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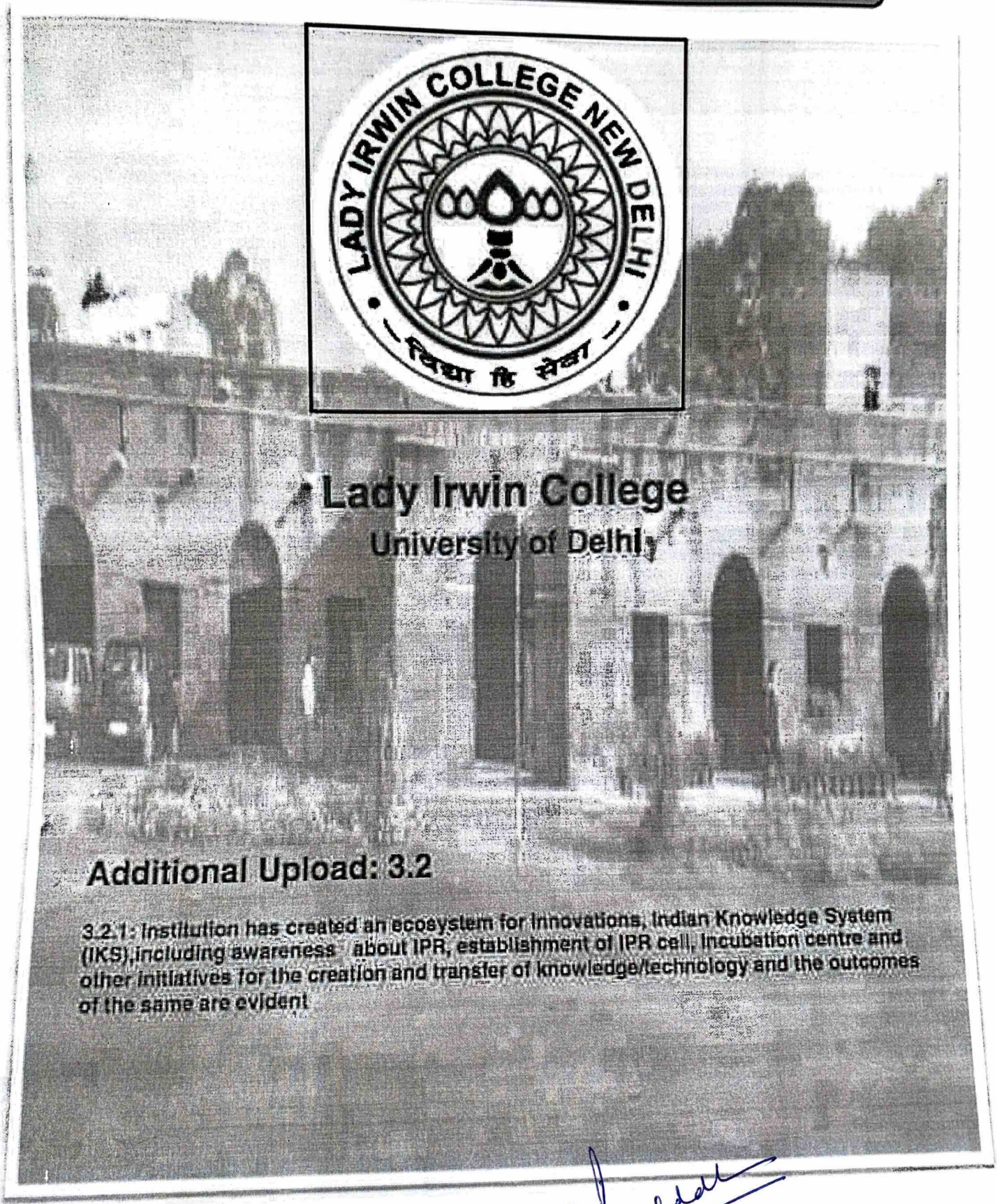

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CONTENTS:

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- **Design Innovation Centre Annual Reports**
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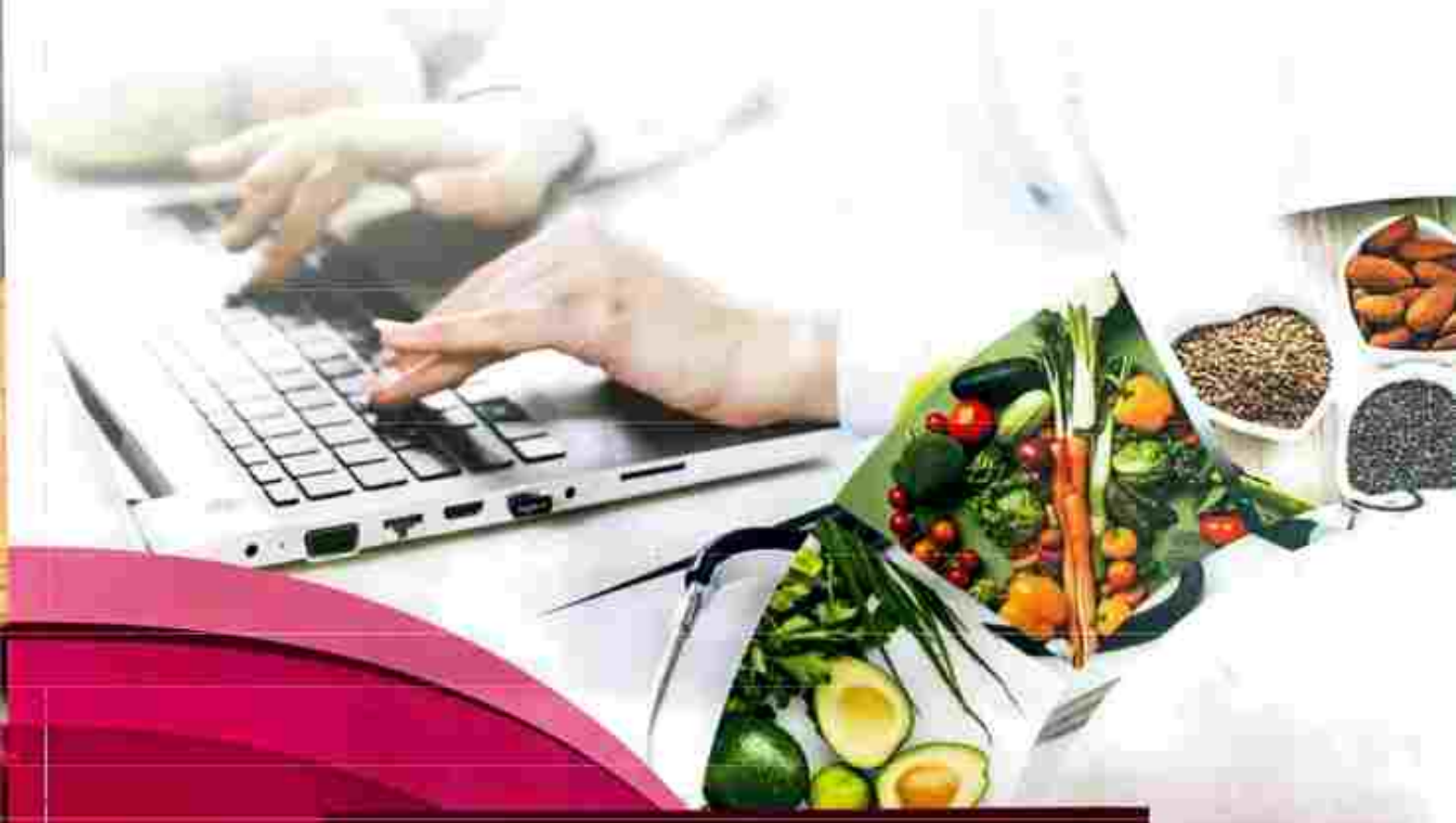

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Contents

NUTRITIOUS RECIPES

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&
Those With Other Nutritional Deficiency Diseases

Prof. (Dr.) Neena Bhatia | Dr. Neha Bakshi | Dr. Anjani Bakshi

Microorganisms as Potential Source for Food Sustainability

| Chapter | First Online: 21 February 2024

| pp 167–175 | Cite this chapter

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Aarti Yadav, Rekha Mehrotra & Preeti Verma

Part of the book series: World Sustainability Series ((WSUSE))

Abstract

The existing food structures are based on unsustainable methods that fails to circumvent the issue of rising population and accessibility for the nutritious diet, thus embarking the new sustainable, reliable and nutritious sources such as micro-organisms. Microbes are the most suitable alternative as nutritional source as they have minimal carbon footprint, limited usage of resources such as land, water, nutrients and seasonal dependence. Additionally, with the advances in synthetic biology, potential of microbes has been raised to the next level to meet the many unmet nutritional demands.

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Chapter 5 - Laccase engineering: tailoring laccases for effective and efficient catalysis

Aarti Yadav [1], Khushi Khera [1], Arunima [1], Rekha Mehrotra [1], Preeti Verma [1], Deepti Yadav [2], Tukayi Kudanga [2]

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Abstract

Laccases are oxidoreductase enzymes isolated commercially mainly from bacterial and fungal sources. Laccases have a wide range of applications in bioremediation, the food, pulp and paper industries, and dye decolorization due to their ability to act upon various substrates such as polyphenols, aromatic amines, heterocyclic compounds, and some inorganic ions. For many years, these enzymes have been targeted by scientists employing protein engineering approaches such as site-directed mutagenesis, directed evolution, and saturation mutagenesis to alter the amino acid sequences to improve certain catalytic properties such as substrate specificity, stability, and redox potential, in order to make them more efficient. This chapter provides oversight of approaches that can be used to modify bacterial laccases to improve catalytic properties. In addition, an insight into the computational strategies employed for the annotation of enhanced catalytic function is also provided.

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Contents

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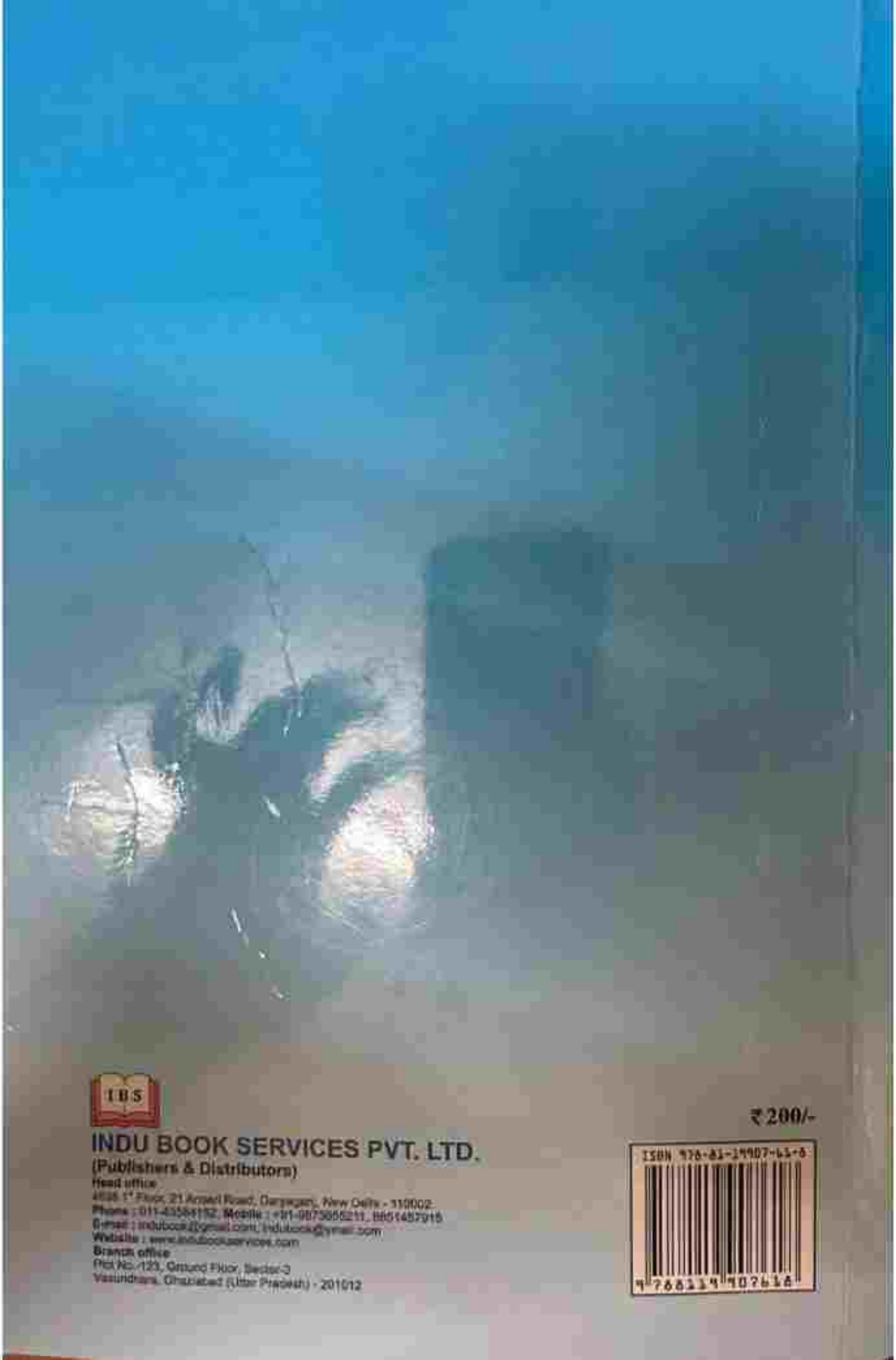

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- The book offers concise, comprehensive, and systematic coverage of all key topics in the Nutrition and Dietetics syllabus for nursing students.
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- Written by nutrition experts from the Department of Food and Nutrition and Food Technology, Lady Irwin College, University of Delhi.
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Chapter 17
General Overview of Composition, Use in Human Nutrition, Process of Sprouting, Change in Composition During Sprouting, Parameters Affecting Nutritional Quality During Sprouting, Benefits of Sprouts, Nutritional Values and Food Safety Issues of Allium Sprouts

Bindu Bazaria and Neeraj

17.1 Introduction

Traditional systems of medicine, contemporary medications, nutraceuticals, dietary supplements, folk remedies, pharmaceutical intermediates, and chemical entities used in the production of synthetic pharmaceuticals all receive their drugs from medicinal plants. Medicinal plants are the richest bio-resource of drugs because they contain active ingredients, medicinal plants can be of use in the treatment of a variety of human illnesses (Dosa, 2009). Plants in their whole, including their leaves, vegetables, roots, and seeds, contain phytochemicals. The genus Allium members like garlic, chives, onions, leeks and scallions also possess health improving compounds. These are rich in the sulphur compounds that are responsible for the therapeutic effects. The cloves of garlic which have the shape of teardrops and are covered in dry skin-like sheets, are combined to form the bulb.

Sprouting has been increasingly popular in recent years. When compared to consuming mature vegetables, the nutritional advantages of sprouts are far more concentrated, which is helping to drive their meteoric rise in popularity (Naji et al., 2017). Most people eat sprouts uncooked since they are low in calories, high in fibre, enzymes, protein, and a variety of other important micro-nutrients. When

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It is reported functional foods are highly nutritious and associated with a number of powerful health benefits. They may protect against disease, prevent nutrient deficiencies, and promote proper growth and development. Functional Foods: Technological Challenges and Advancement in Health Promotion presents information related to bioactive compounds present in the functional foods, derived from fruits and vegetables, cereals and pulses, dairy and meat, herbs and spices and other foods. It describes novel techniques and methodologies used in the extraction, isolation, encapsulation, identification and characterization of bioactive compounds.

Key Features:

- Covers the most recent research related to the bioactive compounds present in the functional foods
- Presents the latest information on extraction, isolation, encapsulation, identification and characterization
- Discusses formulation challenges with an emphasis on stability and safety evaluations of functional foods

Finally, it includes substantial and scientific research and innovation for new product development with health benefits. This book will serve as a valuable resource for researchers, academicians, and students interested in many aspects of functional foods.

Table of Contents

Maiduo Islam, Praveen Saini, Kamlesh Prasad

Chapter 12

Herbs as a functional food for health care

Gholamreza Abdi, Mukul Machhindra Barwant and Abu Saeid

Chapter 13

Potential role of bioactive compounds from foods in current Scenario

Nur Alim Bahmid, Andi Rahmayanti, Heru Pirta Hastuti, Muhpidah, Rawati Karim

Chapter 14

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Micronutrients Levels in Covid-19 Patients - Systematic Review of Hospitalized Patients

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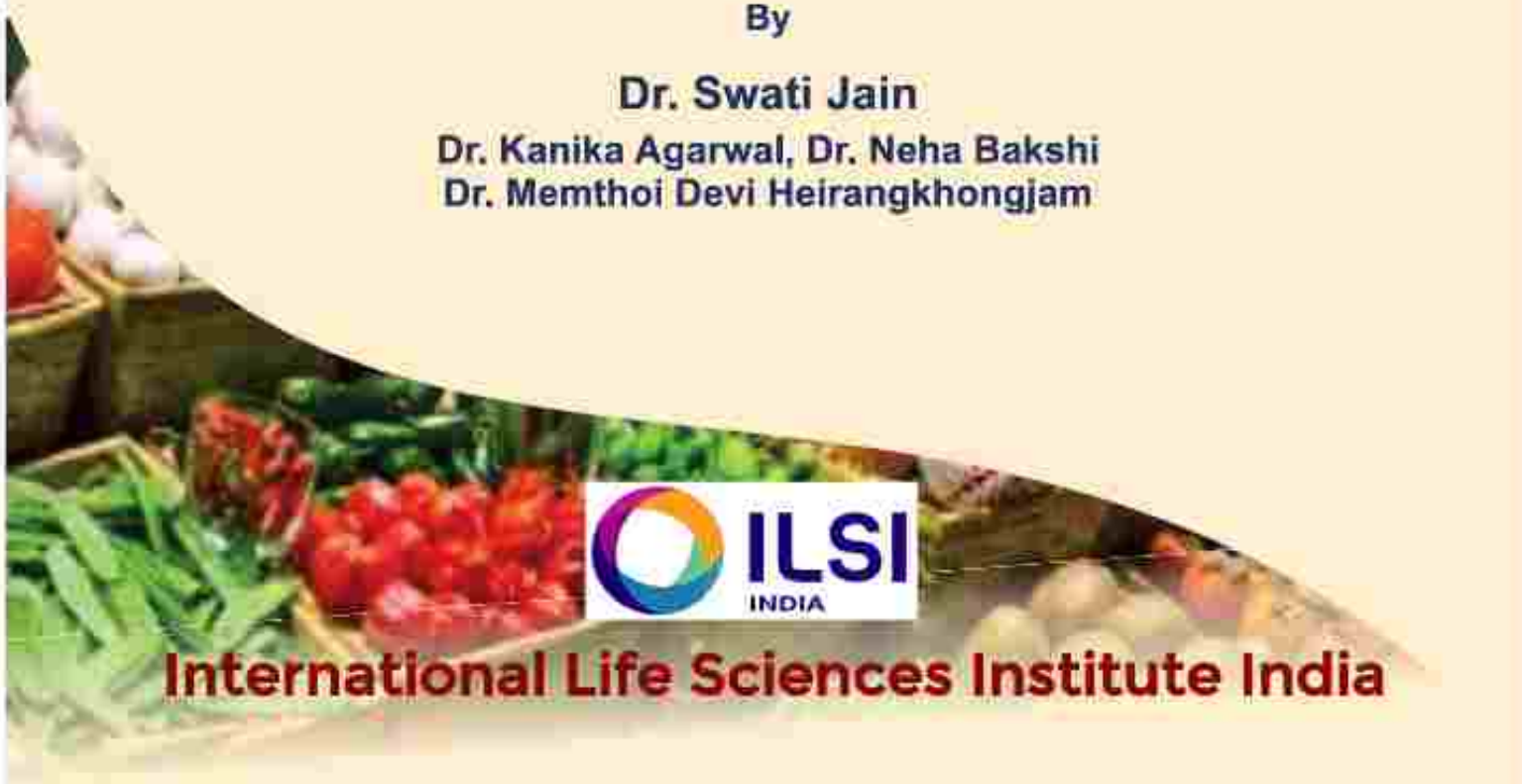

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ILSI India activities primarily focus on local and regional issues and involve leading national and international experts in the deliberations. ILSI India is the leader in the region in focusing attention and devoting resources on critical areas in food and water safety, nutrition, risk assessment, harmonization of food regulations, improvement in the health profile of malnourished children and women, and agriculture sustainability including biotechnology. Special attention is given to the importance of complementary foods and food fortification. All activities follow Principles of Scientific Integrity which are part of ILSI Mandatory Policies.

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ILSI envisions a future where its thought leadership positively impacts health and sustainability through decisions informed by science and provides input to overcome global food challenges through collaboration across sectors.

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Micronutrients Levels in Covid-19 Patients - Systematic Review of Hospitalized Patients

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Contents

LIST OF FIGURES

LIST OF TABLES

Foreword

The world suffered from Covid-19 Pandemic which began towards the end of 2019 and is still continuing. Covid-19 had devastating effects on health, food and nutrition security as well as the economy. The pandemic will be remembered as one of the most disastrous occurrences in human history in the recent times. World still must recover from the unprecedented sufferings and huge devastation caused by Covid-19. However, the world reacted most remarkably in the fight against Covid-19. Sharing of information, resources, cooperation and collaboration in vaccines development and supply had positive impact on arresting the disease spread and bringing it under control.

Indian population also suffered from the adverse consequences of Covid-19. Concerned with the speed at which the infection was spreading and heaping untold miseries on people, ILSI India decided to look at the role of nutrition in prevention and management of infectious diseases like Covid-19. A Systematic Review was undertaken to study micronutrient levels in Covid-19 hospitalized patients. The objective of the Review was to learn some lessons and initiate action to reduce the sufferings.

The Review reveals that patients suffered from Hypovitaminosis as well as mineral deficiencies which adversely affected body's immunity and thus reduced body's ability to fight infections. Micronutrients deficiencies made Covid-19 patients more vulnerable to disease progression and severity outcomes. The presence of co-morbidities such as diabetes, hypertension etc. in Covid-19 patients further complicated the matter. Higher mortality, greater length of hospital stays, ICU admissions, and higher CRP levels were witnessed in such patients.

It is, therefore, recommended that Covid-19 patients should be checked for their micronutrient levels soon after admission to the hospital so as to integrate micronutrient supplementation into therapeutic management of Covid-19. This could be considered as an additional intervention to reduce disease severity.

This study further corroborates the role of nutrition in building health and immunity. It is hoped that the findings will be useful to policy makers, medical professionals, nutritionists, dieticians, researchers besides the other health care providers.

B.K. Nandi
(Chairman)

ABSTRACT

Coronavirus Disease 2019 (Covid-19) pandemic has created a global health crisis. The present systematic review evaluated the impact of micronutrient status on the occurrence and prognosis of Covid-19. The review was done using PRISMA Statement. The main search engines used in the present research were PubMed, Google Scholar, Science Direct and Springer. The search explored all the relevant studies related to micronutrient status of hospitalized Covid-19 patients/critically ill Covid-19 patients, with or without comorbidities. The micronutrients studied were Vitamins A, B, C, D and K and Minerals - Zinc and Selenium. All study designs such as, Retrospective, Cohort, Prospective, Case-Control were included (All papers published till February, 2021). A total of 6944 articles were identified from the databases (PubMed- 657; Google Scholar- 1504, Science Direct- 2840 and Springer- 194) and screened by four reviewers. A total of **42** papers were included for the review. The present systematic review showed lower micronutrient levels among Covid-19 patients. Hypovitaminosis mainly Vitamin D and lower levels of minerals possibly impacted the immune system.

1. INTRODUCTION

Malnutrition in both forms undernutrition and overnutrition has an impact on immune response to infections. The availability of nutrients in the host's body determines and stimulates specific and non-specific defense mechanisms and immune responses towards the pathogen. An acute infectious state induces hyper catabolism in the body, subsequently causing further loss and depletion of body nutrient stores along with increased nutrient demands. In any case, the nutritional state of the host plays an important role in susceptibility to infections and in recovery. The association between nutrition and the immune system is established, hence the role of nutrition in Covid-19 has been emphasized since the beginning of the pandemic (Butler et.al., 2021). Specific nutrients like Vitamins A, B Complex (Folic Acid, Vitamins B_6 and B_{12}), D, C, and the Minerals Fe, Se, Cu, and Zn, have been proven to enhance immune function (Richardson & Lovegrove, 2021). The relationship between nutrition and Covid-19 disease is becoming more distinct. It is imperative to monitor Covid-19 surviving patients for a long-term period to assess their anthropometric and biochemical parameters to ensure satisfactory recovery (Gröber& Holick., 2021).

Recent research has shown that a sub-optimal micronutrient status may support the onset of Covid-19 and augment its severity (Wei et al., 2020; Carr 2020; Alzaben et al., 2020). Micronutrients like Vitamins A, B, C and D along with Zinc and Selenium have especially shown connections in critical illness with complications like respiratory infections, lung function, duration of hospital stay etc. (Szeto et al., 2020; Marik et al., 2020). It is important to consider that differences in susceptibility and severity of Covid-19 could be partly due to insufficient micronutrient levels for adequate immune and organ function. At present, most studies are based on small number of hospitalized patients, generating strong evidence on altered micronutrient status in severe/critical cases of Covid -19 (Abrishami et al., 2020; Arvinte et al., 2020; Ye et al., 2020, Heller et al., 2021). This systematic review aims to examine the influence of micronutrient status of Covid-19 hospitalized patients on their clinical course and prognostic measures like hospital stay, mortality rates, respiratory distress etc. This would be beneficial for critical care physicians in management of the disease and adopting appropriate medical nutrition therapy, thereby improving patient outcomes.

2. METHODS

2.1 SEARCH STRATEGY AND SELECTION CRITERIA

This systematic review was carried out following the guidelines of Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) Statement (Liberati et al., 2009). An extensive literature search was conducted by a team of four reviewers using four databases PubMed, Google Scholar, Science Direct and Springer. The search explored all the relevant studies related to micronutrient status of hospitalized Covid-19 patients/critically ill Covid-19 patients, with or without comorbidities like diabetes, hypertension, obesity, renal dysfunction, non-pregnant, non-lactating women population across the world. The micronutrients studied were Vitamins A, B, C, D and K and Minerals - Zinc and Selenium. Electronic health records of such hospitalized critically ill Covid-19 patients were also taken into account for literature search. Studies with Covid-19 associated complications as outcomes i.e., plasma/serum nutrient levels, length of hospital stay, survival rate to discharge, mortality rate, respiratory distress, any other micronutrient specific measure were included in the review. Only full-length research papers published in English were included. Due to the limited number of research studies conducted on Covid-19, all study designs such as; Retrospective, Cohort, Prospective, Case-Control were included. Owing to the heterogeneity in the selected studies, the collected data was not appropriate for meta-analysis. Therefore, the eligibility criteria of the included studies and study design was conducted according to the PICOS Model (Population, Intervention, Comparison, Outcome, Study Design), to analyze the retrieved relevant articles and to carry out in depth processing of the collected data. A comprehensive search was made using the key words: ("vitamin" OR "micronutrient status") AND ("Covid-19 hospitalized patients" OR "Covid-19 ICU patients"). Other methods were also employed for identifying relevant and additional studies like reference checking, hand searching or contacting experts in the field. The final result is shown with the PRISMA flow diagram (***Figure 1***).

A total of 6944 articles were identified from the databases (PubMed- 657; Google Scholar- 1504, Science Direct- 2840 and Springer- 194) and screened by four reviewers. After an initial screening for the micronutrients, an exclusive screening was undertaken as per the keywords, micronutrients status and title of the study. The assessment of the potentially relevant studies was screened independently by all the four reviewers. Subsequently, all the identified articles were further screened and grouped as accepted or rejected. The rejected papers were further categorized on the basis of 3 Criteria viz. Review Paper, Publication Date i.e., Papers Published after February, 2021 and for any 'Other Reason' like article not related to Covid-19, unavailability of full-length paper, not written in English language, letter to editor, patients aged less than 18 years, not hospitalized, etc. Lastly, all the accepted articles were further screened for any duplicates and any disagreement was resolved through a consensus of all four reviewers.

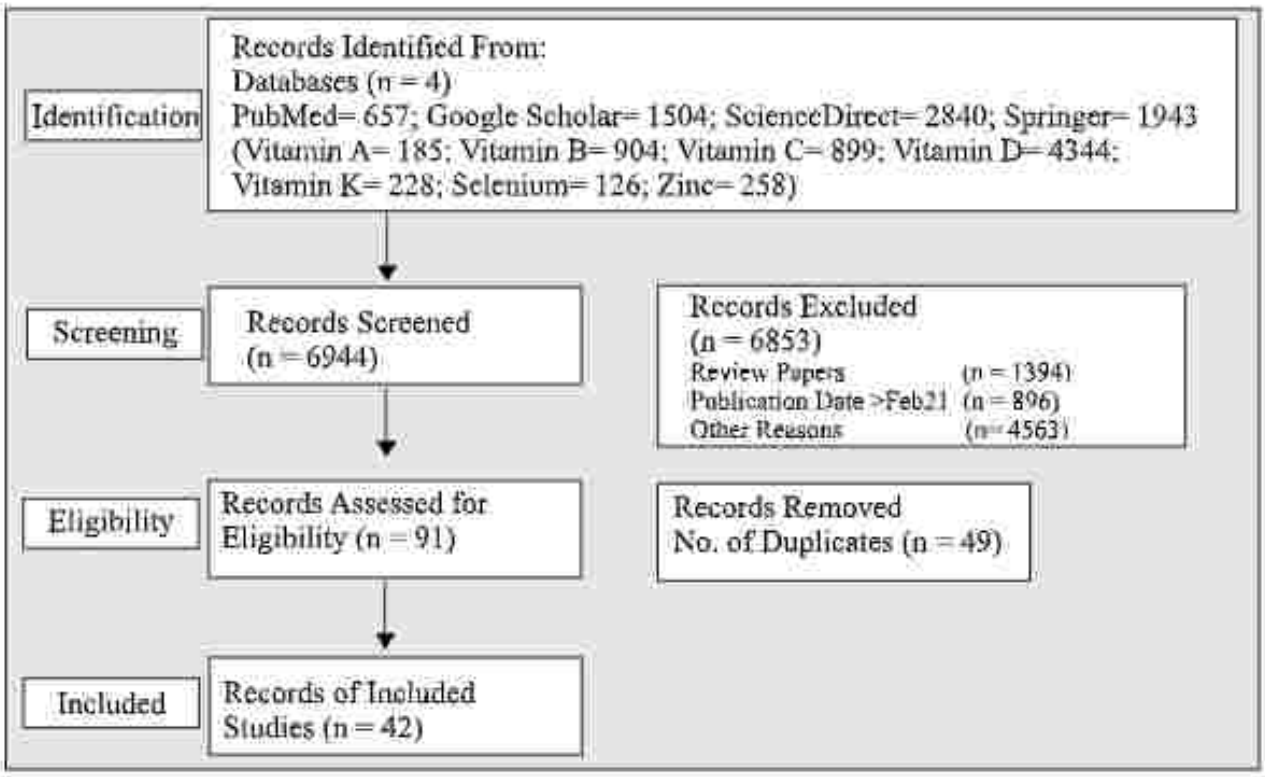

Figure 1. Flow Diagram of Study Selection Process According to PRISMA Guidelines

2.2 DATA EXTRACTION AND ANALYSIS

Descriptive findings from the selected studies were extracted to a spreadsheet and checked for accuracy by all the four reviewers. The following information was extracted from each article- first author, year of publication, study design, locale of the study, study population, severity of Covid-19 infection, sample size and micronutrient status. This extracted information was further segregated and categorized as per the variable of interest viz micronutrient and its baseline level, micronutrient status and its relationship with Covid-19 outcomes/severity, mortality, duration of hospital stay, ICU admission and inflammation. The analysis of the included studies was performed to evaluate and conclude the micronutrient status of Covid-19 hospitalized/critically ill ICU patients ⩾ 18 years and its relation to various outcomes related to plasma/serum nutrient levels, length of hospital stay, survival rate to discharge, mortality rate, respiratory distress, etc.

3. RESULTS

3.1 KEY CHARACTERISTICS OF STUDIES INCLUDED

A total of **42** articles / published papers were included for the review. The key characteristics of the studies are presented in ***Table 1***. Studies included both males and females hospitalized adults. Out of the 42 studies, 8 studies have been conducted in European Countries followed by 6 studies from Asian Countries and the rest were from North America, South America, and Africa. Different types of Observational Studies such as Cross-Sectional, Cohort, Matched Case-Control were included to assess the role of micronutrient status on Covid-19 in hospitalized patients. The sample size of these studies ranged from 21 to 646 patients.

The literature search showed a majority of the studies that assessed Serum Vitamin D Levels followed by studies on other Micronutrients such as Vitamin C, Vitamin K, Vitamins B_1, B_6, and B_{12} and Minerals like Selenium and Zinc. No study was found to assess the Serum Vitamin A Levels among Covid-19 hospitalized patients. The Covid-19 outcomes assessed in each of the included studies covered mostly lung involvement, mortality, length of hospital stay, ventilation support, the severity of disease (ICU admission) to name a few.

Table 1. Key Characteristics of the Studies Included

S.No.	Author/ Year	Country	Population	Severity of Covid-19 Infection	Study Design	Sample Size (Covid-19 Cases)	Micronutrients
1	(Abrishami et al., 2021)	Iran	Adults, Male and Female	**Lung Involvement**	Retrospective Study	73	**Vitamin D**
2	(Arvinte et al., 2020)	USA	Adults, Male and Female	**Critically Ill**	Cross Sectional, Pilot Study	21	**Vitamin C and Vitamin D**
3	(Barassi et al.,n.d.)	Italy	Adults, Male and Female	**Hospitalized Patients**	Cross Sectional Study	118	**Vitamin D**
4	(Bennouar et al., 2021)	Algeria	Adults, Male and Female	**Severe Hospitalized Patients**	Cohort, Prospective, Single-Center Study	120	**Vitamin D**
5	(Carpagnao et al., 2021)	Italy	Adults, Male and Female	**Acute Respiratory Failure due to Covid-19**	Retrospective, Observational Study	42	**Vitamin D**

6	(Demir et al., 2021)	Turkey	Adults, Male and Female	**Hospitalized Patients**	Retrospective Cohort Study	Covid-19 (227) and Non Covid-19 Patients (260)	**Vitamin D**
7	(Elibol & Baran, 2021)	Turkey	Adults, Male and Female	**Hospitalized Patients**	Cross Sectional Study	300	**VitaminD**
8	(Ersöz & Yılmaz, 2021)	Turkey	Adults, Male and Female	**Hospitalized Patients**	Descriptive Observational Study, Retrospective Review of File	310	**Vitamin B 12, Folate, Iron, Vitamin D**
9	(Ferrari et al., 2020)	Italy	Adults, Male and Female	**Hospitalized Patients**	Retrospective Cohort Study.	347	**Vitamin D**
10	(Gonçalves et al., 2020)	Brazil	Adults, Male and Female	**ICU Patients**	Cross-Sectional Descriptive Study	176 Elderly Patients.	**Vitamin D**
11	(Hernández et al., 2021)	Spain	Adults, Male and Female	**Hospitalized Patients**	Retrospective Study	216 Covid Patients and 196 Control.	**Vitamin D**
12	(Infante et al., 2021)	Italy	Adults, Male and Female	**Hospitalized Patients**	Retrospective Study	137	**Vitamin D**
13	(Abdollahi et al., 2021)	Iran	Adults, Male and Female	**Hospitalized Patients**	Matched Case Control	201 Cases with Covid-19 and 201 Controls	**Vitamin D**
14	(Adami et al., 2021)	Italy	Adults, Male and Female	**Hospitalized Patients**	Retrospective Observational Study	61	**Vitamin D**
15	(Baktash et al., 2020)	UK	Older Patients Aged ≥65 Years	**Hospitalized Patients**	Prospective Cohort	105	**Vitamin D**
16	(De Smet et al., 2021)	Belgium	Whites of European Descent	**Hospitalized Patients**	Retrospective Observational	186	**Vitamin D**

17	(Kerget et al., 2020)	China	Adults	**Hospitalized Patients**	Case Control	108	**Vitamin D**
18	(Macaya et al., 2020)	Spain	Adults	**Attending Emergency Department**	Retrospective	80	**Vitamin D**
19	(Orchard et al., 2021)	UK	Adults	**Admitted to ICU**	Cohort Study	646 SARS-CoV-2 Positive Patients Hospitalized	**Vitamin D**
20	(Pizzini et al., 2020)	Austria	Predominantly Male Individuals (60%), Aged 58 ± 14 Years	**Hospitalized Patients as well as Outpatiens with Persistent Symptoms**	Prospective Multicenter Observational Study	22 Hospitalized +87 Out Patients	**Vitamin D**
21	(Radujkovic et al., 2020)	Germany	Adults	**Hospitalized as well as Outpatiens**	Prospective Non Interventional Register	185-93 Hospitalized, 92-Outpatients	**Vitamin D**
22	(Sulli et al., 2021)	Italy	Elderly	**Hospitalized but not in ICU**	Age and Sex-Matched Case-Control Study	65 Consecutive Covid-19 Patients (Mean Age ± 13 Years) and 65 Sex-and Age- Matched Control Subjects (CNT) were Analyzed	**Vitamin D**

23	(Szeto et al., 2021)	USA	Adults	**Covid Positive Hospitalized Patients**	Retrospective Medical Record Review	700	**Vitamin D**
24	(Tehrani et al., 2021)	Iran	Adults	**Hospitalized Patients**	Descriptive Retrospective	205	**Vitamin D**
25	(Vassiliou et al., 2021)	Greece	Adults, Male and Female	**ICU and Non-ICU Patients**	Observational Single-Center Study	29 Covid-19 Patients in ICU and 10 Hospitalized Covid-19 Patients in Non-ICU	**Vitamin D**
26	(Vassiliou et al., 2020)	Greece	Adults, Male	**Critically Ill ICU Patients**	Observational Study	30	**Vitamin D**
27	(Ye et al., 2020)	China	Adults, Male and Female	**Healthy Individuals Mild, Moderate, Severe/ Critically Ill Patients**	Case-Control Study	80 Healthy Controls and 62 Patients Diagnosed with Covid-19	**Vitamin D**
28	(Cereda et al., 2021)	Italy	Adults, Male	**Severe Pneumonia, ICU Patients**	Cohort Study	129	**Vitamin D**
29	(Heller et al., 2021)	Germany	Adults, Male and Female	**Covid-19 Infected Patients**	Cross-Sectional Study	35	**Zinc and Selenium**
30	(Mardani et al., 2020)	Iran	Adults, Male and Female	**Respiratory Difficulties and Lung Infection**	Observational Study	123	**Vitamin D**
31	(Jothimani et al., 2020)	India	Adults, Male and Female	**Acute Respiratory Distress**	Observational Study	47	**Zinc**
32	(Karahan & Katkat, 2021)	Turkey	Adults, Female	**Severe and Critical Covid-19**	Retrospective Observational Study	149	**Vitamin D**

33	(Pinzon et al., 2020)	Indonesia	Adults, Male and Female	**Covid-19 Infected Patientswith Various Signs and Symptoms and Comorbidities**	Case Series	10	**Vitamin D**
34	(Alguwaihes et al., 2020)	Saudi Arabia	Adults, Male and Female	**Covid-19 Infected Patientswith Diabetes Mellitus**	Single-Center Retrospective Study	439	**Vitamin D**
35	(Alkattan et al., 2021)	Saudi Arabia	Adults, Male and Female	**Patients Infected with SARS-CoV-2 and Diagnosed with Covid-19**	Cross-Sectional Study	80 (Severe Cases, n=35, Non-Severe Cases, n=45)	**Copper, Iron, Selenium, and Zinc**
36	(Im et al., 2020)	South Korea	Adults, Male and Female	**Covid-19 Infected Patients with Respiratory Distress**	Observational Study	50	**Vitamin B_1, B_6, B_{12}, Vitamin D (25 hydroxyvitamin D), Folate, Selenium, and Zinc**
37	(Moghaddam et al., 2020)	Germany	Adults	**Covid-19 Patients**	Cross-Sectional Study	33	**Selenium**
38	(Hani et al 2021)	Indonesia	Adults, Male and Female	**Hospitalized Patients**	Cross-Sectional	50 Patients	**Vitamin D**
39	(Pizzini et al., 2020)	Austria	Adults	**Hospitalized Patients**	Prospective Multicentre Observational CoILD Registry	87 Hospitalized Patients 18 out of these were in ICU	**Vitamin D**

40	Dofferhoff et al 2020	Netherlands	68± 12 Years, both Males and Females	**Hospitalized Patients**	Case-Control	135 Hospitalized Covid-19 Patients and 184 Historic Controls	**Vitamin K**
41	(Goncalves et al., 2021)	Brazil	Males and Females, 66-81 Years Old	**Hospitalized Patients**	Observational Study	269 Patients Admitted in the ICU Required Invasive Mechanical Ventilation	**Zinc**
42	(Vogel-González et al., 2021)	Spain	Males and Females, Median Age 65 (54 - 75 Years)	**Hospitalized Patients**	Observational Cohort Study	240 Hospitalized Patients	**Zinc**

Note : "Hospitalized Patients" denotes "Mild Cases and Mild Infections."

3.2 MICRONUTRIENTS STATUS AND RELATIONSHIP WITH COVID-19 OUTCOMES / SEVERITY

3.2.1 Lung Involvement

The relationship of micronutrient status and the Covid-19 related outcomes specific to lung function is described in this section. Studies that assessed the role of micronutrient status with Covid-19 and associated lung involvement are presented in ***Table 2.***

Table 2. Association of Micronutrients Status with Lung Involvement Among Hospitalized Covid-19 Patients

S.No.	Author/ Year	Micronutrients	Measurement of Baseline Levels	Key Findings
1	(Abrishami et al., 2021)	**Vitamin D**	25(OH)D Concentration < 25 ng/mL.	**Higher Levels of 25(OH)D were Associated with Significantly Less Extent of Total Lung Involvement (β=0.10, P=0.004).**
2	(Barassi et al., n.d.)	**Vitamin D**	Vitamin D >30.0 ng/ml	**Vitamin D Levels in O_2 support Patients were Significantly Higher Among Patients than those on Continuous Airway Pressure Devices and Non-Invasive Mechanical Ventilation.**
3	(Demir et al., 2021)	**Vitamin D**	Vitamin D > 30 ng/ml	**Patients with Serum Vitamin D Levels > 30ng/ml had Lower Lung Involvement.**
4	(Kerget et al., 2020)	**Vitamin D**	NA	**Vitamin D Levels were Lower in Covid-19 Patients vs Controls (p=0.004).** **Patients who Developed Acute Respiratory Distress and Macrophage Acute Syndrome had Significantly Lower Vitamin D Levels than Controls (p=0.001).**
5	(Sulli et al., 2021)	**Vitamin D**	NA	**Covid-19 Patients had Significantly Lower Serum Vitamin D Levels vs Controls. Higher Vitamin D Levels were Significantly Correlated with PaO2 (p = 0.03), SO2 (p = 0.05), PaO2/FiO2 (p=0.02).** **A Negative Correlation was Observed Between Serum Vitamin D Levels and Severity of Radiologic Pulmonary Involvement.**

6	(Gonçalves et al., 2021)	**Zinc**	Serum Zinc <70ug/dL - Low Zinc Levels	**Low Serum Zinc Levels were Statistically Significantly Associated with Severe Acute Respiratory Distress Syndrome after Adjusting for Baseline Variables (OR, 15.4; 95% CI, 6.5-36.3; P<.001).**
7	(Adami et al., 2021)	**Vitamin D**	NA	**Patients with pO2 <60 mmHg had Significantly Lower Levels of Serum 25 (OH) D Compared to Patients with pO2 ≥ 60 mmHg (13.3 ng/mL vs 20.4 ng/mL Respectively, p=0.03).**
8	(Alkattan et al., 2021)	**Selenium and Zinc**	Selenium (mcg/L)-138, Zinc (mcg/dl)-121.78	**There was a Significant Elevation of Selenium and Iron Serum Levels Among Severe Cases (Those Who were Later Diagnosed with Respiratory Distress/Pulse Oximeter Saturation <=93% or PaO2/FiO2 <300 mmHg) Compared to Non-Severe Cases of Covid-19. No Significant Difference was Observed Between Zinc Levels of both Groups.**
9	(Orchard et al., 2021)	**Vitamin D**	Normal Vitamin D Level (>50 nmol/L) and Vitamin D Deficiency (<50 nmol/L)	**No Significant Differences in Invasive and Non-Invasive Mechanical Ventilation Between Patients with Low and Normal Vitamin D Levels.**
10	(Jothimani et al., 2020)	**Zinc**	Zinc Concentration was 80–120 mg/dl. A Zinc Level<80 mg/dl was Defined as 'Deficient'	**Covid-19 Patients with Significantly Lower Zinc Levels were Found to have Higher Rates of Complications, Acute Respiratory Distress Syndrome when Compared to Controls.**
11	(Pizzini et al., 2020)	**Vitamin D**	25 (OH)D- 30-50 nmol/L. Insufficient, Above 100 nmol/l- Normal	**Low Vitamin D Levels at the Onset of Disease and At Follow Up were not Significantly Related to Lung Impairment.**

Several studies have observed that lower Vitamin D levels may lead to lung impairment (Abrishami et al., 2021; Adami et al., 2021; Demir et al., 2021; Kerget et al., 2020; Pizzini et al., 2020; Sulli et al., 2021). Few studies have reported that lower Zinc levels may lead to acute respiratory distress (Gonçalves et al., 2021; Jothimani et al., 2020), while some have found no relationship (Alkattan et al., 2021). The results indicate a significant effect of the levels of Vitamin D on pulmonary function during Covid-19. To our knowledge, we provide evidence here that amongst all the micronutrients studied, it is Vtamin D that could have the most profound effect on lung function.

3.2.2 Mortality

Several studies have assessed the role of micronutrient status and Covid-19 associated mortality **(Table 3)**. Majority of these studies reported that a lower micronutrient status (Vitamin D, Zinc, B_{12}, Vitamin C) resulted in higher mortality due to Covid-19. Out of the 19 Studies , 17 studies have shown that a deficient micronutrient status for Vitamins- B, C, D and Minerals - Zinc and Selenium has a direct effect on the survival rates of Covid-19 patients.

Table 3. Association of Micronutrients Status with Mortality Among Hospitalized Covid-19 Patients

S.No.	Author/Year	Micronutrients	Baseline Levels	Findings
1	(Abrishami et al., 2021)	**Vitamin D**	25(OH)D Concentration < 25 ng/mL	**Vitamin D Deficiency was Associated with a Significant Increase in the Risk of Mortality.**
2	(Arvinte et al., 2020)	**Vitamin C and Vitamin D**	Vitamin C (17–154 µmol/L), Vitamin D_2 and D_3 (30–100 ng/mL)	**Older Age and Low Vitamin C Levels were Co-Dependent Risk Factors for Mortality.**
3	(Bennouar et al., 2021)	**Vitamin D**	Vitamin D >78 nmol/l or >30 µg/l	**The Lowest Mortality Rate was Observed Among the Group with Adequate 25(OH) D Levels (>78 nmol/l or 30 µg/l).**
4	(Carpagnano et al., 2021)	**Vitamin D**	Vitamin D Insufficiency, Moderate and Severe 20–29, 10–19, and <10 ng/mL respectively	**After 10 Days of Hospitalization, Severe Vitamin D Deficiency Patients had a 50% Mortality Risk, While those with Vitamin D ≥ 10 ng/mL had a 5% Mortality Risk.**
5	(Ersöz & Yılmaz, 2021)	**Vitamin B_{12}**	NA	**A Lower Level of Vitamin B_{12} was Associated with Patient Mortality.**

6	(Infante et al., 2021)	**Vitamin D**	Serum 25(OH)D Levels <30 ng/mL	**Serum 25(OH)D Levels at Admission were Significantly Higher in Survivors than Non Survivors. Serum 25(OH)D Levels were Significantly Inversely Associated with the Risk of Covid-19 Related in Hospital Mortality.**
7	(Radujkovic et al., 2020)	**Vitamin D**	16.6 (12.4 –22.5) ng/ml	**Vitamin D Deficiency was Associated with Severity/ Mortality of Covid-19 Patients.**
8	(Tehrani et al., 2021)	**VitaminD**	The Mean Level of Vitamin D was 33.86 ± 26.42 in the Moderate Group and 35.41 ± 21.25 in the Severe Group	**Vitamin D Deficiency was Associated with a Significant Increase in the Risk of Mortality.**
9	(Karahan & Katkat, 2021)	**Vitamin D**	Vitamin D Groups; Normal (Serum 25(OH) Vitamin D Level >30 ng/mL), Vitamin D Insufficiency (21-29 ng/mL), and Deficiency (<20 ng/mL)	**Serum 25(OH) D was Independently Associated with Mortality in Covid-19 Patients.**
10	(Alguwaihes et al., 2020)	**Vitamin D**	25(OH)D (nmol/l) (75–250)	**Severe Vitamin D Deficiency (Adjusted HR- 7, CI (2.7-28.2, p=0.007) was Associated with Death.**
11	(Vogel-González et al., 2021)	**Zinc**	Zinc <50ug/dL- Low Zinc Levels	**Serum Zinc Levels Lower than 50 µg/dL at Admission Correlated with Worse Clinical Presentation, Longer Time to Reach Stability, and Higher Mortality. Serum Zinc Concentration at Admission was Significantly Higher Among Individuals who Survived (62 µg/dL. (52–72)) Compared to those who Died (49 µg/dL (42–53); p < 0.001).**
12	(Moghaddam et al., 2020)	**Selenium**	SELENOP Quantification ELISA, Total Serum Se, and Glutathione Peroxidase Activity	**Selenium Status was Significantly Higher Among Survivors than Non-Survivors.**

13	(Heller et al., 2021)	**Zinc and Selenium**	The Lower Limit (Zn Deficiency) at <642.5 µg/L is Represented by the Bottom 2.5% of Zn Values. Serum Zn below 638.7 µg/L and Serum SELENOP below 2.56 mg/L	**Concentrations (Combination of Serum Zn and Serum SELENOP) within the Reference Ranges Indicate High Chances for Survival.**
14	(Szeto et al., 2021)	**Vitamin D**	Vitamin D Deficiency (<20ng/ml) and Normal Vitamin D Levels (>=20ng/ml)	**No Significant Relationship was Observed Between Pre Hospitalization Serum Vitamin D Status and Mortality.**
15	(Vassiliou et al., 2021)	**Vitamin D**	Vitamin D Deficient (19.9 ng/ml, N ¼ 32) and Vitamin D Insufficient (20-29.9 ng/ml, N ¼ 7)	**No Difference was Observed Between Vitamin D Deficient and Insufficient Groups with Respect to Hospital Mortality or Disease Severity.**
16	(Vassiliou et al., 2020)	**Vitamin D**	25(OH)D Levels, Patients were Stratified in Two Groups: Higher and Lower Than the Median Value of the Cohort (15.2 ng/mL)	**Low Vitamin D Group (Lower than 15.2ng/ml) had an Increased Risk of 28-Day Mortality.**
17	(Cereda et al., 2021)	**Vitamin D**	25(OH) D Serum Levels : Insufficient (<30 -20 ng/mL), Moderately Deficient (<20-10 ng/mL), Severely Deficient (<10 ng/mL)	**A Significant Positive Association Between Increasing 25(OH) D Levels and In-Hospital Mortality was Observed.**
18	(Jothimani et al., 2020)	**Zinc**	Zinc Concentration was 80–120 mg/dl. A Zinc Level<80 µg/dl was Defined as 'Deficient'	**Covid-19 Patients Showed Significantly Lower Zinc Levels when Compared to Healthy Controls Resulting in Increased Mortality.**
19	(De Smet et al., 2021)	**Vitamin D**	Serum 25 (OH) D was 18.6 ng/ml	**Vitamin D Deficiency on Admission after Adjusting for Confounders was Found to be Associated with Mortality (Odds Ratio [OR], 3.87; 95% Confidence Interval [CI], 1.30-11.55).**

3.2.3 Duration of Hospital Stay

Few studies have assessed the role of micronutrient status and length of hospital stay among hospitalized Covid-19 patients as shown in ***Table 4.***

Table 4 Association of Micronutrients Status with Duration of Hospital Stay Among Hospitalized Covid-19 Patients

S.No.	Author/Year	Micronutrients	Baseline Levels	Salient Findings
1	(Hernández et al., 2021)	**Vitamin D**	Serum 25(OH)D Levels <20 ng/mL (50 nmol/L)	**Vitamin D Deficient Covid-19 Patients had a Greater Prevalence of Longer Length of Hospital Stay than those with Serum 25(OH)D Levels ≥ 20 ng/mL.**
2	(Demir et al., 2021)	**Vitamin D**	Vitamin D > 30 ng/ml	**Patients with Vitamin D Levels of >30 ng/ml had Significantly Shorter Hospital Stays.**
3	(Szeto et al., 2021)	**Vitamin D**	Vitamin D Deficiency (<20ng/ml) and Normal Vitamin D Levels (>=20ng/ml).	**No Significant Relationship was Observed Between Pre Hospitalization Serum Vitamin D Status and Length of Stay.**
4	(Jothimani et al., 2020)	**Zinc**	Zinc Level<80 µg/dl was Defined as 'Deficient'	**Covid-19 Patients with Significantly Lower Zinc Levels When Compared to Healthy Controls had Prolonged Hospital Stay.**
5	(Orchard et al., 2021)	**Vitamin D**	Normal Vitamin D Levels (>50 nmol/L) and Vitamin D Deficiency (<50 nmol/L)	**No Significant Differences in the Number of Hospital Days Between Patients with Low and Normal Vitamin D Levels.**

3.2.4 ICU Admission

A study by Baktash et al., (2020) conducted on older hospitalized patients of United Kingdom aged 65 years and above reported that Vitamin D deficient patients had a high dependency unit admission (30.77 % vs 9.68%, p=0.042). Another study found that lower Vtamin D levels were associated with ICU admission (Ersöz & Yılmaz, 2021). On the other hand, one study did not report any difference in Vitamin D levels among hospitalized patients and those admitted to the ICU (Orchard et al., 2021). Though, we found an effect of

the serum levels of micronutrients on mortality and hospital stay (***Table 3 and Table 4***), the results do not indicate conclusive evidence on the rate of ICU admissions of Covid-19 infected patients. Further, these studies only show the role of Vitamin D and signifies the importance of the optimal levels of this vitamin.

3.2.5 Inflammation

Five studies reported data on the relationship between serum Vitamin D levels and inflammation among hospitalized Covid 19 patients (Adami et al., 2021; Barassi et al., 2021; Demir et al., 2021; Pizzini et al., 2020; Sulli et al., 2021). The serum levels of 25(OH)D, the circulating metabolite of Vitamin D, are inversely correlated with inflammation. However, owing to the small number of studies and heterogeneity in the study designs included in the review , this warrants further investigation.

Table 5. Association of Micronutrients Status with Inflammation Among Hospitalized Covid-19 Patients

S.No.	Author/Year	Micronutrients	Baseline Levels/ Cut-Offs	Key Findings
1	(Barassi et al., 2021)	**Vitamin D**	Vitamin D >30.0 ng/mL	**Negative Correlation Between Serum Vitamin D and C-Reactive Protein Levels.**
2	(Sulli et al., 2021)	**Vitamin D**	NA	**Statistically Significant Negative Correlation Observed Between Serum Vitamin D levels C-Reactive Protein (p =0.04).**
3	(Demir et al., 2021)	**Vitamin D**	Vitamin D > 30 ng/ml	**Patients with Vitamin D Levels of >30 ng/ml had Significantly Lower D-Dimer and C-Reactive Protein (CRP) Levels.**
4	(Adami et al., 2021)	**Vitamin D**	NA	**Patients with 25(OH)D Below 15 ng/mL were more likely to Show Increased Levels of CRP on Admission. Patients with 25 (OH) D Below 20 ng/mL had a 3-Fold Higher Risk of Having CRP Above 50 mg/L (n=28, 63.8%) Compared to Patients with Normal Vitamin D.**
5	(Pizzini et al., 2020)	**Vitamin D**	25 (OH)D-30-50 nmol/L Insufficient, Above 100 nmol/l-Normal	**Low Vitamin D Levels at the Onset of Disease At Follow Up were not Significantly Related to Inflammation or Severity of Disease.**

3.2.6 Miscellaneous

Apart from the above results, some studies also assessed the prevalence of micronutrient deficiencies among patients with Covid-19. Other research articles focused on Hypovitaminosis among Covid-19 patients (Abdollahi et al., 2021; Gonçalves et al., 2020; Hani et al., 2020; Im et al., 2020; Macaya et al., 2020; Pinzon et al., 2020; Ye et al., 2021). An Observational Study conducted on hospitalized ICU patients (aged 66-81 years) observed a prevalence of 79.6% of Low Serum Zinc Levels (Gonçalves et al., 2021). A Case-Control Study by Dofferhoff et al. (2020) on Dutch hospitalized adults reported an insufficiency of Extrahepatic Vitamin K since dp-ucMGP was increased in Covid-19 patients compared to controls ($p<0.001$).

It is interesting to note that there are a few studies with contradictory findings to what most studies present. A Retrospective Cohort Study conducted in Italy did not find any relationship between Vitamin D status and Covid-19 (Ferrari et al. 2020). Another Cross-Sectional Study conducted in Turkey did not find a statistically significant relationship between Low Vitamin D Levels and Dysgeusia among patients (Elibol & Baran, 2021). One Cross-Sectional study showed that Covid-19 cases had a significant elevation of Selenium (Alkattan et al., 2021), while another reported that many patients were deficient in Selenium (Im et al., 2020). There are limited number of published studies and heterogeneity in the study designs. We believe that these differences could have changed the outcomes.

4. Discussion

Coronavirus disease (Covid-19) is an infectious disease caused by SARS CoV-2. As of 10th December 2021, 267,865,289 confirmed Covid-19 cases and 5,285,888 deaths, have been reported by WHO globally. To curb this deadly virus a Universal Immunization Campaign is running in all parts of the world, wherein 8,158,815,265 vaccine shots have been administered as of 9th December 2021 (WHO, 2021). The unpredicted progression and severity of the infection diverted the objectives of treatment from curing to preventing the spread of infection. Maintenance of optimal nutrition status became a crucial aspect in controlling the infection spread. Optimal nutrition and dietary nutrient intake impact the immune system through gene expression, cell activation, and signaling molecules modification. In addition, various dietary ingredients are determinants of gut microbial composition and subsequently shape the immune responses in the body (Aslam et al., 2017).

This review sought to provide a comprehensive overview of literature investigating association between any micronutrient deficiency in mild and critically ill Covid-19 patients and Covid-19 disease progression with the associated outcomes. In the current review of 42 published studies, we found out that Micronutrients do play an important role in the progression of the Covid-19 disease. Vitamin D was the most studied micronutrient in this review. A Retrospective Study on Spanish adults reported a higher prevalence of Vitamin D deficiency (82.2%) among covid-19 cases ($p=0.027$). Vitamin D has a potential role to act as a pluripotent hormone in different immunological mechanisms and may also have a role in the body's immune response to respiratory viruses (Hejazi et al., 2016). It's deficiency has also been associated with higher severity of pulmonary infection (Abrishami et al., 2021; Barassi et al., 2021; Demir et al., 2021; Kerget et al., 2020; Sulli et al., 2021). Similar findings have been reported in our study, where 14 studies showed a significant association of poor Vitamin D stores along with a higher mortality rate among Covid-19 patients (***Table 3***), while significantly lower micronutrient level among patients determine their length of hospital stay and mortality rates (***Table 1 and Table 2***). Supplementation with Vitamin D to prevent or treat Covid-19 however, remains subject to more research (Diabetes, T.L. , 2021; National Institute for Health and Care Excellence, 2020). Envisaging the length of the hospital stay for Covid-19 infected patients could help health care authorities to better manage the health care facilities (Vekaria et al., 2021). Studies have shown that Vitamin D deficient Covid-19 patients had a greater prevalence of longer length of hospital stay and higher chances of ICU admissions than those with lower serum 25(OH)D levels (Baktash et al., 2020; Demir et al., 2021; Ersöz & Yılmaz, 2021; Hernandez et al., 2014; Orchard et al., 2021; Szeto et al., 2021). The findings of our study are in accordance with this (***Table 4***). Vitamin D plays a crucial role in the regulation of the immune system via modulating the synthesis of inflammatory cytokines and impeding the proliferation of pro-inflammatory cells, which are important in the pathogenesis of many inflammatory diseases (Yin & Agrawal, 2014). The present review also reported a negative correlation between Vitamin D Levels and Inflammation (Adami et al., 2021; Barassi et al., 2021; Demir et al., 2021; Sulli et al., 2021). Nonetheless, this review only identified a single study that did not observe any relationship (Pizzini et al., 2020); while one study found that Vitamin D Levels were inversely related to D Dimer Levels (Hernández et al., 2021).

On similar aspects, the authors have found that Low Zinc Levels have shown associations with Lung Function, Mortality and Length of Hospital Stay (***Table 2 and Table 4***). Of relevance to the current review is the use of Zinc as an adjunct with the drug therapy in treating SARS-CoV2 infection. Zinc is another micronutrient that has been a part of preventive therapy against Covid-19 by diminishing inflammation, improving mucociliary clearance, reduced ventilator-induced lung injury. Zinc has gathered much interest due to its antiviral and antibacterial properties (Skalny et al., 2020). In a study conducted on the Indian population the researchers (Jothimani et al., 2020), reported that Lower Serum Zinc Levels (<80mg/dl) were associated with prolonged hospital stay (***Table 4***). Owing to the limited number of studies, 3 studies stating lung involvement, and 3 studies depicting the association with survival in Covid-19 patients these results warrant caution.

Selenium intensifies antioxidant enzymes and defensive proteins synthesis on the mucosal surface and assists in phagocytic action (Huang et al., 2012; Shi et al., 2020). With plenty of evidence based on animal studies, surprisingly there have been almost no trials of Selenium and Influenza or other respiratory infections. A very small number (9 Meta Analysis, Non-Covid-19) have investigated the impact of Selenium supplementation in critically ill patients in the ICU and reported an improvement with short term mortality (James et al., 2021). The present study show results on similar lines, where 2 studies by Heller et al., (2021) and Moghaddam et al., (2020) have shown a combination of Serum Zn and Serum SELENOP within the reference ranges indicating higher chances for survival among Covid-19 patients (***Table 3***). Vitamin B_{12} has shown a similar role on Covid-19 mortality (Ersöz & Yılmaz, 2021) (***Table 3***). Old Age and Low Vitamin C Levels were co-dependent risk factors for mortality among Covid-19 patients (Arvinte et al., 2020). Elderly obese patients admitted to the ICU reported as high as 94% prevelance of Hypovitaminosis (Gonçalves et al., 2020).

The present review shows the impact of micronutrients on immunity and associated outcomes of the infections. Comparatively, existing reviews have mainly studied the supplemental effect of micronutrients on recovery of Covid-19 patients (Wang et al., 2021; James et al, 2021). In addition, we included only peer reviewed published papers and no pre-prints. The included studies were from different countries of the world including Asian Countries. This increases the external validity of the outcomes across regions. The main strength of this Systematic Review is that it examines the Level of Serum Micronutrients and their association with outcomes of adult patients with Covid-19. The literature taken from other viral infections are far from consistent and this review attempts to ensure that people have an adequate dietary intake is critical.

Limitations also exist in this review. As mentioned, the studies included in this review have varied study designs, owing to the limited number of original research studies on Covid-19. Thus, more robust evidence is required to generalize these findings of Micronutrient Serum Levels for dosage and regimen to prevent coronavirus episodes. Also, the spectrum of micronutrients investigated is skewed towards Vitamin D, given the emphasis this micronutrient has received from most expert bodies and societies and hence the plethora of literature available on it. Given the abundance of micronutrients with beneficial roles in the immune system, more research is warranted on the other micronutrients as well, to examine their synergy to prevent disease progression in mild cases and more so in, critically ill Covid-19 patients. Most prominently, Vitamin D has been proven a vital nutrient in prevention and treatment of Covid-19 patients. Further studies are required to study the role of these micronutrients not only in treatment but prevention of this rapid spreading infection. While, there is extensive literature stating the role of Vitamin A as an antioxidant on improving immunity in infections, there is a dearth of research studies examining the association of Vitamin A status and Covid-19, hence no conclusive evidence on this micronutrient.

5. CONCLUSION

Optimum nutrition has been one of the most researched aspects during this pandemic among researchers and the general public. The present Systematic Review depicts the presence of Lower Micronutrient Levels among Covid-19 patients and the associated occurrence of this disease. Hypovitaminosis particularly seen with Vitamin D and Lower Levels of Minerals pose a great impact on the body's immunity as re-instated and shown by this Systematic Review. This further combined with the presence of comorbidities like diabetes, hypertension etc. affect prognostic parameters, such as Mortality, Greater Length of Hospital Stay, ICU Admissions, and Higher CRP Levels among Covid-19 Patients. The knowledge of the association of micronutrients with Covid-19 disease help us better stratify Covid-19 patients at higher risk allowing a smooth shift in medical intervention from a curative to a preventive approach. This review showed that micronutrients deficiencies made Covid-19 patients more vulnerable to disease progression and severity outcomes. Individuals without micronutrient deficiency had reduced Covid-19 incidence and disease severity. This review suggests that Covid-19 patients should be checked for their micronutrient levels soon after admission to the hospital so as to integrate micronutrient supplementation into therapeutic management of Covid-19. This could be a non-pharmaceutical intervention to reduce disease severity in an unvaccinated population.

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*The Principal Investigator and Co- Principal Investigators have declared no conflict of interest.

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Second Edition

PRINCIPLES OF MEDICAL NUTRITION THERAPY FOR POSITIVE CLINICAL OUTCOMES

EDITED BY
VEENU SETH • KALYANI SINGH

Contents

Waste Water Treatment Plants in Delhi: Prospects and Challenges

[1]Ms. P. Onia Khrasi, [2]Prof. Meenakshi Mital & [3]Dr. Meenal Jain
[1]Student, [2]Professor, & [3]Assistant Professor
Lady Irwin College, University of Delhi, New Delhi

Abstract

The growth of waste water generation is spreading daily from the merging of municipal, industrial effluent and agricultural drainage water. This issue can be balanced if early measures are taken into consideration by treating and utilizing the waste water which will offset the over exploitation of underground water. The study titled "Waste water treatment plants in Delhi: Prospects and challenges" was conceptualized to assess the challenges faced by stakeholders in operation and maintenance, and to gather suggestions for the selected waste water treatment plants for better functioning of these plants. The study was carried out in four Sewage Treatment Plant in Delhi namely 40 MGD, Phase II Rithala, 15 MGD, Delhi Gate Nalla Phase II, 30 MGD, Okhla Mathura Road and 45 MGD, Kondli. Questionnaires were used as tools for data collection and the information was collected from the plants. It was seen that all the selected plants received waste water from domestic use connected to sewer pipes further proceeding for treatment and releasing sludge. The study has revealed various challenges while operating the plants such as the breakdown of machinery owing to low maintenance, inlet flow variation, choking of screen bars due to heavy materials and excessive foul smell in the neighboring colonies. The suggestion was proper site selection should be there so that plants are not installed near residential colonies. Additionally, sewer lines must be connected to all the areas of the city so that all the waste water is treated before being discharged into the river.

Key words:

Waste water, Treatment, Prospects, Challenges

Introduction

At this present time waste water has become a serious threat to the whole environment to sustain. Nature has reduced the quality of self-repairing because of continuous fresh water exploitation. At the same time mismanagement of water consumption can be another factor adding to the problem. Over growing concern, many industrial experts have started to identify treated waste water as a valuable resource for utilizing in different sectors. However, an estimated 80–90% of all waste water produced in Asia and the Pacific region is released untreated, polluting ground and surface water resources, as well as coastal ecosystems. An estimated 44%, i.e.,

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Paper Title:
Barriers in Off-Grid Solar Installations in Commercial Buildings in India: Perspective of Channel Partners

Meenal Jain[1], Meenakshi Mital [2], Matt Syal [3]
[1] Department of Resource Management and Design Application, Lady Irwin College, University of Delhi, Sikandra Road, New Delhi, India,
[2] Department of Resource Management and Design Application, Lady Irwin College, University of Delhi, Sikandra Road, New Delhi, India,
[3] Construction Management, School of Planning, Design & Construction, Michigan State University, USA,

Re: Letter of acceptance – 18th International Conference on Sustainable Development 2023, Montclair, USA.
(This is not an official invitation letter for visa purposes.)

We are pleased to inform you that the above paper/abstract has been accepted to be presented at the 18th International Conference on Sustainable Development 2023. The conference will be held in **the Conference Centre, Montclair State University, 1 Normal Ave, Montclair, NJ 07043, USA, from December 13-14, 2023.**

Conference Proceedings will be published as the conference abstracts (ISSN 1923-6670). In addition, all submitted papers are subjected to peer review, and the presented/defended papers will be published in the peer-reviewed OIDA International Journal of Sustainable Development ISSN 1923-6654 (print) 1923-6662 (online). The papers will also be indexed in **DOAJ, SSRN, EBSCO and AMICUS** Library and Archives Canada's database to ensure their permanent preservation for present and future generations.
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Good Luck, and we look forward to welcoming you to the ICSD 2023 Montclair, USA.

Yours sincerely,

Neville Howage

Neville Howage, Ph.D.
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OIDA Institute of Development Studies
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Chapter 3.2 - Processing of linseed crop for textile purposes

Archana Jain [1], Deepali Rastogi [2]

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Abstract

Flax, also known as linseed, is a crop, which is used for obtaining food and fiber both, and is cultivated in the regions which have temperate climate. The flax agriculture has ecological advantages like it is a good rotation crop and has lesser requirements of fertilizers and chemicals in comparison to

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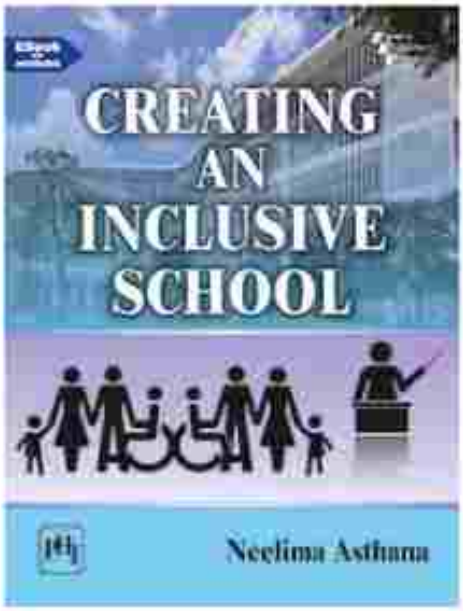

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Description:

Written with two decades of teaching and research experience of the author in the field of special and inclusive education, this intelligible text discusses the principles and philosophy of inclusion for children and students with disability in education. Also, providing necessary information on the disability rights and policies relevant to inclusive education, the book focuses on the moral, social and legal responsibilities of the school in creating the best learning environment for students with additional learning needs. It lays emphasis on teachers' training and skill-development programmes to improve their adaptability, which in turn is required for better growth of the students with special needs. Further, it features the role of parents in the child's mental and physical development and significance of their involvement in inclusive education.

KEY FEATURES:

• Well-researched and highly informative text conforming to the curriculum needs.

• Individual chapters on specific learning disability, challenges and needs of each disability in detail.

• Concepts explained including sensitive issues associated with every disability and define various terms.

• Validated instructional strategies for creating inclusive schools better.

• Pedagogical approach and role of technology in promoting inclusion.

• Role of family, community and society explained in each disability.

• Elucidates the crucial role of national and international agencies in promoting inclusion through acts and policies.

Primarily intended for the students of teacher education programme at undergraduate level (B.Ed.), the book will prove to be a valuable resource for those pursuing B.El.Ed. and M.Ed., teachers and policy makers engaged in inclusive education.

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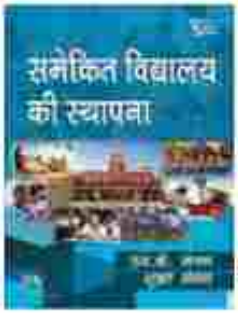

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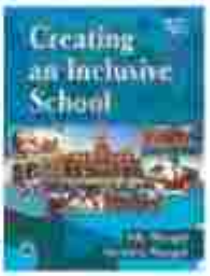

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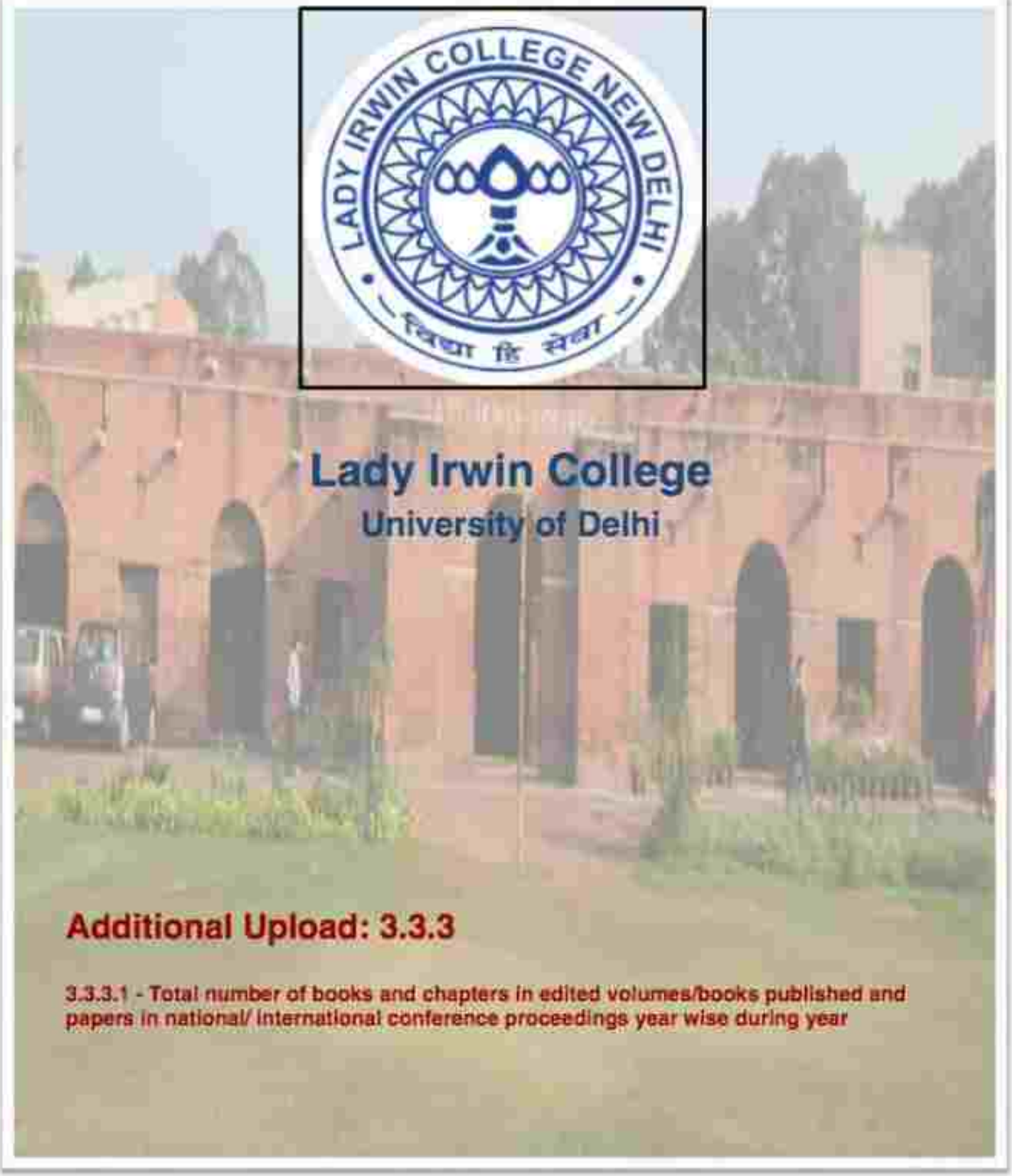

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INDEX

3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during year

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2

History and Evolution of Indian Food

Professor (Dr.) Priti Rishi Lal

Introduction

Indian food culture has evolved alongside Indian civilization and has been mentioned throughout history. Tracing the evolution of food from Indian history, is pivotal to understanding Indian cuisine and dietary practices. In fact, across many cultures, one can historically trace socio-cultural reasons behind culinary choices in India.

For extended periods in Indian history, each of India's conglomerations of kingdoms had a royal court where chefs created a hub, where food innovations, new dishes and methods of cooking evolved. This influenced the kitchens of the common man, cooks or housewives who imbibed these cooking practices using ingredients at their disposal. Modern Indian cuisine, therefore, is an outcome that can socio-historically trace the interaction between personal and social choices, based on available resources.

Methods of Tracing Evolution of Food

The evidence of evolution of food is collected with thorough document analysis. A survey of ancient religious scriptures from archives, newspapers, memoirs, travelogues, research articles, poems, history books and books written on food cultures, is conducted and comprehensive notes are made to record all findings. These notes need to be verified through information collected from more than one source. As a result, common patterns in the data are revealed, under which the entire data is organized.

Important Eras in Indian History

The four significant eras of socio-cultural development in Indian history are as follows:

- Prehistoric Era
- Vedic Period
- Mughal Era
- European colonization.

These eras also mark the four most frequently found patterns in food culture. For each era the evolution of food may be looked at through a close interplay between sociocultural factors and the

5

Nutrition and Lifestyle Transition

Dr. Swati Jain

Common terms and definitions:

1. **Nutrition transition**: Modernization, urbanization, economic development, and increased wealth lead to predictable shifts in diet, referred to as "nutrition transitions.
2. **Non communicable diseases** (NCDs) : Also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioural factors.The main types of NCD are cardiovascular diseases (such as heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes. NCDs disproportionately affect people in low- and middle-income countries, where more than three quarters of global NCD deaths (31.4 million) occur.
3. **Processed foods**: Processed foods are foods that have been altered during preparation. Some, but not all, processed foods contain high levels of salt, sugar or fat. Processed foods can be classified according to their level of processing into minimally processed foods, processed foods and ultra processed foods.
4. **Demography**:(from Ancient Greek δῆμος (dêmos) 'people, society', and -γραφία (-graphia) 'writing, drawing, description') is the statistical study of populations, especially human beings. Demographers use census data, surveys, and statistical models to analyze the size, movement, and structure of populations.
5. **Physical activity**- WHO defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. Both moderate- and vigorous-intensity physical activity improve health.

Introduction:

Traditional diets and lifestyles change as nations and civilizations, on average, become wealthier, more urbanised, and more open to international trade. Today, the most pervasive transition is the series of adjustments that come along with nations growing wealthier and more industrialised: a shift towards an abundance of fatty, sugary, and highly processed meals, as well as a more sedentary lifestyle at home, at work, and during leisure time. A paradigm known as the "nutrition transition" has been used to describe these dietary and lifestyle shifts, which have implications for both environmental sustainability and human health.

3

Regional Food Traditions of India

Dr. (Vaidyacharya) Vinaya Ballakur
and
Professor (Dr.) Prit Rishi Lal

India is geographically and demographically a large country. Culinary diversity is one of the strengths of our country. India is home to many regions, religions, castes and ethnicities. It is not a surprise that cultural diversity gets translated to culinary diversity. Our country has a large percentage of vegetarians too. There is prevalence of vegetarianism and non-vegetarianism and food stuffs sanctified by religion. Many factors favor the continuity of diverse food traditions. India is centrally located between east and west Asia. She has every possible landscape that the earth has, mountains, deserts, plains, plateau and a vast coastline. The country has clearly demarcated seasons, a good monsoon, tropical climate favour the variety of seasonal fruits, vegetables and food crops. It supports the growth of variety of crops and animal products. As an agrarian economy historically, many varieties of cereals, vegetables and fruits are locally grown. There is no shortage of locally grown fresh foods.

Food: Vedic History

The Vedas are the source and reservoir of all knowledge in India. They are the oldest texts that humanity is aware of. They are the source of our glimpse into the old Indian way of life because they have been translated into the most widely spoken languages. When society is viewed through the lens of food, we discover a very civilised ancient society, that was aware of food ethics and eating customs.

Rigveda only describes barley (*yava*) as a food grain, not rice or wheat. In addition to a panicum cereal (*priyangu*), an oilseed (*tila*, sesame), and a number of pulses, including *masha* (urad), *masura* (*masoor*), *mudga* (*mung*), and *kalaya* (peas or *matar*), the Yajurveda lists rice, wheat, and barley as the main foods.

The *Brhadaranyaka Samhita* states that there are ten food grains namely, rice, wheat, barley, sesame, kidney beans (*masha*), millet, panicseed (*priyangu*), lentils (*khalva*), canake and horse gram (*khalakhula*, later *kulthi*).

Aman rice, wild rice (*nivara*), a novel variety of "flute barley" (*venuyava*, bamboo grains), *gavedhuka* (coix, Job's tears), chickpeas (*chana*, Bangal gramme), and shyamaka are all mentioned in the *Markendeya Purana* and the *Vishnu Purana*, p. 31.

A prayer, from the *Yajurveda*, composed around 800 BC, gives us a pretty good indication of the food of that people ate during that period.

1

Introduction to Traditional Indian Knowledge Systems

Professor (Dr.) Priti Rishi Lal

Traditional Knowledge

Traditional Knowledge is unique to any specific region or socio-cultural group and reflects the evolutionary path that marked the development of such knowledge. It is integral to the cultural identity of the social group in which it operates and is preserved. The World Intellectual Property Office (WIPO) defines traditional knowledge as "indigenous knowledge relating to categories such as agricultural knowledge, medicinal knowledge, biodiversity-related knowledge, and expressions of folklore in the form of music, dance, song, handicraft, designs, stories and artwork". Traditional knowledge, therefore, provides an open-ended method of referring to traditional literature, artistic work, scientific inventions, discoveries, names & symbols, designs, marks, undisclosed information, and all creative work and innovations resulting from intellectual activities.

In the modern era of "patents", the development of new technology and the new use of traditional knowledge based products may pose a serious threat to the survival of many traditional communities. Modern, culturally oriented industries may exploit the traditional knowledge based products, manufacturing them using modern technology without permission and sharing of profits with these communities. This is being used extensively in biotechnology, medicine and agricultural industries. Some of this knowledge has no formal documentation. Hence, knowledge of traditional social and cultural origin needs to be collated and protected for protecting the livelihoods and survival of communities it got generated from.

Traditional Indian Knowledge Systems

India is a civilisation with origin in ancient eras, hence, it has a plethora of traditional information and work. The Government of India, in a pioneering effort, has collected traditional knowledge from various sources in India and collated it in a digital form in a library, called Traditional Knowledge Digital Library (TKDL). It is available free of cost at the following URL:

URL: http://www.tkdl.res.in

The entire knowledge of India was traditionally contained in **2 main domains:**

Domain 1: This is termed as the ***"Para Vidya"***. It was originally addressed as the "higher form" of knowledge and covers all aspects related with "Metaphysical knowledge."

13

Traditional Medicinal Plants in the Management of Stress and Prevention of Non-Communicable Diseases

Dr. Memthoi Devi Heirangkhongjam

Introduction

Traditional medicinal plants have been using for centuries in various cultures around the world for their therapeutic properties. Ayurveda, a traditional system of Indian medicine, has been in practice for over 3,000 years and utilizes traditional medicinal plants to prevent and treat diseases. Ayurvedic medicine emphasizes a holistic approach to health, considering the whole person and their environment.

The use of medicinal plants in Ayurveda is based on the concept of "rasa," which refers to the taste, energy, and effects of the plant. Different tastes of plants, such as sweet, sour, salty, pungent, bitter, and astringent, are believed to have varying effects on the body and mind, and are used to balance the different doshas or energies in the body.

The traditional practice of Ayurveda involves the utilization of several medicinal plants, among which aloe vera holds a preeminent position and is acknowledged as the "King of medicinal plants." Aloe vera is employed in the treatment of various ailments, including skin problems, digestive disorders, and diabetes. Furthermore, mint, a widely used medicinal plant in Ayurveda, is recognized for its ability to enhance mood and alleviate indigestion. Fennel, also known as saunf, is used to increase breast milk supply. Tulsi is another plant widely used in Ayurvedic medicine and is characterized by its potent anti-bacterial, anti-inflammatory, and anti-viral properties. It is frequently employed to treat respiratory ailments, digestive disorders, and skin conditions. Ashwagandha, on the other hand, is employed to boost the immune system, enhance cognitive function, and promote overall well-being. Lastly, Triphala is a blend of three fruits - Amalaki (Indian gooseberry), Haritaki (chebulic myrobalan), and Bibhitaki (belleric myrobalan) - and is utilized to promote digestive health, improve liver function, and support healthy bowel movements.

Importance of traditional medicinal plants in managing stress and prevention of non-communicable diseases

Traditional medicinal plants have been utilized for centuries for their medicinal properties, which are due to the presence of bioactive compounds. The use of these plants has gained importance in recent years because of their effectiveness and minimal side effects. Stress is a prevalent problem in modern society, which can lead to various health conditions such as anxiety, depression, and

4

Understanding Rich Sources of Nutrients

Dr. Swati Jain

Terms and definitions:

Health: is a state of complete physical, mental and social wellbeing, and not merely the absence of disease and infirmity.

Disease: is a particular abnormal condition that negatively affects the structure or function of all or part of an organism, and that is not immediately due to any external injury.

Food: is anything solid or liquid which when swallowed, digested and assimilated, nourishes the body.

Food ingredient: is any substance, including a food additive used in the manufacture or preparation of food and present in the final product, possibly in a modified form.

Nutrition: is the science of foods, the nutrients and other substances therein, their action, interaction and balance in relationship to health and disease.

Nutrients: are the constituents in food that must be supplied to the body in appropriate amounts.

Macronutrients: are the nutrients that our required by our body in large amounts on everyday basis (in gms) like carbohydrate, protein and fat.

Micronutrients: are the nutrients that our required by our body in lesser amounts on everyday basis (in miligrams or micrograms) like vitamins and minerals.

Diet: is the usual food and drink consumed by an organism (person or animal).

Menu: is a list of food and beverages available or to be served in a restaurant or at a meal.

Thali: is a meal in Indian cookery consisting of several small meat or vegetable dishes accompanied by rice, bread, etc, and sometimes by a starter or a sweet.

Calorie(kcal): is the heat required to raise the temperature of 1 kilogram of water by 1°C from 14.5°C to 15.5°C.

Nutrient-Rich source: "High," "Rich in," or "Excellent Source of" any nutrient contains 20% or more of the daily value per serving.

Serving size: Measured amount of food or drink that people typically eat. Eg- a slice of bread or glass of milk

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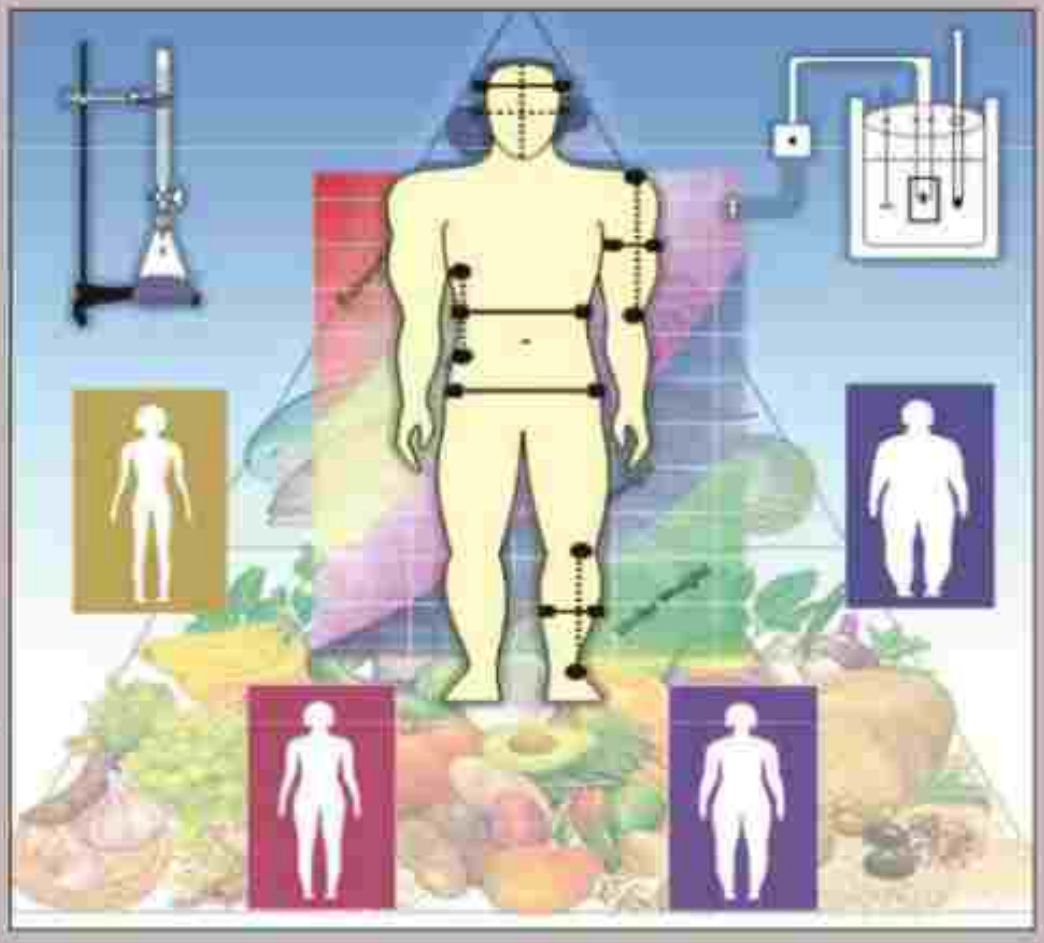

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BBCEL-142: NUTRITIONAL BIOCHEMISTRY (PRACTICAL)

NUTRITIONAL BIOCHEMISTRY

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Food Waste to Green Fuel: Trend & Development pp 21–41

Bioenergy and Food Processing Waste

Aparna Agarwal, Memthoi Devi Heirangkhongjam & Kanika Agarwal

Chapter | First Online: 18 May 2022

Part of the Clean Energy Production Technologies book series (CEPT)

Abstract

Food wastage is a serious issue worldwide and has been anticipated to increase considerably in the subsequent 25 years because of the growth in economy and population across the globe. The biodegradable wastes discharged from several sources such as households, food industries, and hospitality sector are known as food wastes. Fresh fruits, vegetables, bakery products, meat, and dairy products are the chief food items lost throughout the food supply chain. In this chapter, we briefly discuss overall food wastage, focusing mainly on food processing wastes (FPW), the residuals which are left over after a primary product have been processed in the food processing industry. And it

Dr. H. Memthoi Devi

Novel Food Grade Enzymes pp 139–164

Enzyme in Milk and Milk Products: Role and Application

Aparna Agarwal, Naman Kaur, Nidhi Jaiswal, Memthoi Devi Heirangkhongjam & Kanika Agarwal

Chapter | First Online: 22 September 2022

Abstract

Enzymes are biocatalysts that catalyse a desired chemical reaction. Enzymes are specific in their action and yield into products. The enzymes that are utilized in the dairy industry for processing milk and milk products, like yoghurt, cheese, and fermented milks, are commonly known as dairy enzymes. These enzymes mostly aid in coagulation, cheese production, and enhancing shelf life of various dairy products. The most used dairy enzymes include lactase, amylase, lipases, transglutaminase, protease, catalase, and rennet. The functions of enzymes vary with the kind of the product to be processed. Both endogeneous and exogeneous enzymes are important for dairy

Dr. H. Memthoi Devi

3 Waste Management of the Fruit and Vegetable Industry

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CONTENTS

3.1 INTRODUCTION

Fruit crops are those yielding fruits and berries, which generally are characterized by their sweet taste and their high content of organic acid, fiber, and pectin. Fruits are generally found in great numbers attached to the branches or stalks or trunks of the plants, in most cases singly, in other cases grouped in bunches and clusters (e.g. bananas and grapes). The commercial crops are cultivated in well-ordered orchards and compact plantations. Bananas, plantains, grapes, and dates are considered fruit crops by the Food and Agricultural Organization (FAO), while nuts, olives, and coconuts are not considered fruit crops. Fruits at times are classified into pome fruits (with seeds/pips contained in rather light endocarp, e.g. apples and pears) and stone fruits (with seeds/kernels enclosed in hard woody shells surrounded by the pulp or mesocarp, e.g. peaches and plums). Fruits are broadly classified as either sub-tropical/tropical fruits, or fruits of the temperate zones.

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Novel Food Grade Enzymes pp 65–105

Role of Enzymes in Fruit and Vegetable Processing Industries: Effect on Quality, Processing Method, and Application

Memthoi Devi Heirangkhongjam, Kanika Agarwal, Aparna Agarwal & Nidhi Jaiswal

Chapter | First Online: 22 September 2022

Abstract

The significance of enzymes and their application in food processing industry is increasing rapidly. Different kinds of enzymes are extensively used based on their effective application. In fruits and vegetables processing, several endogenous enzymes and newly developed enzymes are used. Enzymes present in fruits and vegetables play a huge role in determining the texture, colour, flavour, and taste attributes of the processed products. The continued enzymatic activity in fruits and vegetables affects the storage quality, shelf life, and palatability of the product. Therefore, several processing methods such as grinding, crushing, slicing, juices, or preservation are used to prolong

Dr. H. Memthoi Devi

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A HANDBOOK OF AYURVEDA AND NUTRITION

Prof. (Dr.) Priti Rishi Lal

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12

Ayurveda Aahar: FSSAI Regulations

Dr. Memthoi Devi Heirangkhongjam

Introduction

Ayurvedic Aahar is a term in Ayurveda, that refers to the dietary principles and guidelines recommended to promote holistic health. According to Ayurvedic principles, Aahar is considered an essential aspect of overall well-being, along with lifestyle choices, mental and emotional wellness, and spiritual practices. The main goal of Ayurvedic dietary principles is to nourish not only the body but also the mind and soul.

The Ayurvedic diet focuses on the consumption of natural, whole foods that are suitable for an individual's unique constitution and dosha type. The diet emphasizes mindful eating, proper food combining, and avoiding foods that are not compatible with one's body constitution or health condition. Ayurveda recognizes that every individual is unique, and dietary choices must reflect that individuality.

The significance of Ayurvedic Aahar in Indian culture and medicine dates back thousands of years and is still widely practiced today. Ayurvedic dietary principles are deeply rooted in Indian cuisine and are followed by millions of people worldwide. The benefits of an Ayurvedic diet are numerous, including improved digestion, increased energy, and enhanced mental clarity.In Ayurveda, food is considered a form of medicine, and specific foods are prescribed to treat specific health conditions. For instance, ginger is used to aid digestion, turmeric is used as an anti-inflammatory, and ghee is used to nourish and strengthen the body.

Logo of Ayurveda Aahara

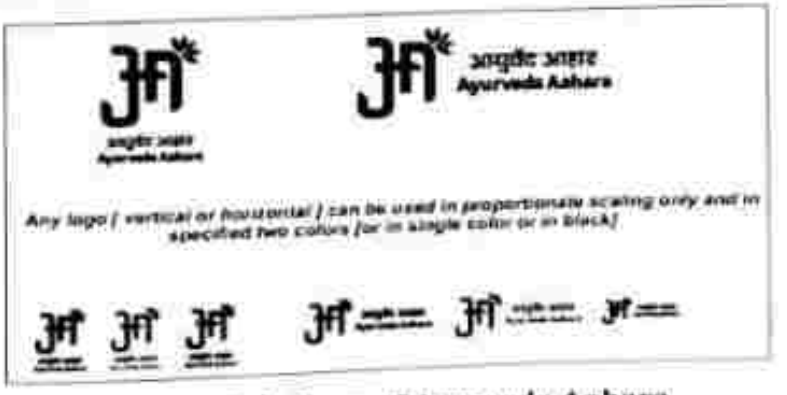
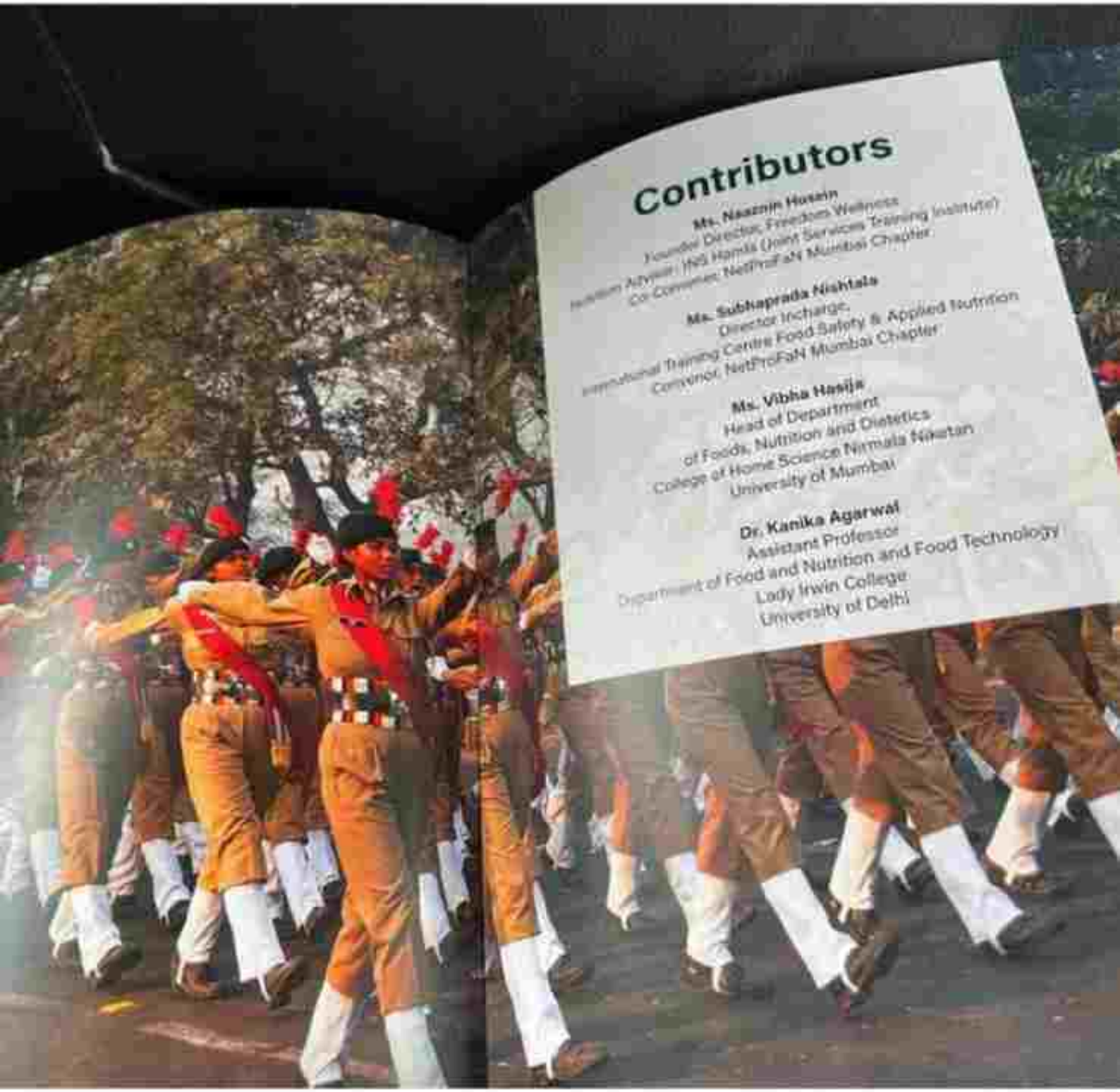


Figure 12.1: Logo of Ayurveda Aahara

Source: *Food Safety and Standards (Ayurveda Aahara) Regulations, 2022.*



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Ultrasound and Microwave for Food Processing

Synergism for Preservation and Extraction

2023, Pages 19-59

Chapter 2 - Microwave: An overview

Neha Bakshi, Swati Jain, Aishwarya Raman, Taru Pant

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Abstract

The uses and applications of microwave for processing at industrial level have gained immense interest over the years due to the notable decrease in consumption of energy and cooking time. Drying and sterilization as microwave processing techniques are significantly contributors for food quality and safety control processes. This chapter provides an overview of the microwave processing techniques used in the food industry. An introduction is presented to the fundamentals and principles of microwaves. This chapter also describes the advantages and benefits of microwave-assisted techniques as compared to conventional techniques. The varied applications of microwave energy in the food industry are summarized and an insight is provided into the current research and up-to-date developments.

Reflective Teaching : Perceptions and Practices

Ms. Geetika Sharma
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Dr. Mani Bhasin Kalra
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ABSTRACT :-

Reflective teaching requires a teacher to pause and analyze the classroom transactions carried out by her. It is built upon the teacher's ability to introspect and speculate about one's own work. It allows the her to find gaps in her teaching practice and to address the same. Reflective teaching is a major focus in all the teacher training programmes. This study was conducted on 120 student teachers of the Preservice Teacher Education Programme of the University in Delhi. Purposive sampling was used to collect the sample. The reflections were collected in the form of a self-report form. Students' interest and motivation came out to be the most vital factors affecting the teaching process. Hence, this study has important connotations for the practicing and future teachers.

Keywords : teaching learning process, reflective practices, reflective teaching, student teachers

INTRODUCTION :

Reflection is in distinction to solely thinking about one's teaching instruction. It is a tenaciously resolute act that begins with a stumbling block occurrence or milieu, elucidates the problem, hunts for the credible solutions, investigation with solutions, and finally assesses the outcome. In various teacher training programs reflection is proclaimed as an intent but how it might be proselytize in student teacher and its denotation are conflicting. Here, an exposition is provided of the result of reflections of student teachers, specifically pointing on plan of action which aids its evolution in pre-service teaching learning programs.

Reflective Teaching :

In teacher education, reflective teaching has become a pivot of delight and a robust movement and for their own professional blooming in order to refine and to enhance learners' performance the intricacy of teaching requires teachers to re-visit their practices. In the course of teaching practice period, this article intend at scrutinizing student teachers' reflective experiences. Issuing of the report by National Institute of Education in 1975, however laid emphasis on the inception of reflective teaching discourse, centralizing on teachers' thought. As far as the teachers are concerned for reflecting there is an interrelation between thought and action, the report, then, prompted. Accordingly, the investigator began to ponder upon and consider that teaching behaviour is affected by teachers' idea.

Killen (2007) stated that reflection assist teachers to cherish that they too can be the builders of educational proficiency. By this, teachers superintend their own progress. It enables teachers to be aware of their experiences and analyze their own practice. Hence, it is a revolution in teacher education and climacteric kind of thought (Fatemipour & Hosseingholikhani, 2014).

Use of Smartphones to Increase the Learning Potential of Mild Intellectually Disabled Persons

Ram Niwas*, H B Patel and Shankar Lal Bika*****

Intellectual disability is a condition characterised by significant limitations in both intellectual functioning and adaptive behavior that originates before the age of 22 (AAIDD, 2021; Parekh, 2017). Individuals' adaptive functioning is examined via standardized exams and interviews with family members, teachers, and caregivers. Around 85% of people with intellectual disabilities are classified as mild, and many of them succeed academically. Mild ID is defined as the ability to benefit educationally within a regular class with the help of significant instructional modifications and supportive services; the inability to profit academically within a mainstream school due to slow cognitive growth; and the opportunity for academic advancement, autonomous social growth, and financial independence. Children with mild ID may have literacy and numeracy levels that are three or even more years below their age-appropriate levels. They may also tend to get easily distracted, have short attention spans, struggle in all academic subjects, experience delays in language development, and have memory problems. Students with mild ID may have trouble comprehending nonverbal clues (e.g., body language, gestures), social linguistic and behavior, understanding and expressing a range of emotions, childish behavior, and excessive behavior (Fey, et al., 2006). Children with intellectual disabilities may appear awkward and require assistance with personal care/hygiene skills; use unsophisticated, ambiguous, or vernacular language; demand routine consistency; and regularly "lose" pencil, pen, notebooks, and homework (The Ontario Curriculum Unit Planner Special Education Companion, 2022). Children with mild ID may be afraid to try, use denial or inappropriate behaviour to divert attention from their incapacity, withdraw in reaction to stress or fear of failure, absent independent work behaviors, be incredibly irritable, and be vulnerable to peer pressure, taunting, and embarrassment. They may also need help or significant support to establish a positive self-image. They could be easily misled by metaphorical and complex language, take language literally, require assistance in generalizing and applying taught concepts to new contexts, and prefer regular and repetitive work. Current techniques to assist these pupils, as well as current intelligence theories, such as multiple intelligence and emotional intelligence theories, provide different teaching methods and modifications that teachers can utilize to accommodate a variety of student requirements. They exhibit a wide spectrum of abilities and requirements. It's vital to keep in mind that not all children will exhibit all of the traits. Children with mild ID need training in functional communication skills, empathy, social judgment, the ability to follow rules, and the ability to form and maintain friendships (Jurisperitus, 2017) are all examples of social skills. Practical means being self-sufficient in areas like personal care, enjoyment, school organization, job duties, money management, and work assignments.

Potentials of Children with Mild Intellectual Disabilities

Individuals with mild intellectual disabilities have the potential to live independently, maintain employment, access community facilities, and services, engage in meaningful family and social connections, and participate in leisure and recreational activities with the right support (O'Connor, 2014). While not all of these pupils will exhibit all of these qualities at the same time, they will all show a widening disparity between their abilities and those of their peers their age. The likelihood of these children failing increases as the demands of the curriculum and daily life become much more sophisticated and abstract (The Ontario Curriculum Unit Planner Special Education Companion, 2022). We can repeat every instruction or direction several times and ask the learner if further clarification is needed, we should avoid distractions; we should use basic, short,

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EFFICACY OF TRADITIONAL FLOOR GAMES FOR PROMOTING ELECTORAL LITERACY: A STUDY IN DELHI

Dr. Aparna Khanna[1], Ms. Sapna Rani[2], Ms. Arushi Srivastava[1], Ms. Aprajita Sharma[1]

Abstract

The research titled 'Efficacy of Traditional Floor Games for Promoting Electoral Literacy: A Study in Delhi' was conducted to inquire into the urban youth's knowledge and opinion about the importance, myths and misconceptions, and process of voting in India. Further, the study sought feedback about the content and the design of five traditional floor games to create awareness about the electoral process. Perceptions of the youth regarding the use of a games-based approach to learning were also studied. The sample comprised sixty youth (equal number of males and females) in the age group of 18-30 years. A semi-structured questionnaire was administered to the youth to assess their knowledge, and get their views about the floor games as tools for entertainment, information and education. It was found that a large number of respondents were not aware of the way to register themselves on the electoral rolls, the process of casting a vote, and the concept of social inclusion and diversity in the electoral process. The results indicated that the youth's knowledge increased after playing the traditional floor games. Youth expressed happiness and appreciation for the traditional floor games. They found the activity-based approach to learning very engaging and a lot of fun.

Keywords: *Electoral Literacy; Floor Games; Entertainment; Information, Education, and Communication (IEC)*

1. Introduction

India is the largest democracy in the world. Democracy is defined as a government of the people, by the people, and for the people. All the people in a big country like India cannot participate in the government. Due to this, they are required to exercise their franchise and elect their representatives at regular intervals. The Election Commission of India is an autonomous constitutional authority responsible for administering election processes in India. The body administers elections to the Lok Sabha, Rajya Sabha, and State Legislative Assemblies in India and the offices of the President and Vice President in the country. The Election Commission operates under the authority of the Constitution per Article 324 and the subsequently enacted Representation of the People Act. Developing

4

RESURGENCE OF SELECTED INDIAN CRAFTS IN COVID-19 PANDEMIC

Ashima Anand & Dr. Seema Sekhri

Abstract

Traditional crafts have been practiced in India since time immemorial. These have been renowned worldwide for their unique designs, intricate work and quality. Their production has always engaged various craft communities and other stakeholders associated with it. Craftspeople earn their living by practicing such age-old traditions along with preserving the legacy of Indian crafts. However, traditional crafts have always been known for struggling with multitude of factors to keep themselves thriving in today's competitive fast paced society. In spite of it, craftspeople have always tried to physically reach out to the consumers through various platforms like exhibitions, fairs and retail outlets to make the consumers understand the value of crafts' legacy and inculcate appreciation for their skills. But, the recent pandemic COVID-19 posed a new and bigger challenge in front of the craft community. Direct interface with consumers through fairs and exhibitions for selling their products was not possible. At the consumers' end too, considering the change in lifestyle, deviations were seen with respect to the consumption of craft-based products. Hence a need was felt to bridge the gap between producers and consumers of craft-oriented goods. The present paper shares the details of resurgence of selected Indian crafts in pandemic times and asserting its relevance in twenty first century. For this purpose, a systematic model was developed, tested and executed. This involved multi-stage approach viz. communication, design and product intervention, product development, marketing and sales. Efforts were also made to generate awareness and popularize Indian crafts through series of webinars. The model developed was tested with

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Solar Energy Policies for Commercial Buildings Sector: Experiences from India

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Abstract: In an effort to meet the demands of a developing nation, the Indian energy sector has witnessed a rapid growth. However, the country lacks sufficient domestic energy resources, and must import much of its growing requirements. Given this scenario, it is of paramount importance that the country develops all possible domestic energy sources. At the same time, India is still heavily dependent on fossil fuels which is set to lead to multiple challenges like depletion of fossil fuel reserves, global warming and other environmental concerns. Renewable energy, particularly solar is the solution to the growing energy challenges as they are abundant, inexhaustible and environmentally friendly. Given the vast potential of solar energy in India, all it needs is comprehensive policies. It has been seen that there are many initiatives taken by the Indian government, both at the National and the State level for promoting solar energy, but its use and production in the commercial buildings sector is still limited. On studying some of the initiatives of the central and selected state governments, it was found that there were a number of policy related impediments associated with implementation of these initiatives. Thus, there is an urgent need to take steps to minimize these impediments and generate awareness among the stakeholders regarding the government initiatives, so that solar energy can be tapped to its best possible extent.

Keywords: Commercial Buildings, Government Policies, Impediments, India, Solar Energy

Introduction

Future economic growth crucially depends on the long-term availability of energy from sources that are affordable, accessible and environmentally friendly [1]. There is a strong two-way relationship between economic development and energy consumption. On one hand, growth of an economy hinges on the availability of cost-effective and environmentally benign energy sources, and on the other hand, the level of economic development relies on the energy demand [2]. Global energy consumption is projected to increase by 48 percent from 1990 to 2040. The combination of the growth in world population and in Gross Domestic Products (GDP) of all the nations, will, in the absence of dedicated policies, lead to a steady growth in energy consumption [3]. Figure 1 illustrates the projected world energy consumption from different sources.