immune system. Therefore, the only sustainable way to survive in current context is to strengthen the immune system using healthy foods and nutrient in their dietary pattern. There is no evidence found that supplement can cure the immune system except Vit C, which is one of the best ways to improve immune system. A proper diet can ensure that the body is in proper state. However along with the dietary management guidelines the food safety management and good food practices is compulsory. This article explores the importance of nutrition to boost immunity and gives some professional and authentic dietary guidelines about nutrition and food safety to withstand COVID-19. (Akala, 2020)

3. USAGE OF ELECTRONIC GADGETS BEFORE AND DURING COVID PANDEMIC SITUATION

Covid-19 pandemic has led to an inevitable surge in the use of digital technologies due to the social distancing norms and nationwide lockdowns. People and organizations all over the world have had to adjust to new ways of work and life. We explore possible scenarios of the digital surge and the research issues that arise. An increase in digitalization is leading firms and educational institutions to shift to work-from-home (WFH). Workplace monitoring and technostress issues will become prominent with an increase in digital presence. Online fraud is likely to grow, along with research on managing security. The regulation of the internet, a key resource, will be crucial post-pandemic. Research may address the consequences and causes of

the digital divide. A key research issue will also be the impact and consequences of internet shutdowns, frequently resorted to by countries. Digital money, too, assumes importance in crisis situations and research will address their adoption, consequences, and mode. Aspects of surveillance and privacy gain importance with increased digital usage (Shah, 2020). Increasing digitalization - As the use of video and audio-conferencing tools increases significantly, organizations will ramp up their technology infrastructure to account for the surge. This will lead to increased investment in bandwidth expansion, network equipment, and software that leverages cloud services. This is being adopted by many firms, which have the digital infrastructure in place to handle the required load and bandwidth. (Upadhyay,2020). Education is another domain in which there a dramatic shift to the online mode of transacting. Since the beginning of the lockdown, schools, colleges, and universities around the world have shifted their classes to video conferencing platforms like Zoom and Google Meet. Along with these synchronous modes of teaching, asynchronous platforms like edX and Coursera have also seen an increase in enrolments (Bhattacharya, 2020). Some institutions are now shifting entirely to the online mode for the forthcoming academic year, with the exception of sessions that require a physical presence.

Digital transformation technologies such as Cloud, Internet-of-Things (IoT), Blockchain (BC), Artificial Intelligence (AI), and Machine Learning (ML), constitute a bulk of the of what is being adopted by organizations as part of their transformation effort. Blockchain (BC) technology presents an opportunity to create secure and trusted information control mechanisms (Agarwal *et al*.,2017). As education and healthcare services witnesses a shift to the digital domain, BCs enable a way to secure and authenticate certificates, health records, medical records, and prescriptions. Research on the design of such systems, along with maintaining their ease-of-use and usefulness will gain importance. Another issue is that of designing systems that work with smart contracts – how the contracts are authenticated, how these contracts will be designed in a complex chain of processes with many agents involved, and how arbitration related to contracts will be handled. Work-from-home and gig workers - The gig economy is driven by online platforms that hire workers on an ad hoc, short-contract, and mostly informal basis. Well-known examples of these include Uber and Airbnb globally and Ola and Swiggy in India. These platforms have grown immensely since the wide availability of smartphones from 2010 onwards. During the lockdown, workers employed by these platforms have suffered heavily, as the demand for their services, taxi rides, rentals, or skill work, has disappeared (Chhibber, 2020). Further, since these workers had no guaranteed salaries, their incomes dropped dramatically. In the post-pandemic scenario, there is a slow return of gig economy workers, as manufacturing and service firms return to their old activities. However, we anticipate that in the longer term as the threat of infection and spread recedes, the gig economy will thrive. This will also be driven by the WFH culture. Along with the surge in the use of digital technologies, there is a rise in online fraud, scams, intrusions, and security breaches. The pandemic has created a scenario of insecurity that is inviting fraudsters to exploit the crisis situation by extracting money or information or by creating vulnerabilities (Scheerder et al,2017). Many users are beginning to rely on digital resources extensively, some for the first time, and are becoming targets for fraud and scams. Organizations and governments are aware

of this threat and are taking countermeasures – for instance, governments of Tamil Nadu, Kerala and southern part of India took a strong stand against Zoom sessions for education, forcing the platform provider to upgrade security. The use of electronic devices, particularly mobile phones, by youngsters has become a global concern. The worldwide COVID-19 ban has only exacerbated the problem. College students' time on their electronic devices has grown as a result of the extended lockdown and virtual classrooms. Excessive use of electronics has been shown to have negative health consequences. Long-term gadget use has a variety of side effects, including headaches, nausea, ophthalmological issues, and psychological consequences. The goal of the study is to determine the difference in time spent using devices before and during the lockdown, as well as the health consequences. The total number of participants in the study was 348 (n=348), including 183 females and 165 males. Data was acquired from college students via Google forms using a semi-structured questionnaire. The results suggested that the average time spent on gadgets increased from 4.75hrs/day before lockdown to 11.36hrs/day during lockdown among participants. Most health complaints like headaches, insomnia, eye complaints, tiredness and restlessness were associated with gadget use during the lockdown. The percentage of participants experiencing these complaints during lockdown was also significantly higher than before lockdown. By understanding the effects of gadget use, it would be possible to create interventions and suggest ways to manage the excessive use of gadgets. It is of prime importance to handle the issue considering the quality of life and wellbeing of students. Due to the rapid advances in technology, the usage of gadgets has increased exponentially. Smartphones have become more common among the general population these days, including children. It is now well understood that using gadgets for a longer duration impacts an individual's health leading to health hazards. Possession of gadgets and gadget dependence is increasing among the younger generation. Innovations like Bluetooth, video calls, video games, mobile data, camera and email have become popular along with regular voice calls in recent times. Earlier studies have suggested that using the internet associated with gadget usage for a longer duration might be related to subjective distress, loneliness and social isolation. Excessive gadget usage is of concern because of the growing addiction to the latest gadgets such as smartphones, tablets, laptops and other electronic gadgets that pose a threat to the existing social infrastructure. The term “gadget” discussed in the present study refers to the portable electronic devices that belong to either one or more of the following categories: Mobile phones, MP3 players and gaming consoles or any other wireless enabled devices. Gadget usage is of significant concern due to the health implications they cause. Continuous use of gadgets leads to many reported health problems like eye strain, fingerpain, backache, neck pain and sleep disturbances. Depending on the amount of time spent on gadgets (duration and frequency), there are adverse physiological, psychological, social and emotional effects. Excessive use of gadgets among youth during a time of stress is a growing threat as well. There has been an established relationship between excessive internet use and loneliness, antisocial values, lower emotional intelligence and depression. Social media, video calls and virtual meetings are being used extensively for various purposes during the lockdown. Headache, earache, neck pain, tinnitus, painful fingers, fatigue, eye symptoms, morning tiredness, restlessness and sleep disturbances are health issues found to develop due to mobile phone usage (Sañudo et al., 2020) found that students delayed their wake time by 12 minutes with an increase of sleep time of 5 minutes per day during the lockdown. However, no change

in sleep quality was observed. Mobile phone radiation and its impact on health have been generated from its innovation and researchers have tried to analyze the actual hazardous nature of radiation to human health. Organizations like WHO and IEEE Committee on Man and Radiation (COMAR) have serious public safety concerns about the exposure of individuals to Radio Frequency (RF) and Microwave (MW) field from handheld, portable cell phones since these devices use electromagnetic radiation in the microwave range. The physical and psychological consequences of mobile phone users are increasing at an alarming rate. A study conducted by (Roberts et al,2019). highlighted that texting is the most important activity college students carry out using their mobiles. The findings also suggest that the time college students spend on social media networks and the number of calls made is a good indicator of cell phone addiction. Earlier studies on mobile phone usage suggest a change of lifestyle pattern related to mobile phone use during lockdown with decreased physical activity, increased smartphone use, and increased sleeping time. India had 18,985 confirmed cases and 603 deaths due to COVID-19 as of April 22, 2020. The first case of COVID-19 was reported in India on 30th January 2020. The Government of India closed down the nation's international borders and enforced a nationwide lockdown on 25th March 2020. However, the distinct and diverse nature of the Indian population posed several challenges during the lockdown, including increased gadget usage. Smartphone usage has become more profound during the outbreak of the Novel Corona Virus globally. (Sanudo et al,2020) found an increase of 2 hours/day of smartphone usage during the lockdown. There was a 185% increase in gadgets like smartphones and computers in countries like Denmark. Online tools like Zoom, Google Hangouts, Skype Meet up, Google classrooms, and YouTube has been used to carry out student's academic activities. Although virtual classes held during the lockdown have increased student engagement in courses15, social media activity has also increased among students, either in content uploading or creating social awareness messages. A pressing concern associated with excessive gadget usage is the amount of content that has been binge-watched by individuals. Distress among students has increased due to binge-watching. It is also known to be associated with several adverse psychological outcomes.

Internet access and digital divide - Information technology, and particularly the internet, will remain central to the post-pandemic scenario, where innovations will drive the surge in use. A key aspect of this surge will be the management and regulation of the internet itself. Though the internet is a global resource and no one country can control its protocols and features, its local access and availability remain an in-country issue. During the pandemic too some countries have restricted access to the internet (N Pandey,2020), for certain reasons. The regulation of the internet will become crucial after the pandemic as it will remain a policy tool for governments. They can intercede on aspects of monitoring, bandwidth control, surveillance, intermediary liability, and e-commerce. The pandemic has brought the world to a situation where those not connected to the internet are facing total exclusion. With strict social and physical distancing measures in place, new routines require accessing the internet for most services. Hence, those on the wrong side of the digital divide are completely left out. Reasons for the divide are many: unaffordable device access, unaffordable Internet access, content relevance, access skills or government ordered Internet shutdowns (Rahul *et al*., 2020).In

developing countries, the condition is more serious. COVID-19 has brought about a situation where internet access seems to have become necessary for survival. With substantial use of technology in accessing basic requirements like health and education, it is imperative to understand the impact of the digital divide on social equality. Internet governance: net neutrality and zero-rating - Heavy use of the internet during the pandemic, for various purposes, has raised people's data requirements. With a significant digital divide in societies, this surge in the Internet data requirement has revived the discussion on zero-rating plans. Although the government did not permit the implementation of such plans, in the aftermath of the pandemic, the telecom regulatory authority of India (TRAI) decided to allow waiving charges for data and voice for certain websites (Kathuria *et al.,* 2020). The list primarily consisted of the sites related to COVID-19 - such as the World Health Organisation and India's Ministry of Health and Family Welfare. The list also included some private players. The principal aim was to allow people, across all socio-economic levels, access COVID-19 related information.

Internet governance: shutdowns - In current times, when the productivity of people depends significantly on the internet, its shutdown can be extremely detrimental to societies (Gardner, 2020) However, internet shutdowns are not uncommon even in times like these. Basic internet services, such as filing for driving licenses, were accessed by locals using the Internet Express, which is a train that shuttles to the nearest town where they can get online. With the pandemic, when the internet has become the most important tool available to citizens, the impact of Internet shutdowns has become grimmer. Shutdowns lead to severe implications for all aspects of life, and there are many issues that require research in this regard. The impacts resulting from a climate of uncertainty can potentially discourage foreign investors and spill over to a wide range of sectors, including education, healthcare, press and news media, and e-commerce (Bhandari,2020). It is important to understand the far-reaching human rights impact of internet shutdowns, which are exacerbated in the current scenario. Shutdowns have deep political reasons and in many cases the consequences are indeterminate. Digital money - Digital payments and digital currencies are likely to have a key role in the post-pandemic situation. As digital payments are contact-less they will be encouraged by governments, and will likely see a surge. This will also be boosted by the gig economy and WFH situations. There are two distinct phenomena related to digital money that has aided the fight during the pandemic. First, banknotes and coins were suspected to be carrying the virus and digital payment was preferred to the 'dirty money' (Faseeha ,2020). Second, during the lockdown, there was a loss of jobs, and governments provided aid through payment apps and digital payment modes. In various crisis and disaster events, where the mobility of civilians was restrained, many mobile payments service providers (e.g. Vodafone in Afghanistan, Safaricom in Kenya, and Orange in Africa) provided quick funds transfer of remittances from migrants to their homes, and relief aid from the government to victims (Faseeha ,2020). This is once again observed in the Covid-19 crisis and needs further examination. Before the COVID-19 pandemic, studies in 2018 and 2019 recommended limiting the use of gadgets by adolescents to 3-4 hours a day because prolonged use can interfere with learning and cognition related activities. The use of gadgets also needs to be limited so that adolescents are more productive in using their time, and have social interactions with their environment. During the COVID-19 pandemic, adolescents become used to doing online learning for 3-4 hours a day. In addition,

the use of gadgets for other activities such as playing games, browsing, and other activities continues. Thus, based on additional field findings and studies from other sources, this study found that the use of gadgets by adolescents for up to 8 hours a day during the COVID-19 pandemic is recommended. (Rahul *et al,* 2020)

4. EFFECTS OF ELECTRONIC GADGETS ON FOOD CONSUMPTION PATTERN AND LIFESTYLE MODIFICATION

The novel coronavirus disease 2019 (COVID-19), originated in Wuhan city of China, has spread rapidly around the world, sending billions of people into lockdown. The World Health Organization (WHO) declared the coronavirus epidemic a pandemic. In light of rising concern about the current COVID-19 pandemic, a growing number of universities across the world have either postponed or cancelled all campus events such as workshops, conferences, sports, and other activities. Universities are taking intensive measures to prevent and protect all students and staff members from the highly infectious disease. Faculty members are already in the process of transitioning to online teaching platforms.

During the lockdown, there was limited access to fresh food and a reduction in variety of food groups. Instead, people might turn to more processed convenient foods products which can be high in energy and low in nutrients. Besides that, the boredom caused by reduction or loss of work and media reports on coronavirus makes life stressful. Boredom or stress can lead to emotional, overeating, and high energy food craving and ultimately adversely affect well-being. Therefore, lifestyle and dietary behaviour changes were to be expected because of the COVID-19 pandemic. However, a healthy diet and lifestyle is helpful to support health and well-being. For this reason, several health organizations including the World Health Organization and European Federation of the Association of Dietitians offered several nutritional and lifestyle recommendations to follow during lockdown. (Jap *et al.,* 2020)

The use of electronic gadgets, especially mobile phones among youth, has been a growing global concern. The worldwide COVID-19 lockdown has only amplified the issue. The extended period of lockdown and virtual classes has increased college students' time on their electronic gadgets. The debilitating health effect of excessive usage of gadgets has been well established. There is an array of effects like headache, nausea, ophthalmological concerns and psychological outcomes associated with gadget use for extended periods. The study aims to understand the difference in time spent using gadgets before and during the lockdown and the associated health impacts (Mohammadi *et al.,* 2020). The link between stress and emotional eating has long been known. Previous research has found a link between stress and the amount of food ingested. It has been proven that people who are stressed seek more high fat and high sugar foods, because their bodies require more energy to function when they are stressed. Furthermore, the body stores more abdominal fat. COVID-19-related risk perceptions may influence people's food purchasing and consumption decisions. People may try to reduce their risk of infection by increasing their use of delivery services, purchasing more packaged food, which is seen as more hygienic, purchasing food with a longer shelf-life (and thus purchasing less fresh food) to limit their shopping trips, or eating more healthy food in an attempt to boost their immune system. Furthermore, people's fears of food shortages may have influenced shopping behaviour, such as stocking up on specific goods. COVID-19 has recently been

proven to provide additional health hazards as a result of the metabolic consequence of overeating while confined at home. (Ammar *et al*,2020). The food security and nutrition risks of these dynamics are serious. Already, before the outbreak of the pandemic, according to the latest State of Food Security and Nutrition report (FAO et al., 2020), some two billion people faced food insecurity at the moderate or severe level. Since 2014, these numbers have been climbing, rising by 60 million over five years. The COVID-19 pandemic is undermining efforts to achieve SDG 2. The complex dynamics triggered by the lockdowns intended to contain the disease are creating conditions for a major disruption to food systems, giving rise to a dramatic increase in hunger. The most recent estimates indicate that between 83 and 132 million additional people (FAO *et al.,* 2020)—including 38-80 million people in low-income countries that rely on food imports (Torero, 2020)—will experience food insecurity as a direct result of the pandemic. COVID-19 is a respiratory illness and there is no evidence that food itself is a vector of its transmission (ICMSF, 2020). However, the virus, and measures to contain its spread, have had profound implications for food security, nutrition and food systems. At the same time, malnutrition (including obesity) increases vulnerability to COVID-19. Initial and ongoing uncertainty surrounding the nature of the spread of COVID-19 led to the implementation of strict lockdown and physical distancing policies in a number of countries. These measures caused a serious slowdown in economic activity and disrupted supply chains, unleashing new dynamics with cascading effects on food systems and people's food security and nutrition. These trends are affecting the six dimensions of food security proposed by the HLPE in its 15th report—availability, access, utilization, stability, agency and sustainability—which are essential for ensuring the right to food (HLPE, 2020).

As the COVID-19 pandemic unfolded, many countries moved to shut down informal food markets, which governments saw as spaces for potential disease transmission, reflecting a 'formality' bias in public health and food policy (Battersby, 2020). Informal markets are extremely important as sources of food and livelihoods in developing countries (Young *et al* 2019). In South Africa, formal food retail outlets, which sell processed and packaged foods, were allowed to remain open while informal and open-air food markets, which typically sell more fresh fruits and vegetables, were shut down (even though open-air markets are actually safer in terms of person-to-person transmission (Moseley *et al.,* 2020)). This move was especially detrimental to poor people who are more reliant on such markets for food because they can buy produce and foodstuffs in smaller quantities. After lobbying from academics and civil society, these markets were eventually allowed to reopen. Differentiated responses to these changes have emerged.

A recent study suggests that poor households are likely to shift their spending away from fresh fruits and vegetables with high micronutrient content to less nutrient-rich staple foods as a direct result of the pandemic (Laborde *et al.,* 2020). Other studies also showed a shift towards consumption of more processed foods (Bracale *et al.,* 2020). At the same time, in North America, there was a resurgence of interest in community supported agriculture (CSA) subscriptions, as people increasingly grew concerned about the safety of shopping in supermarkets and desired more direct access to fresh fruits and vegetables (Worstell, 2020), meat and fish products. CSA farms, however, were unable to meet all of this demand. There

was also increased interest in home and community gardening as people sought to grow their own food to ensure their food security and nutrition (Lal, 2020). These changes to food environments had variable impacts on food diversity and nutrition.

The increase of unstructured time and the psychological impact of the enforced isolation have been suggested to cause changes in dietary habits and lifestyle. The primary goal of this study was to look at the effects of the COVID-19 outbreak on eating habits and other health-related behaviours among individuals in Kuwait during the lockdown. The second step is to look at the demographics (Wafaa , 2020).

5. FORMULATION OF IMMUNE BOOSTERS

Current scenario depicts that world has been clenched by COVID-19 pandemic. Inevitably, public health and safety measures could be undertaken in order to dwindle the infection threat and mortality. Moreover, to overcome the global menace and drawing out world from moribund stage, there is an exigency for social distancing and quarantines. Since December, 2019, coronavirus, SARS-CoV-2 (COVID-19) have come into existence and up till now world is still in the state of shock. At this point of time, COVID-19 has entered perilous phase, creating havoc among individuals, and this has been directly implied due to enhanced globalisation and ability of the virus to acclimatize at all conditions. A wide spectrum of studies is being conducted to design a formulation with the aid of medicinal plants, millets, pulses and green leafy vegetables. The naturally occurring products and phytomedicines are coming to the fore all around the world, owing to the orientation of the social fabric to such remedies in different health care centres all across the globe (Mordeniz, 2019). The global outlook for drug formulation is showing a paradigm shift as individuals are facing chronic as well as lifestyle-related disorders, due to which they are turning their stance towards improving life-styles and disease deterrence. However, during ancient period herbal phyto-constituents were the only alternatives for healing the illness as antibiotics were not discovered. Particularly, herbal formulations endow with toolbox to concoct novel antiviral products. This pragmatically involves the understanding of antiviral mechanisms of natural products and their role in heckling virus life-cycle, replication, assembly and its release. Ever since, the safety and clinical characteristics of traditional medicines have come out, their consumption have been gradually elevating after approval by scientific communities (Baell, 2016). Attributable to the side-effects of chemical compounds onto human bodies, it has believed to utilize the herbal therapies with much more effectiveness and nil side-effects. Recently, WHO, has estimated that approximately 80% of the world population has been trusting the herbal therapeutics, yet, a quite a few numbers of plants have been studied for this noble work (Sarfraz, I et al., 2020). Undeniably, traditional drugs are long in the tooth since primordial times and play a significant role to meet global health needs. Coronavirus COVID-19 pandemic is a huge catastrophe that has caused devastating effects on global populations. It has wreaked havoc on populace of the planet and killed enormous human beings worldwide, yet still under ruination. Consequently, this pandemic has led to complete lockdown of different countries around the globe, yet this situation is still prevailing on earth. Since decades, vaccination have been the only means to treat the viral infections. Understanding the gravity of the situation and health crises, it is the responsibility of all the scientific community to look for the alternatives or techniques to develop viral vaccination against COVID-19 infection. The mounting substantiation reveals

that having healthy lifestyle, natural food products can boost the immune functions of the body to combat the severity of viral infections. While, improving the immune responses they also provide resistance against pathogenic organisms (Grant *et al.,* 2020).

In the view an argument, early adaptive defense responses might draw a parallel link with superior clinical results, it is pertinent to accentuate that a strong immune system play a pivotal role in the prevention and cure of COVID-19 ailment. The facets for a healthy immune system is to have balanced diet, to be physically fit and ingest vital nutrients, polyphenols and natural antiviral compounds and protect nasal and oropharyngeal mucosal layers along with halting smoking habits (Jayawardena *et al*., 2020). The upliftment of immune responses of body is the cutting edge in thwarting the viruses to stay healthy. For this purpose, it is rudimentary to amend the current lifestyle by adding smarter works in 'to do's' list so as to make inner immune/defence competitive against viruses such as COVID-19. This would naturally heal the antiviral effects within the body by dissolution of the avidity of the disease and infection. (García, 2020). Majority of these attributes are linked to reboot the functions associated with improved immunity via mediating anti-inflammatory activities, enhancing cell-mediated immune functions, modulated APC (Antigen Presenting Cell) activities and suppressing pro-inflammatory mediators. In addition, they also mediate effective cell-cell communication during innate as well as adaptive immune responses (Sarfraz et al., 2020). Hence, a scientific expedition of escalating immune system through appropriate sleep, judicious exercise, stress-free environment, proper nutritive foods, water intake and consumption of fresh and healthy fruits and vegetables would anticipate the citizenry to cope with coronavirus battle via naturally vaccinating their systems (Mousa, 2017). The most momentous weapon against any kind of viral infection is a strong immune system. There is plethora of studies done in past that suggest an imperative role of trace elements and vitamins in normal performance of the immune system (Kalra ,2003). Furthermore, there are reports of elevated resistant to viral infection in response to their supplementation. There is a wide range of herbals, nutraceuticals and probiotics have been found to be effective against viral infestations and stimulation of immune responses. Immunity is the state of being immune especially a condition of being able to resist a particular disease especially through preventing development of a pathogenic microorganism or by counteracting the effects of its products. (Yaseen,2021). Nutritional immunity is a process by which a host organism sequesters trace minerals in an effort to limit pathogenicity during infection. Circulating concentrations of minerals, such as iron and zinc, decline rapidly and dramatically with the inflammation associated with infection. The decline in iron and zinc is thought to starve invading pathogens of these essential elements, limiting disease progression and severity. The immune system protects our body from outside invaders, such as bacteria, viruses, fungi, and toxins. Many cells and organs work together to protect the body. White blood cells, or leukocytes, play an important role in the immune system. Ancient grains like jowar, ragi, foxtail, bajra and other minor millets are promising cereals which are nutritionally superior to major cereals and serve as a good source of protein, high dietary fibre, vitamins, minerals, antioxidants and micronutrients. Millets seem to be in demand again as it is known to be a promising immunity booster. First up in our list of foods to help boost your immune system is the finger millet - Ragi or Nachni. This versatile superfood brings with it the powers

of calcium, gluten-free protein, a whole lot of fiber, and lots of amino acids. All this helps boost your immune system. Once a staple diet in South India for a long time, ragi is now all the rage and it's easy to see why. You can get your ragi fix easily in our delicious Fruit and Nut Millet Muesli, Ragi Bites Cereal, Namkeens, and Smoothie Shakes. (https://millets.res.in/). Yes Covid-19 pandemic has made everyone conscious about selection of foods in the diet so as to boost immunity to combat the dare consequences of the disease. Everyone is cautious about their choice of foods for their good, health and vigour so as to increase the index of QOL (Quality of life). Remaining healthy is just not be free from disease but to have good QOL is very mandatory now. Of course, one such food ingredient that is the household name of most of the people and that is millet and we are addressing them as nutri cereals now. Ragi - Finger millet or Ragi or naachini is one such humble grain that is a common ingredient in each and every household. The procurement of Ragi is increased after Covid has shown its various forms of versatility. Finger millet (Eleusinecoracana L. Gaertn), is a crop with potentially tremendous but under-explored source of nutraceutical properties as compared to other regularly consumed cereals. These characteristics must be harnessed to develop finger millet as a novel functional food. In addition, introgression of these traits into other staple crops can improve the well-being of the general population on a global scale. Finger millet or Ragi displays an impressive nutritional profile, encompassing all the essential macronutrients like carbohydrates, fats, proteins, along with noteworthy levels of key micronutrients especially vitamins and minerals. It has negligible levels of cholesterol and sodium, to promote heart wellness. In addition, it contains considerable quantities of vitamins C and E, to boost immune, skin and hair health. The B complex vitamins - thiamine, riboflavin, niacin and folic acid as well as calcium, magnesium, iron and phosphorus are also found in ample amounts in ragi flour, truly justifying its status as a wholesome breakfast cereal and a superfood. Finger millet grains are powerhouse of essential minerals such as calcium (Ca) and phosphorus (P). The grains contain the highest amount of Ca, ranging from 162-358 mg/100 g when compared to other millet species. Calcium which is predominantly present plays an essential role in growing children, pregnant women, the elderly as well as in people suffering from obesity, diabetes and malnutrition. Deficiency of Calcium in the body can be mitigated by consuming fingermillet based food products in the daily diet of both young and elderly people. Phosphorus, another mineral present in Finger millet (130-283mg/100g) contributes to the development of body tissue and energy metabolism. Other minerals include iron with a concentration of 3-20% and magnesium implicated for the reduction of high blood pressure, severity of asthma, frequency of migraines and the risk of heart attack. In comparison with other millet species, Finger millet is more nutritious with higher mineral content and proximate composition and in fact, a favourable fibre rich food, that serves as an alternative to other routine cereal and grain crops in the Indian diet regime such as rice, wheat or barley. It has the crucial essential amino acids namely isoleucine, tryptophan, valine, methionine and threonine, thus complementing both vegetarian and vegan diets. Hence, finger millet can be a versatile portion in our diet so that it meets the nutritional requirements and also aids in boosting immunity in (above six months), Children, adolescents, adults as well as geriatrics too (Begum, 2021).

Varagu - Kodo millet (Paspalum scrobiculatum (L.)) is widely distributed in damp habitats across the tropics and subtropics of the world (Fig. 6). It is indigenous cereal of India and is grown today in Uttar Pradesh in the North and Kerala and Tamilnadu in the South. This cereal is also known as varagu, haraka and arakalu. It forms the main stay of the dietary nutritional requirements. It has high protein content (11%), low fat (4.2%) and very high fibre content (14.3%). Kodo millet is very easy to digest, it contains a high amount of lecithin and is excellent for strengthening the nervous system. Kodo millets are rich in B vitamins, especially niacin, B6 and folic acid, as well as the minerals such as calcium, iron, potassium, magnesium and zinc which nutrients enhance the immune response of an individual (Dayakar et al.,2017)

Medicinal plants like Hibiscus - *Hibiscus sabdariffa* (HS) is a shrub that belongs to the Malvaceae family. Hypertension, liver disorders, pyrexia, dyslipidemia, diabetes, high blood pressure, liver diseases, ulcers, abscesses, and anaemia are all treated with a water decoction made from dried HS calyx. HS's fleshy calyces are eaten as vegetables and used to make jellies, wine, cakes, syrup, and colourants.

Many research has supported the use of HS calyx extracts in traditional medicine. Extracts from HS have anti-oxidant, radical scavenging and angiotensin converting enzyme 1 (ACE1) inhibitory (12–14) properties, according to this research. Antihypertensive, antibacterial, antiproliferative, anti-glycemic, anti-hyperlipidaemic, antiobesity, anti-inflammatory, anti-carcinogenic, antinociceptive, antiproliferative, anti-glycemic, anti-hyperlipidaemic, anti-hyperlipidaethe presence of different bioactive agents in extracts of HS, suggests the possible involvement of several mechanisms in the suppression of immune and inflammatory responses. Suggested mechanisms include the suppression of cellular stress, inhibition of enzymes that can trigger inflammatory reactions, and down-regulation of pro-inflammatory genes (Umeoguaju *et al*, 2021).

Indian Borage - Plectranthus ambionicus belongs to the family Lamiaceae and commonly called borage in English. It occurs naturally in tropics and warm regions of Australia, Africa, and Asia. The plant is succulent, the aromatic herb has the nutritional and therapeutic properties, because of its phytochemical compounds. The leaves of the plant are acrid, bitter, and used in folk medicine for constipation, cold, asthma, cough, fever, skin diseases and headache. The leaves also used often eaten raw or as flavoring agents in preparations of traditional food items. The health benefits of a lot of herbal plants are associated with nutritional content. (Lukhoba *et al.,* 2006 and Rout et al., 2012). Hence,P. amboinicus is a very significant source for compounds that help in increasing the taste and the shelf life of the food.

According to the research, a high concentration of minerals like calcium and potassium is present (Lukhoba *et al.,* 2006). These minerals confer huge health benefits by improving the strength of bones and optimize the function of some vital organs like kidney, heart, nerves, and muscles. The iron content in P. amboinicus is quite significant at 0.262%. Hemoglobin contains iron and helps the RBCs to carry the oxygen to all parts of the body. Approximately, two- thirds of the iron is constituted by hemoglobin and the deficiency of which causes anemia. Moreover,

the plant also contains zeaxanthin is, neoxanthin, leptin, violaxanthin, and carotene. Therefore, P. amboinicus can be regarded as a very potent supplement in diet (Prasad, 2020).

Drumstick leaves - Moringa is a plant native to South Asian countries with the botanical name Moringa oleifera. Moringa has been used in many countries for decades and is an important part of traditional medicine. Moringa leaves are the most nutritional part of the plant, with an impressive nutritional profile consisting of Vitamins A, B, C, K as well as beta carotene, manganese, protein, calcium and fibre. Vitamin C, Vitamin A, and protein are the most significant nutrients for immunity, and all three are high in moringa. Moringa pods provide 157 percent of the daily Vitamin C requirement, making them an essential for immune system support. Flavonoids, polyphenols, and ascorbic acid are all abundant in Moringa. Moringa has been demonstrated to be especially advantageous for postmenopausal women, whose reduced oestrogen levels produce a drop in antioxidant enzymes. Moringa aids in the suppression of inflammatory enzymes in the cells. Moringa's anti-inflammatory characteristics make it an excellent choice for people suffering from chronic pain problems like arthritis (Pratibha pal,2019).

Horse gram, one of the lesser-known beans is horse gram (Macrotyloma uniflorum). Horse gram is a tropical and subtropical legume that is mostly used in dry-land agriculture. Unprocessed raw horse gramme seeds have been demonstrated in studies to have antihyperglycemic characteristics as well as attributes that diminish insulin resistance. Polyphenols, flavonoids, and proteins, the principal antioxidants found in fruits and other food components, are abundant in raw horse gramme seed. Additionally, Kaulath, a solid-state fermentation product derived from horse gramme, shown improved free radical scavenging properties and can be added in the diet and designed meals. The nutritional value of horse gramme has also been proven to improve when the seeds are dehulled and germinated. These horse studies grams show the importance of including it in the diet (Vrinda et al.,2017).

Nutraceuticals are the products which are argued to provide physiological assistance and protection against varied persistent diseases. Wide range of nutraceutical products have been isolated herbal products, dietary supplements, isolated nutrients, genetically engineered foods and processed cereals, beverages and soups (Mousa, 2017). Certain nutraceuticals have been shown earlier to enhance the immune function. The ingredients like Varagu (Kodo millet), Ragi (Finger millet), Horse gram, Hibiscus flower, Mexican mint (Indian Borage), Cumin seeds, Coriander seeds, Black Pepper, Dried Ginger, Drumstick leaves were collected from local market and used for the study which are highly rich in Carbohydrate, Protein, Fibre, Vit – C, Calcium, Iron, Phosphorus, Phytochemicals, Antioxidants. (Tamilselvan *et al.,* 2021)

III. RESEARCH METHODOLOGY

The research methodology pertaining to the present study on **"Effect of Electronic Gadgets on Nutritional Status, Dietary pattern and lifestyle modification of the young adults (19-25 years) before and during covid pandemic situation and standardization of Immune Boosters rich soup mix"**is presented under the following phases.

PHASE-I: Identification of the Subjects

A. Selection of area and subjects
B. Formulation of tools to conduct online survey
C. Framing and validating the questionnaire on the basis of –

1. Socio economic status
2. Anthropometric measurements
3. Dietary pattern
4. Lifestyle profile
    i. Physical Fitness
    ii. Stress Management
    iii. Sleeping pattern
    iv. Other behaviors – Helping Household activities, Watching TV, Listening Music, reading books, Gardening, smoking, alcohol consumption and chewing of betel leaves and tobacco.
5. Usage of electronic gadgets
    i. Type of gadgets used
    ii. Purposes of usage
    iii. Screening time – Frequency and time duration
    iv. Pros and cons of using electronic gadgets

PHASE II - Collection of data via online survey using validated questionnaire

A. Created a google link and shared in the online platforms (E-Mail, WhatsApp, Instagram, Facebook Pages.)
B. Effect of Electronic gadgets on dietary and lifestyle pattern of the selected subjects.

PHASE - III: Formulation, sensory evaluation, shelf-life assay and nutritional analysis of the Immune booster's rich soup mix

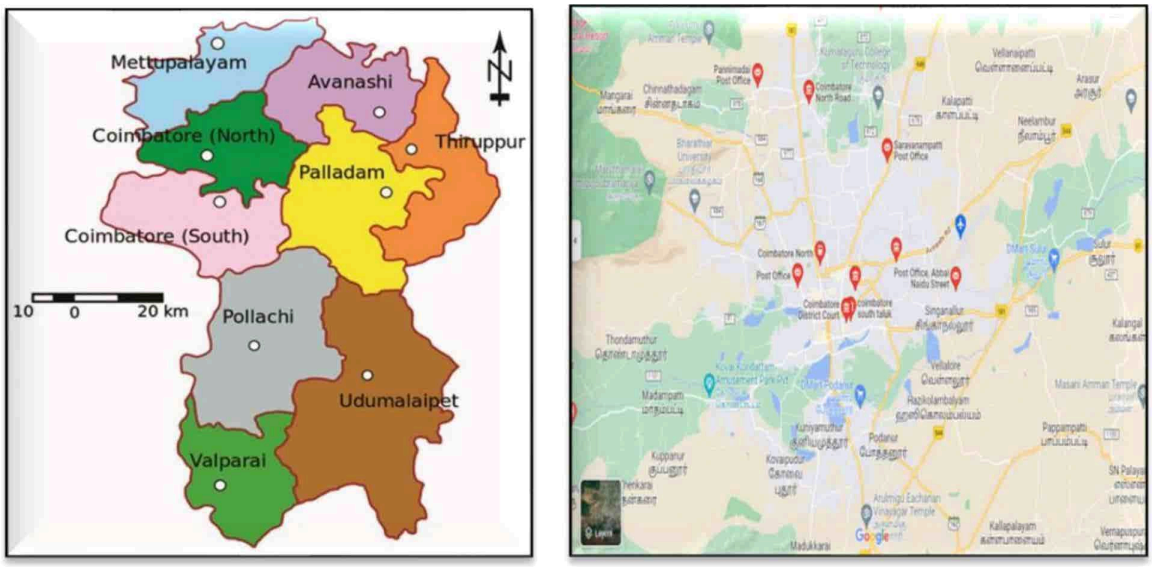
A. Selection of ingredients rich in immune boosters
B. Formulation and Sensory evaluation of the Immune booster's rich soup mix
C. Colour Analysis of the Immune booster's rich soup mix
D. Nutrient analysis of Immune booster's rich soup mix
E. Qualitative analysis of phytochemicals and antioxidant properties.
F. Shelf-life assay
G. Cost Effectiveness

PHASE - IV: Statistical Analysis and Data Interpretation

PHASE-I: Identification of the Subjects

A. Selection of area and subjects

COVID-19 is a global burden which continues to redefine daily lifestyle-related habits in a significant manner as the pandemic progresses through its different phases. The society has entered the era of the Industrial Revolution 4.0 which is marked by the increasingly dominant role of information technology, including the role of electronic gadgets. COVID-19 pandemic also affects education system. The research was carried out among young adults in the age of 19- 25 years, since this particular age group uses the gadgets for a longer period of time compared with other age categories. Thus, the study was carried out for the young adults, between the age of 19 - 25 years for both genders including Under graduates, post graduates, and Research Scholars. The locale selected for the study was Coimbatore city, especially in Coimbatore north taluk includes Koundampalayam, Saibaba colony, R.S. Puram and Vadavalli. Coimbatore is the second largest city of Tamilnadu. It is situated in the western corner of Tamil Nadu, a short distance from the border with the neighbouring state of Kerala, and is surrounded by the Western Ghats on all sides. Coimbatore is located at 11.0161°N 76.971°E. This area was chosen because of the availability of the required number of subjects, habitual location to the investigator, the ease of cooperation from the authorities to conduct the study successfully. Before conducting the study, the approval was obtained from the institutional human etics commity, Avinashilingam institute for home science and higher education for women, Coimbatore (AUW/IHEC/FSN-21-22/XPD-09).



The geographical locale of the study area

The present cross-sectional web-based online survey was carried out using google form in online platform, based on the probability sampling method and the study subjects were selected using simple random sampling method. Simple random sampling is a sampling technique where every item in the population has an even chance and likelihood of being selected in the sample. Simple random sampling gives everyone in the target population an equal and known probability of being selected as a respondent in the sample group(Lauren

Thomas,2020). The target sample size for the study was 150 (both male and female) young adults who were college students – Undergraduates, postgraduates and Research scholars.

Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Adolescents and young adults both genders in the age group of 19 and 25 years	Adolescents and middle age adults of Less than 19 years and more than 25 years
Able to read / write / Understand / cooperative / willing to involve in the study by giving oral and written consent	Not able to read / write / Understand / cooperative / willing to involve in the study and noy giving oral written consent

B. Formulation of tools to conduct the online survey

A questionnaire has prepared to collect demographic profile related to family background, age, educational status, lifestyle pattern, food consumption pattern, physical activity, sleeping behavior and usage of electronic gadgets before and during covid pandemic situation and the formulated questionnaire was validated and applied for the study.

The selected subject's group of 19 and 25 years were properly oriented in the google survey form to avoid ambiguity and to fill up the questionnaire carefully to obtain reliable and accurate data about the electronic gadgets and its role on food consumption and lifestyle pattern before and during covid pandemic situation.

C. Framing and validating the Questionnaire as a tool to conduct online survey.

1. **Socio economic status** is the social standing or class of an individual or group. It is often measured as a combination of General information's - Age, Gender and education qualification, occupation, Income and no. of family members (John et al.,2020). Socio economic profile related data were collected at the time enrolment in the initial stage of the study.
2. **Anthropometric measurements** are the universally acceptable, inexpensive and non-invasive procedure. It is the measurement of the body's physical dimensions. The physical dimensions are used to develop an understanding of individual's nutritional status. The anthropometric data including height, weight, BMI before and during covid of the selected participants (N=150) were recorded carefully to obtain reliable data for assessing their nutritional status. BMI - The most commonly used, well known indicator of body fatness is the Body Mass Index. According to WHO, Body Mass Index (BMI) is a simple index of height and weight that is commonly used to classify the different grades of malnutrition. BMI is calculated using the formula = Weight(kgs)/Height $(M)^2$. BMI is a measure of the body weight relative to height that is associated with body fat and health risk. As a measure of relative weight, BMI is easy to obtain. It is an acceptable proxy for thinness and fatness, and has been directly related to health risks and death rates in many populations (Nishida et al., 2004). BMI calculation was instructed to the participants in an image format which is inserted in the google form. BMI was computed carefully for the selected subjects, before and during covid pandemic situation.

3. **Dietary pattern** of the selected subjects (N=150) which includes maintenance of balance diet, inclusion of fruits, vegetables, cereals, processed foods in the diet as routine at different intervals, Emotional eating and Consumption of water per day were collected before and during covid pandemic situation.
4. **Lifestyle profile** includes Physical fitness, Stress management, sleeping pattern and other behaviors like smoking, alcohol consumption and so on were collected before and during covid pandemic situation.

i. **Physical fitness** - Physical fitness is a state of health and well-being and, more specifically, the ability to perform aspects of sports, occupations and daily activities. Physical fitness is generally achieved through proper diet, optimum nutrition, appropriate physical exercise, sufficient rest and sound sleep. Physical Fitness before and during covid includes regularity of doing physical activity in terms of type, time and frequency of adopting physical exercise.

ii. **Stress Management** – It is a wide spectrum of techniques and Psychotherapy aimed to control a person's level of stress, usually for the purpose of and for the motive of improving everyday functioning capacity. Stress produces numerous physical and mental health issues based on the individual's situational factors. These could be included by decline in physical health as well as leads to have depression(Huang *et al.,* 2020). The process of stress management is named as one of the keys to a happy and successful life in modern society. Stress pattern of an individual before and during covid includes the usage of electronic gadgets and to experience any form of stress and its impact on food consumption pattern, eating habits basically with this backdrops stress and strain were considered as an important aspect in this covid situation.

iii. **Sleeping pattern** - A sleep pattern, also referred to as sleep-wake pattern, is a biological rhythm that guides the body as to when it should sleep and when it should wake. It is one of the body's circadian rhythms and typically follows a 24-hour cycle, controlling the body's schedule for sleeping and waking (Eric, 2022)**.** Sleep patterns were affected by many factors in terms of age, the amount of recent sleep or wakefulness, the time of the day or night relative to an individual's internal clock, other behaviours and life style pattern prior to sleep such as exercise, stress, environmental conditions such as temperature and light, and various chemicals. Sleeping pattern of the selected subjects were analysed before and during covid includes pattern of sleep and usage of gadgets.

iv. **Other behaviors** like smoking and alcohol consumption of an individual before and during covid has been checked.

5. **Usage of electronic gadgets** – electronic gadgets are appliances which work on information and communication technology or electronic technology. Modern gadgets are basically advanced in quantity and quality of gadgets. They are user friendly electronic appliances using in our daily routine activities like desktops, laptops, tablets, iPad, smartphones and so on. Usage of electronic gadgets before and during covid pandemic were collected in terms of types of gadgets, its screening time per day, side effects of using these gadgets, Purpose of usage, Pros and cons of using electronic gadgets.

PHASE – II: Online Data collection using a validated questionnaire

A. Created a google link and shared in the online platforms (E-Mail, WhatsApp, Instagram, Facebook Pages.)

online survey was carried out by using validated questionnaire and created a google link which is shared in the online platforms (E-Mail, WhatsApp, Instagram, Facebook) to collect the data related to the present study. The data collection has conducted during the study period. The collected data were analysed and presented in the Chapter IV Results and discussion.

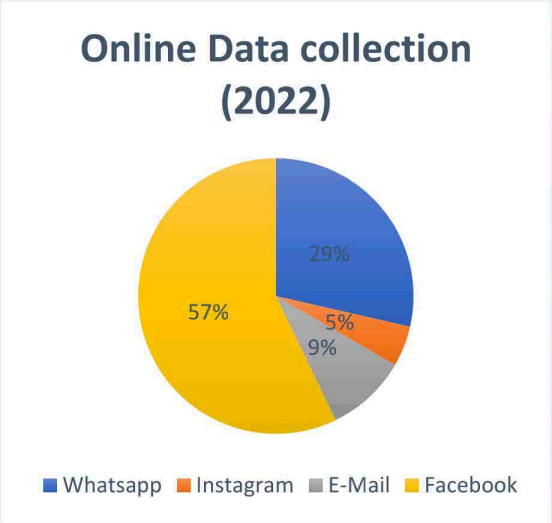


Figure 1
Online data collection

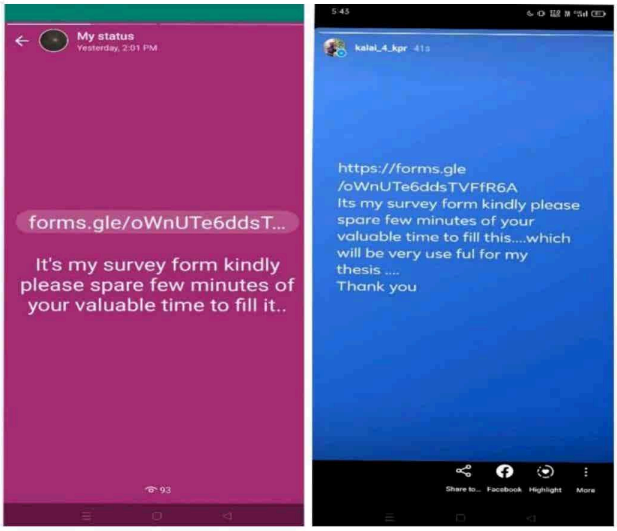


PLATE I - ONLINE DATA COLLECTION

B. Effects of using electronic gadgets on dietary and lifestyle pattern before and during covid pandemic situation

From the responses of the respondents. Since there is no other source of communication other than through online mode during this covid pandemic. The usage of electronic gadgets (Mobile, television, laptop, desktop, tablets) and screening time were increased when compared to before covid period. At the same time, there was also change in their purpose of usage compared to before covid period. Thus, increase in the usage of these electronic gadgets also has impact in one's mental and physical health with changes in their eating pattern. Among 150 college going boys and girls were participated in this survey, common in skipping of meals, irregular intervals of food intake, improper in maintaining a balance diet, increased consumption of junk and processed foods before covid were adhered of the selected subjects were assessed. During this covid period, dietary pattern among youngsters maintaining their fitness were challenging and were interested in this aspect. Physical activities during covid, due to the excessive usage of gadgets before and during covid period, the sleeping pattern was disturbed and were recorded. In recent years, Stress plays a major role among youngsters due to their lifestyle pattern. In turn these lifestyle related behaviors led to weight gain and data related to anthropometric measurements were recorded. Since individuals with obesity and

associated metabolic comorbidities such as diabetes and cardiometabolic disease are more prone to getting COVID-19 infection (Garg,2020). The control on adaptation of negative lifestyle related behaviours becomes a crucial preventive step in containing the spread.

PHASE - III: Formulation, Preparation, sensory evaluation, nutritional analysis and Shelf-life assay of the Immune booster's rich soup mix

As the coronavirus (COVID-19) is spreading rapidly across the globe, it is important to take note of the approaches that can help to prevent and fight against infections particularly viral infections. Evidences already suggested that viral infections are one of the world's greatest public health challenges affects the health and wellness of the population (WHO, 2020). Good nutrition is fundamental aspect for improving immunity. The immune system is the body's defense against diseases and infection and it has long been established that several factors influence the function of the immune system including stress, sleep and nutrition (Song et al, 2019 and Gombart et al 2020). The WHO guidance on diet, especially during the current pandemic states that "good nutrition is crucial for health, particularly in times when the immune system might need to fight back" (WHO, 2020). Providing a diet high in nutritious foods rich in vitamins and minerals support optimal functional capacity of the immune system by providing Macro and micro nutrient especially antioxidants help to slow damage of cells caused by free radicals (Lobo 2010) or assisting in T-cell production. Good nutrition is thus important in supporting an optimum immune system which can reduce the risk of viral infections (Beck and Levander, 2000). It is now recognized that the complex, integrated immune system requires several micronutrients that have essential, often synergistic roles at every phase of the immune response. In fact, even marginal deficiencies in certain nutrients have been shown to impair the immune system are believed to work collectively to support an optimum immune system. Based on a variety of systematic and clinical data, vitamins A, C, D, E, Zinc, Iron, Calcium, Copper, and selenium are particularly important to boosting immune response(Gombart et al, 2020).

Balanced food for preventing and correcting nutritional deficiencies should have a high nutritive value, be appropriate, be readily available at low cost, and be familiar in the community. One of the techniques that have been shown to be successful in improving the health status of the population during covid pandemic situation is the development of supplements using low-cost, locally available indigenous foods that are common to the community. With these background Information, low cost, locally available immune booster's rich functional foods were used for the formulation of soups and were subjected to have sensory evaluation, nutrient analysis and calculation of nutrient content of the formulated immune boosters rich soup mix. Thus, food-based supplementation which is one of the most effective methods of promoting health and preventing or combating health problems (Cohen 2017).

A) Selection of ingredients rich in immune boosters

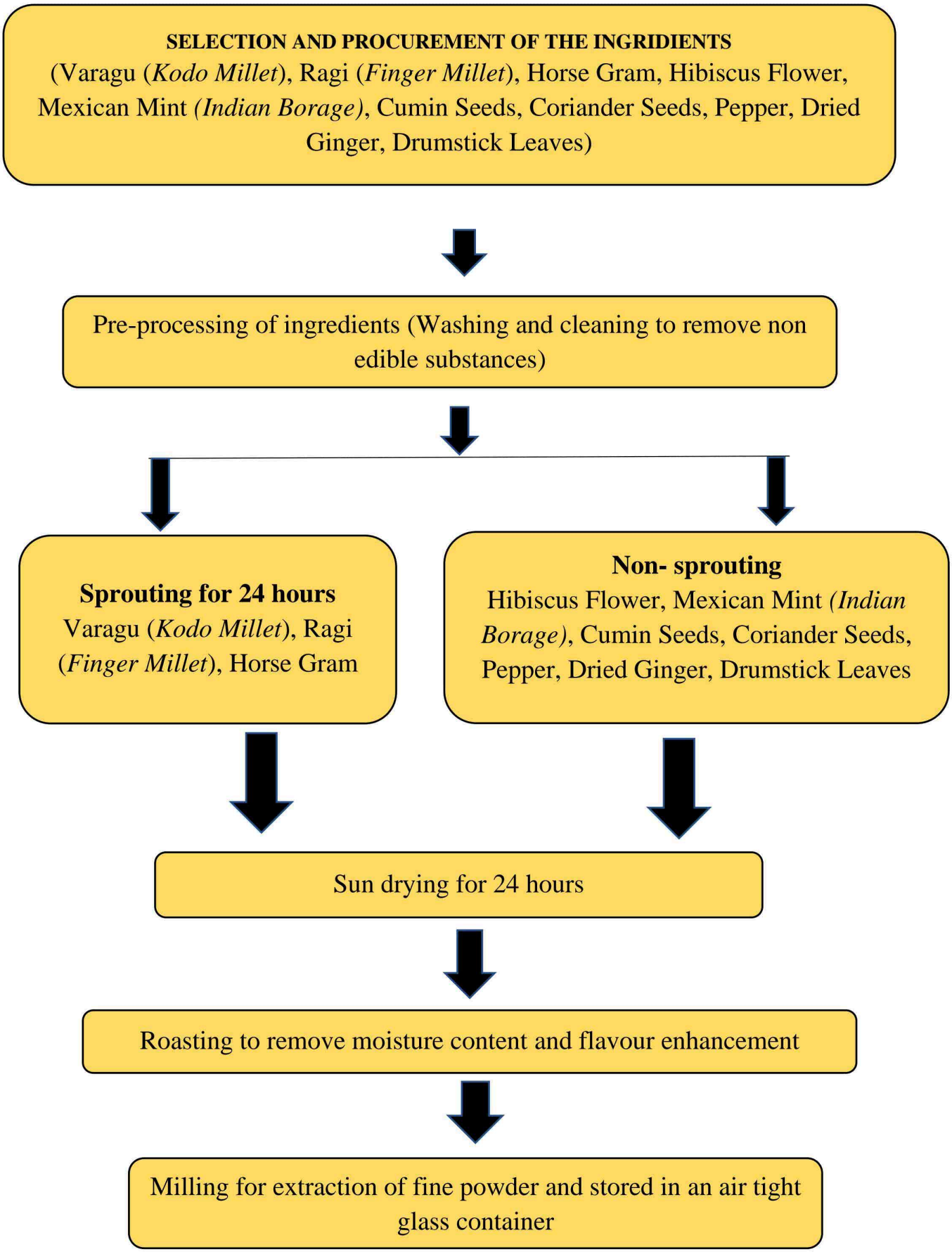
Millets such as Varagu (*Kodo millet*) and Ragi (*Finger millet*), Horse gram, Hibiscus flower, Mexican mint *(Indian Borage)*, Cumin seeds, Coriander seeds, Black Pepper, Dried Ginger and Drumstick leaves collected from local market were used for the study.

TABLE I

Selection of ingredients having nutritional significance and health benefits for immune booster's rich soup mix

Name of the ingredients and picture	Botanical name and quantity used	Nutritional significance	Health benefits
Kodo millet 	*Paspalum Scrobiculatom(20g)*	Protein, Fat, Fibre, Carbohydrate, Thiamine, Niacin, Calcium, Iron, Phosphorus, phenolic and flavonoid.	Has powerful antioxidants and increases immunity and protect the body from cancer, premature ageing and oxidative stress.
Finger millet 	*Eleusine coracana(20g).*	Carbohydrates, Fibres, Fats, Proteins, Thiamine, Riboflavin, Niacin, Folic acid, Calcium, Magnesium, Iron, Phosphorus, Vit-C, and Vit – E	Phytates, polyphenols and tannins have antioxidant activity property, which is an important factor in health, aging, Immune system and metabolic diseases.
Horse gram 	*Macrotyloma uniflorum (25g)*	Protein, Carbohydrates Antinutritional compounds, Prebiotic, Phytochemicals, Antioxidant, Bioactive compounds, Oligosaccharides	Has high levels of antioxidant and radical scavenging activities. The bioactive substances have immense potential for curing varieties of diseases such as common cold, throat infection, fever, urinary stones, asthma, bronchitis, leucoderma, etc.
Hibiscus flower 	*Hibiscus rosa-sinensis (5g)*	carotene, riboflavin, anthocyanins, ascorbic acid, niacin, calcium, iron and vitamin C.	Has Antimicrobial, Emollient, Antipyretic, Diuretic, Anti-Helmentic, Sedative Properties, antifungal, antioxidative activities and as a Soothing Cough Remedy
Mexican mint 	*Indian Borage (5g)*	flavonoids, anthocyanins, terpenoids, steroids, polysaccharides, alkaloids, amino acids, sesquiterpene, quinones, and naphthalene groups.	Ability to improve skin, detoxify the body, defend against cough and cold, ease arthritis pain, relieve stress, and optimize digestion.
Cumin seeds 	*Cuminum cyminum(5g)*	Fat - Monounsaturated Fat), Protein, Dietary Fibre, Vitamins - B,E , Iron, Magnesium, and Manganese	Helps in digestion, immune system, and circulation. Has anti-inflammatory, Anti-cancer and Antioxidant property.
Coriander seeds 	*Coriandrum Sativum (20g)*	Protein, Folic acid, Vit-C, Vit – A, Beta – Carotene	It is a powerful antioxidant, anti-edemic, anti-inflammatory, antiseptic, emmenagogue, antihypertensive, and myorelaxant.
Black Pepper 	*Piper nigrum (5g)*	Vitamin K, iron, manganese with trace amounts of other essential nutrients, protein, and dietary fibre.	Its active compound piperine may have potent antioxidant, improves cholesterol levels, blood sugar control, brain and gut health and has anti-inflammatory properties.
Dried Ginger 	*Zingiber officinale (5g)*	It is rich in polysaccharides, lipids, organic acids, and raw fibres, phenolic - gingerols, shogaols, and paradols, terpene compounds - β-bisabolene, α-curcumene, zingiberene, α-farnesene, and β-sesquiphellandrene.	It possesses multiple biological activities, including antioxidant, anti-inflammatory, antimicrobial, anticancer, neuroprotective, cardiovascular protective, respiratory property antiobesity, antidiabetic, antinausea, and antiemetic activities.
Drumstick leaves 	*Moringa oleifera(15g)*	It is rich in B vitamins, vitamin C, provitamin A as beta-carotene, vitamin K, manganese, fibre, potassium, magnesium and protein	High on vitamin C and antioxidants, drumstick combat against common cold, flu and stave off several common infections. The anti-inflammatory and anti-bacterial properties of drumstick assists in lessening the symptoms of cough, wheezing and other respiratory problems

B. Process involved in the formulation of the Immune boosters rich soup mix



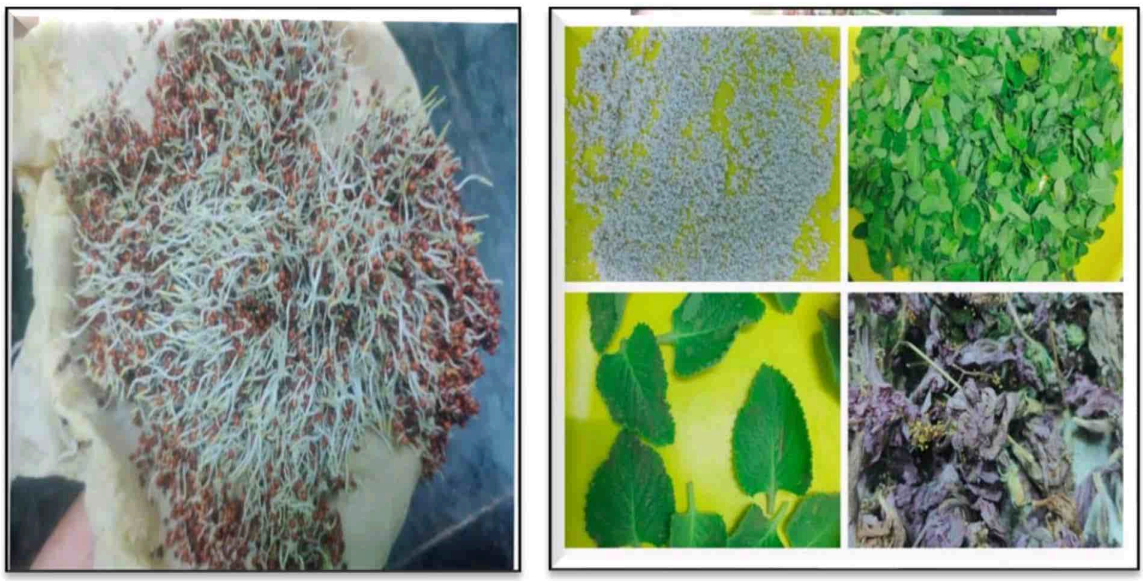


PLATE II - PREPARATION OF INGREDIENTS FOR THE FORMULATION OF THE IMMUNE BOOSTER'S RICH SOUP MIX

B. Sensory evaluation of the Immune booster's rich soup mix

The formulated food product can be recommended to the young adults to include in their food consumption pattern especially during this covid pandemic situation. Evaluation of sensory attribute is a science by using human senses for measuring the appearance, flavour, colour, texture and taste. The immune booster was tested organoleptically by a panel of 20 semi-skilled evaluators belonging to II MSc FSN and PhD Scholars. Each panel members received the formulated immune boosters rich soup mix in the form of soup, prepared by mixing 5gms of health mix with 25ml hot water to evaluate sensory attributes such as appearance, colour, flavour, taste, texture and overall acceptability using a nine-point Hedonic Rating Scale. The panel members were instructed about the evaluation procedure, and score rates recording in the sensory evaluation sheet.

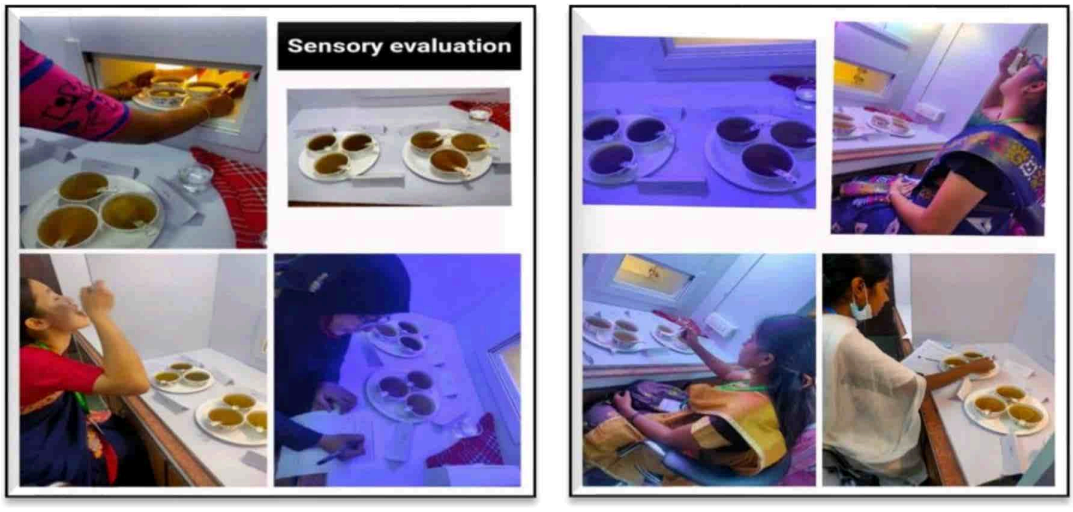


PLATE III - SENSORY EVALUATION OF THE IMMUNE BOOSTERS RICH SOUP MIX

C. Colour Analysis

Food colour reader is an instrument which measures and quantifies three primary colours namely, red, green and blue which are the components of light seen by the human eye Yellow, orange colours are secondary and tertiary colours which were not quantified individually. Food colour reader is used to check and standardize the colour of samples like solid, powder, paste, liquids etc. CIE LAB is color space based on the fact that a color can't be both red and green, or both blue and yellow, because these colors oppose each other. So, a single data could be used to describe red/green and yellow/blue. When we use CIEL 'a'b' to describe a color, L means lightness, a means red/green and b* means yellow/blue. 1 gm of Soup mix powder and 1 ml of soup which was prepared from the immune booster's rich soup mix was taken in a watch glass and tested for their colour intensity using the food colour reader

PLATE IV – COLOUR ANALYSIS OF THE IMMUNE BOOSTERS RICH SOUP MIX

D. Nutrient analysis Immune boosters rich soup mix

A food substance provides energy or is necessary for growth and repair. This specific property of food is due to its chemical content. Food contains specific components particular to that specific food which are called as nutrients. Nutrients are of two types- Macronutrients (Carbohydrates, Proteins, Fats- which are consumed in major amounts) and micronutrients (vitamins and minerals) which are consumed in little amounts. A chemical substance that provides nourishment and affects the nutrition and metabolic processes of the body are called as nutrients. Nutrients are essential for growth, reproduction, and maintenance of health. Nutrients analysis refers to the process of determining the nutritional content of foods and food products. The different nutrients namely energy, crude fibre, carbohydrate, protein, fat, vitamin c, Phosphorous, calcium, iron, phosphorous, β-carotene, and Zinc of the highly accepted immune boosters rich soup mix were analysed using the standard method (AOAC,2005).

Analysis of Macro and Micro nutrients:

i. Ash

Ash content by continuous heating, dry powder of the fresh samples is obtained which can be used for the determination of minerals present. Dry ashing involves the use of high

temperature muffle furnace capable of maintaining temperature between 500 to 600° C. Water and other volatile materials are vapourised and organic substances are burned in the presence of the oxygen in the air to CO2, H2O and N2. Most minerals are converted to oxides, sulphates, phosphates, chlorides and silicates (AOAC,2005).

ii. Moisture content

Estimation of moisture is one of the most often performed determinations in food analysis. Moisture is lost when food is heated not much higher than the temperature of boiling water or by allowing to stand overnight over dehydrating or by heating over vacuum. The sample substance mass is measured before and after drying process for final moisture determination on percentage basis (AOAC,2005).

iii. Crude fibre content

The term "crude fibre" ordinarily meant in agriculture and food analysis is the organic residue consisting largely of cellulose, that is left after other carbohydrates and proteins have been removed by successive treatment with boiling acids and alkalies. The crude fibre obtained in this way is not cellulose but contains distinct properties of hemicellulose, and nitrogenous substances. These however are not sufficient to prevent the results from being reasonably accurate and comparable. It is determined after chemical digestion and solubilisation of another materials present (AOAC,2005).

iv. Fat

Ether extraction of the crude fat in vegetable products is carried out in a continuous extractor in an apparatus in which the ether, after dissolving a portion of the fat of the material and discharging into the extraction flask, is volatized, condensed and again allowed to act on the material. The steps in the process are repeated continuously and automatically until the extraction is complete. The Soxhlet extraction used depends on the intermittent action of a glass syphon. The ether gradually condenses into the extraction tube containing the material until it rises to the top when it is discharged into the extraction flask (AOAC,2005).

v. Protein

The samples were digested with sulphuric acid in a macrokjedahl flask when nitrogen gets converted to Ammonium Sulphate. Ammonia is liberated by the action of strong alkali in a macrokjedahl steam distillation apparatus. This nitrogenous substance was converted to ammonium borate by absorbing 4%boric acid and is titrated against 0.1N HCL (AOAC,2005).

vi. Beta-carotene

Carotene present is extracted with petroleum ether and the intensity of the colour of the extract is compared with that of the standard solution using colorimeter (AOAC,2005).

vii. Ascorbic acid

Vitamin C is a good reducing agent and it reduces the dye 2,6 dichlorophenol- indophenol. In this reaction, the ascorbic acid itself is oxidised to dehydro ascorbic acid. In the absence of interfering substances, the capacity of an extract of the sample to reduce a standard solution of the dye as determined by titration is directly proportional to the vitamin C content. Oxalic acid is not only used to reduce the pH of the extracting medium, thereby establishing vitamin-C but

also form complexes with metals eg. copper thereby preventing the catalytic oxidation of vitamin (AOAC,2005).

viii. Calcium

Calcium is determined by precipitating it as calcium oxalate and titrating the oxalate solution in dilute sulphuric acid against standard potassium permanganate (AOAC,2005).

ix. Phosphorous

When the ash solution is treated with ammonium molybdate, phosphomolybdic acid is formed. Phosphomolybdic acid is reduced by the addition of 1,2,4 amino naphtholsulphonic acid reagent to produce a blue colour which is apparently a mixture of oxides of molybdenum. The intensity of the colour developed is the measure of phosphorus present (AOAC,2005).

$H_3PO_4 + 12(NH_4)_2MoO_4 \longrightarrow (NH_4)_3PO_4.12MoO_3$

Ammonium Molybdate Ammonium phosphomolybdate

x. Iron

The food sample is oxidized with ignition or oxidation. Iron as ferric iron reacts with ammonium thiocyanate or with potassium thiocyanate to give ferric thiocyanate which is red in colour. The colour which is a measure of the concentration is measured colorimetrically. (AOAC,2005).

Fe^{3+} (aq) + SCN (aq) $\longrightarrow$ [Fe(SCN)]2+ (aq)

(Iron) (Thiocyanate) (Ferric Thiocyanate)

xi. Zinc

The contents of Ca, Zn and Fe in foods were measured by atomic absorption spectro-photometer according to the method of Hernandez et al. (2004). A 5g sample was placed in a previously weighed porcelain crucible and heated. The resulting white ash was weighed, dissolved in 3ml of concentrated nitric acid and diluted with distilled water in a 25ml calibrated flask. The solution then was used to determine Ca, Zn, and Fe. Standard stock solution of iron, zinc and calcium was prepared from AAS grade chemicals (AOAC,2005).

xii. Vitamin A

The vitamin A is rehydrated with light petroleum and saponified using an ethanolic potassium hydroxide solution. The light petroleum is removed by evaporation, and the remainder is dissolved in 2-propanol. Reverse-phase liquid chromatography is used to quantify the amount of vitamin A in 2-propanol juice under conditions that yield a single peak for all retinol isomers (AOAC, 2000).

PLATE V - NUTRIENT ANALYSIS IMMUNE BOOSTERS RICH SOUP MIX

E. Qualitative analysis of Physiochemical and anti-oxidant properties:

The highly accepted immune boosters rich soup was evaluated for Phytochemical and anti-oxidant activity of the developed soup mix was determined by DPPH assay. Phytochemical analysis, was done using the solvent hydro-ethanol for the screening of alkaloids, saponins, phenolic compounds, protein, carbohydrate, amino acid, glycosides, fats and oils. Extraction All plant samples were extracted in solvent hydro-ethanol. Many solvents like water, methanol, benzene can be used. Hydro-ethanol was chosen as a solvent due to its high solubility properties

of both polar and non-polar phyto- constituents. Powdered plant material (20 gm) was extracted in 200 ml of hydro-ethanol using maceration method. The sample was first soaked in the solvent for a period of 24-48 hours after maceration. Then, the samples were made to evaporate until thick gel like slurry was formed. The dried crude concentrated extract was weighed to calculate the extractive yield and then transferred to glass vials (6 ×2 cm) and stored in a refrigerator (4°C), till used for analysis. Then, 0.1 gm and one gm of each sample were taken and diluted to 100 ml so that the concentration was one mg/ml and 10 mg/ml. These diluted samples were used for preliminary analysis of phytochemicals.

The following qualitative phytochemical tests were carried out in the advanced nutrition laboratory and are listed below.

i. **Tannins- Ferric chloride Test:** About 0.5 g of the extract was boiled in 10 ml of water in a test tube and then filtered. Few drops of 0.1% ferric chloride were added, and the solution was observed for brownish green or a blue-black colouration. The presence of blue-black colouration indicated the presence of tannins.

ii. **Saponins- Frothing test:** To 0.5 g of extract, five ml of distilled water was added in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with three drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion. The formation of froth indicated the presence of saponins.

iii. **Flavonoids- Alkaline Reagent Test:** Extracts were treated with few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on the addition of dilute acid, indicates the presence of flavonoids.

iv. **Test for glycosides- Keller-Killani test:** To five ml of each extract, two ml of glacial acetic acid containing one drop of ferric chloride solution was added. This was underlayed with one ml of concentrated sulphuric acid. A brown ring at the interface indicates a deoxy sugar characteristic of cardenolides. A violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form just gradually throughout thin layer. The formation of this brown or greenish ring indicates the presence of glycosides.

v. **Test for phenols- Ferric Chloride Test:** Extracts are treated with 3-4 drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenols

vi. **Test for alkaloids- Dragendroff's Test:** Extracts are treated with Dragendroff's reagent (solution of Potassium Bismuth Iodide). Formation of red precipitate indicates the presence of alkaloids.

vii. **Terpenoids- Salkowski's test:** To 0.5 g of each the extract, two ml of chloroform is added. Concentrated sulphuric acid (H2SO4), (three ml) is carefully added to form a layer. A reddish-brown coloration at the interface indicates the presence of terpenoids.

viii. **Steroids- Libermann- Buchard test:** To five ml of plant extract, two ml of chloroform and few drops of concentrated sulphuric acid are added. In the lower chloroform layer, the appearance of red colour indicated the presence of steroids

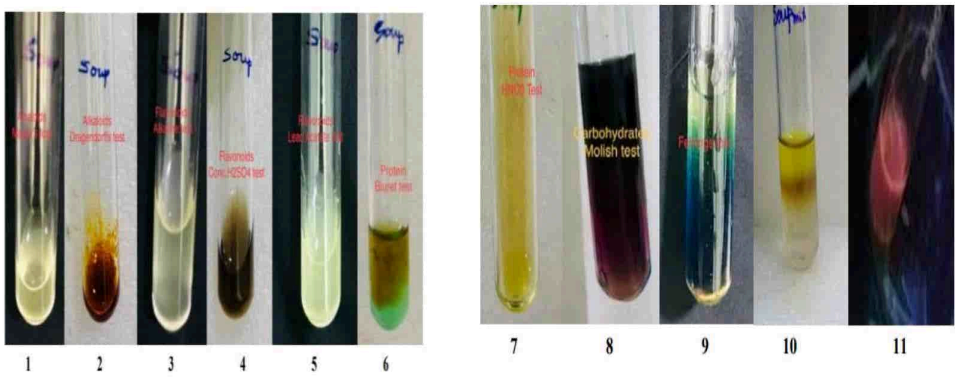
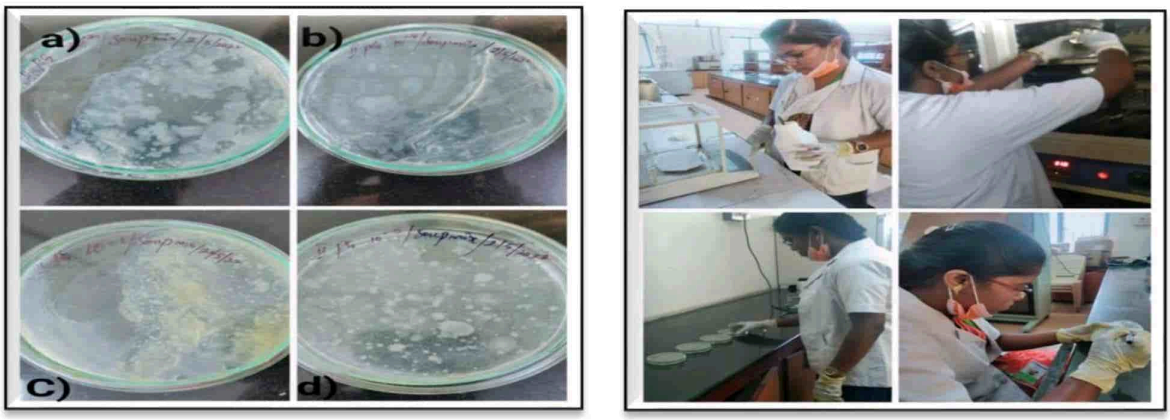


PLATE VI - QUALITATIVE ANALYSIS OF PHYTOCHEMICALS

F. Shelf-life Assay: The selected Soup mix was stored in air tight glass container and kept at room temperature between 270° C and 350 °C with a relative humidity of 70-85 per cent for 90 days for the keeping quality evaluation. The container was opened twice per day at a regular interval to establish expected regular use. The immune boosters rich soup mix was assessed for organoleptic parameters and moisture content such as 0 days, 30 days, 60 days and 90 days and compared with the fresh formulations. Changes during storage were also noted. Microbial load of the immune booster rich soup mix was tested using pour plate method which is one of the conventional methods. The original food sample is diluted several times to reduce the microbial population sufficiently to obtain separate colonies when plating. Then small volumes, around one ml of several diluted samples mixed with liquid agar that has been cooled to about 45°C, and the mixtures are poured immediately into sterile culture dishes. After the agar has hardened, each cell is fixed in place and forms an individual colony (CFU). Plates containing between 30 and 300 colonies are counted. The total number of colonies equals the number of viable microorganisms in the diluted sample. Colonies growing on the surface also can be used to inoculate fresh medium and prepare pure cultures (Jonathan F. Blaize,.2022). Microbial load estimation for the immune boosters rich soup mix sample was carried out for fresh, 30^{th} , 60^{th} and 90^{th} days old samples.

Plate VI – Shelf-life Assay in terms of Microbial Load



a) 0^{th} day b) 30^{th} day c) 60^{th} day d) 90^{th} day

Plate VII - SHELF-LIFE ASSAY IN TERMS OF MICROBIAL LOAD

G. Cost effectiveness: The ingredients used in the formulation of immune booster were seasonal, locally available and low-cost items. Cost per 100gm of Formulation was found to be Rs. 13.5/- and it was affordable to all class of people. Moreover, it is highly nutritional and rich in antioxidant activity.

INGREDIENTS	QUANTITY (g)	COST/ KG(Rs)	COST/QUANTITY(Rs)
Ragi	20	50	1.00
Varagu	20	60	1.20
Horse gram	25	60	1.50
Drumstick leaves	15	40	0.60
Coriander seeds	15	55	0.825
Cumin seeds	5	40	0.200
Black pepper	5	170	0.825
Dried ginger	5	255	1.275
Hibiscus leaves	5	-	1.00
Indian Borage	5	-	1.00
Labour charge			2.00
Packaging cost			2.00
TOTAL			13.5

PHASE - III: Statistical Analysis and Data Interpretation

After the data collection, it is essential to organize the discrete data in a systematic manner to obtain the desired results and interpretation scientifically. The collected data was systematically consolidated and statistically analysed for arriving at the result. Data, once collected, must be arranged purposively, in order to bring out the important points clearly. Therefore, the data was expressed in terms of number and percentage regarding qualitative variables, the mean and standard deviation for quantitative variables.

RESEARCH DESIGN

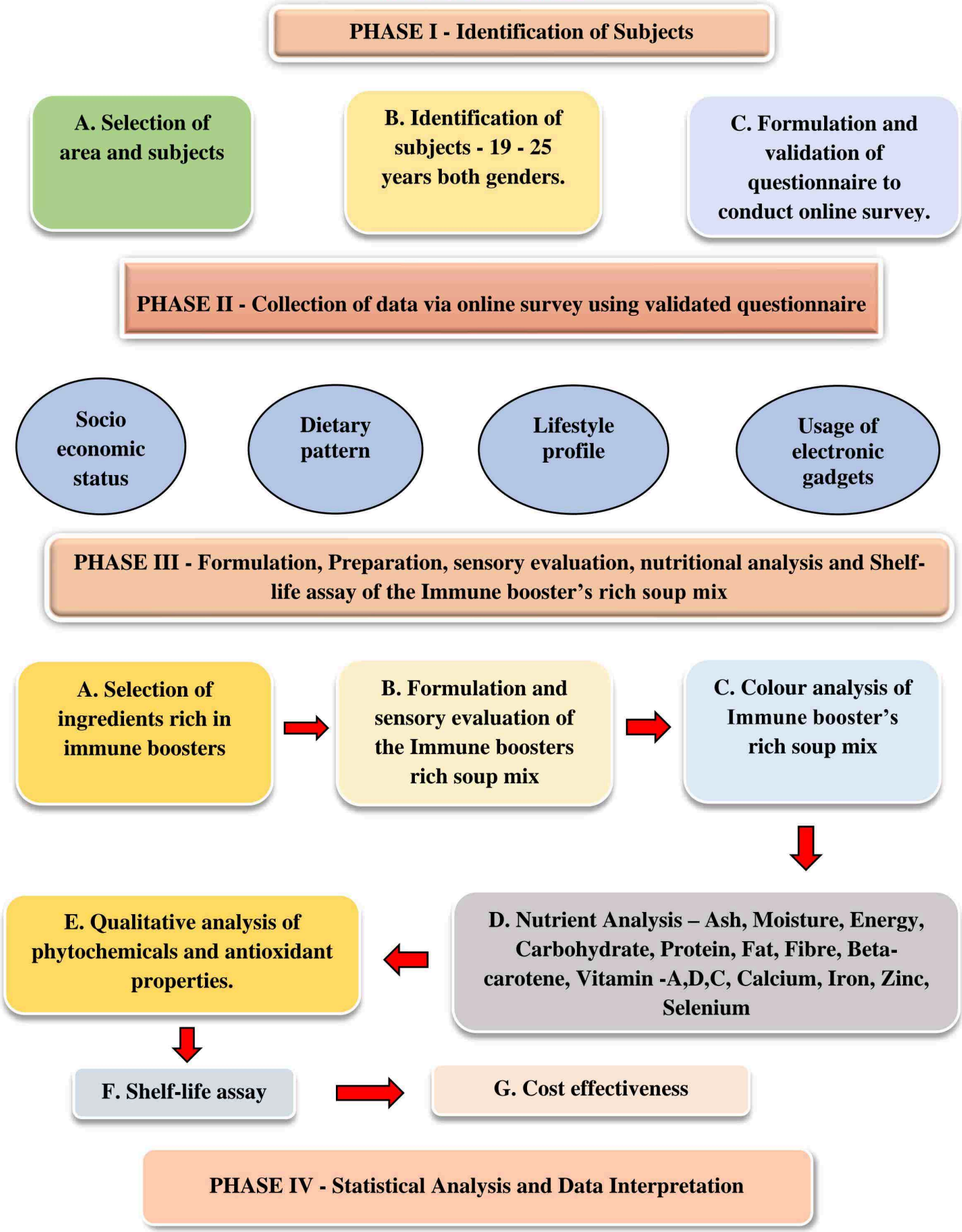


Figure 1

IV. RESULTS AND DISCUSSION

The results pertaining to the present study on **"Effect of Electronic Gadgets on Nutritional Status, Dietary pattern and lifestyle modification of the young adults (19-25 years) before and during covid pandemic situation and standardization of Immune Boosters rich soup mix"** are presented and discussed under the following headings.

A. Socioeconomic profile of the selected subjects
B. Dietary habits of the selected subjects before and during covid.
C. Lifestyle pattern of the selected subjects before and during covid.
D. Nutritional status of the selected subjects before and during covid.
E. Pattern of using electronic gadgets before and during covid.
F. General outcome of the online survey
G. Formulation, sensory evaluation, nutritional analysis and shelf-life assay of the Immune booster's rich soup mix

A) Socioeconomic profile of the selected subjects

Health and nutritional status of an individual are affected by an unfavorable socio-economic status of the family, dietary pattern, ineffective health care, poor medicinal care and so on. Hence it is essential to include the Socioeconomic profile in the present study. A total of 150 subjects were selected to this study to know their status of dietary and life style pattern of selected subjects (19-25 years). Based on their change in lifestyle pattern, dietary pattern and health status due to their usage of electronic gadgets before and during covid has been documented and evaluated. Based on their preference of food choice during the covid pandemic situation, the immune boosters rich soup mix has been formulated.

Background information regarding the type and size of the family, age, gender, No of family members, education qualification and monthly income of the parents of the subjects were collected and are discussed in Table. II

Table II

Socio economic profile of the selected subjects

SOCIOECONOMIC PROFILE		NUMBER (N=150)	PERCENT
AGE	19 – 21 years	78	52
	22 – 25 years	72	48
GENDER	Male	67	45
	Female	83	55
NUMBER OF FAMILY MEMBERS	< 3 members	15	10
	4 – 5 members	110	74
	6 – 8 members	20	13

	> 8 members	5	3
MONTHLY INCOME OF THE FAMILY *	Lower income (<3300)	-	-
	Lower middle income (Rs.3301- 7300)	10	7
	Middle income (7301-14500)	85	57
	High income (>14500)	55	36
EDUCATION QUALIFICATION	Undergraduate	65	43
	Postgraduate	67	45
	Research scholar	10	7
	Others	8	5

***HUDCO INCOME CLASSIFICATION (2020)**

i)Age and Gender of the selected subjects

Among the selected 150 subjects, 52 percent of them were in the age group of 19 to 21 years and 48 percent were in the age groups of 22 to 25 years. Of which 45 percent was male and 55 percent were female subjects.

ii) Size of the families

It was noted that 10 percent of the families selected for the study had less than three members, 74 percent had four to five members in their families. Nearly 13 percent had six to eight members in their families and three percent had more than eight members in their families.

iii) Economic status of families of the selected subjects

As per HUDGO 2020, income classification about seven percent parents of the selected subjects earned lower middle income, nearly 57 percent were in middle income group and 36 percent of the parents of the selected subjects were in high income group.

iv) Education qualification of the selected subjects

Among the selected 150 subjects, 45 percent were Undergraduates, nearly 45 percent were postgraduates, seven percent were Research scholars and five percent were belonged to other categories of education.

B) Dietary habits of the selected subjects before and during covid

Diet and nutrition are synonymous with health. They provide the necessary nutrients, which give energy, promote growth and sustain metabolic functions and repair process that are essential for healthy and active life (www.women's health.gov.)

i) **Dietary habits of the selected subjects:** Dietary habits refer to an individual's or a culture's regular decisions on what foods to eat. The utilization of a certain nutrient intake for health or weight management is generally implied by the term diet. Despite the fact that humans are omnivores, each culture and individual have food

preferences or taboos for personal or ethical reasons. Dietary choices vary in terms of how more or less healthy. The dietary habit of the selected subjects was shown in Figure III.

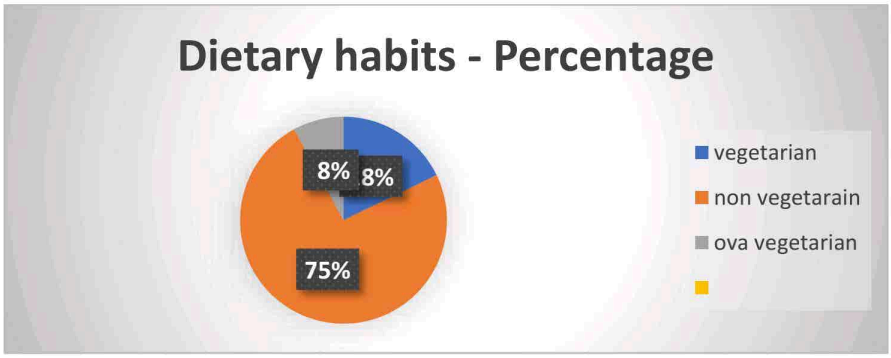


Figure III

Dietary habits of the selected subjects (N=150)

Majority of the selected subject's 75 percent were non – vegetarians,18 percent were vegetarian and nearly eight percent were Ova – vegetarians. During covid situation, frequency of consumption of fleshy foods and sea foods were reduced. It might be due to non-availability of non-vegetarians food items whereas consumption of plant-based food items were increased due to easy availability at their door step.

ii) Comparison of No. of meals taken per day before and during covid pandemic situation of the selected subjects

Dietary consumption pattern of an individual is varied from person to person. The young adult both genders consumption pattern will vary according to their lifestyle pattern including their socio-economic profile of their family.

Table III

No. of meals taken per day before and during covid pandemic situation of the selected subjects

No. of meals taken per day	Before covid		During covid	
	N=150	Percentage	N=150	Percentage
2 meals	15	10	28	18
3 meals	114	76	71	48
4 meals	8	6	32	22
More than 4 meals	6	4	19	13

Among 150 selected subjects who were participated in this online survey who were commonly stated that their meal consumption pattern were irregular intervals of meal intake per day compared to before and during covid pandemic situation. No. of meals taken by the selected subjects for about 2 meals before covid was ten percent and during covid was 18 percent, where as those who had taken 3 meals per day was 76 percent and increased to 48 percent during covid. Those who took 4 meals a day before covid was six percent, which was

increased twice the amount compared to non- covid period for about 22 percent. There was also increased in the meal intake, more than 4 meals per day compared to before and during covid pandemic situation by four percent to 13 percent.

iii) Skipping of meals of the selected subjects

Regularly eating helps to maintain weight, improves the academic performance and mood of an individual, and even help to prevent diseases. Skipping meals can also cause metabolism to slow down, which can cause weight gain or make it harder to lose weight. It is known to cause a slow of bad chain reactions throughout the body. Table IV shows the skipping of meals daily by the selected subjects.

Table IV

Skipping of meals per day of the selected subjects

Meals skipping daily	**Before covid**		**During covid**	
	N=150	**Percentage**	**N=150**	**Percentage**
1 meal	60	40	53	35
2 meals	6	4	16	11
More than 2 meals	3	2	8	5
None	81	54	75	50

From the Table IV, it shows that about 40 percent used to skip a meal per day before covid which was decreased to 35 percent during covid pandemic situation. Nearly four percent of the selected subjects used to skip two meals per day before covid which was increased to 11 percent during covid period. Before covid period a meagre percent used to skip more than two meals per day which was increased to five percent during covid pandemic situation. Nearly 54 percent did not skip their meal per day before covid which was decreased to 50 percent during covid period. From the obtained data, it was clear that the no. of skipping of meals per day by the selected subjects were reduced during covid pandemic situation compared to non-covid situation.

iv) Increase intake of snacks over screen usage

Screen time duration and dietary habits showed that the longer the screen time, the increased the odds of unhealthy dietary habits such as skipping breakfast, consuming fast food frequently and eating sweets frequently, and the decreased the odds of healthy dietary habits such as consuming a second fruit every day, consuming fresh or cooked vegetables or/and fish regularly, in both genders, after adjusting for several covariates. From the Figure III and IV about 48 percent had the habit of snacking over screen mostly of Packed and processed snacks (40 percent) compared to other fast foods, junk foods, bottled juices and so on. Furthermore, the longer the screen time the increased the odds of total and central obesity, insufficient sleep (< 8-9 h/d), and inadequate Physical activity, and the decreased the odds of healthy physical fitness. The present study was par on the study (Konstantinos *et al, 2020*) Figure III & IV depicts Increase intake of snacks over screen usage of the selected subjects. (N = 150)

Figure III

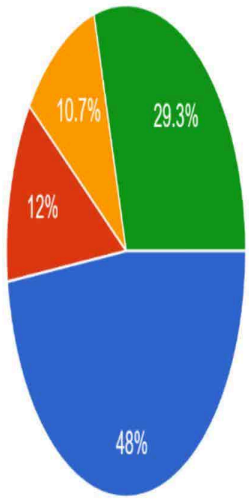
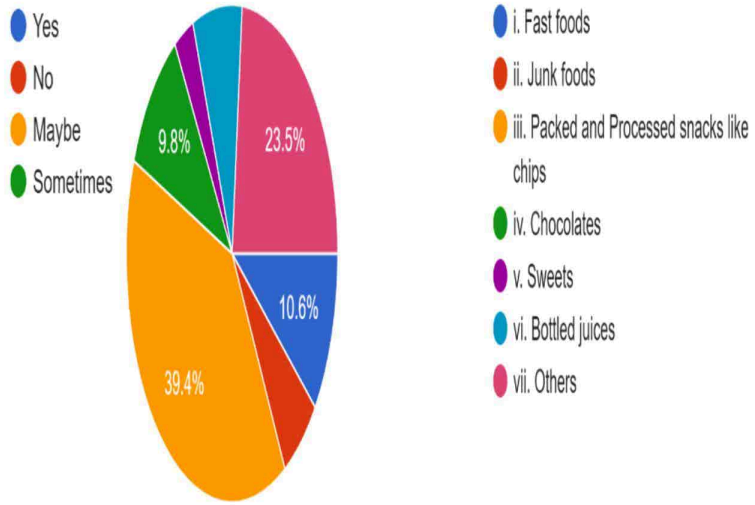


Figure IV



v) Comparison of dietary pattern of the selected subjects before and during covid pandemic situation

Dietary consumption pattern of an individual is varied from person to person. The young adults both gender population consumption pattern will vary according to their lifestyle including their socio-economic profile of their family (Alkerwi, 2015).

Table V

Comparison of dietary pattern of the selected subjects before and during covid pandemic situation

FACTORS	BEFORE COVID					DURING COVID				
	a)	b)	c)	d)	e)	a)	b)	c)	d)	e)
Consumption of balances diet	53 (35%)	43 (28%)	29 (19%)	8 (5%)	23 (15%)	37 (25%)	43 (27%)	27 (18%)	7 (5%)	41 (27%)
Fruits and vegetable intake	55 (36%)	40 (27%)	26 (17%)	4 (3%)	26 (17%)	37 (25%)	39 (26%)	32 (21%)	7 (5%)	37 (25%)
Consumption of milk Products	57 (38%)	31 (21%)	22 (15%)	9 (6%)	33 (22%)	41 (27%)	33 (22%)	20 (13%)	10 (7%)	47 (31%)
Consumption of pulses, meat, egg	52 (35%)	55 (36%)	27 (18%)	4 (3%)	15 (10%)	40 (26%)	55 (36%)	25 (17%)	10 (7%)	24 (17%)
Consumption of millets &products	89 (59%)	41 (27%)	14 (9%)	3 (2%)	4 (3%)	64 (43%)	47 (31%)	21 (13%)	9 (6%)	9 (6%)
Boredom eating	82 (55%)	28 (18%)	15 (9%)	2 (1%)	3 (2%)	66 (44%)	31 (22%)	15 (9%)	11 (8%)	4 (3%)

*a) Not regularly, b) 1-2times week, c)3-4 times a week, d) 5-6 times a week, e) Almost daily

From the above Table V, it was inferred that the frequency of routine consumption of the cereals, millets, pulses, fruits and vegetables, milk products, meats and eggs, and millets products were increased compared to before and during covid with 15 percent to 41 percent of inclusion of all food items, 17 percent to 25 percent of fruits and vegetables, 22 percent to 31 percent of dairy products, 10 percent to 17 percent of meat ang eggs and three percent to six percent increase in consumption of millet products in their daily dietary pattern. But the frequency of boredom eating habits of the selected subjects 1-2times week, 5-6 times a week, and almost daily percentage has been increased slightly compared to before and during covid pandemic situation habits of the selected subjects.

i) **Water consumption of the selected subjects before and during covid**

Water is the principal chemical component and makes up to 50 percent to 70 percent of our body weight. Every day there is a loss of water through your breath, perspiration, urine and bowel movements. For the body to function properly, must be replenish its water supply by consuming beverages and foods that contain water. As per the results of a large-scale survey conducted across India in 2020, young adults of 19 - 25 years drank about 2.06 litres of water on average every day in the country. The recommended amount of water intake to stay hydrated is a minimum of two litres every day. About 15.5 cups (3.7 litres) of fluids a day for men. About 11.5 cups (2.7 litres) of fluids a day for women. These recommendations cover fluids from water, other beverages and food. About 20 percent of daily fluid intake usually comes from food and the rest from drinks (Tiseo, 2022).

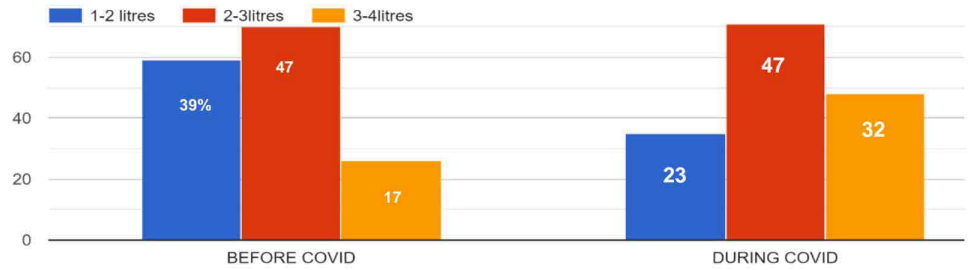


Figure VI

Water consumption of the selected subjects before and during covid

From the Figure VI, it was inferred that about 39 percent of the selected subjects consumed 1-2 liters of water per day before covid, which was decreased to 23 percent during covid. There is no difference in the 2-3 liters water consumption of the selected individuals with 47 percent. But there was an increased from 17 percent to 32 percent of 3-4 liters of water intake per day before and during covid among the selected subjects.

i) **Eating of processed and junk foods by the selected subjects before and during covid**

In this current scenario, fast food and junk foods consumption pattern was commonly existed in 58% of the selected subjects before covid and the frequency was gradually decreased in all parameters during covid pandemic situation. Table VI shows the frequency of eating processed and junk foods before and during covid of the selected subjects

Table VI

Eating processed and junk foods of the selected subjects before and during covid

FACTOR	BEFORE COVID (N / %)						DURING COVID (N / %)					
	a)	b)	c)	d)	e)	f)	a)	b)	c)	d)	e)	f)
Eating junk & processed foods	58 (37 %)	37 (25 %)	23 (14 %)	13 (7 %)	17 (11 %)	8 (5 %)	38 (25 %)	36 (24 %)	29 (19 %)	13 (7 %)	26 (17 %)	25 (16 %)

*a) Once a week, b) Twice a week, c) More than twice a week, d) Once in a month, e) Occasionally, f) none.

From the Table VI, it was inferred that 37 percent of the selected subjects used to have the junk and processed food once a week before covid and 25 percent were during covid. 25 percent of the selected subjects consumed the junk and processed food twice in a week before covid and 24 percent were during covid. 14 percent of the selected subjects consumed the junk and processed food more than twice a week before covid and 19 percent during covid. Same number of selected subjects nearly seven percent were consumed the junk and processed food once in a month. About 11 percent were consumed the junk and processed food occasionally before covid and it was increased to 17 percent during covid. Five percent of the selected subjects not consumed junk and processed food and the percentage was increased to 16 percent during covid pandemic situation.

C. Lifestyle pattern of the selected subjects before and during covid.

A way of living of individual, families (households), and societies, which they manifest in coping with their physical, psychological, social, and economic environments on a day-to-day basis. Lifestyle is expressed in both work and leisure time behavior pattern and (on an individual basis) in activities, attitudes, interests and opinions.

i) Physical activity

Physical activity is essential to maintain an ideal body weight by big and has significant impact on their health promotion and prevention of diseases. Physical fitness plays a major role in lifestyle modification. Among young adults, maintaining of their fitness is challenging and they also interested in that. According to the data collected (Figure VI, VII), comparatively they are less active in involving themselves in physical activities during covid. Since during this lockdown, all were doing their studies through online mode in home, because of that 50 percent of them become so lazy and spending maximum of the time in sitting and sleeping.

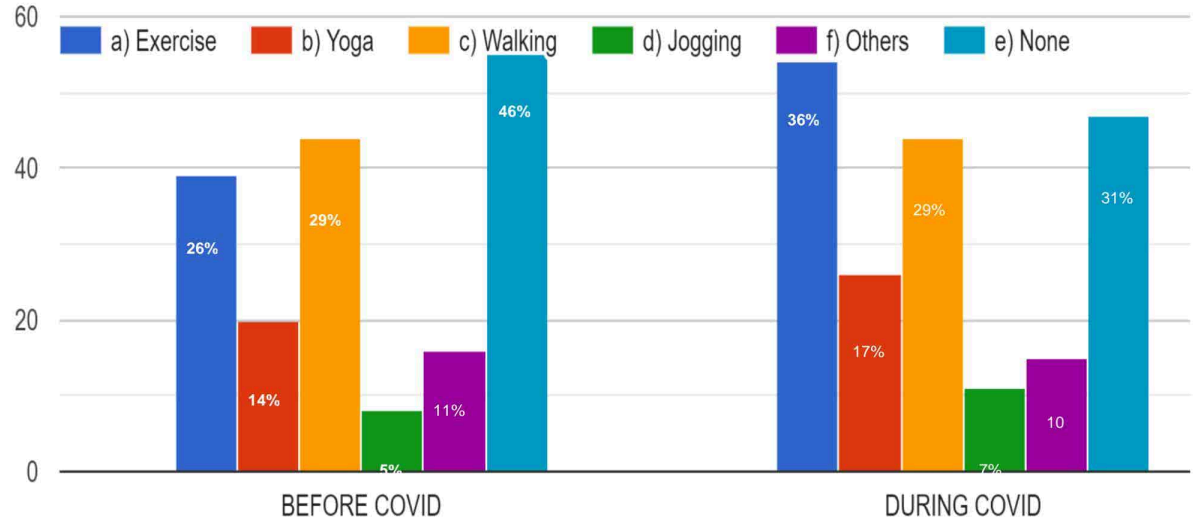


Figure VII

Physical activities

From the Figure VII it was inferred that 46 percent of the selected individuals were not involved in any kind of physical activity before covid, but the percentage has decreased to 31 during covid and there was increase in the involvement of physical activities among the selected subjects during covid of about exercise (36 percent), Yoga (17 percent), Walking (29 percent), Jogging (seven percent) and Other (10 percent) activities.

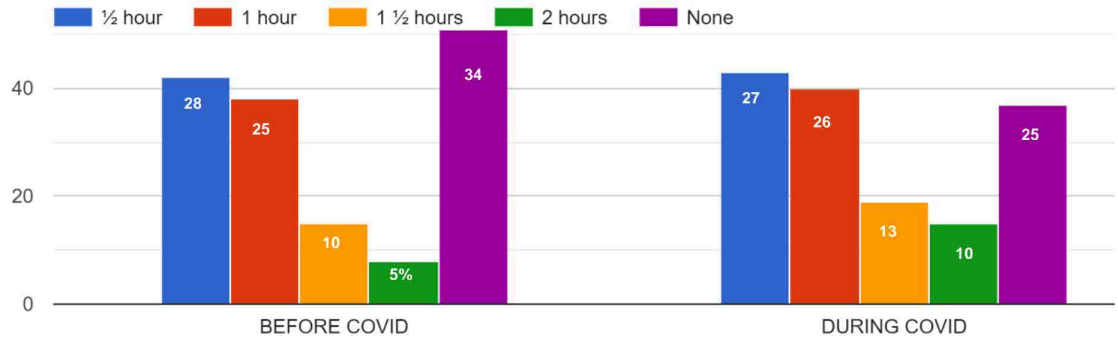


Figure VIII

Duration of exercise

From the Figure VIII comparison of duration of exercise adopted before and during covid, it was noted that 28 percent were used to do exercise for half an hour before covid which was decreased to 27 percent during covid. About 25 percent were used to do exercise for 1 hour before covid and it was notes that 26 percent were used to during covid. From Ten percent to 13 percent increase in doing exercise for one and half an hour before and during covid. Almost 34 percent of the selected individual were not involved any of the exercise before covid but it was decreased to 25 percent during covid.

ii) Sleeping pattern – before and during covid

Stress is a common feature of modern life for people of all ages but it can be more common among younger adults. Every young adult is different but there are some common sources of stress that tend to have a greater impact on this age group. Young adults spend increasingly more time on electronic devices, and sleep deficiency rising in them constitutes a major public health concern. Use of electronic devices is frequent in young adults, during the day as well as at bedtime. They spent a large amount of time during the day and at bedtime using electronic devices. Daytime and bedtime use of electronic devices were both related to sleep measures, with an increased risk of short sleep duration, long sleep onset latency and increased sleep deficiency. A dose–response relationship emerged between sleep duration and use of electronic devices, exemplified by the association between PC use and risk of less than 5 h of sleep and comparable lower odds for 7–8 h of sleep. Due to this excessive usage of electronic gadgets during sleep time, it was evident to note that there is a health issues among young adults due to poor sound sleep. Table VII, VIII and Figure IX depicts the sleep pattern among the selected subjects before and during covid.

Table VII

Daily sleeping pattern

Sleeping pattern	Before covid		During covid	
	N=150	Percent	N=150	Percent
< 6 hours	47	31	28	19
6-8 hours	83	55	68	45
> 8 hours	22	15	56	37

From the table VII, it was shocked to note that 31 percent had less than six hours of sleep before covid, which was decreased to 19 percent during covid. 55 percent of them had proper sleep between 6-8 hours during covid and it was decreased to 45 percent during covid period. Whereas only 15 percent of them had greater than eight hours of sleep per day before covid which was increased to 37 percent during covid among the selected individuals.

Table VIII

Increased usage of gadgets before sleeping

Sleep Intervals	Before covid		During covid	
	N=150	Percent	N=150	Percent
½ - 1 hours	89	19	21	14
1 – 2 hours	36	24	42	28
2 – 3 hours	14	9	61	41
More than 3 hours	12	8	29	19

From the Table VIII, it was inferred that before covid around 19 percent of the selected subjects used gadgets ½ - 1 hours before going to sleep and it was reduced to 14 percent during covid. 24 percent use gadgets 1 – 2 hours before going to sleep before covid and it was increased to

28 percent during covid. Nine percent use gadgets 2 – 3 hours before going to sleep before covid and it was increased to 41 percent during covid. Around eight percent of them use gadgets more than 3 hours before covid and it was increased to 19 percent during covid period. Increased usage of gadgets before sleeping was mainly due to their life style changes and leisure time in the morning hours, without having academic commitments.

Figure IX

Types of health and mental health issues due to poor sound sleep

From the figure IX, it was inferred that around 17 percent of them suffered from body pain, 14 percent had headache, Nine percent had depression, three percent had anxiety, Seven percent had negative feelings, nine percent had negative imagination,14 percent had Sleeplessness, four percent had some other disturbances due to improper sleep and nearly 25 percent of the selected subjects did not experience any kind of mental and health issues. It might be due to their sound sleep.

iii) Stress pattern – before and during covid

In recent years, Stress is the word which is common among youngsters due to so many factors and parameters includes – peer group, studies, financial, family, social media, society and so on. Table IX and Figure X indicated the stress among young adults due to the excessive usage gadgets, poor and unhealthy eating habits and eating over stress in their pandemic situation.

Table IX

Stress due to excessive usage of mobiles and laptops for professional purposes

Stress due to gadgets	Before covid		During Covid	
	N=150	Percent	N=150	Percent
Yes	43	27	52	37
No	80	53	48	32
Maybe	16	11	20	13
Sometimes	11	7	30	20

From the table IX, it was inferred that among 150 selected subjects, nearly 70 percent had experienced stress due to excessive usage of gadgets during covid compared to non-covid period for professional purposes.

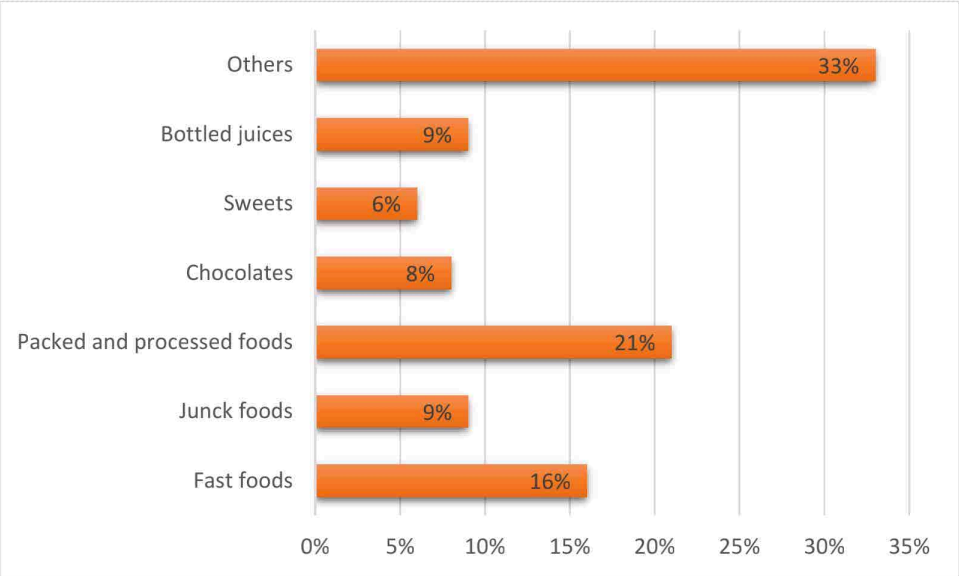


Figure X

Eating over stress – Preferences of food items

From the above Figure X, it is observed that among the 150 selected subjects nearly 89 percent of them preferred to eat more food items over stress. In which 16 percent like to eat fast foods, nine percent prefer junk foods, 21 percent packed and processed snacks, nearly eight percent prefer chocolates, 6 percent like to have sweets, nine percent preferred bottled juices and 33 percent used to prefer other kind of foods during their stress.

iv) Life style habits– before and during covid

Table X

Life style habits– before and during covid

Factors	**Before covid**		**During covid**	
	Yes	**No**	**Yes**	**No**
Smoking	140 (93%)	10(7%)	133 (89%)	17 (11%)
Alcohol consumption	150 (100%)	-	150 (100%)	-
Chewing of betel leaves and tobacco.	150 (100%)	-	150 (100%)	-

From the Table VII, it was inferred that nearly 93 percent were not smoking and rest of the seven percent were smokers and smoke on occasional days before covid and during covid almost 89 percent were not smoked and 11 percent were started smoking. Almost all the selected subjects were not consumed alcohol and chewing of betel leaves and tobacco before and during covid.

D. Nutritional status of the selected subjects before and during covid.

i) Anthropometric assessment

Anthropometric measurements are used to assess the size, shape and composition of the human body measurements of height and weight for BMI and measurements of waist and hip circumference for waist-to-hip ratio. The commonly used methods for assessing the nutritional status of the selected subjects are objective and are usually an important aspect of nutritional assessment and are also valuable in evaluating the health status of an individual, Body Mass Index (BMI) of the selected subjects. Body Mass Index was calculated using standard formula and are presented in Table XI

Table XI

Body Mass Index of the selected subjects

Grade of malnutrition	Height in cm	Before covid	During Covid	Range of Weigh(kg)	Before covid	During Covid
Under Nutrition	140- 145	12(6%)	12(6%)	35- 40	13(8.5%)	4(2%)
	146- 150	3(1.5%)	3(1.5%)	41-45	4(2%)	7(3.5%)
	151-155	12(6%)	12(6%)	-	-	-
	156-160	10(5)	10(5)	-	-	-
Optimum Nutrition	145-150	23(11.5)	23(11.5)	40-45	18(9%)	5(3%)
	151-155	4(3%)	4(3%)	46-50	29(14.5%)	9(4.5%)
	156- 160	10(7%)	10(7%)	51-55	15(10%)	8(4%)
	161-165	4 (3%)	4 (3%)	56-60	9(6%)	15(10%)
	166-170	5(3%)	5(3%)	61-65	3(2%)	18(9%)
Over Nutrition	151-155	10(7%)	10(7%)	51-55	7(4.7%)	9(6%)
	156-160	5(3%)	5(3%)	56-60	6(3%)	18(9%)
	161-165	8(6%)	8(6%)	61-65	7(3.5%)	15(10%)
	166-170	2(1%)	2(1%)	66-70	5(2.5%)	3(2%)
Obese	145-150	9(4.5%)	9(4.5%)	55-60	6(3%)	6(3%)
	151-155	20(13.3)	20(13.3)	61-65	9(4.5%)	7(4.7%)
	156-160	2(1%)	2(1%)	66-70	8(4%)	29(14.5%)
	161-165	1(1%)	1(1%)	71-80	5(3%)	13(8.5%)

***Multiple responses**

Based on the above mention data related to height and weight of the selected subjects were computed using the standard formula of, weight in kilogram divided by square root of height in meter. Computed BMI was given in Table XII

TABLE XII

Change in BMI before and during covid pandemic situation

No of subjects	↑ BMI compared to before covid	↓ BMI compared to before covid	Same BMI maintained	Non-respondent
150	89 (59%)	45(30%)	12 (8%)	4(3%)

From the table XII, it was inferred that among the 150 selected subjects 59 percent have increased in their BMI during covid period compared to before covid period. Whereas 30 percent of them had less BMI during covid period compared to before covid period. Eight percent were had same BMI and nearly meagre percent were not responded.

E. Usage of electronic gadgets before and during covid of the selected subjects.

Broadcast or storage media that take advantage of electronic technology. They encoding of information included television, radio, Internet, CD-ROMs, DVD, Mobiles, Laptops, Desktops and any other medium that electricity or digital (www.businessdictionary.com). Now a day's the usage of electronic gadgets was increased among young adults which was depicted in the Table XIII, Figure XI, XII. Due to the excessive usage of electronic gadgets, it was evident that there was an increase in the physical and mental health issues among young adults compared to before covid period which was shown in Table XII.

Usage of electronic gadgets

Table XIII

Screen usage of the selected subjects before and during covid period

No. of subjects (N=150)	Mobile	Laptops	Tablets	Television	Desktop
Before covid	144(96%)	45(30%)	8(5%)	75(50%)	5(3%)
During Covid	140(93%)	99(66%)	24(16%)	87(58%)	19(13%)

From the Table XIII, it was understood that 96 percent of subjects used mobile,30 percent of laptops, Five percent of tablets, 50 percent television and nearly three percent of desktop were exclusively used for their academic, professional and /or recreational purposes whereas during covid situation, 93 percent, 66 percent, 16 percent, 58 percent and 13 percent were utilized mobile, laptops, tablets, television and desktops respectively. There was an increased in screen usage compared to before covid period among the selected subjects.

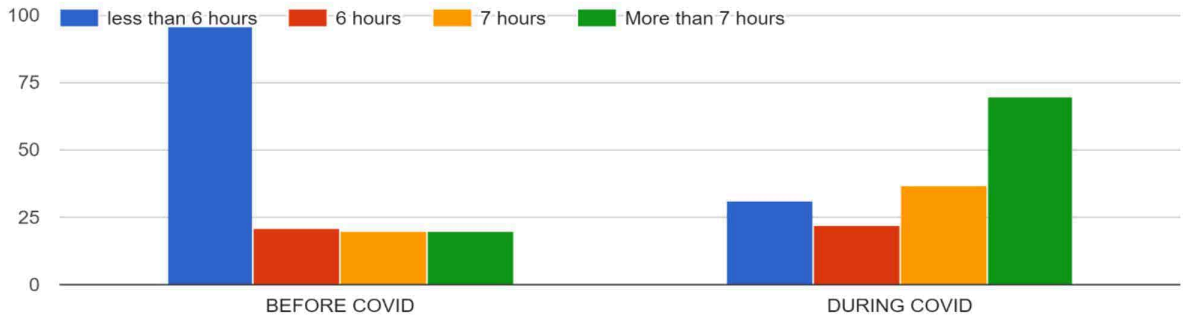


Figure XI

Usage of gadgets for study purposes

From the figure X, it is evident to note that nearly 45 percent used their gadgets more than seven hours for study purpose during covid compared to non-covid period. Before covid

nearly 64 percent use less than six hours of gadgets for study purpose and it was reduced to 21 percent during covid pandemic situation.

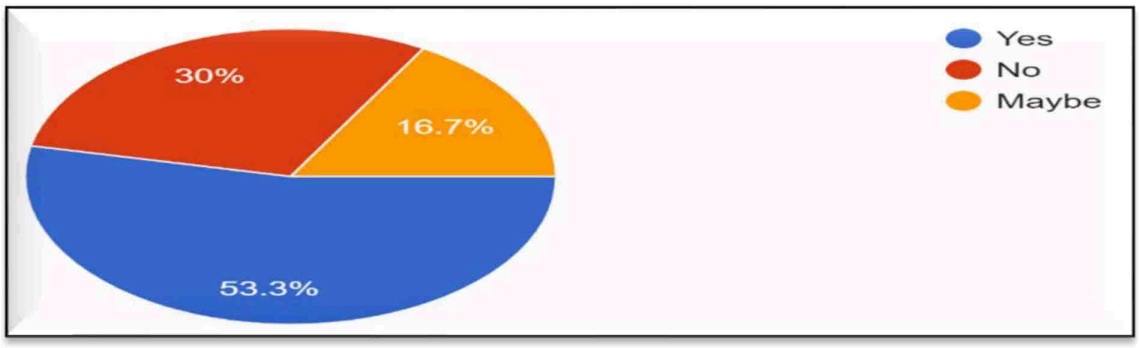


Figure XII
Comfortable usage of gadgets

From Figure XI, it was evident to note that nearly 53 percent were more comfortable and rest 47 percent were not comfortable using various types of electronic gadgets.

Table XIV
Comparison of physical and mental health issues before and during covid

Total respondents (150)	Frequent headache	Eye irritation	Tiredness	Negativity	Loneliness	Insomnia	Irregular period	None
BEFORE COVID	28(17%)	36(24%)	30 (20%)	8(5%)	12(8%)	4(3%)	4 (3%)	3 (2%)
DURING COVID	50(34%)	79(57%)	70(47%)	37(25%)	36(24%)	43 (27%)	15 (10%	18 (12%)

From table XIV, it was inferred that before covid situation - 17 percent, 24 percent, 20 percent, five percent, eight percent, 3 percent and two percent of the selected subjects experiences Frequent headache, Eye irritation, Tiredness, Negativity, Loneliness, Insomnia, Irregular period respectively and whereas meagre percent of the selected subjects did not experience any kind of symptoms. During covid the percentage of symptoms were increased to 34 percent,57 percent,47 percent,25 percent, 24 percent,27 percent, 10 percent and 12 percent of the selected subjects experienced Frequent headache, Eye irritation, Tiredness, Negativity, Loneliness, Insomnia, Irregular period respectively and nearly 12 percent of the selected subjects did not experience any symptoms during covid pandemic situation.

F) General outcome of the online survey

The online survey was conducted to maintain social distancing among the selected population. From the collected data it was understood that there was an increase in usage of electronic gadgets among young adults of both genders with change in their food consumption pattern and lifestyle pattern compared to before covid situation. It was also evident that the preferences of food during covid situation have been changed from processed easily available junk foods to nutritious foods with instant usage. Figure XIII, XIV and XV depicts the outcome of the online survey.

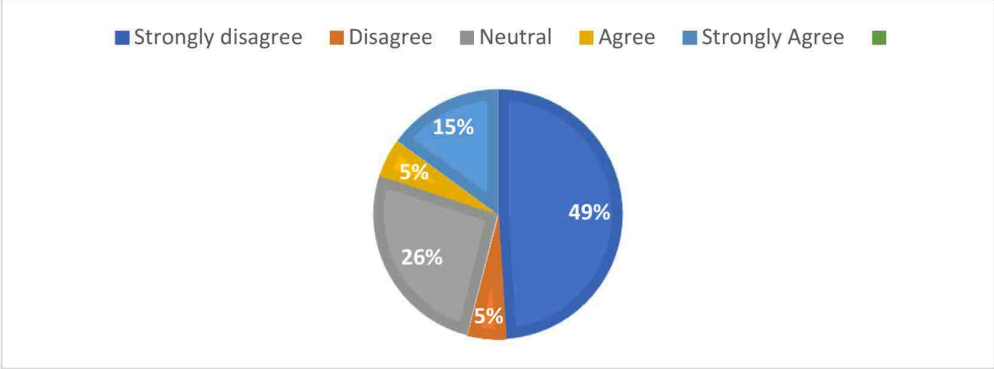


Figure XIII
Usage of gadgets

From figure XII, it was inferred that nearly 49 percent gave positive response on the usage of gadgets, 26 percent had neutral response.

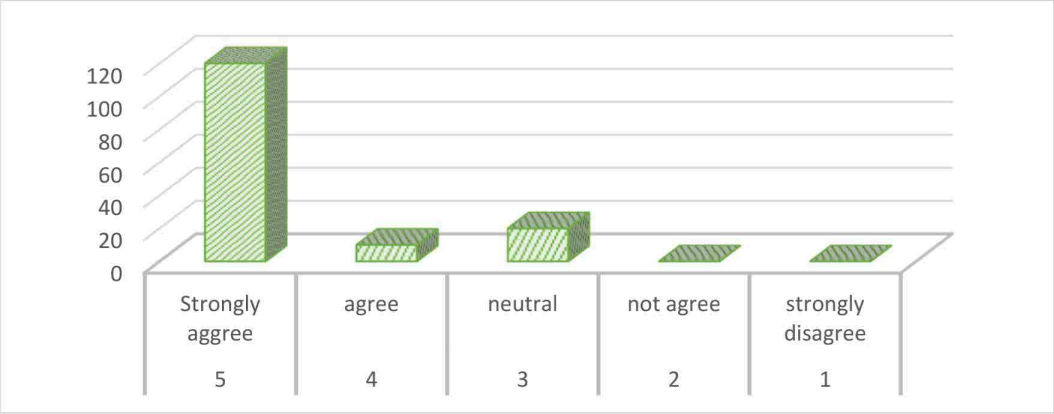


Figure XIV
Feedback of the online survey

From the figure XIII it was inferred that nearly 150 selected subjects were benefited out of the survey of which 120 strongly agreed,10 agree, 120 of them neutrally benefitted out of it.

a) Food preference during this covid period

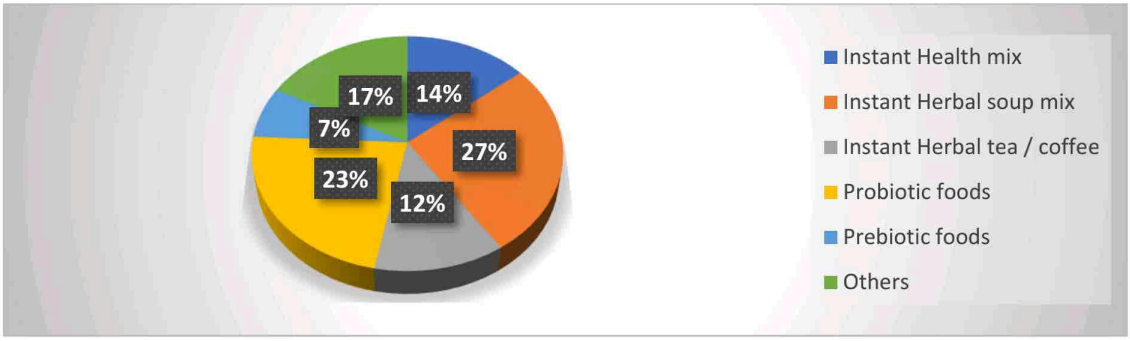


Figure XIV
Food preference during this covid period

From figure XIV, it was inferred that nearly 27 percent had preferred Instant herbal soup mix, 23 percent had preferred probiotics.

From the preferences of the selected subjects the Immune booster rich soup mix was developed.

F) Formulation, sensory evaluation, nutritional analysis and shelf-life assay of the Immune booster's rich soup mix

i) Organoleptic Evaluation of the Prepared immune boosters rich soup mix

The soups were prepared using different quantity and quality of ingredients. The formulated soup mix, subjected to an acceptability trial and is discussed below. The mean and standard deviation scores of six variations of immune booster rich soup mix in appearance, flavour, taste, texture, colour and overall acceptability are presented in Table XV.

Table XV

Organoleptic evaluation of immune booster rich soup mix

(Panel Members = 30)

Particulars	IBSM 0	IBSM 1	IBSM 2	IBSM 3	IBSM 4	IBSM 5	Oneway Anova	
							F value	P value
Appearance	8.7 ± 0.4	8.5 ± 0.6	8.9 ± 0.3	8.5 ± 0.5	8.3 ± 0.8	8.5 ± 0.6	6.058	.000
Colour	8.8 ± 0.3	8.3 ± 0.6	8.7 ± 0.4	8.1 ± 0.7	8.0 ± 0.7	7.8 ± 0.7	13.877	.000
Flavour	8.8 ± 0.5	8.5 ± 0.6	8.7 ± 0.5	8.1 ± 0.7	7.8 ± 0.8	7.9 ± 0.8	12.612	.000
Texture	8.7 ± 0.5	8.5 ± 0.6	8.7 ± 0.4	8.0 ± 0.7	7.9 ± 0.6	8.1 ± 0.8	12.324	.000
Taste	8.6±0.7	8.3± 0.7	8.7 ± 0.6	8.3± 0.7	7.7± 0.5	7.9± 0.5	12.525	.000
Overall acceptability	8.5 ± 0.6	8.5 ± 0.5	8.8 ± 0.5	8.1 ± 0.5	7.8 ± 0.6	7.9 ± 0.5	14.998	.000

P Value is ≤0.05 so null hypothesis is rejected alternate hypothesis accepted

The results showed that IBMS 0 had reached the maximum scores in the sensory qualities like Appearance, flavour, texture and taste. The IBMS 0 had secured the highest score in Colour (8.8 ± 0.3), Flavour (8.8 ± 0.5) and Texture (8.7 ± 0.5) compared to other variations. The mean score of appearance (8.9 ± 0.3) and taste (8.7± 0.6) of IBMS 2 had secured highest score compared to other variations. The mean score of texture was maximum in IBMS 0, IBMS 1 and IBMS 2 due to the combination of ingredients, namely, Ragi, Varagu, Horse gram and Drumstick leaves since these ingredients give the coarse structure. It was observed during sensory evaluation that the flavour of the IBMS 0, IBMS 1 and IBMS 2 was liked extremely, and they were highly appreciated by the panel members when compared to other variations. IBMS 2 had secured highest score in overall acceptability compared to other variations. IBMS 4 obtained the lowest overall acceptability scoring than others. Figure 1.2 stated the results of the mean scores of overall acceptability of all variations of the prepared Immune boosters rich soup mix. Although the panel members had liked, and appreciated all developed IBMS variations, one has to be selected for further processes. However, IBMS 0 was being selected as the best based on the overall rating for further Recommendation for the young adults (19 – 25 years) to boost their immunity during this covid pandemic situation. The ingredients which

are selected for the formulation of immune booster's rich soup mix were collected from local market and used for the study which are highly rich in Energy, Carbohydrate, Protein, Fibre, Vit – c, Calcium, Iron, Phosphorus, Phytochemicals, Antioxidants, Vit – A, Zinc and Vit – D which are the major nutrients enhance the immune response of the body (Nagalambika,2020). The selection of ingredients for the preparation of immune booster's rich soup mix in the present study is par on the study of many researches (Tamilselvan et al., 2021; Dr Shamshad Begum, 2021; Dayakar et al.,2017; Francis et al, 2021). which was clinically proven for its therapeutic benefits and has been added as a functional ingredient in preparing commercial food products. The functional immune boosters rich soup mix is well acceptable and rich in some of the potential nutrients to meet the body's requirements.

Figure XVI

Overall acceptability scores of immune booster rich soup mix

ii) Colour Analysis of the standard Immune booster rich soup mix

Organoleptically accepted (IBSM) immune booster's rich soup mix was tested for the colour intensity using food colour reader also known as chronometers or colorimeter. Food colour reader is an instrument which measures and quantifies three primary colours namely, red, green and blue which are the components of light seen by the human eye Yellow, orange colours are secondary and tertiary colours which were not quantified individually. Food colour reader is used to check and standardize the colour of samples like solid, powder, paste, liquids etc. CIE LAB is color space based on the fact that a color can't be both red and green, or both blue and yellow, because these colors oppose each other. So, a single data could be used to describe red/green and yellow/blue. When we use CIEL 'a'b' to describe a color, L means lightness, a means red/green and b* means yellow/blue. 1 gm of Soup mix powder and 1 ml of soup which was prepared from the immune booster's rich soup mix was taken in a watch glass and tested for their colour intensity using the food colour reader. The obtained scores were tabulated in Table XVI.

Table XVI

Colour analysis of the immune booster's rich soup mix

Colour Intensity	IBSM Powder	IBSM – soup
l *	52.09	46.60
a*	-3.81	-9.06
b*	30.34	8.10

l* means lightness, a* means red/green and b* means yellow/blue

The intensity of the colour was recorded using colour reader, the obtained values for Lightness of IBSM powder was 52.09 which is higher compared to the IBSM soup 46.60. a* values for IBMS soup (-9.06) is higher compared to IBSM powder (-3.81) with green colour. b* values for IBSM powder was 30.34 has higher value compared to IBSM soup (8.10).

iii) Nutrient Analysis of the formulated Immune booster rich soup mix

The nutrients in an organoleptically approved immune booster's rich soup mix were analyzed. The AOAC methodologies were used to analyze the nutrients in the IBSM. The powdered material was ashed and diluted. The nutritional content was determined using a diluted ash sample. The nutrient content of the IBSM was tabulated in Table XVII

Table XVII

Nutrient Analysis of the formulated Immune booster rich soup mix

NUTRIENTS	Contribution of nutrients by IBSM (100g)
Ash (%)	68
Energy(kcal)	256.78
Carbohydrates (g)	52.71
Protein(g)	13.10
Fat(g)	4.52
Fibre(g)	10.35
Iron(mg)	5.63
Calcium(mg)	392.9
Zinc(mg)	2.03
Phosphorous(mg)	289.5
Vit – C(mg)	36.33
Beta – Carotene (mcg)	1,280.82

The Ash content in IBSM was estimated and it was 68 percent. The proximate values included 256.78 kcals of energy, 52.71 grams of carbohydrate, 13.10 grams of protein, 4.52 grams of fat, and 10.35 grams of fibre. Calcium was 392.9 mg, iron 5.63 mg, phosphorus 289.5 mg, and zinc 2.03 mg in the IBSM's mineral content and also contributed 1,280.82 mcg of beta-carotene and 36.33 mg of vitamin C were found in selected IBSM. Contribution of nutrients is highly involved to enhance the immunity of an individual and considered as the immune booster rich soup mix.

iv) Phytochemical analysis and Anti-oxidant Activity of the formulated Immune booster's rich soup mix: Anti-oxidant activity and Phytochemicals present in the Organoleptically accepted (IBSM) immune booster's rich soup mix is depicted in Table XVIII,

a) Qualitative Analysis of Phytochemical

Phytochemicals (Greek word "Phyto" means plant) refer to biologically active, naturally formed chemical compounds in plant. Thousands of different phytochemicals have been found in millets, pulses, herbs and Green Leafy vegetables. These chemicals are synthesized in each and every part of plant. These Phyto constituents work with nutrients and fibres to form an integrated part of defence system against various diseases and stress conditions. Phytochemicals are basically divided into two groups, i.e., primary and secondary metabolites according to their functions in plant metabolism. Primary metabolites comprise of carbohydrates, amino acids, proteins etc., while secondary constituents consist of alkaloids, phenolic compounds, flavonoids, tannins, glycosides, terpenoids, saponins, and so on (Khandare, 2021). Qualitative chemical tests were carried out using 20% hydro-ethanol extract, to identify different Phyto-constituents present in the IBSM by using standard methods/ procedure. The tests were carried out for concentrations 0.1 mg/ml and 1 mg/ml and the results are tabulated in Table XVIII

Table XVIII

Phytochemical analysis of the formulated Immune booster's rich soup mix

S.No	Metabolite	Test preformed	Result
1.	Alkaloids	+ Mayer's reagent	+
		+ Dragendorff's reagent	+
2.	Flavonoids	Alkaline test	+
		+ H_2SO_4	+
		+ lead acetate	+
		Shinoda test	-
3.	Proteins	+ 2% Ninhydrin reagent	-
		+ 2% $CuSO_4$ + 95% ethanol + KOH pellet	+
		+ conc. HNO_3	+
4.	Cardiac glycosides	+ Baljet reagent	-
		Bromine water test	+
		Keller -killani test	+
5.	Carbohydrate	Molisch's test	+
		Fehling's test	+
6.	Volatile oils	Fluorescence test	+

The preliminary analysis was done for the selected Immune booster rich soup mix. Mayer's test was done to know the presence of alkaloid in the Immune booster's rich soup mix which was observed by the Presence of Cream coloured precipitate and Dragendorff's test indicates the Presence of reddish-brown precipitate which also indicates the presence of alkaloids. Presence of carbohydrates in the IBSM was identified using Molisch's and fehlings test. Keller Kelliani's test revealed the presence of cardiac glycosides whereas Baljet and Bromine water test does not show the presence of carbohydrates in it. The presence of flavonoids in the sample was identified using Alkaline Reagent Test with the observation of Intense yellow with NaOH and becomes colourless on addition of dil. HCl. Ninhydrin test was used to determine the

presence of protein samples. Florescence test indicates the presence of volatile oils in the Immune booster's rich soup mix.

b) Antioxidant activity

The antioxidant activity of the organoleptically selected Immune booster rich soup mix was investigated by measuring DPPH. It is a stable free radical and extensively used to measure the free radical scavenging capacity of various antioxidant substances (Baliyan ,2022). The DPPH scavenging activity of the prepared sample was exposed as 53.1% at the concentration of 10 µg/ml followed by 57% in 50µg/ml concentration,69.5% in 150 µg/ml concentration, and as high as 71.8 in 250 µg/ml concentration. The radical scavenging activity of the sample increased with increase in concentration. The mean obtained for standard Ascorbic acid is 81.88 with the standard deviation of 12.7 and 63.34 of mean value for Immune boosters rich soup mix with 8.6 standard deviation. The scavenging inhibition capacity was compared to the standard ascorbic acid ranging from 65.63 mg /100g to 96.09 mg /100 g. Table VII depicts the Antioxidant activity of the selected immune boosters rich soup mix. IC50 value for both standard ascorbic acid and Immune boosters rich soup mix was 49.1 which has antioxidant activity.

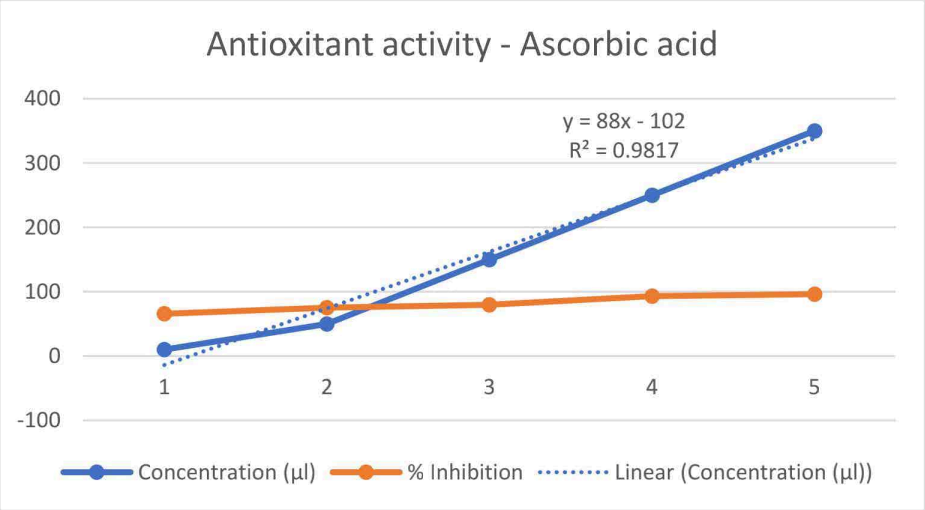
Table XIX

Antioxidant activity of the selected immune boosters rich soup mix

Concentration (µg/ml)	Scavenging Activity-DPPH (1,1-Di Phenyl-2-Picryl-Hydrazyl assay)	
	Standard Ascorbic Acid(mg)	Immune boosters rich soup mix(mg)
10	65.63	53.1
50	75.00	57
150	79.69	69.5
250	92.97	71.8
350	96.09	70.3
IC50	49.1	49.1
Mean ± SD	81.876 ± 12.7	63.34 ± 8.6

Figure XVII

Antioxidant activity of standard ascorbic acid



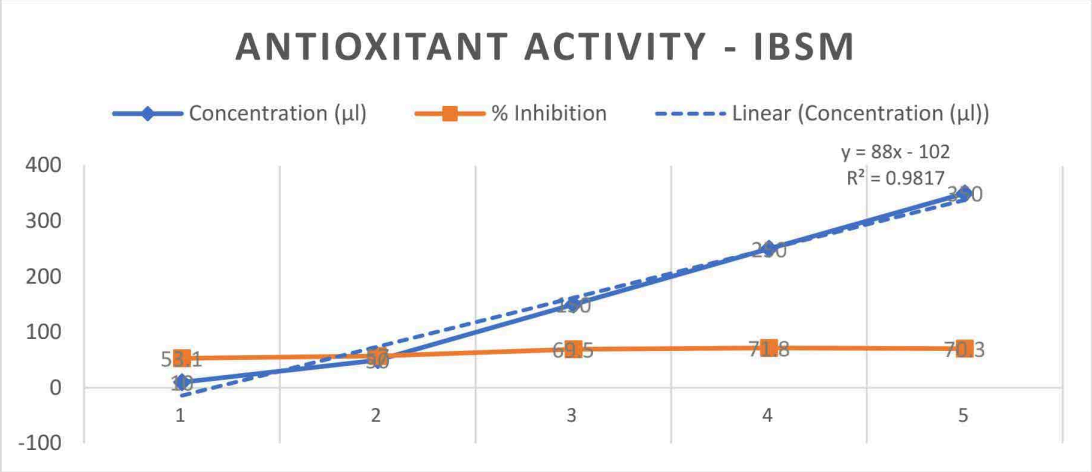


Figure XVIII

Antioxidant activity of IBSM

Oxidative stress produced by free radicals as a result of normal metabolism, can damages an organism, particularly if there is an antioxidant deficiency. Increased antioxidant capacity and decreased oxidative stress reduce the incidence of many degenerative diseases such as cancer, diabetes, cardiovascular diseases, and prevent cognitive decline and functions (Carvalho et al., 2017).

v) Shelf-life assay of the Immune booster's rich soup mix

a) Moisture Content

Based on the sensory attributes and nutrient analysis, the Immune boosters rich soup mix (IBSM 0) obtained the maximum score and selected for recommendation. It was subjected to shelf-life study. The developed IBSM had a shelf life of 90 days at room temperature by keeping it in a glass container and opened twice a day. The quality of the IBSM was maintained throughout the storage period with the slight increase in moisture which was tabulated below.

TABLE XX

Moisture content of the selected immune boosters rich soup mix

Days	**Moisture content %**
0^{th} day	96.8
30 days	94.2
60 days	91.5
90 days	89.3
Mean ± SD	92.95 ± 3.25

The mean initial reading of the moisture content was 96.8 percent and the moisture content decreased gradually to 89.3 percent after 90 days of storage in a controlled condition, considered under the permissible limit for human consumption. The mean and standard deviation obtained for the moisture content was about 92.95 and 3.25.

b) Microbial Assay

The microbial safety of the Immune Booster's Rich Soup Mix on storage in a glass container at room temperature is depicted in Table XXI

TABLE XXI

Total microbial load of immune booster's soup mix

Dilution	Total microbial count (cfu/gm) Time Line			
	Day 1	**30 days**	**60 days**	**90 days**
10^2	TNTC	TNTC	TNTC	TNTC
10^3	TNTC	TNTC	TNTC	TNTC
10^4	23	35	40	45
10^5	3	2	3	3
10^6	NIL	NIL	NIL	NIL

TNTC = Too Numerous To Count (More than 300 Colony Forming Units (CFU))

The total microbial count of the serial dilution of the sample in different concentrations was measured for three months of storing the sample in a glass container which was opened for one minute twice a day to stimulate daily usage. Too numerous to count was observed on the dilution of 10^2 and 10^3 in all the timelines. Total microbial count on the fresh sample at the dilution 10^4 ranged from 23000 units initially, 35000 units in 30 days, 40000 units in 60 days and 45000 units in 90 days. Total microbial count on the dilution of 10^5 for the period of 1 st day, 30th day, 60th day and 90th days were 40000 units, 50000 units, 40000 units and 50000 units. There was no microbial count found on the dilution of sample 10^6. Jay, 1992 reported that a product is microbiologically safe if total microbial count of dry soup is less than 1×10^4 cfu/g. Based on the microbial enumeration and hold time study for three months, the total microbial counts were in the acceptable range and safe limit for human consumption. And also, the microbial count was increased when the storage time increased up to three months provided with the recommended storage condition for the daily usage**.**

V. SUMMARY AND CONCLUSION

Changing behaviour, eating and exercise habits focus on gradual and permanent changes in of an individual. Among various pattern, diet plays an important role in the maintenance of good health and stamina and also in prevention and cure of disease. In modern scenario, observed changes in dietary patterns are likely to continue and combined with changes in lifestyle, particularly the decrease in physical activity will exacerbate emerging problems of over nutrition and diet-related chronic disease. Appropriate dietary intakes during among young adults both genders can have health benefits. Thus, Good Nutrition is easily achieved by eating the right kinds of food and eating them in the right proportions. Communication especially digital mode plays an important role in the lifestyle modification. Exposure to the digital technology includes electronic gadgets with mass media is an important variable in large scale directed social change and modernization in developing societies particularly during this covid pandemic situation. Today, electronic gadgets play an important role in spending leisure time. Education and usage of electronic gadgets during covid pandemic situation have interdependent relationship, because during this pandemic situation the usage of electronic gadgets such as Mobiles, Laptops, Tablets, Desktops and so on among young adults has been increased drastically for education and professional purposes compared to non-covid period. There by healthy eating habits and lifestyle play a key role in promoting optimum health and preventing chronic non communicable diseases (NCDS) such as diabetes, cardiovascular diseases, cancer, Alzheimer's disease, and hepatic steatosis. While prevention of nutrition-related non communicable diseases has become a worldwide challenge, it has been documented that NCDs share four main behavioural risk factors all of which will likely escalate in developing countries including insufficient physical activity unhealthy diet, obesity and tobacco use. The traditional healthy food habits have been replaced by more westernized food habits, which are characterized by low intake of dietary fibre, vegetables, and fruit and high make of foods rich in fat, sugar, and salt. The choice of foods is described as a complex process involving multiplication influencing aspects such as the socioeconomic and cultural level and availability of food, as well as the educational level and age range of a person.

With these backdrops, the study was conducted with following objectives:

- To elicit information related to food consumption and lifestyle pattern of the selected young adults.
- To examine the changes in food consumption and dietary pattern among the selected young adults due to usage of electronic gadgets
- To find out the effect of electronic gadgets on food consumption pattern and lifestyle modification among the selected young adults during the covid pandemic situation.
- To compare the time spent by the young adults with their electronic gadgets before and during covid pandemic situation.
- To study the effects of using electronic gadgets on physical health, mental health and lifestyle modification

- Formulation and standardisation of the immune booster's rich product and recommending as per the preference given by the selected subjects.

The methodology pertaining to the study is discussed in the following paras. In consideration with covid pandemic situation during the initial stage of the study, the survey was conducted in the online platform. A total of 150 young adults of both genders in the age group of 19 - 25 years, were selected by random sampling method and were belonged to either low- or middle-income groups. Willing to give consent and taking part of the study regularly for the period of two months, anthropometric measurements and computation of BMI values were compared with the standard values of NCHS. Co-operative and ready to give reliable data for the effective completion of the study. A detailed questionnaire, specially designed for an interview will be used to gather information related to demographic and dietary pattern such as size of the family, Education qualification and food preferences, life style pattern, usage of electronic gadgets among the selected participants was used to evaluated Nutritional status was assessed in terms of Anthropometric measurements and computation of BMI. Based on the food preferences given by the selected individuals, a Immune boosters rich soup mix was formulated and subjects to have organoleptic evaluation, Nutrients analysis including phytochemical qualitative tests and antioxidant properties and Shelf life assay and analysis of cost effectiveness. The Salient features of the present study are presented follow:

A. Background information of the selected subjects

Demographic profile regarding age, gender, education qualification, occupation, Income and number of family members of the selected subjects were collected and salient findings are given below:

- Among the selected 150 subjects, 52 percent of them were in the age group of 19 to 21 years and 48 percent were in the age groups of 22 to 25 years. Of which 45 percent was male and 55 percent were female subjects.
- It was noted that 10 percent of the families selected for the study had less than three members, 74 percent had four to five members in their families. Nearly 13 percent had six to eight members in their families and three percent had more than eight members in their families.
- As per HUDGO 2020, income classification about seven percent parents of the selected subjects earned lower middle income, nearly 57 percent were in middle income group and 36 percent of the parents of the selected subjects were in high income group.
- Among the selected 150 subjects, 45 percent were Undergraduates, nearly 45 percent were postgraduates, seven percent were Research scholars and five percent were belonged to other categories of education.

B. Dietary habits of the selected subjects before and during covid

Dietary habits are the corner-stones that promote the health status of an individual. It proves the way to grow, develop, work, resist on infection and aspire to realize the health potential of an individual. During this covid pandemic situation how the dietary pattern of the young adults has been changed compared to non-covid period were collected and the salient findings are given below:

- Majority of the selected subject's 75 percent were non – vegetarians,18 percent were vegetarian and nearly eight percent were Ova – vegetarians. During covid situation,

frequency of consumption of fleshy foods and sea foods were reduced. It might be due to non-availability of non-vegetarians food items whereas consumption of plant-based food items were increased due to easy availability at their door step.

- Among 150 selected subjects who were participated in this online survey who were commonly stated that their meal consumption pattern were irregular intervals of meal intake per day compared to before and during covid pandemic situation. No. of meals taken by the selected subjects for about 2 meals before covid was ten percent and during covid was 18 percent, where as those who had taken 3 meals per day was 76 percent and increased to 48 percent during covid. Those who took 4 meals a day before covid was six percent, which was increased twice the amount compared to non- covid period for about 22 percent. There was also increased in the meal intake, more than 4 meals per day compared to before and during covid pandemic situation by four percent to 13 percent.
- From the Table IV, it shows that about 40 percent used to skip a meal per day before covid which was decreased to 35 percent during covid pandemic situation. Nearly four percent of the selected subjects used to skip two meals per day before covid which was increased to 11 percent during covid period. Before covid period a meagre percent used to skip more than two meals per day which was increased to five percent during covid pandemic situation. Nearly 54 percent did not skip their meal per day before covid which was decreased to 50 percent during covid period. From the obtained data, it was clear that the no. of skipping of meals per day by the selected subjects were reduced during covid pandemic situation compared to non-covid situation.
- Screen time duration and dietary habits showed that the longer the screen time, the increased the odds of unhealthy dietary habits such as skipping breakfast, consuming fast food frequently and eating sweets frequently, and the decreased the odds of healthy dietary habits such as consuming a second fruit every day, consuming fresh or cooked vegetables or/and fish regularly, in both genders, after adjusting for several covariates. From the Figure III and IV about 48 percent had the habit of snacking over screen mostly of Packed and processed snacks (40 percent) compared to other fast foods, junk foods, bottled juices and so on. Furthermore, the longer the screen time the increased the odds of total and central obesity, insufficient sleep (< 8-9 h/d), and inadequate Physical activity, and the decreased the odds of healthy physical fitness. The present study was par on the study (Konstantinos *et al, 2020*) Figure II & III depicts Increase intake of snacks over screen usage of the selected subjects. (N = 150)
- It was inferred that the frequency of routine consumption of the cereals, millets, pulses, fruits and vegetables, milk products, meats and eggs, and millets products were increased compared to before and during covid with 15 percent to 41 percent of inclusion of all food items, 17 percent to 25 percent of fruits and vegetables, 22 percent to 31 percent of dairy products, 10 percent to 17 percent of meat ang eggs and three percent to six percent increase in consumption of millet products in their daily dietary pattern. But the frequency of boredom eating habits of the selected subjects 1-2times week, 5-6 times a week, and almost daily percentage has been increased slightly compared to before and during covid pandemic situation habits of the selected subjects.
- About 39 percent of the selected subjects consumed 1-2 liters of water per day before covid, which was decreased to 23 percent during covid. There is no difference in the 2-3 liters

water consumption of the selected subjects with 47 percent. But there was an increased from 17 percent to 32 percent of 3-4 liters of water intake per day before and during covid among the selected subjects.

- Nearly, 37 percent of the selected subjects used to have the junk and processed food once a week before covid and 25 percent were during covid. 25 percent of the selected subjects consumed the junk and processed food twice in a week before covid and 24 percent were during covid. 14 percent of the selected subjects consumed the junk and processed food more than twice a week before covid and 19 percent during covid. Same number of selected subjects nearly seven percent were consumed the junk and processed food once in a month. About 11 percent were consumed the junk and processed food occasionally before covid and it was increased to 17 percent during covid. Five percent of the selected subjects not consumed junk and processed food whereas percentage was increased to 16 percent during covid pandemic situation.

C. Lifestyle pattern of the selected subjects before and during covid

- Physical activity is essential to maintain an ideal body weight by big and has significant impact on their health promotion and prevention of diseases. Physical fitness plays a major role in lifestyle modification. Among young adults, maintaining of their fitness is challenging and nearly 52 percent were adopting physical activities.
- 46 percent of the selected individuals were not involved in any kind of physical activity before covid, but the percentage has decreased to 31 during covid and there was increase in the involvement of physical activities among the selected subjects during covid of about exercise (36 percent), Yoga (17 percent), Walking (29 percent), Jogging (seven percent) and Others (10 percent) activities.
- Comparison of duration of exercise adopted before and during covid, it was noted that 28 percent were used to do exercise for half an hour before covid which was decreased to 27 percent during covid. About 25 percent were used to do exercise for 1 hour before covid and it was notes that 26 percent were used to during covid. From Ten percent to 13 percent increase in doing exercise for one and half an hour before and during covid. Almost 34 percent of the selected individual were not involved any of the exercise before covid but it was decreased to 25 percent during covid situation.
- Nearly, 31 percent had less than six hours of sleep before covid, which was decreased to 19 percent during covid. 55 percent of them had proper sleep between 6-8 hours during covid and it was decreased to 45 percent during covid period. Whereas only 15 percent had greater than eight hours of sleep per day before covid which was increased to 37 percent during covid among the selected subjects.
- Before covid around 19 percent of the selected subjects used gadgets ½ - 1 hours before going to sleep and it was reduced to 14 percent during covid. 24 percent use gadgets 1 – 2 hours before going to sleep before covid and it was increased to 28 percent during covid. Nine percent use gadgets 2 – 3 hours before going to sleep before covid and it was increased to 41 percent during covid. Around eight percent of them use gadgets more than 3 hours before covid and it was increased to 19 percent during covid period. Increased usage of gadgets before sleeping was mainly due to their life style changes and leisure time in the morning hours, without having academic commitments.

- Around 17 percent of them suffered from body pain, 14 percent had headache, Nine percent had depression, three percent had anxiety, Seven percent had negative feelings, nine percent had negative imagination,14 percent had Sleeplessness, four percent had some other disturbances due to improper sleep and nearly 25 percent of the selected subjects did not experience any kind of mental and health issues. It might be due to their sound sleep.
- Stress is the word which is common among youngsters due to so many factors and parameters includes – peer group, academic activities, performances, financial, family, social media, society. Among 150 selected subjects, nearly 70 percent had experienced stress due to excessive usage of gadgets during covid compared to non- covid period for professional purposes.
- Among the 150 selected subjects nearly 89 percent of them preferred to eat more food items over stress. In which 16 percent like to eat fast foods, nine percent prefer junk foods, 21 percent packed and processed snacks, nearly eight percent prefer chocolates, 6 percent like to have sweets, nine percent preferred bottled juices and 33 percent used to prefer other kind of foods during their stress.
- Nearly 93 percent were not smoking and rest of the seven percent were smokers and smoke on occasional days before covid and during covid almost 89 percent were not smoked and 11 percent were started smoking. Almost all the selected subjects were not consumed alcohol and chewing of betel leaves and tobacco before and during covid. It is heart soothing findings of the present research study.

D. Assessment of Nutritional status of the selected subjects before and during covid

- Anthropometric measurements are used to assess the size, shape and composition of the human body measurements of height and weight for BMI and measurements of waist and hip circumference for waist-to-hip ratio. The commonly used methods for assessing the nutritional status of the selected subjects are objective and are usually an important aspect of nutritional assessment and are also valuable in evaluating the health status of an individual, Body Mass Index (BMI) of the selected subjects.
- Among the 150 selected subjects 59 percent have increased in their BMI during covid period compared to before covid, 30 percent had less BMI during covid compared to before covid. Eight percent had same BMI and three were not respond.

E. Pattern of using electronic gadgets before and during covid of the selected subjects.

- Broadcast or storage media that take advantage of electronic technology. They encoding of information included television, radio, Internet, CD-ROMs, DVD, Mobiles, Laptops, Desktops and any other medium that electricity or digital. Now a day's the usage electronic gadgets were increased among young adults either for academic or non-academic purposes.
- 96 percent of subjects used mobile,30 percent of laptops, Five percent of tablets, 50 percent television and nearly three percent of desktop were exclusively used for their academic, professional and /or recreational purposes whereas during covid situation, 93 percent, 66 percent, 16 percent, 58 percent and 13 percent were utilized mobile, laptops, tablets, television and desktops respectively. There was an increased in screen time compared to before covid period among the selected subjects of the present study.

- Nearly 45 percent used their gadgets more than seven hours for study purpose during covid compared to non-covid period. Before covid nearly 64 percent use less than six hours of gadgets for study purpose and it was reduced to 21 percent during covid pandemic situation.
- Nearly 53 percent were more comfortable and rest 47 percent were not comfortable using various types of electronic gadgets for their academic and non-academic purpose.
- It was inferred that before covid situation - 17 percent, 24 percent, 20 percent, five percent, eight percent, 3 percent and two percent of the selected subjects experiences Frequent headache, Eye irritation, Tiredness, Negativity, Loneliness, Insomnia, Irregular period respectively and whereas meagre percent of the selected subjects did not experience any kind of symptoms. During covid the percentage of symptoms were increased to 34 percent,57 percent,47 percent,25 percent, 24 percent,27 percent, 10 percent and 12 percent of the selected subjects experienced Frequent headache, Eye irritation, Tiredness, Negativity, Loneliness, Insomnia, Irregular period respectively and nearly 12 percent of the selected subjects did not experience any symptoms during covid pandemic situation.
- The online survey was conducted to maintain social distancing among the selected population. From the collected data it was understood that there was an increase in usage of electronic gadgets among young adults of both genders with change in their food consumption pattern and lifestyle pattern compared to before covid situation. It was also evident that the preferences of food during covid situation have been changed from processed easily available junk foods to nutritious foods with instant usage.It was inferred that nearly 49 percent gave positive response on the usage of gadgets, 26 percent had neutral response.
- Nearly 150 selected subjects were benefited out of the survey of which 120 strongly agreed,10 agree, 120 of them neutrally benefitted out of it.
- In case of dietary intake and preferences to boost their immunity, it was inferred that nearly 27 percent had preferred Instant herbal soup mix, 23 percent had preferred probiotics.

F. Formulation, sensory evaluation, nutritional analysis and shelf-life assay of the Immune booster's rich soup mix

- The soups were prepared using different quantity and quality of ingredients. The formulated soup mix, subjected to an acceptability trial. The results showed that IBMS 0 had reached the maximum scores in the sensory qualities like Appearance, flavour, texture and taste. The IBMS 0 had secured the highest score in Colour (8.8 ± 0.3), Flavour (8.8 ± 0.5) and Texture (8.7 ± 0.5) compared to other variations. The mean score of appearance (8.9 ± 0.3) and taste (8.7± 0.6) of IBMS 2 had secured highest score compared to other variations. The mean score of texture was maximum in IBMS 0, IBMS 1 and IBMS 2 due to the combination of ingredients, namely, Ragi, Varagu, Horse gram and Drumstick leaves since these ingredients give the coarse structure. It was observed during sensory evaluation that the flavour of the IBMS 0, IBMS 1 and IBMS 2 was liked extremely, and they were highly appreciated by the panel members when compared to other variations. IBMS 2 had secured highest score in overall acceptability compared to other variations. IBMS 4 obtained the lowest overall acceptability scoring than others. The ingredients which are selected for the formulation of immune booster's rich soup mix were collected from local market and used for the study which are highly rich in Energy, Carbohydrate, Protein, Fibre, Vit – c,

Calcium, Iron, Phosphorus, Phytochemicals, Antioxidants, Vit – A, Zinc and Vit – D which are the major nutrients involved to enhance the immune response of the body. The functional immune boosters rich soup mix is well acceptable and rich in some of the potential nutrients to meet the body's requirements for enhancing immune response and promoting health status.

- The intensity of the colour was recorded using colour reader. The obtained values for Lightness of IBSM powder was 52.09 which is higher compared to the IBSM soup 46.60. a* values for IBMS soup (-9.06) is higher compared to IBSM powder (-3.81) with green colour. b* values for IBSM powder was 30.34 has higher value compared to IBSM soup (8.10).
- The nutrients in an organoleptically approved immune booster's rich soup mix were analyzed. The AOAC methodologies were used to analyze the nutrients in the IBSM. The powdered material was ashed and diluted. The Ash content in IBSM was estimated and it was 68 percent. The proximate values included 256.78 kcals of energy, 52.71 grams of carbohydrate, 13.10 grams of protein, 4.52 grams of fat, and 10.35 grams of fibre. Calcium was 392.9 mg, iron 5.63 mg, phosphorus 289.5 mg, and zinc 2.03 mg in the IBSM's mineral content and also contributed 1,280.82 mcg of beta-carotene and 36.33 mg of vitamin C were found in selected IBSM. Contribution of nutrients is highly involved to enhance the immunity of an individual and considered as the immune booster rich soup mix.
- Anti-oxidant activity and Phytochemicals present in the Organoleptically accepted (IBSM) immune booster's rich soup mix. The preliminary analysis was done for the selected Immune booster rich soup mix. Mayer's test was done to know the presence of alkaloid in the Immune booster's rich soup mix which was observed by the Presence of Cream coloured precipitate and Dragendorff's test indicates the Presence of reddish-brown precipitate which also indicates the presence of alkaloids. Presence of carbohydrates in the IBSM was identified using Molisch's and fehlings test. Keller Kelliani's test revealed the presence of cardiac glycosides whereas Baljet and Bromine water test does not show the presence of carbohydrates in it. The presence of flavonoids in the sample was identified using Alkaline Reagent Test with the observation of Intense yellow with NaOH and becomes colourless on addition of dil. HCl. Ninhydrin test was used to determine the presence of protein samples. Florescence test indicates the presence of volatile oils in the Immune booster's rich soup mix.
- The antioxidant activity of the organoleptically selected Immune booster rich soup mix was investigated by measuring DPPH. The radical scavenging activity of the sample increased with increase in concentration. The mean obtained for standard Ascorbic acid is 81.88 with the standard deviation of 12.7 and 63.34 of mean value for Immune boosters rich soup mix with 8.6 standard deviation. The scavenging inhibition capacity was compared to the standard ascorbic acid ranging from 65.63 mg /100g to 96.09 mg /100 g. IC50 value with for both standard ascorbic acid and Immune boosters rich soup mix was 49.1 which has antioxidant activity.
- Based on the sensory attributes and nutrient analysis, the Immune boosters rich soup mix (IBSM 0) obtained the maximum score and selected for recommendation. It was subjected to shelf-life study. The developed IBSM had a shelf life of 90 days at room temperature by keeping it in a glass container and opened twice a day. The quality of the IBSM was

maintained throughout the storage period with the slight increase in moisture. The mean initial reading of the moisture content was 96.8 percent and the moisture content decreased gradually to 89.3 percent after 90 days of storage in a controlled condition, considered under the permissible limit for human consumption. The mean and standard deviation obtained for the moisture content was about 92.95 and 3.25.

- The microbial safety of the Immune Booster's Rich Soup Mix on storage in a glass container at room temperature was assessed. A product is microbiologically safe if total microbial count of dry soup is less than 1×10^4 cfu/g. Based on the microbial enumeration and hold time study for three months, the total microbial counts were in the acceptable range and safe limit for human consumption. And also, the microbial count was increased when the storage time increased up to three months provided with the recommended storage condition for the daily usage**.**
- The ingredients used in the formulation of immune booster were seasonal, locally available and low-cost items. Cost per 100gm of Formulation was found to be Rs. 13.5 paise and it was affordable to all class of people. Moreover, it is highly nutritional and rich in antioxidant activity.

CONCLUSION

Changing lifestyle has shifted in eating habits which have profound influence on health of population compared to before and during covid pandemic situation. This study provides an overview of the food access, food intake, and physical activity, usage of electronic gadgets among collage going students during the COVID-19 lockdown. The Majority of the selected subjects maintained their eating habits, while 70% increased their snack intake. Most of the people had reduced physical activity and increased sleep duration during the lockdown. Majority of the selected subjects have increased their gadgets usage for professional purposes along with personal usage. Always staying at home/working/studying from home was associated with an increase in food consumption, sleep duration, and frequency of skipping breakfast. Hence it is essential to enlighten the public on healthy lifestyle pattern using appropriate holistic approaches during this covid pandemic situation.

Recommendations

- Further the study should be made to encourage people to reduce calorie rich junk foods/ fast foods and snacks intake, follow strict daily consumption of three meals including breakfast, and increase physical activity in their daily routine work schedule. Hence it is essential to enlighten the public on healthy lifestyle pattern using appropriate holistic approaches.
- More research has to be suggested for the supplementation of the immune boosters among the selected population to enhance their immunity during pandemic situation by using low cost locally available indigenous ingredients.
- Mobile apps and web-based tools are highly helpful in their covid situation. when all the individuals are advised to maintain social distances. This research study also shows light into the wide area for formulating many applications for the benefits of the society by having optimum health for their quality life.

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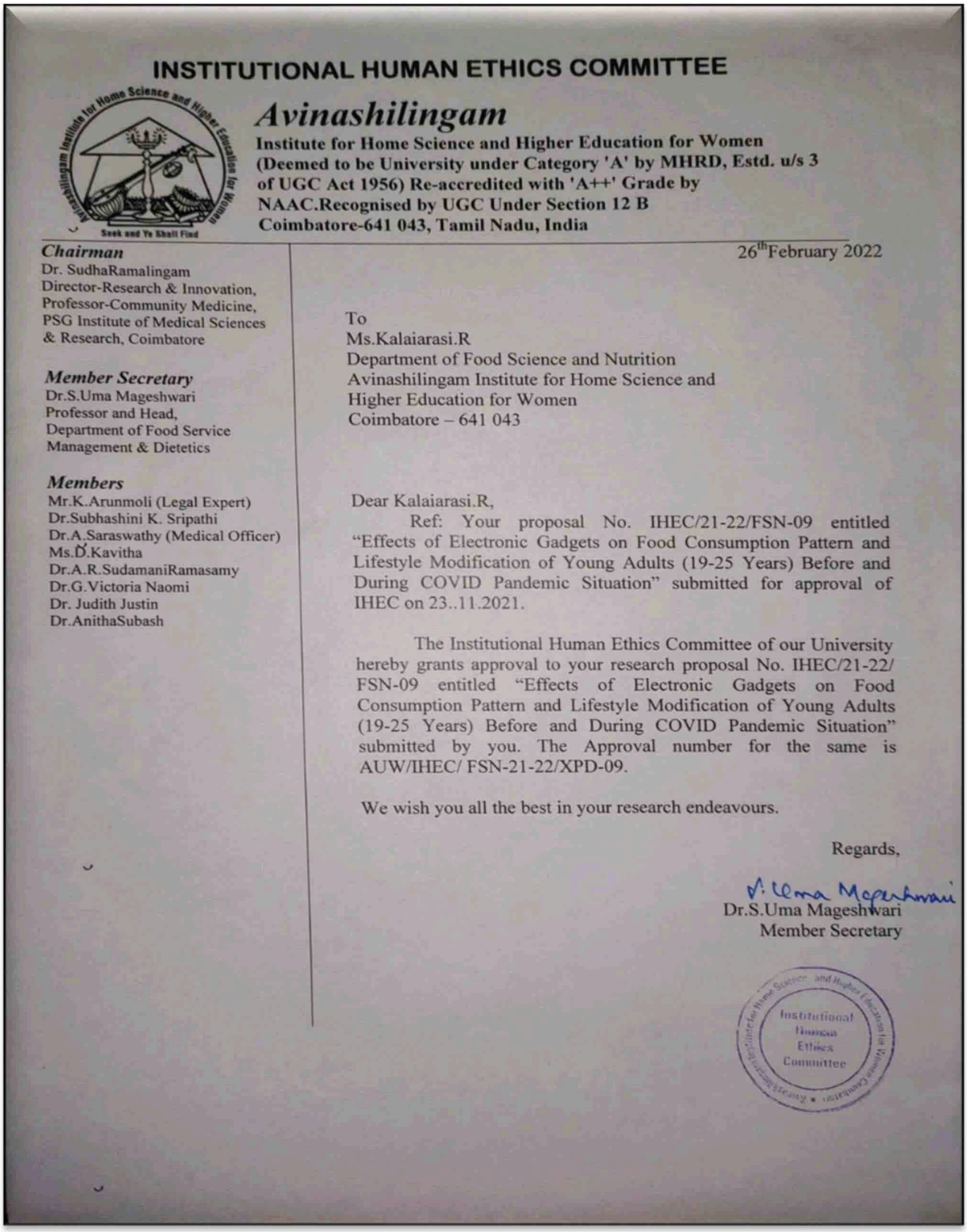
APPENDIX I

ETICAL CLEARANCE



INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956) Re-accredited with 'A++' Grade by NAAC.Recognised by UGC Under Section 12 B
Coimbatore-641 043, Tamil Nadu, India

Chairman
Dr. SudhaRamalingam
Director-Research & Innovation,
Professor-Community Medicine,
PSG Institute of Medical Sciences & Research, Coimbatore

Member Secretary
Dr.S.Uma Mageshwari
Professor and Head,
Department of Food Service Management & Dietetics

Members
Mr.K.Arunmoli (Legal Expert)
Dr.Subhashini K. Sripathi
Dr.A.Saraswathy (Medical Officer)
Ms.D.Kavitha
Dr.A.R.SudamaniRamasamy
Dr.G.Victoria Naomi
Dr. Judith Justin
Dr.AnithaSubash

26th February 2022

To
Ms.Kalaiarasi.R
Department of Food Science and Nutrition
Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore – 641 043

Dear Kalaiarasi.R,

Ref: Your proposal No. IHEC/21-22/FSN-09 entitled "Effects of Electronic Gadgets on Food Consumption Pattern and Lifestyle Modification of Young Adults (19-25 Years) Before and During COVID Pandemic Situation" submitted for approval of IHEC on 23..11.2021.

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No. IHEC/21-22/ FSN-09 entitled "Effects of Electronic Gadgets on Food Consumption Pattern and Lifestyle Modification of Young Adults (19-25 Years) Before and During COVID Pandemic Situation" submitted by you. The Approval number for the same is AUW/IHEC/ FSN-21-22/XPD-09.

We wish you all the best in your research endeavours.

Regards,

Dr.S.Uma Mageshwari
Member Secretary

Institutional Human Ethics Committee

APPENDIX II

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN COIMBATORE – 641043, INDIA

Effect of electronic gadgets on nutritional status, dietary pattern and lifestyle modification of the young adults (19-25 years) before and during covid pandemic situation and standardization of immune boosters rich soup mix

A. QUESTIONNAIRE TO FIND OUT SOCIO-ECONOMIC STATUS

1. Name
2. Age
3. Gender Male b. Female
4. Number of family members a. < 3 members b. 4 – 5 members c. 6 – 8 members d. > 8 members
5. Monthly income of the family a. Lower income (<3300) b. Lower middle income (Rs.3301-7300) c. Middle income (7301-14500) d. High income (>14500)
6. Education qualification a. Undergraduate b. Postgraduate c. Research scholar d. Others
7. Email id

B. QUESTIONNAIRE TO FIND OUT ANTHROPOMETRIC MEASUREMENTS BEFORE AND DURING COVID

Attributes	Before covid	During covid
1. Height(cm)		
2. Weight(kg)		
3. BMI		

4. Mention the differences in BMI

C. QUESTIONNAIRE TO FIND OUT DIETARY PATTERN AND EATING HABITS BEFORE AND DURING COVID

1. Are you a – Vegetarian/ Non- vegetarian/ Ova vegetarian
2. How the no. of meals taken per day differs before and during Covid? – 3 /4 / 2 / above 4
3. what is the timing of your breakfast, lunch and dinner? Before and during covid.

a) Breakfast: 7.00am -9.00 am
b) Breakfast: 9.00am - 11.00am
c) Breakfast: 11.00am - 12.00pm
d) Lunch: 1.00pm - 3.00pm
e) Lunch: 3.00pm - 5.00pm
f) Dinner: 7.00pm - 9.00pm
g) Dinner: 9.00pm - 11.00pm

4. Do you skip meals? – yes / No/ May be
5. If yes, tick the number of meals you skip? before and during covid – 1 /2 / more than2
6. Will you snack over screen usage? – Yes/ No/ May be/ Sometimes
7. If yes, what types of snacks;
   i. Fast foods
   ii. Junk foods
   iii. Packed and Processed snacks like chips
   iv. Chocolates
   v. Sweets
   vi. Bottled juices
   vii. Others
8. Tick the number of times you eat junk foods and fast foods – before and during covid

i) once a week ii)twice a week iii)more than twice a week iv)once in a month v) occasionally vi) none

9. Consumption of balanced diet by including healthy ingredients (whole wheat, pulses, legumes, eggs, nut, fruits and vegetables) – Before and during covid

a. Not routinely b) One to two times a week c) Three to four times a week d) Five to six times a week e) Almost Daily

10. Frequency of your fruits and vegetables intake – before and during covid

a. Not routinely b) One to two times a week c)Three to four times a week d)Five to six times a week e)Almost Daily

11. Consumption of milk or its products (curd, lassi, cheese, paneer etc) – Before and during covid

a. Not routinely b) One to two times a week c)Three to four times a week d)Five to six times a week e)Almost Daily

12. Consumption of one or more servings of pulses, egg or meat in a day – before and during covid

a. Not routinely b) One to two times a week c)Three to four times a week d)Five to six times a week e) Almost Daily

13. Daily Consumption of sugar/honey/jaggery

a) Zero teaspoons per day, I don' t add sugar in my meals/beverages – before and during covid b) One to two teaspoons per day c)Three to four teaspoons per day d)Five to six times teaspoons per day e)More than 6 teaspoons per day

14. Consumption of millets and its products (eg.Ragi, Varagu, Saamai) - Before and during covid.

a) Not routinely b)One to two times a week c)Three to four times a week d)Five to six times a week e)Almost Daily

15. Consumption of water per day – Before and during covid

a) 1-2 litres b)2-3litres c)3-4litres

16. Emotional Eating (boredom/distress/disappointment) – before and during covid

a. Not routinely b)One to two times a week c)Three to four times a week e) Five to six times a week f)Almost Daily

D. QUESTIONNAIRE TO FIND OUT THE LIFESTYLE PROFILE BEFORE AND DURING COVID

➢ **PHYSICAL FITNESS**

1. Do you suffer from any disease condition? Before and during covid

a) Obesity b) Heart diseases c)Hypotension/ Hypertension d) Diabetes Mellitus e)Kidney diseases f)Covid g)Others

2. What physical activity you practice regularly? – before and after covid

a) Exercise b)Yoga c)Walking d)Jogging e)None f)Others

3. Tick the duration you engage in physical activity – before and during covid

a) ½ hour b)1 hour c)1 ½ hours d)2 hours e)Others

4. Participation in household chores (cooking, laundry, cleaning) – Before and during covid

a) Not routinely b)One to two days a week c)Three to four days a week d) Five to six days a week e)Almost Daily

5. Participation in leisure related activities (eg: gardening) – before and during covid

a) Not routinely b) One to two days a week c) Three to four days a week d) Five to six days a week e) Almost Daily

6. How long do you sit at work continously – before and during covid

a) Less than 2 hours b) 2–4 hours c)4-6 hours d)6–8 hours e)More than 8 hours

7. Breaks from sitting (such as standing up, or stretching or taking a short walk) – before and during covid

a) 0 breaks b)1-2 breaks c)3-4 breaks d)5-6 breaks e)More than 6 breaks

➢ **SLEEPING PATTERN**

1. Daily hours of sleep – before and during covid

a) <6 hours b)6–8 hours c)>8 hours

2. Timing of sleep – before and during covid

a) 9.00pm b)10.00pm c)11.00pm d)After 11.00pm

3. Quality of sleep – before and during covid

a) Excellent b)Very good c)Good d)Bad e)Very bad

4. Will you use gadgets (Mobile/TV/Laptop) before sleep? Before and during covid – yes/ no/ sometimes
5. How long will you use the gadgets (Mobile/Laptop/TV) before going to sleep?

a) ½ - 1 hours b)1-2 hours c)2-3 hours

6. Till which time you will use the gadgets (Mobile/Laptop/TV)

a) Till 10.00 pm b)Till 11.00 pm c)Till 12.00am d)After 12.00 am

7. what are the purposes you use these gadgets before sleep? – before and during covid

a) Chatting with friends b)Educational purpose c) Professional purpose d)Watching news feeds e) Posting your updates / status f) Watching movies g)Others

8. Is the use of gadgets delay your sleeping time? Before and during covid – yes / no/ sometimes
9. If yes, How long it takes to fall asleep after usage of these gadgets?

a) After ½ hour of lying b)After 1 hour of lying c)More than a hour

b) Others

10. Do you use any of your gadgets immediately after you wake up? – before and during covid – yes / no/ sometimes/ may be
11. Do you have a good sleep? – before and during covid. – yes/no/maybe/ irregular
12. If No, Mention the type of disturbances you have

a) Headache b)body pain c)Depression d)Anxiety e) Negative feelings f)Imaginations g) Insomnia (Sleeplessness) h)Others

➢ **STRESS PATTERN**

1. Do you experience any form of stress due to use of the gadgets? Before and during covid – yes/no/may be/sometimes
2. If yes, mention which gadgets (Mobile/Laptop/TV) makes you more stress and why?
3. Do you have the habit of eating more over stress? – Yes/No/Maybe/Sometimes
4. If yes, what are they

a) Fast foods b)Junk foods c)Packed and Processed snacks like chips d)Chocolates e) Sweets f)Bottled juices g)Others

➢ **OTHER BEHAVIOURS**

Attributes	Before covid		During covid	
	Yes	No	Yes	No
1. Smoking				
2. Alcohol				
3. Chewing of Betel leaves and Tobacco				

E. QUESTIONNAIRE TO FIND OUT THE ELECTRONIC GADGETS USAGE BEFORE AND DURING COVID

1. What are the gadgets you use per day?

a) Mobile b)Laptop c)Tablets d)Television e)Desktop

2. Mention the time of the day when you use these gadgets mostly?

a) Early morning b)Morning c)Afternoon d)Evening e) Night f)Midnight g)Anytime

3. What is the frequency of your screen use?

a) With interval of 15 to 30 minutes b)With interval of 45 to 60 minutes c)others

4. What is your usual screen time?	Before covid	During Covid
a) Below 6 hrs per day		
b) 6 hrs per day		
c) 7 hrs per day		
d) More than 7 hours per day		

e) others		

5. Do you use spectacles while using the gadgets? Yes / no
6. If yes, how long will you use?

7. Using of the gadgets for study purposes– mobiles/tablets/laptops	Before covid	During covid
a) 3-4 hours per day		
b) 4-5 hours per day		
c) 5-6 hours per day		
d) more than 6 hours		
e) Others		

8) Are you comfortable while using the gadgets? yes / No
9) If NO – please Mention the reason
Eg: Eye irritation/Frequent head pain/with compulsion in need of doing the work/compulsion in attending the online classes/others.
10) Tick the purposes for which the gadgets are used by you before and during COVID

i) To know General information
ii) To know COVID related information
iii) For Educational Information
iv) Browsing for current updates

11) Did you notice any health and mental disturbances due to usage of gadgets before and during covid?

a) Frequent head ache b)Eye irritation c)Tiredness d)Negativity e)Loneliness f) Insomnia (sleeplessness) g)None h)Others

12) How do you access to these gadgets (mobile/laptop/television/desktops)?

a) Individually b)With friends c)With siblings d)With Parents

F. **QUESTIONNAIRE TO FIND OUT THE GENERAL OUTCOME OF THE STUDY CONDUCTED ONLINE SURVEY**

1. The gadgets are helpful for you during this covid pandemic – Disagree/Agree
2. Give a small description about positive impact of the usage of gadgets during this covid pandemic
3. Give a small description about negative impact of the usage of gadgets during this covid pandemic
4. Does this survey was helpful for you to know about your usage of electronic gadgets, lifestyle behaviour before and during covid pandemic – Disagree/Agree
5. What kind of foods do you prefer to have in a regular basis during this pandemic after getting enough knowledge on the situation (new normal world). Which may be Instant and Nutritious too.

a) Instant Health mix b)Instant Herbal soup mix c)Instant Herbal tea / coffee d)Probiotic foods e)Prebiotic foods f)Others

APPENDIX III
NUTRIENT ANALYSIS
DETERMINATION OF ENERGY VALUE OF FOOD USING PARR OXYGEN BOMB CALORIMETER

AIM

To determine the energy value of food stuff using Parr oxygen bomb calorimeter.

EQUIPMENT: Parr oxygen bomb calorimeter, analytical balance, weight box.

DESCRIPTION OF THE APPARATUS : An oxygen bomb calorimeter is consisting of three essential parts namely,

1. Bomb or the vessel, in which the combustible food is burnt.
2. The calorimeter bucket, or the water container holding measured quantity of water, in which the bomb thermometer and the stirring device are immersed.
3. The jacket for protecting the calorimeter bucket from the effects of variation in room temperature.

The bomb consists of thick-walled vessel with a mechanically sealed cover, which can be removed for cleaning and for inserting the sample. The apparatus works at a normal pressure at 100 atmospheres, but can withstand a pressure upto 200 atmospheres. The air which is trapped into the bomb when it is closed, contains nitrogen and in the presence of oxygen at a high temperature and pressure developed within the bomb, some of the nitrogen oxidises and combines with water vapour to form nitric acid. Likewise if the samples being burnt contain sulphur, that is converted to sulphuric and sulphurous acids. These several acids combine to form a mixture (corrosive) which with residual oxygen gas at high temperature generates an atmosphere, which will corrode the ordinary metals. There are two electrodes attached to the underside of the double walled head. Both electrodes serve as binding posts for the fuse wire which is strung between them and bent down in contact with the food, which encloses simplified ignition circuit. The calorimeter bucket 84 provides for total immersion of bomb in a measured quantity of water. It must have a constant stirrer running at constant speed to circulate the water for rapid absorption of heat liberated by the bomb and to maintain temperature equilibrium throughout the bucket. All Parr Calorimeters are furnished with solid stem mercurical thermometer made according to highly developed specification which assure the greatest possible accuracy and ease in reading.

PROCEDURE: The food was weighed and taken in a capsule. 11 cm of the fuse wire was attached and the capsule was placed in loop electrodes. The bomb was assembled and oxygen was filled with 15 atmospheres. Two litres of distilled water which was cooled to 2° F below the room temperature was taken in the calorimeter bucket. The calorimeter was then closed. The thermometer was inserted and the stirring mechanism was started, while the terminals were attached to the bomb. It was allowed to run for 2 minutes before taking the temperature. The temperature readings were recorded at one minute interval for an initial period of five minutes. Exactly at the 5th minute, the wire was ignited and the button was held for 15 seconds. The temperature readings exactly the minute after ignition were recorded. The readings of the thermometer were taken at 15 seconds intervals thereafter until 2 minutes have elapsed, when the readings were taken at one-minute intervals. After the maximum was reached, the temperature was noted every one minute for 5 minutes. The calorimeter was opened, the bucket and the bomb were removed, and the residual pressure was released. Then the bomb calorimetric cover was taken out. The combusted pieces of the fuse wire were removed from the electrodes. They were straightened and the length of all the pieces combined to make the fuse wire correction. All the inner surface of the bomb, the cylinder and the cover were rinsed.

ESTIMATION OF MOISTURE CONTENT

AIM

To determine the moisture content of the given food sample and calculate the percentage of moisture content.

APPARATUS

Low – flat bottomed dishes, asbestos, analytical balance, weight box, tongs, desiccators and electric oven.

PROCEDURE: A pair of weighing bottles are heated at 100° c in an oven and labelled as a and b. they were placed on a butter sheet fortwo minutes and transferred them to a desiccator where they remained for half an hour. Their weight was recorded in an analytical weighing balance. This procedure was repeated till two successive weights obtained were constant (with maximum difference of 0.0002 g).

Weighed different amounts of two g in dry powder and placed in an electric oven thermostatically controlled at 100-105 °c. They were heated for a stipulated time (two hours), cooled in a desiccator for half an hour and weighed. This was also weighed till successive weight showed no further loss.
Moisture % = Initial weight – Final weight/ Weight of the sample × 100

ESTIMATION OF NITROGEN

AIM

To determine the amount of nitrogen present in the given sample.

REAGENTS

1. N/70 Sulphuric acid
2. 40% Sodium hydroxide
3. 2% Boric acid (in a warm water)
4. Digestion mixture: a mixture of copper sulphate and potassium sulphate in the ratio 2:98
5. Concentrated sulphuric acid
6. Mozazagaindicator : a mixture of Bromocresol green and methyl red indicator in 95% alcohol in the ratio 4:1 (80mg and 20mg in 100ml alcohol).

PROCEDURE: 0.5g of the sample was taken into the digestion flask. to this added 15ml of concentrated sulphuric acid and a pinch of digestion mixture as a catalyst. Kept at boiling gently over a heating mantle. After digestion, the flask was cooled and the contents were transferred to a 100ml standard flask and made upto the mark with distilled water. The whole apparatus was washed with distilled water and allowed to back suck. 10ml of boric acid was taken in a conical flask. A drop of indicator was added to it and kept under the condenser. The tip of the condenser was well below the liquid. 5ml of the digested blank was added into the distillation chamber through the funnel. Then added 10ml of 40% sodium hydroxide. Washed the funnel with two to three ml of distilled water. Closed the tap and steam was generated. Steam entered the distillation chamber and drove all the ammonia which is in turn absorbed by boric acid. Solution was pinkish white in colour, turned blue. Steam was passed for five minutes and then the conical flask was lowered and the tip of the condenser washed. The boric acid solution containing liberated ammonia was titrated against n/70 sulphuric acid. The end point was the appearance of pale permanent pink colour. Between each estimation the apparatus was washed. The experiment was repeated to get concordant values.

ESTIMATION OF FIBRE CONTENT

AIM

To determine the fibre content of the given food sample.

APPARATUS

1. 0.255N Sulphuric acid: 0.9ml of sulphuric acid in 99.1 ml of water.
2. 0.313N Sodium hydroxide: 0.8g sodium hydroxide in 99.2 ml water, Ether, Alcohol

PROCEDURE: Weighed 5g of the dry powder into a 500 ml beaker and 200 ml of boiling 0.225 n sulphuric acids was added. The mixture was boiled for 30 minutes, keeping the volume constant by adding water at frequent intervals, (a glass rod was inserted in the beaker for smooth stirring and boiling). at the end of the period, the mixture was filtered through a muslin cloth and residue was washed with hot water till free from acid. The mixture was then transferred to a beaker containing 200 ml of boiling 0.313N sodium hydroxide. After boiling for 30 minutes (keeping the volume constant as before), the mixture was filtered through a muslin cloth. The residue was washed with hot water till free from alkaloid followed by washing with some alcohol and ether. It was then transferred into a crucible, dried overnight at 80 – 100 ° c and weighed. The crucible was heated in a muffle furnace at 600 ° c for 2-3 hours. It was cooled and weighed again. The difference in the weight represents the weight of the fibre.
Percentage of fibre = Weight of the fibre alone (g)/ weight of sample × 100

ESTIMATION OF FAT CONTENT

AIM

To determine the fat content of the food stuff.

REAGENT: Petroleum ether (60-80°C boiling point).

PROCEDURE: The soxhlet flask was weighed to consecutive concordant weights eight gram of the moisture free sample was packed into an extraction thimble and placed in an extractor which was fixed into a soxhlet flask. Sufficient amount i.e., 150 ml petroleum ether was added so as to permit siphon action. The thimble and the content were allowed to soak in ether for 24 hours. The entire set up was kept oven an electric water bath and the extractor was connected to the condenser. The nozzle of the

condenser was always plugged with moistened cotton. The temperature was maintained at 60 oC. A steady stream of water in the condenser was maintained. The ether evaporated but owing to the condenser arrangement, it fell back into the condenser extractor. When the extractor got filled with ether, it was siphoned back into the flask. This went on till the ether that got collected in the extractor was free from any yellow colour indicating the presence of fat. The soxhlet flask was then disconnected and ether was evaporated in a water bath maintained at 60°C. When the ether in the flask was evaporated, the flask was weighed again to get concordant values. From the difference in weight, the fat content was calculated.

ESTIMATION OF ASH CONTENT

AIM

To determine the ash content of the given food sample.

APPARATUS

Porcelain crucible, Clay pipe triangle, Muffle furnace, Desiccator, Weighing balance, Asbestos sheet.

PROCEDURE

About five gm of the sample was weighed accurately into a tarred platinum or porcelain crucible (which had previously been heated to about 600° c and cooled). The crucible was then placed on a clay pipe triangle and heated over a low flame till all the material was completely charred, followed by heating in a muffle furnace for about 3-5 hours, at 600° c. The crucible was then cooled in a desiccator and weighed. To ensure completeness of ashing the crucible was again heated in a muffle furnace for half an hour, cooled and weighed. This was repeated till two consecutive weights were the same and the ash was almost white or greyish white in colour.

ESTIMATION OF IRON

AIM

To estimate the amount of iron present in 100g of the given food sample. APPARATUS Volumetric flask, test tubes, klett, pipette.

REAGENTS

1. Stock iron solution: Dissolved 0.0702gm (70.2mg) of reagent grade crystalline ferrous ammonium sulphate (Mohr's salt) in 100 ml of water.

2. Working standard: Prepared a working standard solution in a 100ml volumetric flask by adding 10ml of the stock solution and diluted to the mark with distilled water.

3. Saturated potassium persulphate solution: Shook 7to8 g of reagent grade potassium per sulphate in 100ml of water in a glass stoppered flask. The undissolved crystals settled to the bottom and compensate the loss by decomposition.

4.3N Potassium thiocyanate: Dissolved 146g of reagent grade potassium thiocyanate in water and diluted to 500 ml with water. Filtered if turbid.Added 20ml of pure acetone to improve the keeping quality. Deterioration will be evident from the rapid fermentation of a yellow colour in the blank. Stored in brown bottles.

PROCEDURE

Two gms of the sample was ashed by ignition. When ashing had been completed 5 ml of hydrochloric acid was added and made up to 100 ml in a volumetric flask. Took different aliquots of the standard solution (1ml – 5ml) corresponding to 10-50 gamma in a series of test tubes. Two ml of the unknown solution was taken in the test tube. Added one ml of 30% H_2SO_4, one ml of potassium persulphate and 1.5 ml of potassium thiocyanate to all the test tubes. This was made upto 10ml with water. A blank was prepared by adding the reagents 90 except the standard or the unknown solution. Allowed the colour to develop for 20 minutes and the intensity was read at 530-540 μ filters in the colorimeter.

ESTIMATION OF CALCIUM

AIM

To estimate the amount of calcium present in the given sample.

APPARATUS: Beaker, burette, pipette, flask and standard flask

REAGENTS

1. Ammonium oxalate: ammonium oxalate was dissolved in 200ml of water till it was saturated.

2. 0.001n oxalic acid: 0.0063g oxalic acid crystals weighed and dissolved in 100 ml of distilled water.

3. 0.01n Potassium Permanganate: 0.316g of potassium permanganate was dissolved in 1000ml of distilled water.

4. Strong ammonia

5. Glacial acetic acid 6. 2n Sulphuric acid: 5.5ml of sulphuric acid was dissolved in 94.5ml of distilled water.

PROCEDURE

Calcium is determined by precipitating it as calcium oxalate and titrating the oxalate solution in dilute sulphuric acid against standard potassium permanganate. Ash from the ignited sample of is separately dissolved in hydrochloric acid and made up to 100 ml in different standard flasks. 10 ml of the ash solution was pipetted out in a conical flask and 90 ml of distilled water was added to it. To these two drops of methyl red indicator was added. It was made strongly alkaline by adding ammonium and kept for boiling. 20 ml of saturated ammonium oxalate was added to the solution, 10 ml each time to ensure complete precipitation directly. When it was hot, a few drops of acetic acid were added to render the medium acidic. The precipitate was 91 allowed to settle overnight. The next morning the solution was filtered with whattman no.40 filter paper. The precipitate was washed first with ammonical water and then with hot water several times until it was free from chloride. To test it five ml of the washing was collected in a test tube and a drop of silver nitrate or calcium chloride solution was added. The filter paper was collected in a flask by making a hole in the filter paper. To this, two ml of 2n sulphuric acid was added. This solution was heated to 60-80 oc and when still hot was titrated against n / 100 potassium permanganate solution. From the volume of potassium permanganate solution used up the milligrams of calcium present in 100 gram of the sample was calculated.

ESTIMATION OF PHOSPHORUS

AIM

To estimate the amount of phosphorus present in the given sample.

APPARATUS: Measuring cylinder, Klett, Test tubes, Pipette.

REAGENTS

1.Molybdate solution No.I: Dissolved 25g of reagent grade ammonium molybdate in about 200 ml of water. In one litre volumetric flask 500ml of 10N sulphuric acid was added. The molybdatesolution was added and was diluted with water to one litre. This solution is stable indefinitely.

2.Molybdate solution No.II : Dissolved 25g of reagent grade ammonium molybdate in about 200ml of water. In one litre volumetric flask, 300ml of 10N sulphuric acid was added and was diluted with water to one litre. This solution is stable indefinitely.

3. ANSA: 195ml of 15% sodium bisulphite solution was placed in a glass stoppered cylinder. 0.5g of 1,2,4 ANSA (amino naphtholsulphonic acid) was added followed by 5ml of 20% sodium sulphite. Put the stopper and shook until the powder was dissolved. If the solution was not complete, added more sodium sulphite, 1 ml at a time with shaking but avoided excess. This solution was transferred to a brown glass bottle and stored in the refrigerator.

4.Stock standard phosphorus solution: 35.1 mg of pure potassium di-hydrogen phosphate is weighed and dissolved in water. Added 10ml of 10N sulphuric acid and made upto 100ml with water. Five ml of the solution contains 0.4mg of phosphorus.

Prepared a working standard containing 8 gamma of phosphorus in one ml of the solution by making up 5ml of the standard solution to 50ml with water.

PROCEDURE:

One ml of the diluted ash (10ml of ash solution is diluted into 100ml) solution was taken in two test tubes. One ml of molybdate II and 0.4 ml of 1,2,4 Amino naphtholsulphonic acid were added and the volume was made upto 10ml with distilled water. To 1ml, 2ml, 3ml, 4ml and 5ml of standard solution, 1ml of molybdate I solution and 0.4ml of ANSA were added and made upto 10ml. All the tubes containing 10ml of the solution were mixed well and allowed to stand for 15 minutes. Simultaneously, a blank was prepared by mixing 8.6ml of water, 1ml of molybdate II and 0.4ml of ANSA. The colour developed was read in the colorimeter using red filter of wavelength 660 millimicrons

ESTIMATION OF CAROTENE(BETACAROTENE)

AIM:

To estimate the amount of carotene in 100g of food sample.

REAGENT:

1.**STOCK STANDARD SOLUTION**: 1mg of the standard carotene was weighed and made up to 10ml with petroleum ether.

2.**WORKING STANDARD**: 2ml of the stock standard was taken and made up to 50ml with petroleum ether.
3.95% Ethanol
4.85% Ethanol
5.Petroleum ether (40 to 60)
PROCEDURE: The given sample was pulverized with 95% ethanol. The suspension was refluxed for about half an hour in a boiling water bath. The clear supernatant was filtered, diluted with 20ml of 85% ethanol. Extracted the solution repeatedly with petroleum ether using 20ml portion every time and the extraction was done for 3 or 4 times. Carotene was extracted in the petroleum ether pooled the ether extracts and made up to 100ml with ether. Take different volumes of standard carotene solution 2 to 8ml corresponding to 40 to 160gama. The volume of all solution was made up to 8ml with petroleum ether.

ESTIMATION OF VITAMIN C BY COLORIMETRY

AIM:
To estimate the amount of ascorbic acid present in 100g of the given food sample.
APPARATUS:
Volumetric flasks, test tubes, pipette and colorimeter
REAGENTS:
1. Bromine water
2. 10% Thio urea solution
3. 2% Solution of 2,4 dinitro phenyl hydrazine in 9N H_2SO_4
4. 85% Sulphuric acid
5. 4% Oxalic acid
6. Stock standard solution: 100mg of ascorbic acid dissolved in 100ml of 4% oxalic acid in standard flask
7. Working standard: 100ml of stock solution was pipetted out and made up to 100ml in a standard flask with 4% oxalic acid.

PROCEDURE:
Weighed 10 g of lime juice and made up to 25 ml with 4% oxalic acid. Pipetted out 10ml of it into a clean conical flask.
Added a few drops of bromine water, till the solution turned yellow and then removed the excess of bromine by aeration. Made it up to 50ml with 4% oxalic acid and one ml of it was taken for experiment.

PROCEDURES USED FOR MICROBIAL ANALYSIS SERIAL DILUTION TECHNIQUE

AIM
To dilute the sample and find the microbial load
EQUIPMENTS : Incubator, laminar air flow, autoclave, Bunsen burner Materials Sample, sterile distilled water, conical flask, test tubes, etc.,
PROCEDURE
Using separate sterile pipettes make decimal dilutions of 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} and 10^{-6}
Add 10ml of seaweed homogenate to 90ml of diluent it is 10^{-2} dilution
Serially dilute in flasks containing 90 ml of diluent and soon up to 10^{-6}

APPENDIX 1V
SCORE CARD FOR SENSORY EVALUATION

Name	
Class	
Date & sign	

Product name	**Appearance**	**Colour**	**Flavour**	**Texture**	**Taste**	**Overall Acceptability**
Standard						
Variation 1						
Variation 2						
Variation 3						
Variation 4						
Variation 5						

9 - Like extremely, 8. Like very much, 7.Like moderately , 6. Like slightly, 5.Neither like nor dislike, 4. Dislike slightly, 3 Dislike moderately, 2. Dislike very much, 1.Dislike extremely