

# **DEVELOPMENT OF DIETARY INFORMATICS FOR COVID PATIENTS**

**APHILARISA DIENGDOH**

**(20PFD005)**

**Thesis submitted to the**

**Avinashilingam Institute for Home Science and  
Higher Education for Women, Coimbatore – 641 043**

**In Partial Fulfillment of the Requirements for the**

**Degree of Master of Science in  
Food Service Management and Dietetics**

**May 2022**

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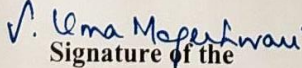
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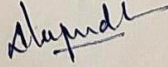
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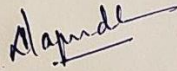
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## CERTIFICATE

This is to certify that the thesis entitled “**Development of Dietary Informatics for Covid Patients**” submitted to the Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for the award of the degree of Master of Science in Food Service Management and Dietetics is a record of original research work done by **Ms. Aphilarisa Diengdoh**, during the period of her study in the Department of Food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore – 641 043, under my supervision and guidance and the thesis has not formed the basis for the award of any Degree / Diploma / Associateship / Fellowship or similar title to any candidate of any University



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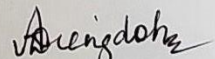


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## DECLARATION

I hereby declare that the matter embodied in this thesis is the result of investigation carried out by me in the Department of Food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore under the supervision of **Dr. S. Uma Mageshwari**, Dean Student Affairs and Professor, Department of Food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore – 641 043 and that it has not been submitted for the award of any degree / Diploma / Associateship / Fellowship or similar title to any candidate of any University or Institute.

  
Signature of the Guide

  
Signature of the Candidate

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# INTRODUCTION

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# I. INTRODUCTION

Health is the most important aspect of human life. Good health leads to good quality of life. In recent years, however there has been a drastic decline in the quality of life and well being of the majority of the people. This is due to the changing lifestyle and dietary habits which has led to the emergence of a wide range of communicable and non communicable diseases.

Non Communicable diseases like diabetes mellitus, cancer and cardiovascular disease are common cause of mortality and morbidity worldwide. It has killed 41 million people each year, which is equivalent to 71% of all deaths globally (WHO, 2021). Among these 41 million, cardiovascular diseases account for most deaths with 17.9 million people annually, followed by cancer with 9.3 million, respiratory diseases with 4.1 million, and diabetes mellitus with 1.5 million deaths per annum.

These patients living with non communicable diseases also contributes to 60-90% of the mortality rate during the coronavirus pandemic. (Basu, 2020). Globally, Covid 19 has claimed the lives of more than 6 million people worldwide with 512,607,587 confirmed cases. Of those cases, 43,088,118 cases were from India alone. (WHO, 2022)

Optimal nutrition and eating healthy foods has been viewed to be effective in boosting immunity during the pandemic. In individuals infected with the virus, supplementation of their diets with multivitamins and minerals helps in the treatment of the condition and prevents them from developing secondary infections. In those individuals who are more likely to develop respiratory diseases, vitamin C intake of 2g/day, vitamin D supplements intake of 2000 to 4000 I.U/day and zinc intake of less than 40mg/day and foods low in saturated fats and high in MUFA and PUFA is usually prescribed. (Ravagnani et al., 2020).

Eating disorder is another major concern which can affect the nutritional status of people. Eating disorders can be assessed using the Eating Attitude Test (EAT-26 Scale) for high risk groups such as adolescent girls who are more prone to suffer from this psychiatric disorder. (Mageshwari, S. U. & Rajbanshi, K. (2020). People need to be aware about the various factors that can contribute to poor nutritional status and make them susceptible to contracting Coronavirus.

Sometimes it becomes difficult to convey health and diet related information to the public during Covid 19 pandemic through traditional methods like the use of pamphlets, posters or

through verbal guidance and hence a new approach to help in tackling the pandemic is by the proper use of informatics. (Bakken, S., 2020).

Informatics has been defined by Bernstam (2010) as the field of study where information is processed in the form of computational data which has meaning. Informatics can also be defined as clinical computing or computers in medicine.

Charles Friedman (2012) has defined informatics as a link between scientific information with its application using a computer or digital devices. It also reveals the psychological as well as institutional knowledge of a person. It enables people to take care of their health in a better way by the use of information technology and track their health progress.

Informatics has been compared to a tower of achievement having four levels where the base will be the formulation of the model, the second higher level is development of a system, the third higher level is the deployment or the system being put into practice and the last step is the study of the effects of the system. As Friedman (2012) states all these levels are interdependent on each other and makes any informatics successful in its goal.

Nutrition informatics is the intersection of information, nutrition and technology (Rusknak and Charney, 2019). There is however no universal definition of informatics as the term itself is quite vast in its meaning and hence it mainly depends on its area of application (Krupitzer et al., 2021)

Information is wealth and this holds true if people know how to use that knowledge for their benefit and become more aware about their health and well being. A person who has equipped himself with the information he gets from different sources will be capable to solve his problems in a much better and effective way. Patients who knows how to use health informatics will be able to manage their conditions and will not be totally dependent on their health care workers for every step of their treatment. They can use the informatics as an aiding tool for self management and get a speedy recovery.

Informatics is an innovative way of disseminating information by health care providers and the links can be easily shared in social media platforms like facebook, instagram, whatsapp, twitter, linkedin and pinterest. It is not only inexpensive but it can be easily used by people of all age groups who have knowledge on the usage of mobile devices. Informatics has thus bridged the gap that existed between patients and the health care providers because it saves the physicians time and effort and also helps the patients to better assess their

condition. However patients should be aware about the type of informatics they referred because nowadays both genuine and unauthentic sites will be easily available.

Nutrition informatics can be helpful to people to identify food items available in the market, determine nutrient content of the food, assist them on their lifestyle changes and daily food habits and identify food items they consume. Nowadays, nutrition and dietetics professionals work in an enormous data rich world. Dietitians have started using various types of informatics for easier nutritive value calculations, clinical decision support facility, customize meal plan for patients, disseminate diet related information, give online consultations and provide health care to people living in remote areas of the country.

Nutrition informatics allows dietetic professionals to more effectively use their knowledge and skills through the support of technology, whether collecting data to document outcomes or even planning of their work schedule (Rusnak & Charney, 2019).

Informatics is thus not only limited to be used by dietetic or medical professionals but it can also serve its purpose to the general public as well as patients to track their health status for self actualization and self management. Informatics can also be used for fitness purposes, entertainment, health management as well as learning purposes.. (Rapp A. and Tirabeni L., 2018).

Informatics has demonstrated potential to improve productiveness, reduce costs, support research and development, easier access by both health workers and public and ultimately enhance patient care. (Maunder et al., 2014).

Till date 24 hour recall, food journals and food dairies have been used extensively by nutrition experts to track the dietary habits of people but has also been found to be difficult to use at a national level. Only few informatics have also found its way into the healthcare system.

Nutri-informatics is deeply underrated as pointed out by Lauren Chan (2019) and his colleagues when compared to a field like genomics where informatics has made it easier for genomicist to study the human genome. Only when nutrition researchers work together as a community, develop standardised nutrition data, develop informatics for disease condition and use technology for the exchange of information in a large heterogeneous network will the dream of making nutrition informatics come true.

Although some studies have been conducted on the use of informatics for patient education, however no study has been conducted so far on the development of informatic tools for the most recent pandemic that is happening and that is Covid 19 and it has therefore led to this research that will enable people to know about the types of food they can eat during the condition, how to prepare some Covid friendly recipes and finally to better manage their symptoms if they have to undergo quarantine at home and even for patient care in the hospital setup.

Covid 19 has changed people's lives in ways unimaginable. It has pose a major challenge to the healthcare providers in giving the best treatment to such patients at the appropriate time. By developing a dietary informatic tool for Covid, it will be helpful for dietitians as well as doctors in dessiminating the information to the general public as well as the patients who has been suffering from this infectious disease.

#### **OBJECTIVES:**

In order to address the above mentioned issues, the research study was carried out with the following objectives: To-

- i) Develop model diets for all age groups for Covid 19
- ii) Develop dietary informatic tools with model diets
- iii) Evaluate the effectiveness and acceptability of the developed dietary informatic tools.

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# REVIEW OF LITERATURE

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## **II. REVIEW OF LITERATURE**

The review of literature pertaining to the study of “**Development of Dietary Informatics for Covid Patients**” is discussed under the following headings:

- A. Technology and Health
- B. Informatics as viable tool for patient education
- C. Dietary informatics as Assisted Learning Techniques

### **A. TECHNOLOGY AND HEALTH**

Health has been defined by the World Health Organization as “a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity” (WHO, 1948).

The word technology comes from the Greek word “*techne*” meaning art, or skill. (Sazali Wahab et al., 2012). Technology is also the branch of applied science and digital knowledge that has made human lives much more easier. It has shifted the conventional ways of delivering healthcare facilities to the people in an innovative and well ordered manner.

Health information technology has improved the doctor-patient relationship. It has helped in storing the patient’s information regarding their lab tests done, previous medical history with the exact date and time and allows the exchange of information between healthcare providers located in different hospitals or setups thereby saving the time and energy of both the patient and the physician treating them. (Qiang et al., 2008)

e-Health is a broad term that covers mHealth, telehealth, telemedicine, telesurgery and it makes use of electronic devices and gadgets. Technologies like mHealth has made its way into the healthcare system whereby digital devices like wearable sensors, smartphone connected monitoring devices, lab-on-a-chip, implantable and ingestible sensors are used for monitoring patient’s health. (Marjan Laal, 2012)

Wearable sensors can be worn by individuals in the form of smartwatches, patches, wristband, clothing which can detect the biochemical changes that happens inside the human body including hydration level, heart rate, EKG, blood pressure, blood glucose, oxygen level and then the wireless data will either be shown in the sensor itself or sent to the wearer’s cell phone and even to his doctor. Some sensors can also monitor environmental concerns such as

carbon monoxide, ozone level which can be detrimental to the human health. These sensors can pull us back on a healthy track to avoid illnesses or to deal with diseases in an efficient manner.

Lab-on-a-chip based devices work by detecting pathogens present in urine, saliva, blood and other bodily fluids and gives the result within minutes just like the Covid test. In cases where patients does not wear sensing devices, ingestible sensors can be containing components that are approved by the Food and Drug Administration and these sensors can detect core temperature, heart rate, breathing rate and gut health.

Implantable sensors are devices that are inserted in the body surgically and are being used in patients that are having chronic illnesses and monitor their drug administration so that they do not miss their medications.. A circuit can be implanted in the abdomen which will determine the changes in the electrodes and send the data to the patch situated above it and the data will then be sent to an application in the smartphone for reviewing by a physician. (Marjaan Laal, 2012).

The use of digital thermometer has been used for many decades to measure the body temperature of patients but can inaccurate. For this reason, a body temperature distributed monitor system has been developed whereby a patient needs to pass through a door like entrance and his temperature will be automatically recorded into the system. (Chen, Y. et al., 2008)

mHealth works by two mechanisms i.e, push and pull mechanism. Push mechanism is the one where data will be sent to the patient or the user of the phone whereas pull mechanism works by requesting the data from the user. mHealth can be provided in the form short message service, voice call, web browser, or remote sensors. mHealth can be used by patient, health care provider, health system manager or the supply chain firm. (Qiang, C. Z. et. al., 2012)

mHealth can also be used to monitor reproductive health, child count, avail ambulance services, monitor healthy living, increase productivity, and remote monitoring of patients. mHealth like Red cross allows food and healthcare to reach the flood affected areas on time through the short message service. Arogya Raksha Yojana is a a health insurance scheme that can register the maximum number of patients in rural India in a day and provide healthcare to them immediately.

During an emergency the first and foremost tendency of the people is to call an emergency number so that they can send an ambulance to the accident site. In this context, Ziqitza Healthcare which is a call centre located in India has been attending to 1298 distress calls from patient's family during such instances and proves that mHealth can be very beneficial and tactful during those times. (Qiang, C.Z et al., 2012)

Technology such as Clinical decision support system helps to provide decision making strategy to clinicians to diagnose a diseased condition. Computerized physician order entry system is another technological advancement that enables physicians to order drugs and laboratory tests electronically for in patient care. HIT also helps in sharing radiological images of the patient in paediatric wards. (Marjan Laal, 2012)

Electronic health records are another advancement in the healthcare setting. Here, all the patient's details will be collected which includes their sociodemographic data, past medical conditions, laboratory tests, treating physician, medications prescribed, food allergies, drug allergies and surgeries undertaken by the patient. These data can be shared from one hospital unit to the other. (Danny Meetoo, Rebecca Rylance, and Hanan Abdulrahman Abuhaimid, 2018)

Information and communication technology (ICT) in one study has been shown to indirectly help in the eradication of poverty and achieve sustainable development goals. Health InterNetwork Access to Research Initiative (HINARI) which was started by the WHO to provide access to famous medical journals is another achievement for researchers and medical students to study on different health issues.

Telemedicine is the use of technology and digital devices to treat patients without having any physical contact. It mainly involves video conferencing. PDA or personal digital assistant is a small computer like device that came into existence before the invention of mobile phones. These devices can be used by practitioners for both personal use and also for tracking patient's health condition. (Frederick Bukachi & Neil Pakenham Walsh, 2007)

Home telehealth is used to monitor patients at home if they have lifelong conditions and sometimes require the family to ensure that the patient is eating healthy and taking his medications at the appropriate time. It also detects early vital changes in the patient and provide immediate intervention.

Personal health records are possessed by patients themselves and they can share their health records with anyone. The two categories are tethered and standalone. Tethered PHRs are made usable by consumers that has a link with any health setup whereas standalone PHRs can be used by anyone. Another intervention called open notes allow patients to read clinicians notes and prescriptions electronically. (Demiris, G., 2016)

There is a traditional way of prescribing medicines to patients written in a prescription pad by a physician but nowadays most physicians have started using E-RX where prescription is done electronically by the help of a tablet or technological device. The physician will enter the patient's details into the device and the device will be connected to a printer where the drugs prescribed by a physician will be printed out instantly. (Lizzi, L. T. et. al., 2005)

At Mission Bay Medical centre of the United states, robots are being used to deliver drugs, linens, and food to the patient. Robots are also used to transfer patient from one room to the other for doing the various diagnostic tests and for helping patients with back pain and mobility issues to do their exercises thereby reducing the demand for human resources in the hospital particularly physiotherapists. (Vincent, J. L. et. al., 2017)

Vincent study has proposed the use of non invasive multimodal probes that will be fitted to the patient and it will immediately detect not just the pulse rate, blood pressure, body temperature, blood sugar level, skin perfusion, biological fluids level, and if there is any changes in the patient, the hospital team will be alerted to check on the patient and provide immediate intervention (Vincent J. L. et al., 2017)

Telesurgery also known as remote surgery is another advancement in the healthcare system whereby physician will be now able to operate on a patient situated at a distant location. This is possible by the use of satellite and robotic instruments. Telesurgery is a huge success in this technological era since professionals will be able to use their expertise from any corner of the world and serve mankind.

Smart cards with embedded microchip has been used in the clinical practice to keep a record on the patient's details such as their name, age, medical condition, identification mark, food allergies, drug allergies, medical history, medications, blood group and other medical details. A pilot study which was conducted on 299 health professionals and 7248 patients has

shown interest in using the card but lack of motivation and awareness remains the problem. (Aubert, B. A. & Hamel, G., 2001)

The European Union has taken a number of initiatives to improve the healthcare facilities for its citizens through the development of GEPIMI (Integrated Geographical System for Epidemiological and other Medical Information) which is a system that utilizes the function of telematics like global positioning system, Geographic information systems, integrated circuit card or chip card as well as other web based databases. (Ptochos, D. et. al., 2004)

According to a survey done by the world health organization in the year 2005, it was found that around 112 countries had started using ehealth strategies to provide faster healthcare to patients. Ehealth is the modern method of providing healthcare services to people by the use of electronic health records, patient administrative systems, and diagnostic laboratory system (Qiang, C. Z. et al., 2012)

A maternal and child tracking system known as MCTS database has been found to improve maternal and child health. It enables the pregnant mothers to be informed about the importance of taking iron and folic acid tablets, getting immunized against tetanus, antenatal visits to the hospital to ensure everything is going well during her pregnancy period and the importance of early breastfeeding practices. (Balakrishnan, R. et. al., 2016)

mHealth however has its own minus point for critically ill patients and those patients requiring immediate intervention as the physician cannot diagnose the patient properly over a smartphone and hence can be challenging at times for health care providers.

Heart is the most important organ of the cardiovascular system. Two of the most common diseases of the heart are Cardiac arrest and heart attack Educational tip on how to perform CPR has now been made available in the form of VR technology whereby a person will be able to see 3D view of a mannequin and in the form of a game they can do the CPR. This technology name has been given as VR (Virtual Reality) Mannequin Hybrid technology (Almoussa, O., 2019)

Cardiovascular diseases are those diseases that affects the normal functioning of the heart and blood vessels. It is one of the problems that affect people of all age groups particularly seen in those with a sedentary lifestyle and poor food choices. There are a

number of technological initiatives that has been undertaken to spread awareness by healthcare providers to the general public on the epidemiology of the condition, its signs and symptoms, causative factors, risk factors and preventive measures. These initiatives include virtual congress of cardiology, heartfile, global cardiovascular infobase, and ProCOR (Jabbour, S. et. al., 2003)

iECG is an example of a Smartphone-connected rhythm monitoring device that can detect atrial fibrillation and protect people suffering from arrhythmias. The patient needs to keep his finger on the smartphone for a few seconds and the electrocardiogram will be recorded. (Marjan Laal, 2012)

mHealth is the use of gadgets such as mobile phones, tablets or computers to educate patients and allow them to monitor chronic illnesses by downloading certain apps in their devices. Different health related, fitness and wellness apps are available in Playstore and apple store that are easily downloadable in mobile phones and computers. (Danny Meetoo, Rebecca Rylance, & Hanan Abdulrahman Abuhaimid, 2018)

In Rwanda, AIDS patients can be tracked down on their recovery status by their healthcare providers through an application use by these professionals. This initiative has been called as Phones for health because phones are used to improve the health status of AIDS patient living in African nation. TxtAlert is another mhealth service that will remind AIDS patient everytime they need to take their medications through a text message. (Qiang C. Z. et. al., 2012)

Electronic health records are also found to be beneficial in giving good service to people suffering from chronic ailments like HIV and AIDS since these patients require assistance at all stages of their treatment process. It enables physicians to track down patients who are missing out on their appointments and thus improves patient-physician relationship.

Text messaging, social media, visualization tools, contact tracing apps, chat bots, digital diagnostic tools and genomics, interactive geospatial maps, symptoms reporting apps, wearables, self testing diagnostic tools are some of the recent technologies used during coronavirus pandemic. (Jobie Budd et al., 2020)

Google's SOS alert interventions ensures that false and hoax news are not delivered to the masses and gives only reliable information to them. Chatbots are softwares that are made to imitate human beings while conversing with a patient or customer online. They are used to

provide assistance to people that do not require immediate intervention and lessen the workload of healthcare workers. (Jobie Budd *et al.*, 2020)

Artificial intelligence can also be used for computed tomography scan (CT Scan) of the patient to see pneumonia conditions in severe Covid patients. AI can be used for faster development of vaccines against the virus. Robots can also be made with the help of artificial intelligence to sanitize the work area, hospital area thereby reducing the workload on human resources during the pandemic. (Javaid *et al.*, 2020)

3D printing, another invention mentioned by the researcher has found its innovative way to make anti viral masks that are both reusable as well as recyclable. These masks have been claimed to kill any virus due to the presence of virucides. These virucides will be sprayed in the mask to kill the virus instantly within few minutes.

Biosensor patch 1AX is a another invention to detect vital signs like the heart rate, body temperature, respiratory rate and any possible deterioration of health condition. The patch can be attached to the chest of the patient and the physician can assess the patient in the hospital and also those who undergo treatment at home. (Javaid, M. *et al.*, 2020)

The use of Computerized provider order entry (CPOE) along with clinical decision support systems in the paediatric wards of the hospital has shown to effectively reduce the usage of antibiotics for the treatment of ear infections such as otitis media and sore throat which is commonly called pharyngitis in children. This system can also reduce the time for getting the report from the radiologist after their scan is done and helps them to get the treatment from the consulting paediatrician at the correct time (Shekelle, P. G. *et al.*, 2006)

The major advancement among dietetic professionals is the usage of electronic meal ordering solutions (eMOS) in the food service establishments. In Australia, besides eMOS they also have RS eMOS and patient-directed eMOS. In case of RS eMOS, the patient get the opportunity to order food from ala carte menu and tthe food will directly reach their bedroom. The feature of patient- directed eMOS is that the patient can directly order from a computerised system which is situated at their bedside (Maunder, K. L., 2017)

Nutrition Informatics Registered Dietician (NIRD) has become a slowly evolving title for dietitians who are equipped with the knowledge of using different types of informatics for patient care process. These health professionals will be able to monitor patient in a more efficient manner and provide a more satisfying service to their patients. (Bell, A., 2016)

Dietary assessment has been done so far by the help of 24 hour dietary recall. Sometimes these assessment can be wrongly interpreted and hence the idea of attaching images of different types of food for dietary intake assessment can be helpful in accurate evaluation of patient's daily intake. (Lo, F. P. W. et. al., 2020)

The use of informatics in the medical industry has however pose its own challenges. In his paper, Altman has listed down some challenges related to the use of informatics and the first one being the need for a common medical language to be used universally in the electronic medical record. This will make sure that the patient's condition is properly shared between one organisation with the other. (Altman, R. B., 1997)

Secondly, data capture which is a system that enables the smooth transfer of patient's consultation with a physician to a laboratory assistant performing his lab tests to nurses handling his flow sheet from one consultation to the next is missing. Most of the time patient has to wait for long hours to get his medical records processed.

The medical fraternity is the one that demands them to be updated with the latest information at all times. The current research done on various diseases, drugs and treatment are available in various medical journals and publications but the lack of accurate representation of medical literature has made it harder for physicians and other health care providers to choose the correct article they need. Representation of medical data can be upgraded and enhanced so that it will be easier for physicians to do a research on a particular subject at the correct time.

Artificial intelligence has shown to be effective in correctly diagnosing a medical condition. Doctors can benefit a lot of these technologies are developed that will act as an aid to them to diagnose a condition better thereby saving their time and effort in the hospital setup.

Another challenging task is that sometimes patients who comes for a consultation are not well educated to understand what the doctor says about his medical condition and how to go forward with his treatment. These patients lack knowledge on their drug dosage use, dosing schedule, lifestyle changes and the use of informatics in the form of animation and videos can deeply help to change the communication gap between a medical practitioner and the patient with low literacy level.

The next challenge is the lack of an effective evaluation tool to assess the validity, convincingness and effectualness of these medical informatics to know if they are really contributing to the health and well being of its users. Even though some of the tools have been developed and proposed but the use of one universal tool for evaluation is absent and informatics researchers are still on the lookout. (Altman R. B., 1997)

The last challenging task in the use of medical informatics is the inaccessibility of all professionals and patients to these informatics. Sometimes informatics can be helpful only to people living in the urban area with high educational and literacy rate whereas physicians serving to the poorer section of the communities are unable to use these informatics

India has still a long way to go when it comes to improving its health infrastructure. One of the reasons for this drawback is due to the lack of financial assistance from the concerned authorities and also due to decreased awareness on the usage of these tools among health professionals. However, as time passes more and more healthcare providers are slowly becoming aware about the importance of using health information technology (HIT) in the hospital setup and have equipped themselves with the knowledge of using these tools in a more efficient manner for the welfare of the public and the community at large.

## **B. INFORMATICS AS VIABLE TOOL FOR PATIENT EDUCATION**

Telemedicine helps in providing education to expectant mothers to give them guidance on how to take care of themselves better during this crucial stage of their lives thereby reducing maternal and infant mortality rates. A study conducted in rural Uganda of South Africa has shown that the use of high frequency radio has motivated the private health workers who helps delivering babies to team up with public health centres to provide pregnancy and delivery education to the mothers thereby reducing the maternal mortality rate in these areas from 500 deaths recorded in the year 1996 to 271 deaths per 1,00,000 population in the year 1999.

Telemedicine also helps in educating lactating mothers on good hygiene, breastfeeding practices and how to cater to her young after delivery. Awareness on mental health problems and guidance by psychologists online is made possible through the use of these technological tools. (Frederick Bukachi & Neil Pakenham Walsh, 2007)

A study was conducted on the effectiveness of HIV animation videos disseminated through personal digital assistant to 51 english speaking patients and found that after

watching the videos 96% of patients are sure to take their medications on time and are more aware of the disease (Tina Penick Brock, and Scott R. Smith, 2007)

Patients suffering from cancer are informed about their condition through the use of pamphlets, brochure, leaflet, handouts that are written communication that are being handed over to them by their clinicians. The PEMAT or Patient Education Material Assessment Tool evaluates the readability of the written materials given by physicians for patients (Catherine H. Saunders et al., 2018)

A study conducted by Susan P. West (2010) has found that around 610 participants had enrolled themselves in The Informatics for Diabetes and Education Telemedicine (IDEATel) project for a period of 6 years and around 685 of the set goals were met by patients with the help of telemedicine.

In the state of Iowa and Georgia, physicians were given an information Rx prescription pads where they will write the condition of the patient and the patient will be asked to visit MedlinePlus.gov. The site had improved the patient-doctor relationship and 75 percent of the patients found the site to be beneficial. (Elliot R. Siegel et al., 2006)

Web based education for patients in the psychiatric ward was carried out for a period of 1 to 70 days with a time period of 10 to 360 minutes taken per patient. The session has shown a great success rate with three by fourth of the session having no discontinuance or abruption during the sessions. 83 nurses were involved in using this web based educational session. Since people with mental conditions require more guidance, counselling and supervision, hence the use of technology can lower the burden of their nurses and care takers (Antilla, M. et. al., 2010).

Instagram is a new platform that has been used by people to share videos, images in the form of posts and stories in their feed. It has been developed in the year 2010 and has around 700 million subscribers worldwide. This platform offers a wide range of services to people to connect with each other and also share informative stories to benefit people. Educative posts regarding radiology has been given in this study and shown how this platform can be a great tool for patient education. (Shafer. S. et al., 2018)

Instagram has also been considered an effective “infodemiology” which is a branch of science that deals with information technology and epidemics which is the sweeping occurrence of a disease over a large geographical area at a given time. Infodemiology about

oral health has been done using instagram and dental professionals are now using this tool to deliver knowledge on dental care (Oliveira, L. M. et al., 2022)

An overview of different studies how instagram was used by dental professionals has been given in the paper written by Oliveira and his colleagues. Instagram stories was used to show images of how dental caries look like and what are the ways to control the spread of infection. Another study has shown how patient can learn about the use of dental braces to shift crooked teeth and improve their teeth alignment. Instagram can also be used for surveillance and sample recruitment.

Before instagram comes to the picture, Twitter has been the common tool to be used by health professionals to share health related contents and tweets. They can also be used to guide patients to make lifestyle changes and connect with patients worldwide. This has made it possible for health care providers to assist patient digitally.

### **C. DIETARY INFORMATICS AS ASSISTED LEARNING TECHNIQUES**

Nutrition Recommendation system or NRS is a dietary informatics that has been developed to help people make informed food choices and stay fit and healthy. The usefulness of different nutrition applications has been reviewed under this study (Abhari, S. et al., 2019)

Nutrition Informatics can assist to explain the relationships and connection between the food regimen and ailments as those pertain to the socio monetary and agricultural adjustments happening in India on both country wide and regional levels. Poshan Abhiyaan, an e- module scheme developed by the Prime Minister of India in the year 2018 has been given distant nutrition education to people regarding mother's fitness and nutrition, toddler's feeding practices, major nutrients needed by an individual, exercises, supplemented and fortified foods for enhanced nutrition, obesity, non communicable diseases, de worming methods, causes of diarrhoea and other diseased condition and hygienic practices

A mobile application titled "Nurify India Now" helps in providing information on macronutrients and micronutrients present in different food items known in 17 Indian languages. The calorie count can also be done with this app. Nutrition informatics is widely used for both monitoring of food consumption and management of diet during diseased condition. ( Asish Joshi et al., 2021)

A random sampling technique was performed on 40 IT Professionals in which 29 of them are male subjects and 11 of them are female subjects. These professionals are being given CD-Roms educational intervention to improve their nutrition knowledge. The after effect has shown a positive result whereby there is a mean enhancement in their knowledge from 22.30 to 40.55. This assessment is done by the help of nutrition assessment questionnaire. (Sharma, P., & Rani, M. U., 2016)

Bodybugg is an electronic armband that records how much energy is expended by a person and how much calories they need to consume in order to maintain their ideal body weight. This will prevent the individual from consuming excess calorie intake. (Drigas A. & Karyotaki, M., 2013)

Takahashi has developed a tool called an Automatic nutrient calculation system in the internet which makes it possible for people to know the nutritive values without actually counting it manually. In that database, they can also get information on how to cook food, ingredients needed for a particular recipe and also the quantities needed for the recipe. (Takahashi, J. et al., 2012)

A mobile application called mobile food record mFR enables young adults to take images of the food they eat. A study using Connecting Health and Technology (CHAT) was done on a group of people aging between 18 to 30 years (n=247). Three groups were categorised where one group will only receive dietary feedback, one will receive text messages on a daily basis and the third group will be the control group. It was found that those who received dietary feedback only were able to reduce their weight by 1.7 kgs (Kerr D. A et al., 2012)

A study has been conducted on the use of blog as a tool for disseminating health related information and also as a tool to be used by university professors for teaching their students. It is a tool that is easy to use, cost effective and time saving. However their use has to be popularised among the masses and among the students so that it can be viewed as an innovative way to disseminate information. (Caballero, D.C et al., 2019)

A pilot study was done in Australia among middle aged men (N=30) to see if they would use technology tailored dietary interventions to change their dietary habits and lifestyle and it was found that these men were showing a great interest in the use of these tools as it is

less time consuming and can be accessed at any given point of time.(Vandelanotte, C. et al., 2013)

Children are mostly known to be fuzzy eaters and they would never like to eat healthy. They usually go for foods that are tasty but not at all good for their health. In this context, the development of a nutrition education web based search engine will enable kids to search for recipes they like from a wide range of items available in the database and it will also show the preparation methods for cooking healthy and tasty recipes thereby engaging kids in healthy eating practices from a very young age and gives them optimum nutrition for a better tomorrow (Hong, S. M. et al., 2008)

Food composition study Guide is a system which was jointly developed by INFOODS (International Network of Food Data Systems) and the FAO (Food and agricultural Organization). The study guide consists of 15 modules that enables students to gain knowledge on food composition table through the various exercises and questions given under each module. This approach is mainly to provide an aid to inquisitive students and bridge their learning gap in the field of diet and nutrition. (Charrondiere, R. U. et al., 2009)

People who are not having any chemistry background usually finds it difficult to understand how chemical and nutrient analysis of food is done. An e-module that will equip such individuals with the knowledge about nutrients like carbohydrates, dietary fibres, proteins, amino acids, fats and fatty acids has been developed. When subjects are asked to rate the effectiveness of the module in disseminating information to them, a positive result was shown whereby an average score of 4.5 was seen on a scale of 5. (Busstraa, M. C. et al., 2012)

Convolutional Neural Network is a network which was used in Indonesia to identify traditional foods and this database helps the Indonesian people to know more about their own foods and also promote their cuisine to the outside world. This technological tool acts as an informatic to be used by the government as well as the people in general. ResNet50 architecture was utilized for making this database. ResNet50 is the backbone for any network that deals with picture identification (Sarwinda, D. et al., 2020)

An app called Nutricart was developed in order to enable consumers to make wise decision making among Americans while buying foods from a grocery store A list of wholesome food that can be bought from the supermarket will be kept in the app as a

guidance for consumers to buy nutritious food items. Individual can purchase foods based on different food groups and will be notified notify the user if they need to do some modifications in their dietary pattern. (Desiree Lopez et al., 2017)

Anemia Mukh Bharat dashboard is an initiative taken by the Government to prevent the occurrence of anaemia among adolescent child and women of reproductive age. It gives importance on providing iron and folic acid tablets and also deworming medicines twice a year. The Eat Right India Programme initiated by the FSSAI has made consumers aware about the importance of eating healthy food and abstaining from unfit and junk foods.

Nutrition Atlas which was developed by the National Institute of Nutrition gives an overview of the nutritional status of the country at large. It gives an idea about the different types of nutritional deficiencies, epidemiology or the number of occurrence of a disease, nutrient composition of food items, types of high calorie and low calorie foods, information on contagious diseases and non communicable ones such as obesity, diabetes and cancer.(NIN, 2021)

A web based system used by dietetic professionals in Taiwan has made it possible for them to track a patient's nutritional status, their signs and symptoms, causes of the possible diagnosed condition, their laboratory findings, as well as their anthropometric measurements. After all their data has been collected the dietetic professional will be able to diagnose the patient properly and thereby give the patient appropriate nutrition intervention and education as well. (Drigas, A., & Karyotaki, M., 2013)

People who are more prone to suffer from heart diseases can use an accelerometer count application in their phones to allow them to detect their own motion, heart rate and body temperature. Dietary informatic tools can fulfil the function of an online consultant or a nutrition counsellor and bring about a change in people's behaviour and dietary habits. (Drigas A. & Karyotaki, M., 2013)

Sometimes two or more foods can look similar to each other putting consumers at a confused state of mind. Diet Cam is a new invention in which picture of our food can be taken by an artificial intelligence camera linked to an app and the app will identify that particular food instantly. This will be helpful for the consumer to know more about what they eat on a daily basis and also learn about their calorie intake (He, H., Kong, F., & Tan, J. , 2016)

A new dataset has been developed to depict 1027 canteen trays that has been set up and organised in different manner. Each food item on the tray are separated with a polygonal shaped boundary. A reference indicator has also been developed to identify the set tray and gives an accurate image prediction of 79%. This dataset is helpful for dietary evaluation systems. (Ciocca, G., Napoletano, P., & Schettini, R., 2017)

Diabetes mellitus has been the leading cause of death worldwide and India is also known as the diabetic capital of the world. One of the reasons is that people are unaware about the carbohydrate content of the foods they eat. Looking at this context, a model has been developed in 2014 to identify foods automatically using Bag of features (BoF) model. This model will identify and then class the carbohydrate food using the support vector machine classifier. So far, the dataset contains 5000 images which has been grouped under 11 food classes.. (Anthimopoulos, M. M. et. al., 2014)

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# METHODOLOGY

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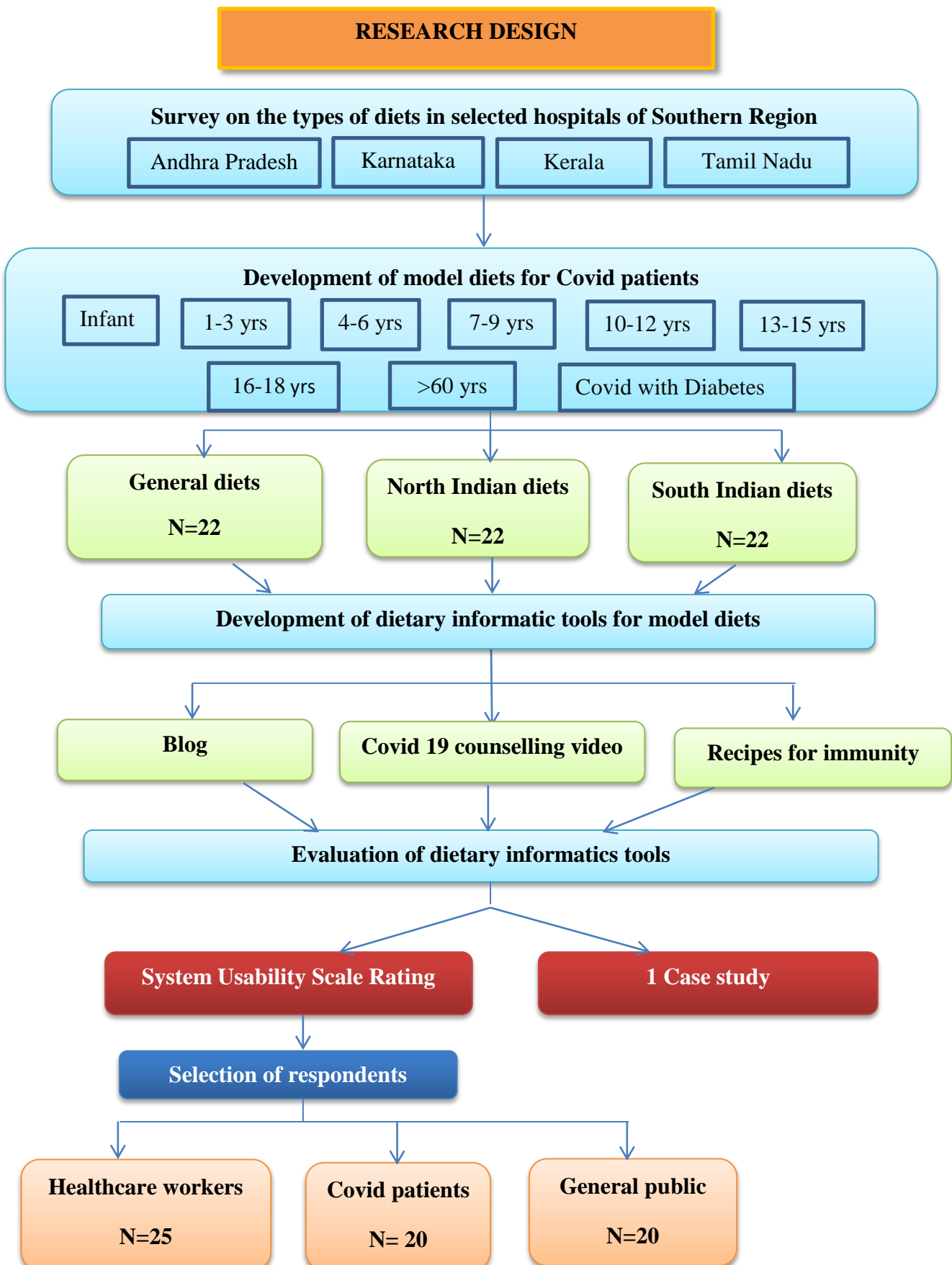
### **III. METHODOLOGY**

The methodology adopted for the study entitled “**Development of Dietary Informatics for Covid Patients**” is discussed under the following headings:

- A. Survey on the types of diets in selected hospitals of Southern Region
- B. Development of model diets for Covid patients
- C. Development of dietary informatic tools for model diets
- D. Evaluation of dietary informatic tools

Ethical clearance for the study was obtained from Institutional Human Ethics Committee, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore with approval no. AUW/IHEC/FSMD-21-22/XPD-05 (Annexure I). The research design followed for the study is given in Figure 1.

Figure 1



## **A. SURVEY ON THE TYPES OF DIETS IN SELECTED HOSPITALS OF SOUTHERN REGION**

### **a. Selection of hospitals**

One hospital each located in the southern region of India namely Andhra Pradesh, Karnataka, Kerala and Tamil Nadu were selected by purposive sampling. Purposive sampling is a technique used by a researcher to conduct a survey based on her predetermined judgement of characteristics possessed by the samples (Etikan et al., 2015 ).

The dietitians of the hospitals were approached to carry out a survey on the types of diets offered in the selected hospitals for Covid patients. The hospitals were chosen since they possess Covid wards and had been providing treatment for Covid patients during the pandemic.

The dietitians were contacted over the telephone and a telephonic interview was conducted to carry out the survey. Telephonic interview is a method of conducting a survey over a telephone or an electronic equipment to reach a target population (Roopa and Rani, 2012 ). A survey form was framed to conduct the telephonic interview (Annexure I). The following were the hospitals selected:

- i. Safa Medcare hospital, Kerala –Hospital I
- ii. Tamil Nadu Government Multi-Super speciality hospital, Chennai – Hospital II
- iii. JSS hospital, Karnataka – Hospital III
- iv. Nalla Reddy Narayana hospital, Andhra Pradesh – Hospital IV

## **B. DEVELOPMENT OF MODEL DIETS FOR COVID PATIENTS**

Keeping the types of diets surveyed from the hospitals as a base, model diets for various age groups starting from infancy to elderly was developed. Three categories of model diets namely General diet, North Indian diet and South Indian diet were developed. North Indian diet and South Indian diet were mainly planned based on the dietary patterns of people residing in these regions whereas general diets were planned mainly for usage by the general public.

The salient features followed for the model diets was:

- I. Minimum deviation from the normal diets
- II. Minimum deviation from the existing hospital diets given for Covid patients.

- III. Based on nutrition guidelines given by Indian Council of Medical Research (ICMR) (2020), National Institute of Nutrition (NIN) (2020), Food Safety and Standards Authority of India (FSSAI) (2020), Ayurveda, Yoga, Naturopathy, Unani Siddha and Homeopathy (AYUSH) (2020) and Indian Dietetic Association (IDA) (2020).

Under each category of General, North Indian and South Indian diets, 22 model diet plans were developed. The nutrient requirements were calculated for all the 66 diets in comparison with the Estimated Average Requirement EAR (2020) for energy, and Recommended Dietary allowances RDA (2020) for protein, carbohydrate, fat, fibre, calcium, iron, zinc and vitamin C. Among the 66 diet plans, three diets were planned for diabetes mellitus and Covid.

For an infant of 0-6 months of age, no meal plan was developed as the child is totally dependent on their mother's milk for their nutritional needs. (ICMR, 2010). For an Infant of 6-12 months, children and adolescent, the energy requirements was calculated by an increase of 30% of EAR. (ICMR, 2020).

For an adult man and woman, 30-35 kcal/kg body weight was taken for calculating the energy requirement . 1.2-1.5g/kg body weight was calculated for protein and 15% of the calories was calculated from fats. (ICMR, 2020). Calorie needs for an elderly was calculated by a 30% increase in EAR for energy according to the recommendation by ICMR for Indians.

People suffering from diabetes mellitus are more likely to contract Covid 19 and hence diet plan for Covid patient with a comorbidity of diabetes mellitus was planned and developed. According to Mahluji (2021), diabetics need an intake of mainly complex carbohydrates contributing 45-55% of the total calorie requirement. In case of protein, 1.2-1.5g/kg body weight, and foods rich in good fats were included in the menu.

## **C. DEVELOPMENT OF DIETARY INFORMATIC TOOLS**

### **a. Development of a blog**

Weblog, or blog, is a series of brief articles on a website (Bruns 2017). A blog has also been defined as an informational website published on the World Wide Web which contains several posts. Posts are typically written pieces or images or even videos which are

displayed in a page in a sequential order with the most recent post appearing first in the page and the oldest post appearing at the bottom of the page. This order can however be modified by a blogger according to his or her own wish depending on the situation. It can be done so by changing the publishing date and time. Blog can resemble a journal that is being published on the world wide web. (Nakajima et al., 2005).

The blog was developed because it is the most advance form of informatics tool and it can be easily shared to other social media platforms such as Email, Instagram, Facebook, Linkedin, Twitter, Pinterest, You tube and Whatsapp.

The first step for developing the blog was registration on Wordpress website which was done by tapping on the “Get Started” option located on the top right corner of the official website of Wordpress. There are different content management systems that provides the option of creating a blog such a Wix, Linkedin, Weebly, Wordpress, Blogger, and Tumblr. The system that had been selected for blog development is Wordpress since it is the most trusted site with the maximum number of users worldwide. Details such as the name, email address and user Id was entered and saved.

The next step was registration of the domain. Domain is the location of the site on the world wide web. Domain selected for the blog was “wordpress.com”. The title of the site was later chosen which was “covidiets.wordpress.com”. There were two plans available for creating the blog. It could be paid version called pro or a free plan. For the blog a free plan was chosen since the space given in the free plan was 3 Gigabyte which was enough for the study purpose.

After the blog registration was completed, the first blog or content for the blog was created by clicking the “start writing” option. Each blog post was given a title which became the heading for the post created. On the left hand side of the page, there were blocks where pictures, quotes and videos could be attached to the post created.

After the post was created, the next step taken was publishing the post online by tapping on the blue colour “Publish” option located at the top right corner of the page.

Every blog has a home page where a preview of the blog can be seen. There were other features on the blog such as selection of the appearance, customizing tools, logo selection and icon selection. Appearance is how the blog will look like to the public. Various appearance options were free of cost and for the blog Dyad 2 appearance was selected. Logo is the emblem or label for the blog and it was customized as covidiets printed in blue colour background. Customizing tools helps in selection of the blog theme, site identity, font shape, font size and background colour for the blog. Site identity is an integral part of any online site since it increases the uniqueness and coherence of the site.

Menus are the categories selected to be displayed at the top of the blog for easier use by the public. Menus that were created for the blog were General diet plan, North Indian diet plan and South Indian Diet Plan. The blog link titled “[covidiets.wordpress.com](https://covidiets.wordpress.com)” is available throughout and can be accessed from any browser online.

#### **b. Development of recipes for immunity**

Recipes such as banana bread, moong dal cheela, golden latte, beetroot kheer and egg dosa were prepared. These were some of the uncommon recipes that were mentioned in the diet plans. The recipes name, ingredients needed alongwith the amounts and steps for preparation was included in the video. The videos of the recipes were captured and edited by the use of Inshots application. The videos were later uploaded in the blog under the Recipes category.

#### **c. Development of covid 19 counselling video**

A covid 19 counselling video had been developed by the help of Inshots application and was later included in the blog. In the video, tips on how to eat healthy and nutritious foods at home was included. The counselling video emphasized on a diet rich in complex carbohydrates with high fibre content, high biological value proteins, good fat sources and adequate intake of foods rich in micronutrients. FSSAI and IDA had earlier developed a tool kit for Covid 19 (2020) and the video was made based on the information provided by this tool kit.

## **D. EVALUATION OF DIETARY INFORMATIC TOOLS**

### **a. Selection of respondents**

Since the blog is for Covid patients and can be helpful for the healthcare professionals, the evaluation was carried out among 25 healthcare workers. As the blog and the videos can be viewed by the general public 20 general public of both the gender were selected as respondents to evaluate the dietary informatics tools. As the blog and other dietary informatics was for covid patients 20 covid patients also were selected to evaluate.

Random purposive sampling technique was being followed for the study. It is a process of identifying a population of interest and developing a systematic way of selecting cases based on the characteristics of a population and the objectives of the study. (Palinkas et al., 2015). The following inclusion and exclusion criteria were selected:-

Inclusion criteria:

- People who use smart mobile phones and internet
- People who can read and write
- Who consented to participate in the study

Exclusion criteria:

- Those who do not use smart mobile phones and internet
- Those who were unable to read and write
- Those who are not willing to participate in the survey

### **b. Demographic details**

Four sets of questionnaires was developed to elicit responses from the four categories of respondents. The questionnaire (Annexures IV, V, VI, VII) contained both open ended and close ended questions and focused on the demographic details of the respondents such as name, age, gender, occupation, email Id, perception of the respondents on the blog and System Usability scale (SUS) rating for the blog.

The survey was conducted online and data collection was done by sharing google forms containing the well structured questionnaire to the four categories of respondents through whatsapp and email ID.

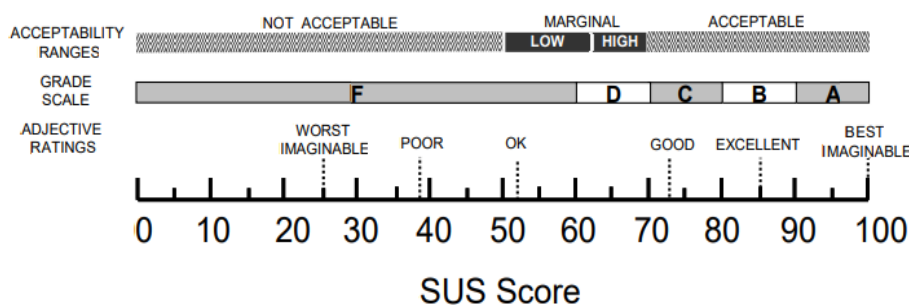
**c. System Usability Scale (SUS)**

System Usability scale is an efficacy tool to check whether a google site or blog can be used effectively by users. The SUS is a popular instrument to measure the perceived usability of a wide range of products and systems. These include websites, apps, everyday products, softwares and hardwares (Mol M. et al., 2020). The scale was originally invented by John Brooke in the year 1986.

The scale contained a set of 10 questions which formed the base of an evaluatory tool for determining the blog efficacy (Annexure VIII). The questionnaire for System usability scale rating was included in the google forms distributed to all the respondents along with the other general questions. SUS is used to evaluate the blog usability by calculating the scores for each respondents’ reply and feedback on the 10 questions.

The pre test and post test SUS score was used to evaluate the acceptability and efficacy of the dietary informatic tools.

Figure 2  
System Usability Scale Scores



(Bangor, 2009)

Table I  
System Usability Scale Grade

Grade	SUS Score	Percentile range
A+	84.1-100	96-100
A	80.8-84	90-95
A-	78.9-80.7	85-89
B+	77.2-78.8	80-84
B	74.1-77.1	70-79
B-	72.6-74	65-69
C+	71.1-72.5	60-64
C	65-71	41-59
C-	62.7-64.9	35-40
D	51.7-62.6	15-34
F	0-51.6	0-4

(Setemen et al., 2019)

#### **d. Case Study**

In order to find out the efficacy of the dietary informatics, one Covid patient was selected to conduct the case study. The Covid patient was a female of 26 years.

The subject's anthropometric, biochemical, clinical and dietary assessment was carried out virtually through zoom meet. The subject was given counselling and asked to follow the diet plan given in the blog and guidelines given by IDA was also shared through whatsapp for her reference. The subject was studied for a period of 5 days and followed up for improvement.

#### **e. Data Analysis and interpretation**

The process of attributing meaning to the acquired data and deciding the conclusions, relevance, and consequences of the findings is known as data analysis and interpretation. It is an important step in the research process. (Mohan, 2007)

A percentage frequency distribution is a visual representation of data that shows the number of observations for each data point. Percentage frequency distributions are frequently displayed as tables, bar graphs, or pie charts. (Lavrakas, 2008). Consolidated data was tabulated for easier interpretation of the research findings. It was later coded, analysed and statistically interpreted with the help of SPSS software.

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## RESULTS & DISCUSSION

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## **IV. RESULTS AND DISCUSSION**

The results of the study “**Development of Dietary Informatic tools for Covid Patients**” is discussed under the following headings:

A. Details on dietary pattern for Covid in hospitals of Southern region and development of model diets

a. Diets in selected hospitals

b. Development of model diets

i. General diets

ii. North Indian diets

iii. South Indian diets

B. Development of dietary informatic tools

a. Development of a blog for model diets

b. Development of Covid 19 counselling video

c. Development of recipes for immunity

C. Evaluation of dietary informatic tools

a. Demographic details of the respondents

b. Perception of the informatic tools by respondents

c. System Usability Scale rating by respondents

d. Case study

## A. DETAILS ON DIETARY PATTERN FOR COVID IN HOSPITALS OF SOUTHERN REGION AND DEVELOPMENT OF MODEL DIETS

### a. DIETS IN SELECTED HOSPITALS

Diets for Covid from four hospitals of Southern India such as Kerala, Tamil Nadu, Andhra Pradesh and Karnataka were assessed.

#### i. Diet in Hospital I

The diet given in hospital I is given in table II.

**TABLE II**  
**DIET IN HOSPITAL I**

Early morning	Lemon tea/Ginger tea	1 cup	<p><i>Menu For Covid</i></p> 
Breakfast	Appam/dosa/idli	3 nos.	
	Egg white	1 no.	
	Pulses curry	1 cup	
	Soymilk	1 cup	
Mid morning	Eggwhite omelette	1 no.	
	Turmeric milk	1 cup	
Lunch	Curdrice/kichdi	1½ cup	
	Chicken curry	1 cup	
	Sprouts salad/microgreens with sautéed vegetables	1 cup	
Post lunch	Stewed fruits	1 cup	
Evening snacks	Vegetable soup/chicken soup	1 cup	
	Egg white	1 no.	
	Steamed ada/kozhukatta/chicken sandwich	1 no.	
Late evening	Soymilk	1 cup	
Dinner	Rice/vegetable chappati/mint dosa	1½ cup/2 nos.	
	Chicken curry/fish curry with vegetables and pulses	1 cup	
Bed time	Oral nutrition supplement/skimmed milk	100ml	

Table II shows the diet suggested for Covid patients in hospital I. It was found that the diet chart incorporated foods rich in antioxidants like ginger tea and lemon tea. All the five food groups were included in the diet such as cereals and millets, pulses and legumes, fruits and vegetables, milk and meat products, fats and sugar. Appam, dosa and idli are refined sources of carbohydrate and included during breakfast since it takes less time for digestion.

Egg white, pulses, chicken and fish are good sources of protein and included to prevent muscle wasting and ensure tissue regeneration. Turmeric contains Curcumin which has anti-inflammatory and medicinal properties and hence turmeric milk was suggested during mid morning ( Azimi et al., 2022).

Fruits are rich in vitamins and minerals and hence suggested after lunch. Four servings of milk was given in day.

Soy milk and skimmed milk were given since they are low in fat content. Sprouting helps to increase vitamin C content (Guo X. et al., 2012) and sprouts salad was given during lunch along with other green vegetables. ONS also called oral nutrition supplement was suggested to be given to some patients who were unable to meet their nutrient requirements through oral diet alone.

## ii. Diet in Hospital II

The diet given in hospital II is given in table III.

**TABLE III**

### **DIET IN HOSPITAL II**

Early morning	Deskinmed almonds soaked overnight	8-12 nos.	<p style="text-align: center;"><i>Menu For Covid</i></p> 
Before breakfast	Golden latte	1 cup	
Breakfast	Oats porridge/dahliya/idli/upma/dhokla	1 bowl	
	Egg white	1 no.	
	Bland dal/sambar	1 cup	
Mid morning	Tomato soup/moringa leaves soup/ vegetable soup	1 cup	
Before lunch	Raw beetroot/amla juice	100ml	
Lunch	Soft cooked dal rice/ curd rice/ tomato dal/vegetable soup/chappati	1 cup 2 nos.	
	Dal	1 katori	
	Vegetable sabzi	1 katori	
Evening snacks	Boiled channa/rajma/sundal/boiled sweet potato+few drops of lime juice	1 cup	
	Ginger tea/tulsi tea/ green tea	1 cup	
Dinner	Soft cooked dal rice/ curd rice/ tomato dal/vegetable soup/chappati	1 cup 2 nos.	
	Dal	1 katori	
	Vegetable sabzi	1 katori	
Bed time	Golden latte	1 cup	

Table III shows the diet prescribed in hospital II for Covid patients. Almonds are usually high in fibre content (Richardson D. P. et al., 2009) and are also rich in good fats such as mono unsaturated fatty acids. Soaking helps to eliminate the toxic constituent present in almonds and hence deskinning of almonds was suggested to a patient. Golden latte is a healthy drink made from low fat milk, ginger, turmeric, cinnamon, cardamom and honey and was suggested to be taken twice a day before breakfast and during bed time.

Oats, dahlia, upma were some of the breakfast cereals that are easier to digest and hence suggested to be taken along with egg white which is a high biological value protein source (Abeyrathne et al., 2013). The diet also focused on including antioxidant rich beverages like tulsi tea, ginger tea and green tea. All the five food groups were included like cereals like rice based products, pulses like dal, rajmah, boiled channa, vegetables and also good fats like almonds.

Roots and tubers were also included such as sweet potato given few drops of lime juice. Amla is a rich source of vitamin C and given as amla juice before lunch. Curd rice is rich in probiotics and good for the gut health of patients and hence was suggested during both lunch and dinner. They also suggested that 2-3 litres of water should be consumed daily by patients to stay hydrated.

### **iii. Diet in Hospital III**

The diet prescribed for Covid patients in hospital III is given in table IV

**TABLE IV**  
**DIET IN HOSPITAL III**

Breakfast	Rava idli/pongal/dosa Sambar	2 nos./1 bowl 1 katori	<p><i>Menu For Covid</i></p> 
Mid morning	Watermelon/papaya/muskmelon juice	1 bowl	
Lunch	Rice Beetroot and greens Palya Chapati Dal Egg boil Curd	1 cup 1 katori 2 nos. ½ cup 1 no. 100 ml	
Evening	Banana shake Protein cookies Dates Mango bar	100 ml 2 nos. 2 nos. 1 no.	
Dinner	Roti Rice Soppina Palya Dal Flavoured milk	2 nos. ½ cup 1 cup 1 katori 100 ml	
Bed time	Milk	100 ml	

Table IV shows the diet prescribed in hospital III. The diet was mainly from refined sources of carbohydrates and good sources of proteins like egg boil, milk and curd. To meet the protein demand during Covid, protein cookies are suggested as evening snack. Soppina palya was a native green vegetable sabji of Karnataka and was suggested during both lunch and dinner. All five food groups were included in the diet.

#### **iv. Diet in Hospital IV**

The diet prescribed for Covid patients in hospital IV is given in table V

**TABLE V**  
**DIET IN HOSPITAL IV**

Early morning	Milk protein supplement	100 ml 1 tbsp	<p><i>Menu For Covid</i></p> 
Breakfast	Idli/dosa/oats porridge Milk Boiled egg white/paneer	2 nos./1 bowl 1 cup 2 nos.	
Mid morning	Fruit milkshake	100 ml	
Lunch	Salad Rice Fish curry/chicken curry/pulse curry Green leafy vegetables Buttermilk	1 cup 1 ½ cup 1 cup 1 katori 100ml	
Evening	Milk Bread omlette Sundal sprouts	100 ml 2 nos. 50g	
Dinner	Rice fish curry/chicken curry Sambar Vegetables Buttermilk (skimmed)	1 ½ cup 1 cup 1 cup 100 ml	
Bed time	Milk	100 ml	

Table V shows the diet prescribed for Covid in hospital IV. All the five food groups were seen in the plan. To meet the protein requirement of patients, protein supplements were suggested in the early morning.

**v. Details on fulfillment of dietary recommendations**

Details on fulfillment of dietary recommendations met by the four hospitals is shown in table VI.

**TABLE VI**  
**DETAILS ON FULFILLMENT OF DIETARY RECOMMENDATIONS**

Details	H I	H II	H III	H IV
Five Food groups	✓	✓	✓	✓
Anti oxidant rich foods	✓	✓	✓	✓
Immune boosters	✓	✓	✓	✓
Indigenous foods	✓	✓	✓	nil
Herbs and Spices	✓	✓	✓	✓
Fibre rich foods	✓	✓	✓	✓

Table VI shows the dietary conditions that were being met by the hospital diets. All four hospitals included the five food groups, anti oxidant rich foods, immune booster foods, herbs and spices, fibre rich foods, indigenous foods except hospital IV which did not include indigenous foods in their menu. The fibre rich foods were however given in easily digestible forms like deskinning almonds and fruit juices.

## **b. DEVELOPMENT OF MODEL DIETS**

The model diet plans is shown as follows:

### **i. GENERAL DIET**

The general diet plans for Covid for various age groups were made for the general public with food items that are commonly known.

#### **I. General diet for children**

General diet for infants of 6 – 12 months, children of 1-3 years, 4-6 years, 7-9 years, 10-12 years boy and 10-12 years girl is shown in table VII.

**TABLE VII**  
**GENERAL DIET FOR CHILDREN**

Details	Infants (6-12 months)	1-3 yrs	4-6 yrs	7-9 yrs	10-12 yrs (Boy)	10-12 yrs (Girl)
<b>Breakfast</b>	Soft cooked kichdi	Poha  Whole milk	Cornflakes Whole milk Steamed strawberries	Sweet semolina Milk Soaked walnuts	Banana nutella pancake Milk with honey Soaked walnut	Milk Sooji With vegetables
<b>Mid morning</b>	Breastmilk	Vermicilli  Strained grape juice	Bread omlette  Starined grapefruit juice	Apple pears banana smoothie	Stuffed paratha  Mango custard	Apple juice  Chicken sandwich
<b>Lunch</b>	Rice and formula feed	Soft cooked dal rice Egg boil Coriander tomato chutney	Rice Beetroot fry Tomato dal Baked fish	Baked chicken Pumpkin spinach curry Rice	Urad dal Rice Eggplant kottu Fish fry	Steamed broccoli Rice Paneer curry
<b>Evening snacks</b>	Breastmilk	Vegetable sandwich Milk	Carrot halwa Milk	Cookies Whole milk	Paneer bread roll Milk Egg sandwich	Milk Dry fruit biscuit
<b>Pre dinner</b>	Mashed banana	Badam kheer	Coconut tapioca pudding	Prawn soup	Vermicelli Milk	Sooji halwa
<b>Dinner</b>	Rice kanji	Spinach egg Sauteed carrot and capsicum Bland dal Soft boiled rice	Chappati Mashed soyabean curry Roast chicken Tomato chutney	Rice Fresh salad(lettuce, tomato, cucumber, onion) Fish stew	Roti Mixed vegetable salad Dal Coriander chutney Egg omlette	Rajma curry Roti Mixed vegetable salad Mint chutney
<b>Bed time</b>	Breastmilk	Caramel custard	Badam milk	Yoghurt with cherries	Toned milk	Milk with powdered dates

Table VII shows the diet plan for children. During infancy no herbs and spices were seen. Breastmilk was the main source of nutrition for the infant along with complementary foods such as rice and formula feed, mashed banana and kanji. Whole milk was mainly suggested in the diet plan since fat cannot be restricted for children under two years of age (Vanderhout et al., 2021)

All the food groups were included in diet plans for children of ages 1-3 years, 4-6 years, 7-9 years and 10-12 years.

## II. Comparison between RDA and nutrients provided

Comparison between RDA and nutrients provided in the menu is given in table VIII.

**TABLE VIII**

### COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU

Nutrients	Infants		1-3 yrs		4-6 yrs		7-9 yrs		Boy 10-12 yrs		Girl 10-12 yrs	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	858	790	1443	1396	1768	1701	2210	1970	2886	2534	2678	2514
Protein (g)	10.5	9	20	19	29	28	38	35	52	45	54	48
CHO (g)	128	120	216	209	265	250	331	320	342	316	323	318
Fat (g)	15	14	24	22	29	25	39	36	48	46	44	41
Fibre (g)	-	8	15	20	20	31	26	26	33	37	31	29
Calcium (mg)	300	283	500	502	550	496	650	590	850	836	850	835
Iron (mg)	3	5	8	6	11	10	15	14	16	14	28	26
Zinc (mg)	2.5	3	3.3	5	4.5	5	5.9	7	8.5	6	8.5	7
Vitamin C(mg)	30	51	30	45	35	67	45	70	55	76	50	65

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table VIII shows that an average of 92 per cent of the energy requirements according to EAR (2020) was met from the diet planned for children. An average of 96 per cent of carbohydrate was met according to the recommended dietary allowances RDA (2020) followed by 92 per cent for fat and 90 per cent for protein.

## III. General diet for adolescent

General diet for adolescent boy and girl from 13 to 18 years is shown in table IX

**TABLE IX**  
**GENERAL DIET FOR ADOLESCENT**

Details	Boy		Girl	
	13-15 yrs	16-18 yrs	13-15 yrs	16-18 yrs
<b>Breakfast</b>	Tricolour sandwich Soaked almonds Milk	Milk Paneer sandwich Soaked almonds	Mushroom vegetable omlette Roti Milk	Vegetable upma Milk
<b>Mid morning</b>	Guava juice Biscuit	Kiwi papaya Milkshake	Egg custard Fruity bread	Strained amla juice Besan pakoda
<b>Lunch</b>	Grilled chicken Rice Dal Brinjal fry	Palak toor dal Rice Braised fish Mint chutney	Carrot rice Onion chutney Low fat dahi Baked chicken	Rice Plain dal Aloo spinach bhaji Fish fry
<b>Evening snacks</b>	Poha with peanuts Milk	Poha Milk	Moong dal chilla Milk	Cashew biscuit Milk
<b>Pre dinner</b>	Rava laddoo	Roasted groundnut	Beetroot kheer	Puffed rice ball
<b>Dinner</b>	Baked salmon Curd rice Vegetable salad	Capsicum egg Rice flour roti Tomato chutney Chicken fry	Stuffed paratha Hummus	Palak paneer Chappati Egg bhurja Plain dal
<b>Bed time</b>	Almond milk	Milk with powdered dates	Almond milk	Sweet lassi

The diet focused on meeting the nutritional requirements for adolescents particularly foods rich in iron such as capsicum, beetroot, spinach and foods rich in iron like green leafy vegetables, lentils and powdered dates.

#### **IV. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table X

**TABLE X****COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Boy				Girl			
	13-15 yrs		16-18 yrs		13-15 yrs		16-18 yrs	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	2860	2700	3320	3209	2400	2265	2500	2450
Protein (g)	51	78	64	73	50	72	55	82
CHO (g)	429	450	498	474	360	320	150	202
Fat (g)	47	30	55	39	40	40	41	34
Fibre (g)	43	40	50	40	36	23	38	34
Calcium (mg)	1000	970	1050	1026	1000	1012	1050	963
Iron (mg)	22	19	26	23	30	26	32	31
Zinc (mg)	14.3	11	17.6	16	12.8	13	14.2	12
Vitamin C(mg)	70	97	85	128	93	76	70	62

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

As evident from table X, 96 per cent of average EAR for energy was met from the diet plan for adolescents of age group 13 to 18 years. An average of 90 per cent RDA requirement for iron was met from the diet planned for adolescents followed by 97 per cent of RDA requirement for calcium was met from the menu planned.

#### **V. General diet for adult**

General diet for adult man and woman along with their physical activity is shown in table XI.

**TABLE XI**  
**GENERAL DIET FOR ADULT**

Details	Male			Female		
	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy
<b>Early morning</b>	Ginger tea	Lemon tea	Cinnamon tea	Warm water with cinnamon	Chamomile tea	Warm water with lime
<b>Breakfast</b>	Low fat milk Oats porridge Boiled egg white Deskinned almonds	White bread Omlette Peanut butter Cashew milk	Milk Chicken breast roast Bread Basil cashew spread	Sardine sandwich Soy milk	Pea milk Rava upma	Quinoa milk Cornflakes strawberries
<b>Mid morning</b>	Tomato soup Banana	Apple papaya banana fruit salad	Chicken soup Bun	Beetroot juice Boiled rajmah	Clementine extract Badam kheer	Banana grape smoothie Puffed rice
<b>Lunch</b>	Soft boiled rice Moong dal curry Mix vegetable fry	Rice Boiled fish with veggies Mint chutney Unsweetened yoghurt	Rice Stewed fish Vegetable salad Mint chutney Curd	Poached egg Black gram dal Aloo gobi Rice	Tomato egg stir fry Chicken stew with veggies Tamarind chutney	Sautéed mushroom Boiled chickpea Rice Lauki sabji Curd
<b>Evening snacks</b>	Almond milk Chicken sandwich	Tea Vegetable pakoda	Pineapple smoothie Pista biscuit	Tulsi tea Marielite biscuit	Green tea Dhokla	Puffed rice Cream cracker biscuit Mulberry smoothie
<b>Pre dinner</b>	Strained apple and pear juice Sprouted greens	Amla juice	Dates halwa	Mulberry pudding	Carrot kheer	Sesame laddoo
<b>Dinner</b>	Rice Fish curry Pumpkin sabji Coriander chutney	Phulka Horse gram curry Green salad	Roti Lentil curry Brinjal fry Tomato chutney	Paneer curry Sautéed zucchini Rice Chicken roast	Plantain stem kottu Rice Cowpea curry Baked salmon	Rice Roti Green moong dal Beetroot chutney Poached egg
<b>Bed time</b>	Turmeric milk	Milk with soaked walnuts	Almond milk	Turmeric milk	Cardamom milk	Fruit yoghurt

Table XI shows the diet planned for adults of both gender for sedentary, moderate and heavy activity. The diet focused on including energy rich foods and foods low in saturated

fats. Almond milk, quinoa milk and skimmed milk were mainly suggested for the adult patients instead of whole milk.

## VI. Comparison between RDA and nutrients provided

Comparison between RDA and nutrients provided in the menu is given in table XII

**TABLE XII**

### COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU

Nutrients	Man						Woman					
	Sedentary		Moderate		Heavy		Sedentary		Moderate		Heavy	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy(Kcal)	1950	1890	2275	2065	2600	2225	1650	1503	1925	1839	2200	2141
Protein (g)	65	60	78	74	97	90	55	45	66	63	82	93
CHO (g)	292	258	341	318	390	356	247	283	288	250	330	342
Fat (g)	32	29	37	28	43	39	27	37	32	39	36	29
Fibre (g)	32	25	41	46	52	47	25	33	32	43	41	46
Calcium(mg)	1000	790	1000	945	1000	1245	1000	952	1000	1120	1000	976
Iron (mg)	19	15	19	21	19	16	29	25	29	33	29	44
Zinc(mg)	17	16	17	16	17	14	13	12	13	13	13	10
Vitamin C (mg)	80	103	80	86	80	107	65	112	65	114	65	133

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XII shows that an average of 92 per cent of energy requirements for adults was met according to Estimated Average Requirements (EAR) followed by 96 per cent of average protein requirement compared to RDA was evident and 96 per cent for carbohydrate.

## VII. General diet for pregnant and lactating mothers

General diet for pregnant and lactating mothers is shown in table XIII

**TABLE XIII****GENERAL DIET FOR PREGNANT & LACTATING MOTHERS**

Details	Pregnant	Lactation (0-6 months)	Lactation (7-12 months)
<b>Early morning</b>	Ginseng cumin tea	Deskinned almonds	warm water with fenugreek powder
<b>Breakfast</b>	Almond milk Peanut butter Avocado sandwich Steamed apple	Scrambled egg Bread toast Toned milk with anise powder	Rice flakes banana porridge soy milk with honey
<b>Mid morning</b>	Strained bathua soup Chickpea sprouts	Strawberry milkshake Fenugreek seed powder	Pea soup Germinated Sprouts with pomegranate
<b>Lunch</b>	Steamed liver Chicken stew with mustard leaves Double boiled rice Sautéed mix vegetables	Parboiled rice Tomato dal Baked chicken	Garlic and onion chutney Rasam Bottle gourd kottu Baked fish
<b>Evening snacks</b>	Rava kheer Mango smoothie	Strained grapefruit juice Poha	Strained mosambi juice Oats laddoo
<b>Pre dinner</b>	Egg custard	Sweet potato with few drops of lime juice	Rice flakes
<b>Dinner</b>	Garlic tofu Rice Chicken broth with squash Ladies finger dry	Aloo gobi Red gram dal Rice	Roti Pumpkin curry Chicken dry Boile mixed vegetable cubes
<b>Bed time</b>	Yoghurt with pomegranate	Badam milk	Buttermilk

Pregnancy is a very crucial stage in a woman's life. During this stage the woman needs to eat for two. The nutrients that are necessary during this stage are iron, calcium, vitamin D, folic acid, vitamin C and omega 3 fatty acids (Marangoni et al., 2016). The diet was planned to nourish the expectant mother as well as the lactating mothers with these essential nutrients. Hence steamed liver which is rich in iron (Kongkachuichai et al., 2002) was given during pregnancy.

Fenugreek powder was suggested for lactating mothers since it has a galactagogue property (Khan et al., 2017)

**VIII. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table XIV

**TABLE XIV**

**COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Pregnant		Lactation (0-6 months)		Lactation (7-12 months)	
	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	2300	2220	2250	1908	2170	1920
Protein (g)	119	135	82	71	68	74
CHO (g)	345	323	337	322	325	278
Fat (g)	30	46	37	22	27	27
Fibre (g)	-	55	-	34	-	43
Calcium(mg)	1000	1343	1200	1122	1200	1349
Iron (mg)	27	39	23	18	23	25
Zinc(mg)	14.5	11	14	10	14	17
Vitamin C(mg)	80	87	115	122	115	89

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XIV shows that 90 per cent of average energy requirement for pregnant and lactating mothers whereas an additional of 12 per cent of iron requirement followed by 4 per cent for protein was evident from the diet plan.

**IX. General diet for elderly**

General diet for elderly is shown in table XV

**TABLE XV  
GENERAL DIET FOR ELDERLY**

Details	Male	Female
<b>Early morning</b>	Cinnamon tea	Warm water with honey
<b>Breakfast</b>	Oats porridge Milk	Cooked Sooji Egg white boil Milk
<b>Mid morning</b>	Tofu with vegetable soup	Papaya juice Banana bread
<b>Lunch</b>	Spinach dal Rice Baked Salmon Curd Steamed strawberries	Pumpkin fry Parboiled rice Plain dal (lemtil) Baked salmon/chicken
<b>Evening snacks</b>	Sticky rice Cardamom tea	Boiled yam Milk
<b>Pre dinner</b>	kichdi	Barley kanji
<b>Dinner</b>	Soft cooked Rice Eggplant curry Baked fish	Double boiled rice Plain dal Boiled egg white Pumpkin fry
<b>Bed time</b>	Turmeric milk	curd

Table XV shows the general diet for elderly population which mainly consisted of easily digestible foods such as oats porridge, soft cooked rice and foods rich in zinc since zinc deficiency is a leading cause of death in the elderly and decreases their immune functions (Cabrera, 2015).

Turmeric has anti inflammatory property (Prasad and Agarwal, 2011) and hence turmeric milk was suggested during bed time.

#### **X. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table XVI

**TABLE XVI**

#### **COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Details	Elderly man		Elderly woman	
	RDA	Menu	RDA	Menu
Energy (Kcal)	1950	1820	1650	1662
Protein (g)	65	58	55	64
CHO (g)	292	209	247	223
Fat (g)	32	26	27	16
Fibre (g)	32	29	25	36
Calcium (mg)	1200	1149	1200	625
Iron (mg)	19	23	19	11
Zinc (mg)	17	16	13.2	12
Vitamin C (mg)	80	38	65	77

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XVI shows that an average of 89 per cent of energy requirement according to EAR (2020) was met from the diet planned for elderly followed by 93 per cent of zinc RDA requirement was met from the menu.

#### **XI. General diet for Covid with diabetes**

General diet for Covid with diabetes is shown in table XVII

**TABLE XVII**  
**GENERAL DIET FOR COVID WITH DIABETES**

<b>Timing</b>	<b>Menu planned</b>
<b>Early morning</b>	Warm water mixed with cinnamon and ginger
<b>Breakfast</b>	Multigrain bread Skim milk Boiled egg white Deskinmed almonds Mulberries
<b>Mid morning</b>	Rice flakes Skim milk
<b>Lunch</b>	Double boiled rice Moong dhal Bitter gourd fry Steamed fish
<b>Evening snacks</b>	Quinoa kichdi Milk
<b>Pre dinner</b>	Strained vegetable soup (carrot, cabbage, beans)
<b>Dinner</b>	Wheat upma Coriander chutney orange
<b>Bed time</b>	Milk with turmeric

Covid patients suffering from diabetes mellitus are more at risk of developing major complications (Leon-Abarca et al., 2021). The diet was planned in such a way that the blood sugar does not rise and at the same time covid symptoms are properly managed. Quinoa can reduce blood sugar (Little et al., 2021) and hence was suggested during evening to be taken along with milk.

## **XII. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table XVIII

**TABLE XVIII**  
**COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

<b>Nutrients</b>	<b>Covid with diabetes mellitus</b>	
	<b>RDA</b>	<b>Menu</b>
Energy (Kcal)	1950	1816
Protein (g)	65	73
CHO (g)	292	278
Fat (g)	32	20
Fibre (g)	32	43
Calcium (mg)	1000	975
Iron (mg)	19	24
Zinc(mg)	17	15
Vitamin C (mg)	80	76

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XVIII shows that 93 per cent of energy requirement was met from the diet planned for diabetics with Covid. 11 g of fibre which accounts to an additional 34 per cent to the RDA recommendation for fibre was noticed in the diet chart.

**ii. NORTH INDIAN DIET**

**I. North Indian diet for children**

North Indian diet for children is shown in table XIX

**TABLE XIX  
NORTH INDIAN DIET FOR CHILDREN**

Details	Infants (6-12 months)	1-3 yrs	4-6 yrs	7-9 yrs	10-12 yrs (Boy)	10-12 yrs (Girl)
<b>Breakfast</b>	Breastmilk	Breastmilk	Cabbage paratha Milk	Egg bhurji sandwich Milk Banana	Lauki paratha Milk Jam	Milk Boiled egg Bread toast Papaya
<b>Mid morning</b>	Sabudana kichdi	Poha Milk	Thandai	Sattu drink	Pineapple juice	Mixed fruit smoothie
<b>Lunch</b>	Cooked apple	Mango juice	Navratan korma Rice Stewed chicken Mustard green sabzi	Rice Dal curry Fish curry Beetgreen fritters	Rice Tadka dal Baked chicken	Rice Channa dal Mixed vegetable sabzi Steamed fish Guava
<b>Evening snacks</b>	Breastmilk	Breastmilk	Pomegranate milkshake Sooji	Apple banana milkshake Chicken sandwich	strawberry milkshake Bread omlette	Oats cookies Milk
<b>Pre dinner</b>	Barley water	Soft boiled Rice Plain dal Vegetable sabji Steamed fish	Kajar ka halwa	Masoor dal paneer soup	Peda	Khurchan
<b>Dinner</b>	Pumpkin kheer	Sooji Boiled milk	Rice Aloo matar Palak dal	Rice Tadka dal Egg curry Cabbage sabzi	Capsicum curry Steamed fish Palak dal	Roti Palak paneer bhurji Dal
<b>Bed time</b>	Breastmilk	Soft boiled Rice Chicken stew	Milk with powdered dates	curd	Toned milk	Milk

Table XIX shows the diet plan for children. During infancy no herbs and spices were seen. Breastmilk was the main source of nutrition for the infant and after 6 months complementary foods such as barley water, cooked apple and pumpkin kheer can be introduced into the diet. Whole milk was mainly suggested in the diet plan since fat cannot be restricted for children under two years of age (Vanderhout et al., 2021)

## II. Comparison between RDA and nutrients provided

Comparison between RDA and nutrients provided in the menu is given in table XX

**TABLE XX**

### COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU

Nutrients	Infants		1-3 yrs		4-6 yrs		7-9 yrs		Boy 10-12 yrs		Girl 10-12 yrs	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	858	800	1443	1422	1768	1722	2210	2066	2886	2600	2678	2529
Protein (g)	10.5	15	20	16	29	19	38	29	52	38	54	79
CHO (g)	128	117	216	200	265	225	331	290	342	345	323	337
Fat (g)	15	14	24	22	29	39	39	30	48	41	44	47
Fibre (g)	13	12	15	12	20	13	26	27	33	25	31	35
Calcium (mg)	261	298	500	630	550	523	650	530	850	760	850	798
Iron (mg)	13	19	8	13	11	7	15	12	16	12	28	20
Zinc (mg)	2	1.6	3.3	5	4.5	5	5.9	5	8.5	7	8.5	6
Vitamin C (mg)	141	167	30	23	35	14	45	43	55	65	50	45

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

It is evident from table XX that an average of 94 per cent of energy requirement was met from the menu plan and in case of protein, 96 per cent of RDA recommendation was met. When it comes to fat requirement, 97 per cent of RDA for fats was met from the plan.

## III. North Indian diet for adolescent

North Indian diet for adolescent is shown in table XXI

**TABLE XXI**  
**NORTH INDIAN DIET FOR ADOLESCENT**

Details	Boy		Girl	
	13-15 yrs	16-18 yrs	13-15 yrs	16-18 yrs
<b>Breakfast</b>	Milk Aloo paratha Tomato chutney	Milk Boiled egg Bread toast Fruit salad	Mushroom veggie omelette Roti Milk	Vegetable paratha Milk Egg boil
<b>Mid morning</b>	Anar pudina juice	Sweet corn and coriander soup	Tender coconut water	Strained amla juice Besan pakoda
<b>Lunch</b>	Rice Coriander chutney Palak kofta curry Sautéed chicken	Rice Roti Tadka dal Mustard green sabzi Steamed chicken	Garlic dal Rice Bhindi ki sabzi Sautéed chicken	rice Egg omlette Bathua ki dal Aloo gobi
<b>Evening snacks</b>	Apple mango milkshake Medu vada	Moong dal kachori Milk	Banana egg pancake Milk	Peanut kheer Milk
<b>Pre dinner</b>	Shahi tukda	Chicken clear soup	Tomato soup	Strained mushroom soup
<b>Dinner</b>	Rice Tadka dal Egg curry Cabbage sabzi	Green gram lentils Rice Roti Salmon fillet Dal	Beetroot curry Rice Carrot capsicum mushroom sabzi Steamed fish	Rice Moong dal curry Red amaranth sabzi Chicken gravy
<b>Bed time</b>	Curd	Milk	Milk with powdered dates	Milk with powdered dates

The diet focused on meeting the nutritional requirements for adolescents particularly foods rich in calcium such as milk and foods rich in iron like green leafy vegetables in the form of palak kofta, pudina juice, bathua dal and powdered dates.

#### **IV. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table XXII

**TABLE XXII****COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Boy				Girl			
	13-15 yrs		16-18 yrs		13-15 yrs		16-18 yrs	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	2860	2565	3320	3165	2400	2150	2500	2431
Protein (g)	51	46	64	54	50	43	55	45
CHO (g)	429	390	498	412	360	302	150	220
Fat (g)	47	37	55	60	40	34	41	31
Fibre (g)	43	22	50	35	36	37	38	40
Calcium (mg)	1000	1050	1050	941	1000	1088	1050	945
Iron (mg)	22	21	26	23	30	28	32	29
Zinc (mg)	14.3	12	17.6	8	12.8	7	14.2	8
Vitamin C (mg)	70	103	85	76	65	54	70	71

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XXII shows that an average of 93 per cent of energy requirement was met from the menu for adolescents and 92 per cent of iron requirement was met from the menu plan. In case of calcium, 98 per cent requirement was observed to be met for adolescents.

#### **V. North Indian diet for adult**

North Indian diet for adult is shown in table XXIII

**TABLE XXIII**  
**NORTH INDIAN DIET FOR ADULT**

Details	Male			Female		
	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy
<b>Early morning</b>	Lemon tea	Ginger tea	Tea with lemon and ginger	Ginger mint turmeric tea	Cinnamon tea	Lemon mint tea
<b>Breakfast</b>	Paneer bread roll Milk Coriander chutney	Milk Egg bhurji Roti Papaya	Chicken sandwich Sooji ka halwa Green smoothie (Mango, pineapple, spinach, banana, milk)	Makki ki roti Urad dal Milk	Chickpea and mushroom patties Milk	Sauteed pasta with vegetables and canned tuna Milk
<b>Mid morning</b>	Strained apple juice	Mint lassi	Tomato soup	Papaya and apricot salad	Green peas stew	Sweet corn soup
<b>Lunch</b>	Rice Egg boil Moong dal Methi Bhindi sabzi	Rice Braised Chicken Aloo palak Steamed chicken	Roti Toor dal Fish gravy Vegetable kadhi	Roti Mughlai dal Methi chole	Bhindi do pyaza Rice Roti Chicken gravy	Jeera rice Dal makhani Steamed chicken
<b>Evening snacks</b>	Tuna sandwich milk	Moong dal cheela Milk	Khao (skimmed milk) Dhokla	Milk Pitha	Sewai	Poha lassi
<b>Pre dinner</b>	Sprouts salad	Rawa dhokla Lemon tea	Steamed chicken	Strained broccoli soup	Mixed vegetable clear soup	Strained apple, pear, pomegranate juice
<b>Dinner</b>	Tandoori roti Tadka dal Chicken curry Mint chutney	Methi roti Rajmah curry Mix vegetable salad (carrot, beetroot, radish) Steamed fish	Tandoori roti Egg omlette Bathua ki dal Aloo matar	Dahi kadhi Rice Steamed chicken Aloo matar	Gucchi matar Rice Baked fish Khajur imli ki chutney	Rajma chawal Roti Paneer bhurji
<b>Bed time</b>	Curd with neem powder	Low fat yoghurt with pomegranate	Skimmed Milk with turmeric and ginger	Skimmed Milk	Milk	Golden latte

Table XXIII shows the diet planned for adults of both gender for sedentary, moderate and heavy activity. The diet focused on including energy rich foods and foods low in saturated

fats. Low fat yoghurt, skimmed milk and skimmed milk khao were mainly suggested for the adult patients instead of whole milk.

## VI. Comparison between RDA and nutrients provided

Comparison between RDA and nutrients provided in the menu is given in table XXIV

**TABLE XXIV**

### COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU

Nutrients	Man						Woman					
	Sedentary		Moderate		Heavy		Sedentary		Moderate		Heavy	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	1890	1730	2275	1998	2600	2536	1650	1609	1925	1880	2200	2190
Protein (g)	70	65	78	68	97	98	55	51	66	59	82	104
CHO (g)	211	240	341	293	390	294	247	232	288	287	330	320
Fat (g)	19	23	37	27	43	26	27	24	32	15	36	40
Fibre (g)	32	26	41	37	52	55	25	36	32	39	41	33
Calcium (mg)	1000	985	1000	981	1000	1108	1000	888	1000	995	1000	1029
Iron (mg)	19	15	19	17	19	17	29	17	29	26	29	23
Zinc(mg)	17	8	17	9	17	13	13	9	13	8	13	10
Vitamin C (mg)	80	71	80	62	80	72	65	41	65	55	65	54

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XXIV shows that 94 per cent of the energy requirement was met from the menu plan and 100 per cent of protein requirement was met for North Indian adults.

## VII. North Indian diet for pregnant and lactating mothers

North Indian diet for pregnant and lactating mothers is shown in table XXV

**TABLE XV****NORTH INDIAN DIET FOR PREGNANT & LACTATING MOTHERS**

Details	Pregnant	Lactation (0-6 months)	Lactation (7-12 months)
<b>Early morning</b>	Lemon tea	Milk thistle tea	Nimbu paani
<b>Breakfast</b>	Toasted bread Egg boil chenna Pomegranate milkshake	Poha Banana Milk	Bread and jam Milk Egg boil
<b>Mid morning</b>	Laapsi	Chicken soup	Strained broccoli soup
<b>Lunch</b>	Roti Aloo gobi Palak dal Chicken curry	Rice Roti Tadka dal Mustard green sabzi	Roti Channa kulcha Spinach Omelette Steamed fish
<b>Evening snacks</b>	Chirwa Milk	Gajar kalakand	Gond ke laddu Strawberry milkshake
<b>Pre dinner</b>	Strained spinach and broccoli soup	Fennel and cauliflower soup	Kajar kheer
<b>Dinner</b>	Roti Toor dal Bathua raita Steamed fish	Aloo gobi sabzi Rice Chicken gravy	Rice Moong dal curry Red amaranth sabzi Chicken gravy
<b>Bed time</b>	Golden latte	Turmeric milk	Milk with powdered dates

Pregnancy is a very crucial stage in a woman's life. During this stage the woman needs to eat for two. The nutrients that are necessary during this stage are iron, calcium, vitamin D, folic acid, vitamin C and omega 3 fatty acids (Marangoni et al., 2016). Fennel seeds was suggested for lactating mothers since it has a galactagogue property (Bethesda, 2006)

**VIII. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table XXVI

**TABLE XXVI**

**COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Pregnant		Lactation (0-6 months)		Lactation (7-12 months)	
	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	2300	2249	2250	2023	2170	1996
Protein (g)	119	121	82	97	68	58
CHO (g)	345	329	337	302	325	242
Fat (g)	30	22	37	32	27	18
Fibre (g)	-	32	-	28	-	32
Calcium (mg)	1000	972	1200	1170	1200	1093
Iron (mg)	27	23	23	19	23	19
Zinc (mg)	14.5	12	14	12	14	10
Vitamin C (mg)	80	77	115	105	115	105

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XXVI shows that an average of 93 per cent of energy requirement was met according to EAR 2020 for pregnant and lactating mothers followed by an excess of 3 per cent of protein was observed from the diet plan compared to the RDA.

**IX. North Indian Diet for elderly**

North Indian diet for elderly is shown in table XXVII

**TABLE XXVII**

**NORTH INDIAN DIET FOR ELDERLY**

Details	Man	Woman
<b>Early morning</b>	Cinnamon tea	Lemon tea
<b>Breakfast</b>	Poha Milk Egg boil	Milk Banana Vegetable poha
<b>Mid morning</b>	Strained apple juice	Strained papaya juice
<b>Lunch</b>	Soft boiled Rice Plain dal fish curry spinach sabzi	Vegetable pulao Steamed fish Coriander chutney
<b>Evening snacks</b>	Dahlia kichdi	Milk Sewai
<b>Pre dinner</b>	Strained palak soup	Strained carrot soup
<b>Dinner</b>	Soft boiled Rice Plain dal Egg curry Cabbage sabzi	Soft boiled Rice Plain dal Tomato omelette Steamed fish
<b>Bed time</b>	Curd	Turmeric milk

Table XXVII shows the north indian diet for elderly population which mainly consisted of easily digestible foods such as dahlia kichdi, soft boiled rice and foods rich in zinc since zinc deficiency is a leading cause of death in the elderly and decreases their immune functions (Cabrera, 2015).

Turmeric has anti inflammatory property (Prasad and Agarwal, 2011) and hence turmeric milk was suggested during bed time.

#### **X. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table XXVIII

**TABLE XXVIII**

#### **COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Elderly man		Elderly woman	
	RDA	Menu	RDA	Menu
Energy (Kcal)	1950	1890	1650	1615
Protein (g)	65	64	55	73
CHO (g)	292	233	247	275
Fat (g)	32	25	27	21
Fibre (g)	32	30	25	21
Calcium (mg)	1200	961	1200	1021
Iron (mg)	19	18	19	16
Zinc (mg)	17	19	13.2	10
Vitamin C (mg)	80	90	65	80

As it is seen from table XXVIII, an average of 90 per cent of energy requirement was met followed by 96 per cent of RDA zinc requirement was evident.

#### **XI. North Indian diet for covid with diabetes**

North Indian diet for covid with diabetes is shown in table XXIX

**TABLE XXIX****NORTH INDIAN DIET FOR COVID WITH DIABETES**

<b>Timing</b>	<b>Menu planned</b>
<b>Early morning</b>	Warm water mixed with cinnamon and ginger
<b>Breakfast</b>	Multigrain bread Skim milk Boiled egg white Mulberries Soaked walnuts
<b>Mid morning</b>	Rice flakes Skim milk
<b>Lunch</b>	Soft boiled rice Moong dhal curry Sautéed gourd veggies Steamed fish
<b>Evening snacks</b>	Quinoa kichdi Milk
<b>Pre dinner</b>	Strained vegetable soup (spinach, cabbage, beans)
<b>Dinner</b>	Wheat upma Coriander chutney orange
<b>Bed time</b>	Milk with turmeric

Covid patients suffering from diabetes mellitus are more at risk of developing major complications (Abarca et al., 2021). The diet was planned in such a way that the blood sugar does not rise and at the same time Covid symptoms are properly managed.

Multigrain bread has low glycemic index (Olagunju, 2019) and hence was suggested during breakfast to be taken along with milk.

## **XII. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided in the menu is given in table XXX

**TABLE XXX****COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Covid with diabetes mellitus	
	RDA	Menu
Energy (Kcal)	1950	1850
Protein (g)	65	58
CHO (g)	292	275
Fat (g)	32	20
Fibre (g)	32	38
Calcium (mg)	1000	1018
Iron (mg)	19	15
Zinc (mg)	17	10
Vitamin C (mg)	80	75

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XXX shows that 95 per cent of the EAR (2020) for energy was met from the diet plan. 94 per cent of the carbohydrate RDA recommendation was met along with 89 per cent of protein recommended intake was fulfilled..

**iii. SOUTH INDIAN DIET****I. South indian diet for children**

South Indian diet for children is shown in table XXXI

**TABLE XXXI****SOUTH INDIAN DIET FOR CHILDREN**

Details	Infants (6-12 months)	1-3 yrs	4-6 yrs	7-9 yrs	10-12 yrs (Boy)	10-12 yrs (Girl)
<b>Breakfast</b>	Breastmilk	Vegetable upma	Rice flakes banana milk	Idiyappam Milk Papaya cubes	Poha Peeled steam Apple Almond milk	Bread Pakoda milk Scrambled eggs
<b>Mid morning</b>	Rice kanji	Barley water	Chicken soup	Carrot and beetroot soup	oats and banana smoothie	Muskmelon smoothie
<b>Lunch</b>	Mashed banana	Dahlia	Mashed carrot rice pumpkin kootu yogurt	Rice Brinjal poriyal Fish Curry	Bisibelabath Boiled eggs Yogurt (low fat)	Rice Capsicum egg Sakkaravalli kizhangu poriyal Spinach dal
<b>Evening snacks</b>	Rice with bassau	Steamed apple	Tender coconut water steamed papaya cubes	Mango and fresh dates smoothie	Pumpkin kheer Pineapple juice	Oats Kozhukattai Milk
<b>Pre dinner</b>	Carrot juice	breastmilk	Orange juice Poached egg	Broccoli soup	Steamed fish Coriander chutney	Chicken Rasam
<b>Dinner</b>	Mashed rice with milk	Rice kanji	Idli Sambar	Green gram sundal Rice Stewed chicken	Veg Upma sambar Coconut chutney	Dosa Chicken curry Avocado
<b>Bed time</b>	Breastmilk	Milk with soaked walnuts	Milk	Milk	Watermelon cubes with milk	Milk

Table XXXI shows the diet plan for children. During infancy no herbs and spices were seen. Breastmilk was the main source of nutrition for the infant along with complementary foods such as rice kanji, mashed banana and carrot juice. Whole milk was mainly suggested in the diet plan since fat cannot be restricted for children under two years of age (Vanderhout et al., 2021)

Fish which is a good source of omega 3 fatty acids (and helps to lower inflammation during Covid 19 (Hathaway et al., 2020)

## II. Comparison between RDA and nutrients provided

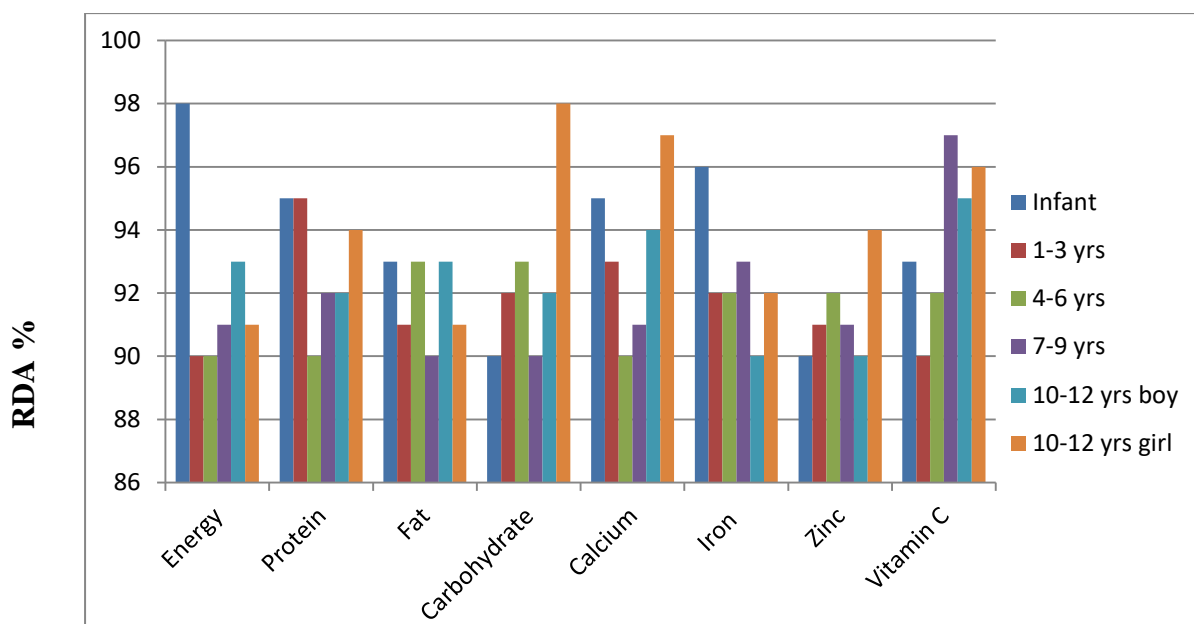
Comparison between RDA and nutrients provided in the menu is given in table XXXII

**TABLE XXXII**

**COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Infants		1-3 yrs		4-6 yrs		7-9 yrs		Boy 10-12 yrs		Girl 10-12 yrs	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	858	842	1443	1310	1768	1603	2210	2013	2886	2676	2678	2450
Protein (g)	10.5	10	20	19	29	26	38	35	52	48	54	47
CHO (g)	128	115	216	199	265	246	331	297	342	315	301	295
Fat (g)	15	14	24	22	29	27	39	35	48	45	44	39
Fibre (g)	-	9	15	9	20	19	26	20	33	23	31	30
Calcium (mg)	300	287	500	465	550	492	650	593	850	799	850	829
Iron (mg)	3	2.9	8	7.8	11	10.2	15	14	16	14	28	26
Zinc (mg)	2.5	2	3.3	2.4	2.1	3	5.9	5	8.5	7.6	8.5	8
Vitamin C (mg)	30	28	30	27	35	32	45	44	55	52	50	48

Table XXXII shows that 92 per cent of average energy requirement was met for children in the age groups of 6 months to 12 years. When it comes to fat, 91 per of average requirement was observed whereas 91 per cent of carbohydrate RDA requirement was met for children from the menu planned. The nutritional fulfilment is further explained in figure 3



**Nutrients provided in the menu**

**FIGURE 3**

**PERCENTAGE OF RDA MET BY DIET PLAN FOR CHILDREN**

Figure 3 shows the various nutrients provided by the menu for children in the age groups of 6- 12 months to 9 years and also 10-12 years of both the gender. It is evident that the highest requirement of energy was met by infants with 98 per cent compared to the Estimated average requirement (EAR) followed by 95 per cent of protein requirement (RDA) which was met by children of age groups 6 months to 3 years and the highest carbohydrate requirement was met in a girl child of 10-12 years with 98 per cent. A range of 90-97 per cent of RDA requirements of micronutrients was met such as calcium, iron, zinc and vitamin C for all the age groups.

### III. South indian diet for adolescent

South Indian diet for adolescent is shown in table XXXIII

**TABLE XXXIII**

#### **SOUTH INDIAN DIET FOR ADOLESCENT**

Details	13-15 yrs Boy	13-15 yrs Girl	16-18 yrs Boy	16-18 yrs Girl
<b>Breakfast</b>	Milk	Mushroom veggie omelette Roti Milk	Vegetable Uthappam Sambar papaya	Vegetable upma Milk
<b>Mid morning</b>	Riceflakes soaked in milk Boiled egg	Ragi kanji Steamed vada	Banana chikku smoothie Upma Boiled eggs	Strained amla juice omapodi
<b>Lunch</b>	Apple, pears, Banana, spinach smoothie	Beans Paruppu usili Mor kuzhambu Rice Egg curry	Rice Lady's finger kolambu Cabbage poriyal Green peas + potato Porriyal Steamed salmon	Rice Moru curry Steamed fish Mix vegetable salad with tamarind juice
<b>Evening snacks</b>	Double boiled rice Red gram dal masiyal Cho cho kootu Buttermilk	Upma kozhukattai Milk	Drumstick leaves soup Steamed modak	Milk Chicken sandwich
<b>Pre dinner</b>	Pomegranate juice	Spinach lentil soup	Chicken soup	Strained carrot soup
<b>Dinner</b>	Banana pudding Oats kozhukattai Appam Chicken stew	Rice Palakura pappu	Rice puttlu Steamed banana	Vegetable Upma Coconut chutney Idli Sambar Eggs
<b>Bed time</b>	Milk	curd with pomegranate	Curd with kalonji seeds	Golden latte

The diet focused on meeting the nutritional requirements for adolescents particularly foods rich in iron such as drumstick leaves, spinach and foods rich in calcium like milk, spinach lentils and foods rich in vitamin C to decrease inflammation (Carr et al., 2020) like amla juice, pomegranate juice and banana pudding.

#### IV. Comparison between RDA and nutrients provided

Comparison between RDA and nutrients provided in the menu is given in table XXXIV

**TABLE XXXIV**

#### **COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Boy				Girl			
	13-15 yrs		16-18 yrs		13-15 yrs		16-18 yrs	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	2860	2795	3320	3285	2400	2368	2500	2408
Protein (g)	51	45	64	54	50	45	55	49
CHO (g)	429	397	498	424	360	320	150	111
Fat (g)	47	35	55	42	40	41	41	39
Fibre (g)	43	42	50	40	36	29	38	17
Calcium (mg)	1000	1010	1050	943	1000	984	1050	923
Iron (mg)	22	21	26	22	30	28	32	29
Zinc (mg)	14.3	9	17.6	14	12.8	10	14.2	12
Vitamin C (mg)	70	59	85	80	65	45	70	65

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XXXIV shows that an average of 98 per cent of EAR for energy was met from the diet for adolescent followed 94 per cent of average calcium requirement and 90 per cent of iron was met from the diet.

#### V. South indian diet for adult

South Indian diet for children is shown in table XXXV

**TABLE XXXV**

**SOUTH INDIAN DIET FOR ADULT**

Details	Male			Female		
	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy
<b>Early morning</b>	Skim milk	Milk with ajwain powder	Lemon water with cinnamon	Giner tea	Milk with powdered sage	Lemon tea
<b>Breakfast</b>	Poha Almond milk Banana	Vegetable upma Peanut chutney	Palak besan cheela Milk	Dosa Sambar	White bread Vegetable omelette Egg white mango smoothie	Appam Egg white curry Roasted chickpea Milk
<b>Mid morning</b>	Tomato rasam	Mix fruit juice	Boiled egg white	Muskmelon juice	Papaya juice Non fried batata vada	Boiled moong beans with microgreens
<b>Lunch</b>	Curd rice Grape juice	Green beans curry Pappad Steamed fish	Lemon rice Phulka Sambar Rasam	Curd rice Steamed fish	Steamed chicken Payasam Tomato charu	Vegetable chappati Cowpea curry Moru curry Steamed Chicken
<b>Evening snacks</b>	Milk bread and apple sauce	Banana smoothie Plain pancake	Apple milkshake Peanut kheer	Ada Milk	Milk Groundnut kheer	Roasted channa Ginger clove tea
<b>Pre dinner</b>	Chicken soup	Egg idli Custard pudding	Tomato broccoli soup	Carrot soup	Dal paani	Rasam
<b>Dinner</b>	Egg Dosa Curry leaves chutney Sambar	Idli Vegetable sambar steamed chicken	Paneer Bhurja Palak fry Roti	Appam Chicken stew	Roti Methi dal Egg curry	Mung dal cheela Paneer curry Garlic chutney
<b>Bed time</b>	Turmeric milk	Buttermilk	Turmeric milk	Soy milk	Almond milk	Low fat milk with pepper and turmeric

Table XXXV shows the diet planned for adults of both gender for sedentary, moderate and heavy activity. The diet focused on including energy rich foods like paneer, poha, besan cheela and foods low in saturated fats such as almond milk, soy milk and skim milk.

**VI. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided by the menu is shown in table XXXVI

**TABLE XXXVI**

**COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Man						Woman					
	Sedentary		Moderate		Heavy		Sedentary		Moderate		Heavy	
	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	1890	1880	2275	2100	2600	2302	1650	1600	1925	1750	2200	1873
Protein (g)	70	61	78	77	97	89	55	50	66	57	82	80
CHO (g)	211	190	341	320	390	373	247	213	288	226	330	297
Fat (g)	19	23	37	35	43	39	27	28	32	28	36	34
Fibre (g)	32	28	41	35	52	48	25	23	32	36	41	42
Calcium (mg)	1000	860	1000	980	1000	885	1000	872	1000	926	1000	985
Iron (mg)	19	17	19	15	19	18	29	13	29	15	29	20
Zinc (mg)	17	6	17	6	17	10	13	11	13	11	13	12
Vitamin C(mg)	80	61	80	76	80	75	65	50	65	54	65	64

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XXXVI shows that 91 per cent of average requirements of calories was met from the diet plan followed by 90 per cent of fat RDA requirement was met.

**VII. South indian diet for pregnant and lactating mothers**

South Indian diet for pregnant and lactating mothers is shown in table XXXVII

**TABLE XXXVII**

**SOUTH INDIAN DIET FOR PREGNANT & LACTATING MOTHERS**

Details	Pregnant	Lactation (0-6 months)	Lactation (7-12 months)
<b>Early morning</b>	Milk	Lemon tea	Cinnamon tea
<b>Breakfast</b>	Appam Kadala curry	Idli upma Milk	pongali Orange juice Coconut chutney
<b>Mid morning</b>	Orange juice with flaxseed powder	Cabbage and moong dal salad	Honey tea with ginger
<b>Lunch</b>	Double boiled rice Roti Plain stewed chicken Karela sabji	Onion and tomato stew Rice Dal methi Fish curry	Rice Moong dal payasam Curry leaves chutney Fish stew
<b>Evening snacks</b>	Chicken liver cutlet Milk	Badam sheera Milk	Rice flakes payasam
<b>Pre dinner</b>	Badam milk Boiled white channa	Muskmelon juice Rava laddo	Chicken soup
<b>Dinner</b>	Ragi roti Pumpkin poriyal Chicken curry	Akki roti Bendakaya pulusu Egg white	Thengai sadam Baked Salmon
<b>Bed time</b>	Turmeric milk	Milk	Skimmed milk with fenugreek powder

Pregnancy is a very crucial stage in a woman's life. During this stage the woman needs to eat for two. The nutrients that are necessary during this stage are iron, calcium, vitamin D, folic acid, vitamin C and omega 3 fatty acids (Marangoni et al., 2016).

Fenugreek powder was suggested for lactating mothers since it has a galactagogue property (Khan et al., 2018)

### VIII. Comparison between RDA and nutrients provided

Comparison between RDA and nutrients provided by the menu is shown in table XXXVIII

**TABLE XXXVIII**

#### COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU

Nutrients	Pregnant		Lactation (0-6 months)		Lactation (7-12 months)	
	RDA	Menu	RDA	Menu	RDA	Menu
Energy (Kcal)	2300	2150	2250	1999	2170	2110
Protein (g)	119	108	82	88	68	50
CHO (g)	345	249	337	222	325	254
Fat (g)	30	29	37	32	27	26
Fibre (g)	-	26	-	32	-	28
Calcium (mg)	1000	980	1200	1120	1200	893
Iron (mg)	27	23	23	21	23	14
Zinc (mg)	14.5	11	14	12	14	11
Vitamin C (mg)	80	65	115	107	115	89

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XXXVIII shows that 93 per cent of average energy requirement for pregnant and lactating mothers was met from the menu. Fat intake suggested came to 93 per cent of the nutrient requirement and protein intake suggested came to 91 per cent of RDA.

### IX. South indian diet for elderly

South Indian diet for elderly is shown in table XXXIX

**TABLE XXXIX****SOUTH INDIAN DIET FOR ELDERLY**

<b>Details</b>	<b>Male</b>	<b>Female</b>
<b>Early morning</b>	Milk	Milk with flaxseed powder
<b>Breakfast</b>	Idli soaked in milk Boiled egg white Steamed banana	Rava idli sambar
<b>Mid morning</b>	Pongal	Papaya juice
<b>Lunch</b>	Rice, dal and carrot puree	Double boiled rice Plain dal masiyal Mashed carrot Curd
<b>Evening snacks</b>	Almond milk Plantain bajji	Plain custard Strained orange juice
<b>Pre dinner</b>	Strained mixed vegetable soup	Tomato soup
<b>Dinner</b>	Carrot palya Soft cooked Rice Dal Steamed fish	Idiyappam Vegetable stew (carrot, peas, potato) milk
<b>Bed time</b>	Curd with kalonji seeds	Turmeric milk with Honey

Table XXXIX shows the south indian diet for elderly population which mainly consisted of easily digestible foods such as idli, soft cooked rice, pongal and foods rich in zinc since zinc deficiency is a leading cause of death in the elderly and decreases their immune functions (Cabrera, 2015).

Turmeric has anti inflammatory property (Prasad and Agarwal, 2011) and hence turmeric milk was suggested during bed time.

**X. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided by the menu is shown in table XL

**TABLE XL****COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

Nutrients	Elderly man		Elderly woman	
	RDA	Menu	RDA	Menu
Energy (Kcal)	1950	1899	1650	1612
Protein (g)	65	60	55	63
CHO (g)	292	227	247	170
Fat (g)	32	29	27	26
Fibre (g)	32	23	25	21
Calcium (mg)	1200	1098	1200	1123
Iron (mg)	19	18	19	13
Zinc (mg)	17	13	13.2	11
Vitamin C (mg)	80	79	65	55

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XL shows that 90 per cent of Estimated Average Requirement for energy was met by the menu plan and 86 per cent of RDA for fats requirement was met followed by 95 per cent of protein RDA requirement.

**XI. South indian diet for Covid with diabetes**

South Indian diet for Covid patient with diabetes mellitus is shown in table XLI

**TABLE XLI****SOUTH INDIAN DIET FOR COVID WITH DIABETES**

Timing	Menu planned
Early morning	Ginger, cinnamon, and lemon in warm water
Breakfast	Multi grained bread Milk Boiled egg white Deskinmed almonds Guava
Mid morning	Strained vegetable soup(carrot, cabbage, beans)
Lunch	Double boiled rice Dhal masiyal Bitter gourd poriyal Steamed fish Papaya
Evening snacks	Murukku Milk with protein powder
Pre dinner	Strained vegetable soup
Dinner	Ragi rava upma Coriander chutney Orange
Bed time	Golden latte (milk+turmeric+pepper)

The menu was planned by incorporating complex carbohydrates and high biological value proteins like egg white in the diet (Abeyrathne et al., 2013). Multigrain bread has a lower glycemic index (Olagunju, 2019) and was mainly suggested for diabetics. Guava has anti diabetic effect and was given during breakfast. The diet was planned to manage the symptoms of covid 19 as well as preventing the elevation of blood glucose level in the patient.

## **XII. Comparison between RDA and nutrients provided**

Comparison between RDA and nutrients provided by the menu is shown in table XLII

**TABLE XLII**

### **COMPARISON BETWEEN RDA AND NUTRIENTS PROVIDED IN MENU**

<b>Nutrients</b>	<b>Covid with diabetes mellitus</b>	
	<b>RDA</b>	<b>Menu</b>
Energy (Kcal)	1950	1875
Protein (g)	65	54
CHO (g)	292	277
Fat (g)	32	29
Fibre (g)	32	22
Calcium (mg)	1000	981
Iron (mg)	19	15
Zinc (mg)	17	16
Vitamin C (mg)	80	75

**\*RDA- Recommended dietary allowances (ICMR, 2020)**

Table XLII shows the nutritive value calculations of the diet planned for covid patients with diabetes mellitus. 96 per cent of Estimated Average Requirement for energy was met by the menu followed by 91 per cent of RDA requirement was met for fat and 94 per cent of zinc requirement was met from the diet plan suggested for covid patient with a complication of diabetes mellitus.

## **C. DEVELOPMENT OF DIETARY INFORMATIC TOOLS**

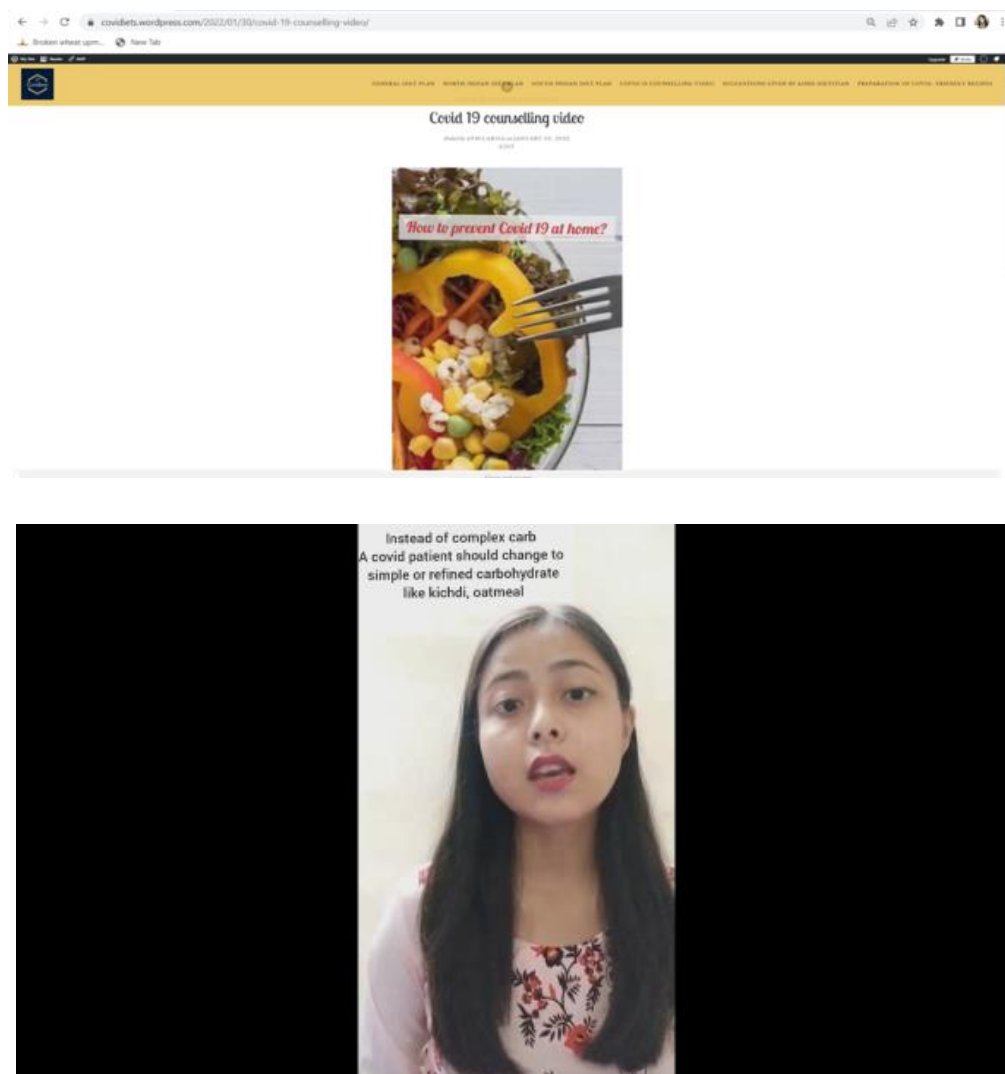
### **a. DEVELOPMENT OF A BLOG**

The blog that was developed was titled covidiets.wordpress.com. In the blog, a voice recording of suggestions given by AIIMS dietitian was included. The General diet plans, North Indian diet plans, and South Indian diet plans in the form of images were uploaded as blog post. Preparation videos of Covid friendly recipes as well as Covid 19 counselling video was uploaded in the blog. All the 66 diet plans that was made was inserted in the blog along



## b. DEVELOPMENT OF COUNSELLING VIDEO

Development of Counselling video is shown in figure 5.



**Figure 5**  
**Covid 19 Counselling video**

Figure 5 shows the counselling video that had been developed for Covid 19 prevention. The video was uploaded in the blog.

## c. DEVELOPMENT OF RECIPES FOR IMMUNITY

Covid friendly recipes for boosting the innate immunity of an individual is shown in table XLIII

**TABLE XLIII**  
**RECIPES FOR IMMUNITY**





<b>Images</b>	<b>Recipes name</b>	<b>Ingredients</b>	<b>Amount</b>
	Banana Bread	Low fat milk Banana Groundnut oil Baking powder Sugar Wheat flour	200 ml 100g ½ tsp ½ tsp 30g 1 cup
	Beetroot kheer	Beetroot Groundnut oil Almond Milk Sugar	2 nos. ½ tsp 5 nos. 100 ml 30g
	Moong Dal cheela	Moong dal (soaked) Turmeric Carrots	1 cup  1 tsp 10g
	Egg Dosa	Urad dal Rice (Fermented) Egg Onion	½ cup 1 cup  2 nos. 10g
	Golden latte	Milk Turmeric Cinnamon Cardamom Ginger Honey	1 cup ½ tsp 1 tsp 1 tsp 10g 1 tsp

Table XLIII shows the various recipes which can be prepared for covid patients. The videos of their preparation were uploaded in the blog.

## C. EVALUATION OF DIETARY INFORMATIC TOOLS

### a. DEMOGRAPHIC DETAILS OF RESPONDENTS

#### i. Age and Gender distribution of the respondents

The age and gender distribution of the selected respondents is shown in Table XLIV

**TABLE XLIV**

#### **AGE & GENDER DISTRIBUTION**

Age (Years)	Gender	n=65		
		Healthcare Workers N= 25	Covid patients N= 20	General public N=20
		N	N	N
17-22	Male N=3	nil	nil	3
	Female N=5	nil	1	4
23-28	Male N=11	6	3	2
	Female N=27	13	7	7
29-34	Male N=3	nil	2	1
	Female N=4	1	3	nil
35-40	Male N=2	nil	1	1
	Female N=3	2	nil	1
41-46	Male N=3	2	1	nil
	Female N=4	1	2	1

Among the total respondents of 65, 43 respondents were females and 22 were males. The highest number of respondents belonged to the age groups of 23 - 28 years with 11 males and 27 females followed by 3 males and 4 females each in the age groups of 29-34 years and 41-46 years respectively. The lowest number of respondents reportedly belonged to the age group of 35 - 40 years with two males and three females only.

## ii. Occupation status of healthcare workers

The occupation status of the respondents is given in table XLV

**TABLE XLV**  
**OCCUPATION STATUS**

Occupation status	Healthcare workers N=25
	N
Physician	9
Dietitian	12
Physiotherapist	2
Junior resident	2

Table XLV shows the occupation status of the healthcare workers. Among the 25 health workers, there were 12 dietitians out of which 11 were working as clinical dietitian and one was a freelance dietitian. For the rest of the 13 medical practitioners who responded, six were working as general doctors, two were dental surgeons, two were physiotherapists and 2 were junior residents.

## iii. Occupation status of Covid patient and general public

**TABLE XLVI**  
**OCCUPATION STATUS OF COVID PATIENTS AND GENERAL PUBLIC**

Occupation status	N=40	
	General Public N=20	Covid patients N=20
	N	N
Teacher	6	3
Government employee	1	2
Business	1	5
others	12	10

Table XLVI shows the occupation status of Covid patients and general public. Nine of the respondents were found to be working as teachers in schools and colleges, three were working as government employees in sectors like interior designing and soft skills training programme and the rest 28 of them were working in their own businesses and other sectors such as Human Resource Development, Arts and Craft and Family life Educator and Counselor.

## **b. PERCEPTION OF THE INFORMATIC TOOLS BY RESPONDENTS**

### **i. General Perception of the blog by respondents**

General perception of the blog by respondents is given in table XLVII

**TABLE XLVII**

#### **GENERAL PERCEPTION ABOUT THE BLOG**

<b>General Perception about the blog</b>	<b>n=65</b>		
	<b>Dietitian N= 12</b>	<b>General public N= 20</b>	<b>Covid patient N=20</b>
	<b>N</b>	<b>N</b>	<b>N</b>
Preparation of Covid friendly recipes	12	20	20
Pictures of menu planned is informative	12	20	20
The blog is helpful for self care during Covid	11	19	20

Table XLVII shows that all 65 respondents found the preparation videos of Covid friendly and immune boosting recipes helpful and 64 respondents felt the blog can help for self care and self management of the condition by the patient.

### **ii. Mode of sharing of blog**

Dietitians perception on mode of sharing of blog is given in XLVIII

**TABLE XLVIII**

#### **DIETITIAN'S PERCEPTION ON MODE OF SHARING THE BLOG**

<b>Dietitian's perception on mode of sharing the blog</b>	<b>N=12</b>
	<b>N</b>
Blog link shared to a patient's mail	7
Link displayed in the hospital poster	2
Blog shown by dietitian in the computer	3
I am not sure	nil

Table XLVIII shows the dietitians's perception on the mode of sharing the blog. Seven of the dietitians preferred sharing the link directly to a patient's mail while two of them

preferred displaying the link in the hospital poster. The rest of the dietitians i.e., three of them preferred showing the blog directly in their monitor to counsel the patients in hospitals.

**c. SYSTEM USABILITY SCALE RATING BY RESPONDENTS**

**i. SUS Rating by Healthcare workers**

SUS Rating of the blog by healthcare workers is given in table XLIX

**TABLE XLIX**

**SUS RATING BY HEALTHCARE WORKERS**

System Usability scale rating	Health care workers N=25					Individual Score	General Score
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
The blog is usable by user	nil	nil	2	15	8	82.5	<b>80.7</b>
The blog is unnecessarily complex	9	12	3	1	nil	70	
The blog is easy to use	nil	nil	1	15	9	75	
The blog requires the support of a technical person	10	12	3	nil	nil	67.5	
The functions of the blog is well integrated	nil	nil	2	16	7	67.5	
The blog is inconsistent	10	12	3	nil	nil	85	
The blog is a learning tool	nil	nil	nil	16	9	85	
The blog is difficult to use	12	11	1	1	nil	75	
The blog instills confidence in the user	nil	nil	3	12	10	55	
The user needs to learn a lot of things before using the blog	8	11	2	4	nil	57.5	
						90	
						67.5	
						100	
						80	
						62.5	
						87.5	
						85	
						92.5	
						100	
						90	
						90	
						82.5	
						85	
						90	
						95	

Table XLIX shows the System Usability scale rating of the blog by the healthcare workers. The blog was given a score of 80.7 which falls under the acceptable range for websites or informatics. (Bangor, 2009). Any site whose score is greater than 71 are considered to be feasible and acceptable by the users.

### ii. SUS Rating of the blog by Covid patients

SUS Rating of the blog by Covid patients is shown in Table L

**TABLE L**

#### **SUS RATING BY COVID PATIENTS**

System Usability scale rating	N=20					Individual Score	General Score
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
The blog is usable by user	1	nil	5	6	8	52.5	<b>82.4</b>
The blog is unnecessarily complex	10	9	1	nil	nil	67.5	
The blog is easy to use	nil	nil	2	8	10	72.5	
The blog requires the support of a technical person	11	6	2	nil	1	85	
The functions of the blog is well integrated	nil	nil	2	8	10	100	
The blog is inconsistent	9	9	2	nil	nil	70	
The blog is a learning tool	nil	nil	1	10	9	75	
The blog is difficult to use	11	8	1	nil	nil	87.5	
The blog instills confidence in the user	nil	nil	3	6	11	67.5	
The user needs to learn a lot of things before using the blog	6	8	2	3	1	67.5	
						90	
						72.5	
						95	
						100	
						100	
						100	
						87.5	

Table L shows the System Usability Scale rating of the blog by Covid patients. A score of 82.4 has been given which also falls under the acceptable range.

### iii. System Usability Scale Rating by General public

SUS Rating of the blog by General public is given in Table LI

**TABLE LI**

**SUS RATING BY GENERAL PUBLIC**

System Usability scale rating	N=20					Individual Score	General Score
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
The blog is usable by user	nil	nil	2	5	13	60	<b>84.3</b>
The blog is unnecessarily complex	12	7	1	nil	nil	75	
The blog is easy to use	nil	1	1	3	15	85	
The blog requires the support of a technical person	9	7	3	nil	1	80	
The functions of the blog is well integrated	nil	nil	1	11	8	87.5	
The blog is inconsistent	7	11	1	nil	1	70	
The blog is a learning tool	nil	nil	1	9	10	100	
The blog is difficult to use	11	8	1	nil	nil	77.5	
The blog instills confidence in the user	1	nil	1	9	9	90	
The user needs to learn a lot of things before using the blog	8	7	2	3	nil	75	

System Usability Scale Score given by General Public for the blog was found to be 84.3 which is A+ grade or best imaginable range according to Setemen (2019).

**iv. SUS Score for blog ( Pre test and Post test)**

SUS Score for pre blog and post blog is shown in table LII

**TABLE LII**  
**SUS SCORE FOR BLOG (PRE TEST AND POST TEST)**

Nature of Respondents	SUS Score Range n=65					
	< 60		60 - 80		81 -100	
	Pre test	Post test	Pre test	Post test	Pre test	Post test
Covid Patients	6	1	12	8	2	11
Healthcare Workers	13	2	11	8	1	15
General Public	10	0	8	8	2	12
Total	29	3	31	24	5	38

The score range taken for System Usability Scale were below 60, 60-80 and 81-100. Among the total respondents of 65, the highest number of 29 respondents rated the usage of blog below 60 during the pre test period followed by 31 respondents who rated it between 60-80 and only 5 rated its usage for the top score range of 81-100.

Post test period for usage of blog showed that highest number of 38 respondents rated the blog for a score range of 81-100 followed by 24 respondents who rated a score of 60-80 and only 3 respondents were found to rate below 60 score for the blog.

**Hypothesis of the study:**

**Null Hypothesis (H<sub>0</sub>) :** As a nutritional information tool, the blog demonstrates no substantial benefit.

**Alternative Hypothesis (H<sub>a</sub>) :** As a nutritional information tool, the blog demonstrates substantial benefit.

**v. T Test to compare Pre test and Post Test**

T Test to compare pre test SUS Sores and post test SUS Scores is shown in table LIII

**TABLE LIII**  
**T TEST TO COMPARE PRE TEST AND POST TEST**

<b>Nutritional Informatic Tool</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>	<b>Remarks</b>
Pre Blog SUS Score	62.0077	8.27623	11.287	64	.000	Significant
Post Blog SUS Score	82.3077	13.03771				

The table value of t-value (two-tailed): +/- 1.99773 at 0.05 significant level for the degrees of freedom 64)

According to the above table, the computed p-value (significant 2-tailed) between Pre-test and System usability scale is <0.01 , which is less than 0.01 at the 1% level of significance. As a result, the null hypothesis is rejected, and it is determined that as a nutritional information tool, the blog demonstrates substantial benefit.

The mean value of 'Pre Blog SUS' score is 62.0077, while the mean value of ' Post Blog SUS' Score is 8.27623, according to the results. When the mean score values of 'Pre Blog SUS' and 'Post Blog SUS' Scores are compared, the blog shows significant improvement as dietary informatic tool.

**vi. Reliability Statistics of the Questionnaire**

Reliability statistics of the questionnaire is shown in table LIV

**TABLE LIV**  
**RELIABILITY STATISTICS OF THE QUESTIONNAIRE**

<b>Reliability Statistics</b>	
<b>Cronbach's Alpha</b>	<b>N of Items</b>
.868	10

It is identified from table LVII that the Cronbach's alpha for all the constructs is above 0.8 which is higher than 0.7, which shows internal consistency among the items in the scale is attained good. So, all the constructs are reliable and fit for further analysis.

**d. CASE STUDY**

**Nutritional Screening and Assessment**

Patient Name: XYZ

Age: 26 years

Gender: Female

Community: Christian

Occupation: Business

Food Allergies: None

**i. Anthropometric Measurements**

Height: 5 feet 3 inches

Weight: 60 kgs

BMI: 23.43 kg/m<sup>2</sup> (Normal)

Physical Activity: Sedentary

**ii. Biochemical Data**

Rapid Antigen Test: Positive as on 16/04/2022

**iii. Clinical data**

C/O: Fever, nausea, fatigue, sore throat, headache

**iv. 24 Hour dietary Recall**

The 24 hour dietary recall is shown in table LV

**TABLE LV  
24 HOUR DIETARY RECALL**

<b>Meal</b>	<b>Food items</b>	<b>Serving</b>
Breakfast	Milk Tea + bread + butter	1 cup + 2 nos. + 1 tbsp
Lunch	Rice + Potato sabzi +Chicken curry + Dal + Tomato chutney	1 bowl + 1 katori + ½ cup + 1 katori + 1 tbsp
Evening	Tea + Marie lite biscuit	1 cup + 2 nos.
Dinner	Rice + vegetable curry + egg	1 bowl + ½ cup + 100gm

**v. Home diet nutritional calculations**

The home diet nutritional calculations is shown in table LVI

**TABLE LVI**  
**HOME DIET NUTRITIONAL CALCULATIONS**

<b>Ingredients</b>	<b>Amount</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Carbohydrate (g)</b>	<b>Fat (g)</b>
Milk tea	1 cup	72.9	3.26	4.48	4.48
Bread	2 nos.	245	7.8	51.9	0
Butter	1 tbsp	107	0.13	0.01	12.17
Rice	30g	106	2.38	23.47	0.16
Potato	100g	69	1.54	14.89	0
Chicken	50g	84	10.9	0	4.5
Dal	30g	159	9.25	22.24	0.2
Oil	5 ml	45	0	0	5
Tomato	30g	5.88	0.27	0.81	0.14
Tea	1 cup	17.5	0	0	0
Marie biscuit	2 nos.	150	3	21	3
Rice	30g	106	2.38	23.47	0.16
Carrot	20g	6.64	0.19	1.11	0.09
French beans	20g	4.88	0.5	0.54	0.05
Tomato	20g	3.92	0.18	0.54	0.09
Onion	10g	4.8	0.15	0.96	0
Oil	5 ml	45	0	0	5
Egg whole	1 no.	84.85	8.27	0	5.8
	<b>Total</b>	<b>1318</b>	<b>50.2</b>	<b>203.24</b>	<b>40.84</b>

The diet of the patient was found to be lower in calories than the recommended dietary allowances for an adult woman with sedentary lifestyle according to EAR 2020 which is 1660 Kcal. Protein is 5 grams higher than the normal dietary intake of 45g. Fat intake is higher than the RDA for women of 25 g/day (RDA, 2020). Diet does not contain all the food groups such as fruits and green leafy vegetables , milk and milk products as well as healthy fats. Carbohydrate intake is mainly from refined sources such as rice, white bread and potato. Diet was found to be low in essential vitamins and minerals.

**vi. Suggested diet plan**

The suggested diet plan for the patient is shown in figure 6

Meal Timing	Meal Planned	
Early morning 6:00 a.m	Ginger tea	100 ml
Breakfast 8:30 a.m	Sardine sandwich Soy milk Deskinnd almonds	2 nos. 100 ml 8 nos.
Mid morning 11:00 a.m	Beetroot juice Boiled Rajmah	100 ml 30 g
Lunch 1:00 p.m	Poached egg Black gram dal Aloo gobi Rice Strained spinach juice	1 no. 1 katori 1 kaori 1 bowl 50 ml
Evening snacks 3:00 p.m	Tulsi tea Marielite biscuit	1 cup 5 nos.
Pre dinner 5:00 p.m	Strained apple and pear juice Sprouted greens	100 ml 30g
Dinner 8:00 p.m	Paneer curry Sauteed zucchini Rice chicken roast	1 katori 1 katori 1 bowl 2 nos.
Bed time 10:00 p.m	Turmeric milk	100 ml

**Figure 6**  
**Diet plan suggested for Covid patient**

**vii. Medications**

Medications taken by the patient is shown in table LVII

**TABLE LVII**  
**MEDICATIONS**

Drug name	Route	Dose/Frequency	Action
Clavam	Oral	625 mg/BD	Antibiotic
Zincovit	Oral	850mg/OD	Multivitamin Multi mineral
Pantoprazole	Oral	40mg/BD	Antacid
Dolo	Oral	650mg/BD	Analgesic

**viii. Nutritional Recommendations**

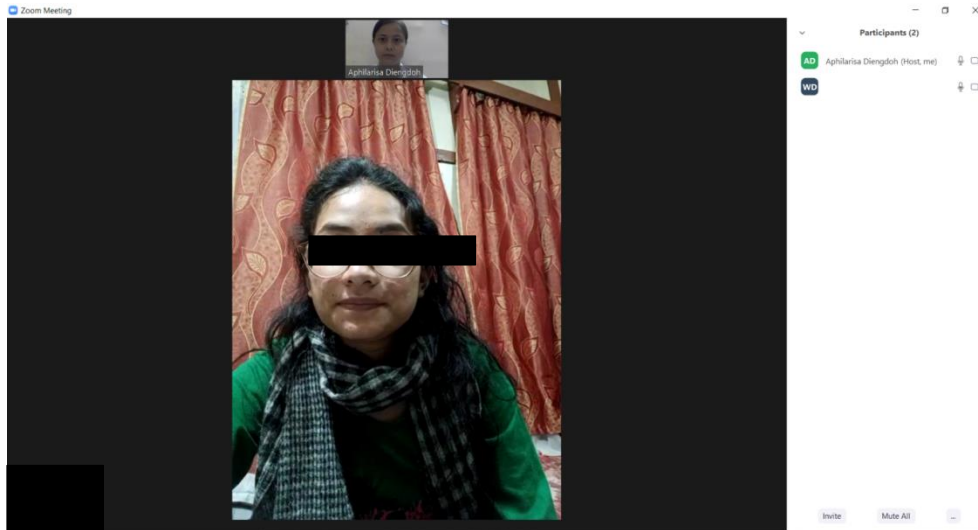
Nutrients recommendation of the patient is shown in table LVIII

**TABLE LVIII**  
**NUTRIENTS RECOMMENDATION**

Nutrients	Recommended intake
Energy	1800 kcal/d
Carbohydrate	270 g/d
Protein	60 g/d
Fat	30g/d

## ix. First day of Counselling for Covid patient

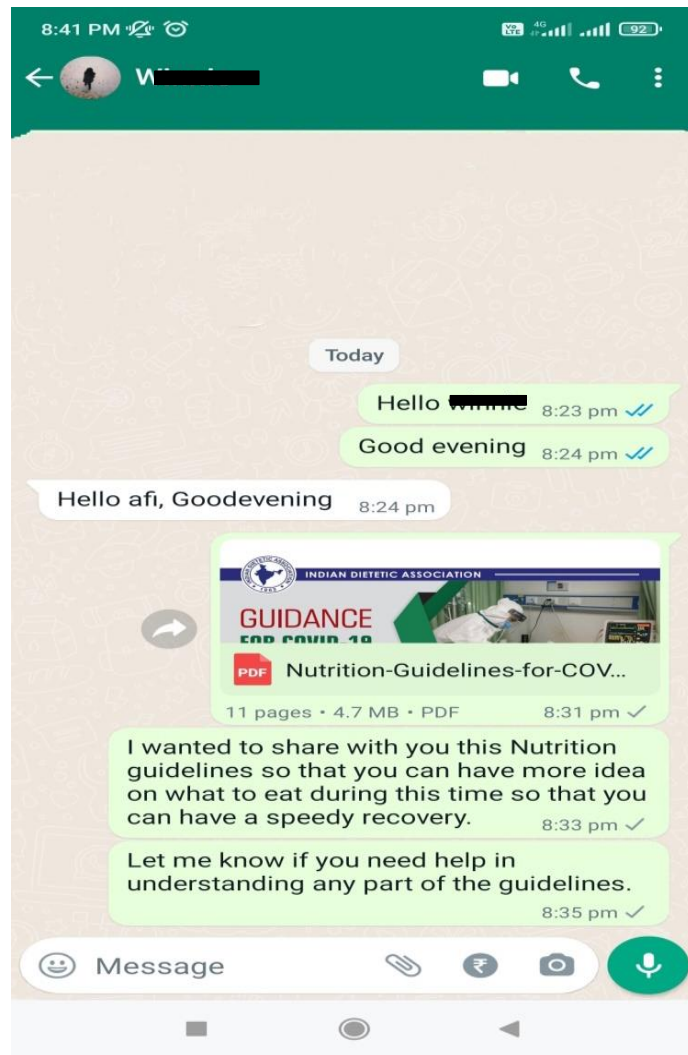
First day of Counselling is showed in figure 7



**Figure 7**

### **First day of counselling for Covid patient**

The patient on first day of Counselling informed to have been diagnosed with Covid 19 after undergoing a Rapid antigen test on the 16<sup>th</sup> of April, 2022. She was advised to go for home isolation for a period of 14 days by the health department. The patient had symptoms like fever, fatigue, nausea and sore throat. Her anthropometric measures, medications and dietary recall was carried out through a zoom call. After nutritional assessment was complete, she was advised to follow the diet planned for a woman with sedentary lifestyle as given in the blog and explanation was given to her on the type of foods to eat and foods to avoid while suffering from Covid 19. Since the patient had nausea, she was advised to include ginger tea too in her diet since ginger was found to have an anti emetic property (Lete et al., 2016). The patient's condition was tracked for a period of 5 days.



**Figure 8**

**Nutrition guidelines shared with patient**

Figure 8 showed the dietary guidelines given by Indian Dietetic Association being shared with the patient on day 1 of Counselling after the zoom meet ended to provide further assistance to her and also to keep her more informed about the dietary changes that she needed to follow for her speedy recovery.

**x. Patient on third day of Counselling**

Patient on third day of Counselling is showed in figure 9



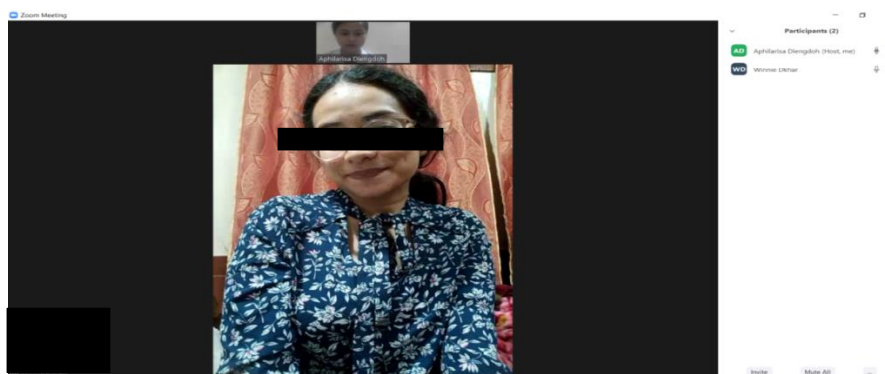
**Figure 9**

**Patient on Third day of follow up**

Third day of follow up was carried out through whatsapp messages. The patient was still having fever on day 3 but her nausea had improved after including ginger tea in her diet.

**xi. Patient on fifth day of follow up**

Fifth day of follow up for the patient is shown in figure 10



**Figure 10**

**Patient on fifth day of follow up**

Figure 10 showed the picture of a zoom meet being held with the patient on fifth day of her recovery period which was on the 21<sup>st</sup> of May, 2022. The patient admitted that the usage of the blog and the suggested diet plan as well as the dietary guidelines being shared had helped her enormously to gain physical strength and saw an improvement in her symptoms.



# SUMMARY & CONCLUSION



## V. SUMMARY AND CONCLUSION

In this new era and age, technology has made the deliverance of healthcare facilities to the people smoother and much more easier. Informatics is the use of technology and scientific knowledge to deliver necessary information to the general public. It has helped to bridge the gap that existed between patients and healthcare professionals. The Covid pandemic has shown how informatics was helpful to the healthcare providers in tackling the infectious disease in an effective manner from detecting the positive cases to providing immediate intervention to the patients in the nick of time.

The study titled “**Development of Dietary Informatics for Covid Patients**” was carried out with the objective of developing model diets for various age groups of Covid patients and dietary informatic tools for disseminating the model diets and finally to evaluate the effectiveness and acceptability of the developed informatics by selected respondents.

The methodology initially was carried out by selecting hospitals located in southern regions of India such as Andhra Pradesh, Kerala, Karnataka and Tamil Nadu since they possessed Covid wards which provides treatment to Covid patients. A survey form was distributed to the hospitals and based on the responses of dietitians, a telephonic interview was further conducted to elicit additional information on the types of diets offered to Covid patients.

Based on the existed Covid diets, 66 model diets were developed for age groups of 6-12 months, 1-3 yrs, 4-6 yrs, 7-9 yrs, 10-12 yrs, 13-15 yrs, 16-18 yrs, elderly and Covid patient with Diabetes mellitus. For the age groups of 10-18 years, the diet plans were developed for both the gender. The diets were developed under three categories such as General diets, North Indian diets and South Indian diets. Among the 66 diets, three diets were planned for Covid patients with diabetes mellitus since the condition was a major complication during the pandemic. A blog titled [covidiets.wordpress.com](https://covidiets.wordpress.com) was developed where the model diets was uploaded as blog post. Five Immunity boosting recipes such as Moong dal cheela, Golden Latte, Beetroot kheer, Egg dosa and Banana bread were prepared and their preparation videos were uploaded in the blog under Covid friendly recipes category. Another Counselling video for prevention of healthy individuals from contracting Covid was developed and uploaded in the blog.

Twenty five healthcare workers, twenty Covid patients and twenty General public were selected for evaluation of the developed dietary informatics tools. Evaluation was conducted online and the respondents were administered with a well structured questionnaire to elicit the required data on their demographic details, general perception on the tools and System usability scale (SUS) rating for evaluation of the blog. The SUS scale contained a set of ten questions written both in positive and negative sense. Questions of odd numbers like 1, 3, 5, 7 and 9 are in positive sense whereas questions of even numbers like 2, 4, 6, 8 and 10 are in negative sense. 5 multiple choice questions will be given for all questions i.e, strongly disagree, disagree, neutral, agree and strongly agree. Even numbered questions should get a response of strongly disagree or disagree whereas odd numbered questions should get a response of strongly agree or agree in order to get an acceptable score for the blog or website developed.

The salient findings of the study are summarized below:

- ❖ The diets prescribed in selected hospitals were found to include all the five food groups, herbs and spices, fibre rich foods, anti oxidant rich foods and immune boosters. Out of the four hospitals, Indigenous foods were however found to be included in only three hospitals except in Nalla Reddy hospital of Andhra Pradesh
- ❖ General diet plans were developed specially to be followed by the general public designed to incorporate food items familiar to the masses as well as those which are easily available and obtainable. It was evident from the study that from the general diets, a range of 90-95 per cent of energy requirements was met for all age groups except for 16-18 years whose energy requirement was higher at 96 per cent compared to the EAR.

When it comes to protein, 90-95 per cent of requirement was met for the age groups of 1 to 15 years including pregnant and lactating mothers when compared with the RDA requirement.

In case of carbohydrate, 95-100 per cent of RDA requirement was fulfilled for age groups of 4-12 years as well as infants of 6-12 months followed by 90-95 per cent being fulfilled for age groups of 1 to 3 years and the elderly population.

Another macronutrient like fat was reportedly to meet 90-95 per cent of requirement for age groups of 10-12 yrs of both gender including the elderly people whereas 95-100 per cent were seen in the rest of the age groups when compared with RDA.

When it comes to micronutrients, 90-95 per cent calcium requirements was met in the age groups of 1 to 18 years except 10-12 years children whose diet plans met 95-100 percent of the recommended calcium intake.

- ❖ North Indian diet plans were developed mainly for people residing in North India keeping in mind their food habits and dietary patterns. After the nutritive value calculations was done, it was evident that 90-95 per cent of energy requirements was met for all the age groups when compared with the Estimated Average Requirement.

Regarding iron requirement , 90-95 per cent was met for age groups of 10-12 yrs of both gender, and elderly people whereas 95-100 per cent were seen in the rest of the age groups when compared with RDA.

Carbohydrate is the main source of energy in the form of glucose and it was observed that 90-95 per cent of requirement was met in age groups of 10 to 18 years of both gender followed by 95-100 met by menu planned for an infant of 6-12 months and a child of 1 to 3 years when compared with RDA.

Calcium helps for bone development and 95-100 per cent was provided from the menu for the elderly and adolescents which justifies the RDA recommendation

- ❖ South Indian diet plans were developed for Covid patients residing in the Southern part of India. It was clear that 90-95 per cent of requirement was met for age groups except adolescents and Covid patients which reached 95-100 per cent of the total requirement compared to EAR.

90 to 95 per cent was seen for all the other nutrients like carbohydrate, protein, fat, calcium, iron, zinc and Vitamin C which was reached by diet plans of all age groups when measured against the RDA recommendation.

- ❖ On the whole, General diet plan, North Indian diet plan and South Indian diet plan met an average of 90-95 per cent of energy when compared with EAR, 90-95 per cent of calcium, iron and zinc requirement when compared with RDA and 95-100 per cent of protein, carbohydrate and fat requirements
- ❖ A blog titled covidiets.wordpress.com was developed using the free plan version and it is made available throughout. The appearance selected for the blog was Dyad 2 and the colour palette used was brownish yellow.
- ❖ In the blog, categories like general diet plan, North Indian Diet plan, South Indian diet plan, Suggestions given by AIIMS dietitian in the form of voice recording, Preparation videos of recipes and Counselling video for Covid prevention was uploaded. Overall 74 posts have been uploaded in the blog
- ❖ Nutritive value calculations of all the diet plans that was developed was uploaded in the blog for people's reference
- ❖ A Counselling video which stresses on the importance of eating healthy and nutritious foods during Covid pandemic to boost the immunity of the healthy person was developed. In the video, the types of foods to eat and avoid in order to prevent an individual from contracting Covid was mentioned.
- ❖ Recipes such as banana bread, beetroot kheer, moong dal cheela, egg dosa and golden latte was prepared and preparation videos was uploaded in the blog under Covid friendly recipes category.
- ❖ Among the total respondents of 65, 43 respondents were females and 22 were males. The highest number of respondents belonged to the age groups of 23 - 28 years with 11 males and 27 females. The lowest number of respondents reportedly belonged to the age group of 35 - 40 years with only two males and three females respectively.
- ❖ Among the 25 health workers who responded, 17 were females and only 8 were males. Among the 17 females, 13 of them belonged to the age group of 23-28 years followed by two in the age group of 35- 40 years and one each in the age groups of 29-34 years and 41-46 years respectively.

- ❖ From the 20 Covid patient respondents, 13 were females and seven were males. From the 13 females, the highest number were in the age group of 23-28 years with 7 females followed by three whose age falls in the age group of 29-34 years and one female patient each in the age group of 17-22 years and 41-46 years.
- ❖ Among the 20 general public who responded, 13 were females and seven were males. From the 13 females, seven of them belonged to the age group of 23-28 years followed by four belonging to 17-22 years age group and one each in the age groups of 35-40 years and 41-46 years respectively.
- ❖ Among the 25 health workers, there were 12 dietitians out of which 11 were working as clinical dietitian and one was a freelance dietitian. For the rest of the 13 medical practitioners who responded, six were working as general doctors, two were dental surgeons, two were physiotherapists and 2 were junior residents.
- ❖ The respondents which comprised of 20 Covid patients and 20 general public were working in various sectors. Nine of them were found to be working as teachers in schools and colleges, three were working as government employees in sectors like interior designing and soft skills training programme and the rest 28 of them were working in their own businesses and other sectors such as Human Resource Development, Arts and Craft and Family life Educator and Counselor.
- ❖ 11 out of 12 dietitians felt that the diet plans met the nutritional requirements of patients and the diet plans developed could help in self care and self management of patients and also save their time in the hospital setup.
- ❖ All 12 dietitians who took part in the study felt that preparation of Covid friendly recipes to boost the immunity of patients helpful.
- ❖ Seven of the dietitians preferred sharing the link directly to a patient's mail while two of them preferred displaying the link in the hospital poster. The rest of the dietitians i.e., three of them preferred showing the blog directly in their monitor to counsel the patients in hospitals.

- ❖ System Usability Scale rating (SUS) was used to evaluate the efficacy and acceptability of the dietary informatics developed. It has a score of 0 to 100 where SUS rating of 71 and above are considered to have a good acceptability by the users.
- ❖ System usability scale can also be shown in terms of adjectives like worst imaginable, poor, OK, Good, excellent and best imaginable with the corresponding scores of 0, 25, 51, 71, 85 and 100.
- ❖ SUS scores can also be interpreted in terms of grades such as A+ for a score of 84.1 and above, grade A for a score of 80.8 and above, grade A- for a score of 78.9 and above, grade B+ for a score of 77.2 and above, grade B for a score of 74.1 and above, grade B- for a score of 72.6 and above and grade C for a score of 65 and above.
- ❖ The System Usability Score given by healthcare worker for the blog was 80.7 followed by 82.4 which was the score given by general public and 84.3 which was the score rated by Covid patients. An Overall SUS score of the blog was found to be 82.5 which falls under the acceptable range for usability and efficacy by respondents.
- ❖ The score range for System Usability Scale were taken as below 60, 60-80 and 81-100. Among the total respondents of 65, the highest number of 29 respondents rated the usage of blog below 60 during the pre test period followed by 31 respondents who rated it between 60-80 and only 5 rated its usage for the top score range of 81-100.

Post test System Usability score showed that highest number of 38 respondents rated the top score range of 81-100 followed by 24 respondents who rated a score of 60-80 and only 3 respondents were found to rate below 60 score for the blog.

- ❖ A T test was done to compare the System usability score for pre blog and post blog, computed p value (significant 2-tailed) was found to be  $<0.01$ , which is less than 0.01 at the 1% level of significance. As a result, the null hypothesis is rejected, and it is determined that as a nutritional information tool, the blog shows substantial benefit
- ❖ The mean value of 'System Usability Scale (SUS)' score for post test is 82.3077, while the mean value of ' System Usability Score' for post test is 62.0077, and when the

mean score values of pre test and post test are compared, the blog shows significant improvement as dietary informatic tool.

- ❖ The reliability of the scale was measured by using the Cronbach alpha coefficient. The Cronbach's alpha for all the constructs is above 0.8 which is higher than 0.7, which shows internal consistency among the items in the scale is attained good.
- ❖ Case study of one female Covid patient whose age was 26 years was done. The patient's anthropometric, biochemical, clinical and dietary habits was recorded using zoom call. The patient was found to lead a sedentary lifestyle and had symptoms like nausea, sore throat, fatigue and body ache.

24 hours dietary recall of the patient was done and it was found that her diet was low in calories and protein and higher in fat intake. Diet did not contain all the five food groups and there was absence of milk and milk products, fruits and vegetables in her diet.

The patient was taking medications like Clavam 625 mg, Zincovit 850 mg, pantoprazole 40 mg and Dolo 625 mg for a period of five days as suggested by the health department.

Dietary guidelines given by Indian Dietetic Association was being shared with the patient on first day of Counselling after the zoom meet ended to provide further assistance to her and also to keep her more informed about the dietary changes that she needed to follow for her speedy recovery.

Since the patient had nausea, she was advised to include ginger tea too in her diet since ginger was found to have an anti emetic property. On the third day, Counselling was done through whatsapp in the form of messages where the patient informed that she was still having fever but her nausea had improved after including ginger tea in her diet.

On the fifth day of Counselling which was being held through a zoom call, the patient admitted that the usage of the blog and the suggested diet plan as well as the dietary guidelines being shared had helped her enormously to gain physical strength and she witnessed an improvement in her symptoms.

## CONCLUSION

Dietary informatics is an innovative tool that can act as an aid to the healthcare workers to save their time and effort in the hospital setup. The idea of the study was to create a tool that is helpful to both the healthcare workers and Covid patients since Covid is the main infectious disease that has been claiming the lives of many people worldwide. The tool success will however largely depend on the willingness of health professionals to incorporate the tool in their health setting and create awareness on their usage.

After the study was conducted, it was concluded that the blog titled [covidiets.wordpress.com](https://covidiets.wordpress.com) which was mainly developed for Covid patients was found to be welcomed by both the medical practitioners as well as the Covid patients. There is an also an increasing acceptability of the blog by the general public who took part in the survey. The presence of categories such as general diet plan, North Indian diet plan and South Indian diet plan has given the choice to patients belonging to any part of India to follow the diet according to their region and food preferences. Respondents also felt that the other dietary informatics developed in the form of Counselling videos and recipes preparation has helped them to gain more insights on the foods to eat and foods to avoid during Covid. The fact that the blog can easily be shared from one person to the other using a digital device has helped them to spread the knowledge they gained with their friends and family members. The blog after statistically tested has also shown to have a significant improvement as a dietary informatic tool and the System Usability Scores has been validated to have a good reliability for further research purposes.

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# ANNEXURES



# ANNEXURE 1

## ETHICAL APPROVAL LETTER

### 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

26<sup>th</sup> Februaury 2022

#### **Chairman**

Dr. Súdha Ramalingam  
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. Sudamani Ramasamy  
Dr. G. Victoria Naomi  
Dr. Judith Justin  
Dr. Anitha Subash

To  
Ms. Aphilarisa Diengdoh  
Department of Food Service Management and Dietetics  
Avinashilingam Institute for Home Science and  
Higher Education for Women  
Coimbatore – 641 043

Dear Aphilarisa Diengdoh,  
Ref: Your proposal No. IHEC/21-22/FSMD-05 entitled  
“Development of Dietary Informatic Tools for Covid-19” 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/  
FSMD-05 entitled “Development of Dietary Informatic Tools for  
Covid-19” submitted by you. The Approval number for the same is  
AUW/IHEC/FSMD-21-22/XPD-05.

We wish you all the best in your research endeavours.

Regards,

*Dr. S. Uma Mageshwari*  
Dr. S. Uma Mageshwari  
Member Secretary



## ANNEXURE II

### DEVELOPMENT OF DIETARY INFORMATICS FOR COVID PATIENTS

#### ORIGINALITY REPORT

<b>4%</b> SIMILARITY INDEX	<b>3%</b> INTERNET SOURCES	<b>2%</b> PUBLICATIONS	<b>2%</b> STUDENT PAPERS
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#### PRIMARY SOURCES

<b>1</b>	<a href="http://www.eatrightpro.org">www.eatrightpro.org</a> Internet Source	<1 %
<b>2</b>	<a href="http://www.ccypcg.qld.gov.au">www.ccypcg.qld.gov.au</a> Internet Source	<1 %
<b>3</b>	<a href="http://www.tarj.in">www.tarj.in</a> Internet Source	<1 %
<b>4</b>	Submitted to University of Pretoria Student Paper	<1 %
<b>5</b>	<a href="http://www.foodandnutritionjournal.org">www.foodandnutritionjournal.org</a> Internet Source	<1 %
<b>6</b>	<a href="http://www.ncbi.nlm.nih.gov">www.ncbi.nlm.nih.gov</a> Internet Source	<1 %
<b>7</b>	<a href="http://www.rsisinternational.org">www.rsisinternational.org</a> Internet Source	<1 %
<b>8</b>	<a href="http://www.scribd.com">www.scribd.com</a> Internet Source	<1 %
<b>9</b>	Joan L. Bottorff, Janice M. Morse. "Mothers' Perceptions of Breast Milk", Journal of	<1 %

### ANNEXURE III

My name is Aphilarisa Diengdoh. I am currently a second year student of Msc Food service Management and Dietetics and I am conducting a survey on the type of diets offered to Covid patients in hospitals. Can I take a moment of your time for this interview session? Yes/No

Name

Hospital you are working in

Designation

Do you have a Covid ward in your hospital

Do you have a specific menu for covid patients

What is the principle of diet followed for making the menu

What are the foods included in the menu

Do you include fibre rich foods in the menu

Do you include indigenous foods in the plan

What are the foods restricted for such patients

Any suggestion you would like to give for making diet plans for covid patients?

## ANNEXURE IV



### **Avinashilingam Institute for Home Science and Higher Education for Women**

(Deemed to be University Estd. u/s 3 of UGC Act 1956 , Category 'A' by MHRD)

Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B

Coimbatore -641 043, Tamil Nadu, India

Department of Food Service management and Dietetics

### **Questionnaire to be filled by a covid patient**

#### **SECTION 1**

1. Name :
2. Age :
3. Gender :
4. Email Id:
5. Occupation:
  - a) Student b) Teacher c) Business d) others, please specify
6. What are the common symptoms that you are experiencing. Please put a tick mark wherever possible
  - Fever
  - Cough
  - Fatigue
  - Sore throat
  - Headache
  - Body ache
7. Do you have any serious complications from Covid?
  - a) Yes b) No
8. If yes, what types of complications are you having?
9. Do you find any difficulty in consuming any food while suffering from Covid 19?
  - a) Yes b) No
10. Are you having any loss of taste or smell?
  - a) Yes b) No
11. Do you have nausea or vomiting sensations ?
  - a) Yes b) No
12. Do you have diarrhoea ?
  - a) Yes b) No
13. Do you have any appetite while having covid?
  - a) Yes b) No
14. If no, Why were you having loss of appetite?
  - a) Food din't look appetizing to me

- b) Because I had nausea and vomiting sensation
- c) Because I had loss of taste and smell
- d) Others

15. If others, please specify?
16. What type of foods you like during Covid?
17. What makes that food palatable to you?
18. Do you have any food allergies?
  - a) Yes
  - b) No
19. If no, what are you allergic to?
20. What would you like to say from your experience with Covid 19?

## **SECTION 2**

21. Do you find the videos on preparation of covid- friendly recipes helpful?
  - a) Yes
  - b) No
22. If no, please specify the reason
23. Do you find the pictures of menu planned informative ?
  - a) Yes
  - b) No, Reason
24. Did you find the video on immune boosting foods helpful?
  - a) Yes
  - b) No
25. Do you feel these diet plans are affordable and cheap?
  - a) Yes
  - b) No. Reason
26. Do you feel this blog can help you for self care during covid at home?
  - a) Yes
  - b) No
27. Did you find foods you like from the menu planned?
  - a) Yes
  - b) No

## **SECTION 3**

28. System Usability scale (Appendix VIII)
29. Do you think you will be able to follow the diet plan suggested according to your age group?
  - a) Yes
  - b) No, Reason
30. If no, please specify the reason
31. Do you find this blog helpful to you?
  - a) Yes
  - b) No
32. What do you like most about this blog?
33. Are you recommending this blog to your friends and family members?
  - a) Yes
  - b) No

## ANNEXURE V

### Questionnaire to be filled by a physician

1.Name :

2.Age :

3.Gender :

4.Email Id:

5.Designation:

- a) Intern
- b) General Physician
- c) Medical officer
- d) Others- please specify

6.Hospital/organisation you are currently working in:

7. System Usability Scale (Appendix VIII)

8.Would you recommend your patients to follow these diet plans?

- a) Yes
- b) No

9.Would you advise dietitians in your hospital to use this blog for covid patient?

- a) Yes
- b) No

10.Will it be time saving for physicians too to use this blog to give counselling to covid patients

- a) Yes
- b) No

11.If no, please specify the reason why?

12.What do you think is the easiest way to use this blog for patient education?

- a) Blog Link shared to a patient's mail
- b) Blog Link shown in a poster in the hospital setup
- c) Blog being shown by a healthcare provider in the computer
- d) I am not sure

13.By using this blog, do you feel it will help you to manage a covid patient during this pandemic ?

- a) Yes
- b) No

14.If yes, in what way will it help you?

15.Have you ever come across a diet related blog used in the hospital setup before?

- a) Yes
- b) No

16.If yes, what was it about?

17.Did you find any discrepancies in this blog

- a) Yes
- b) No

18.If yes, please specify

19.Any feedback or suggestion that you would like to give from a physician's point of view?

## ANNEXURE VI

### Questionnaire to be filled by a dietitian

1. Name :
2. Age :
3. Gender :
4. Email Id:
5. Designation:
  - a) Clinical dietitian
  - b) Community dietitian
  - c) Freelance dietitian
  - d) Others, please specify
6. Hospital/organisation you are currently working in:
7. System Usability Scale (Appendix VIII)
8. As a dietitian, do you find the development of this dietary blog useful?
  - a) Yes
  - b) No
9. Will it save time for dietitians in the clinical setup to use this blog for patient education?
  - a) Yes
  - b) No
10. Do you find the materials in the blog easily understandable?
  - a) Yes
  - b) No
11. Do you feel that the diet plans meet the nutritional requirements of the patients?
  - a) Yes
  - b) No
12. Do you feel that dietary guidelines given by IDA are being met by these diet plans?
  - a) Yes
  - b) No
13. Do you feel patients of different age groups can follow the plans given accordingly?
  - a) Yes
  - b) No
14. Do you feel that videos uploaded on preparation methods of recipes helpful ?
  - a) Yes
  - b) No
15. Do you feel the blog is self- explanatory to patients?
  - a) Yes
  - b) No
16. Do you feel the blog is complicated to be used in the hospital setup?
  - a) Yes
  - b) No
17. Do you feel the blog is a good concept to give diet counseling by sharing the link to patients?

- a) Yes      b) No
18. Do you feel that the blog can support the mission of disease prevention and health promotion?  
a) Yes      b) No
19. Do you find the pictures of meal planned helpful for patient's knowledge?  
a) Yes      b) No
20. Would you recommend your patients to follow these model diet plans?  
a) Yes      b) No
21. Do you feel that the North Indian and South Indian diet planned justify the region's dietary habits?  
a) Yes      b) No
22. Can the use of this blog help self-care management of patients with mild symptoms?  
a) Yes      b) No
23. Do you find the diet which is planned for covid patients with diabetes mellitus safe to be followed?  
a) Yes      b) No
24. Are the amounts given for each meal plan satisfactory?  
a) Yes      b) No
25. Is the counseling video on how to incorporate immune boosting foods for covid 19 prevention helpful ?  
a) Yes      b) No
26. Can these diet plans be easily followed by patients?  
a) Yes      b) No
27. What do you think is the easiest way to use this blog for patient education?  
a) Blog Link shared to a patient's mail  
b) Blog Link shown in a poster in the hospital setup  
c) Blog being shown by a dietitian in the computer  
d) I am not sure
29. If yes, please specify
30. Any suggestion or feedback you would like to give regarding the blog from a dietitian's perspective?

## ANNEXURE VII

### Questionnaire to be filled by general public

- 1 Name :
2. Age :
3. Gender :
4. Email Id:
5. Occupation:
  - b) Student
  - c) Teacher
  - d) Business
  - e) Health worker
  - f) Others- please specify
6. Is the blog regarding Covid 19 helpful to you?
  - a) Yes      b) No
7. What do you like the most about this blog?
8. Please put a tick mark wherever necessary in the table below:-  
  
System Usability Scale (Appendix VIII)
9. Do you find the videos on preparation of healthy recipes helpful?
  - a)Yes      b) No
10. If no, please specify the reason
11. Do you find the pictures of menu planned informative ?
  - a)Yes      b) No
12. Do you feel this blog can help you for self care during covid at home?
  - a)Yes      b) No
13. Do you find the contents in the blog easy to understand?
  - a) Yes      b) No
14. Are you recommending this blog to your friends and family members?
  - a) Yes
  - b) No

## ANNEXURE VIII

1. The blog titled covidiets.wordpress.com has been developed. Please check the blog link provided and put a tick mark in the table below wherever possible.

### System Usability Scale

	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly agree</b>
I think that I would like to use this blog frequently					
I found the blog unnecessarily complex					
I thought the blog was easy to use					
I think that I would need the support of a technical person to be able to use this blog					
I found the various functions in this blog were well integrated					
I thought there was too much inconsistency in this blog					
I would imagine that most people would learn to use this blog very quickly					
I found the blog very cumbersome to use					
I felt very confident using the blog					
I needed to learn a lot of things before I could get going with this blog					