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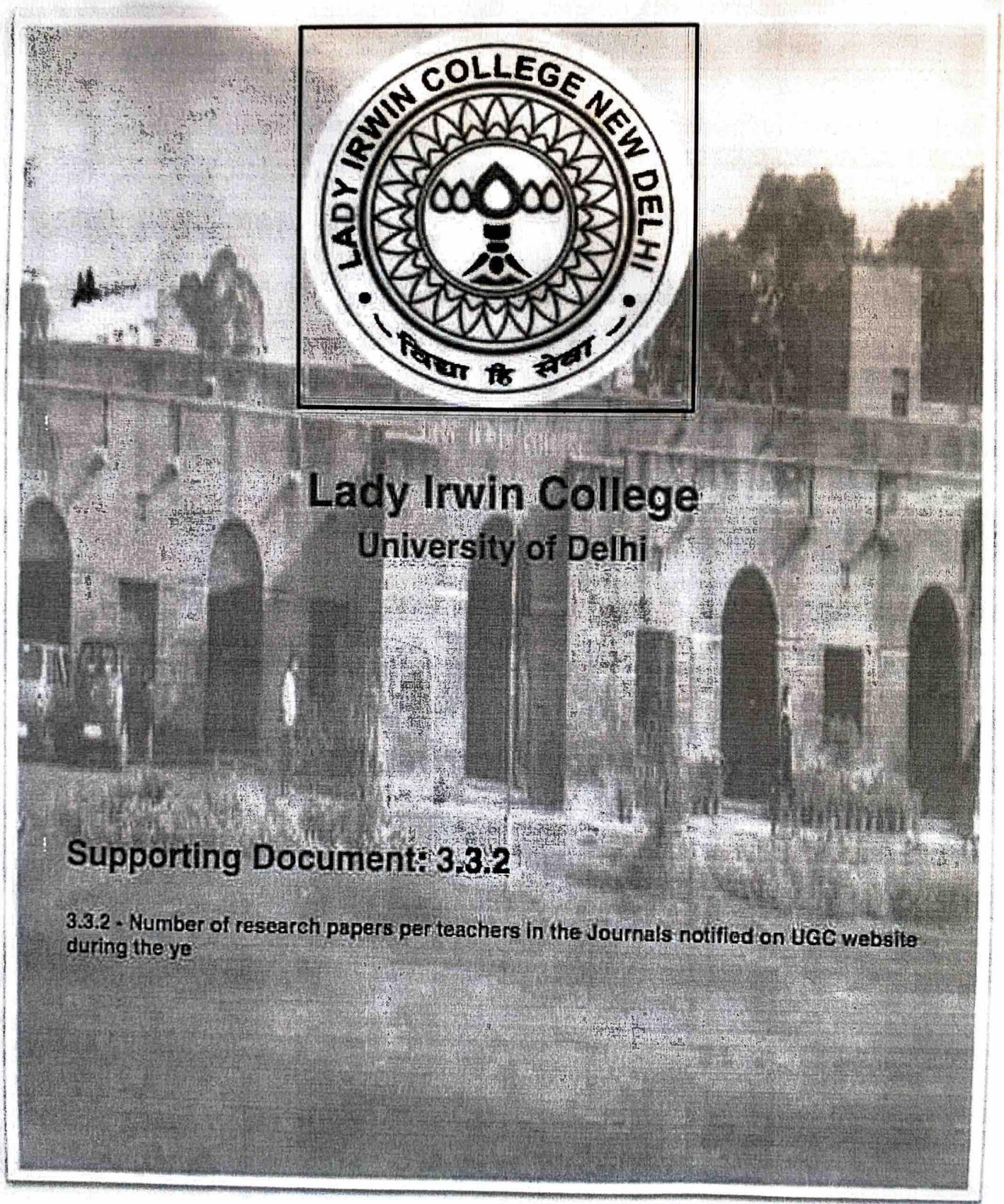

Lady Irwin College
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Supporting Document: 3.3.2

3.3.2 - Number of research papers per teachers in the Journals notified on UGC website during the ye

प्रो. अनूपा सिद्धू
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3.3.2 Number of research papers per teachers in the Journals notified on UGC website during the assessment year (2022-2023)

ANNEXURE

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ANNEXURE

Annexure I:

References

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Development of cake by using persimmon fruit *(Diospyros kaki)* as a fat replacer and its chemical and structural profile analysis

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Keywords:
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ABSTRACT

The burgeoning global production of processed foods high in fat, sugar, and salt; and the nutrition transition have catalysed the global burden of non-communicable diseases, which has necessitated the production of foods with limited fat, sugar, and salt content. This study investigated the feasibility of utilising Persimmon sauce (PS) as a fat replacer to develop cake and evaluated its impact on the physicochemical, functional, sensory, and structural profile of the developed cake variants (control (100g fat) and M1, M2, M3 and M4 with 25g, 50g, 75g and 100 g PS I on 100g butter basis, respectively). A significant increase in the moisture and ash content ($p < 0.05$), total phenolic content (from 540 to 10700 μg GAE/g), and DDPH radical scavenging activity; and linear reduction in fat content ($p < 0.05$) was observed with increasing Persimmon sauce I (PS I) (without added sugar and lemon) levels in cakes. High sensory acceptability of cakes was noted up to 50 g PS I incorporation level on 100g butter basis. A positive correlation between PS I incorporation level and Vitamin C; and fibre content of the cakes ($p < 0.05$) was also observed. The microstructural analysis of cakes exhibited a thinner and ruptured protein matrix in fat replaced cakes resulting from gelatinized starch granules. Therefore, Persimmon fruit can be considered as an effective and acceptable substitute for fat replacement and augmentation of functional properties of cake.

1. Introduction

Non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases, cancer, and chronic respiratory diseases pose a major health and developmental challenge to the mankind and contribute in global increase in the rate of morbidity and mortality (WHO, 2014). The drivers associated with the occurrence of NCDs include improved financial capacity and upsurged disposable income (Dhurigana et al., 2014; Zeba et al., 2014; Zaman et al., 2012), modification in the type and nature of work, sedentary lifestyle and lack of physical activity (Hosey et al., 2014; Lee et al., 2012; Sousa et al., 2013; Zeba et al., 2014) and alcohol and tobacco consumption (Gupta et al., 2015; Menon et al., 2015; Pallipudi et al., 2014; Sousa et al., 2013). In the past few decades, a rising trend in the magnitude of commercially produced processed foods in global food supplies and the shift from traditional foods to high-fat, high-salt and high-sugar processed foods have contributed to the increasing burden of NCDs in various nations (Menon et al., 2015). World Health Organisation (WHO) (2004) recommends limiting the levels of saturated fats, trans fats, free sugars and salts in existing products; continued development and supply of nutritious and economical food choices to consumers; and contemplating the development of new food products with enhanced nutritional value (Scrinis, 2016). Foods developed from this technique are known as functional foods and may comprise several biologically active compounds. Such foods when consumed daily, help in maintaining the optimal state of physical and mental health of the population (Nikolova & Georgieva, 2016). Recently, several studies have emphasized on the significance of foods like whole grains, fruits and vegetables and their bioactive compounds like antioxidants, vitamins, and minerals in averting various ailments (Bernardo & Saraç, 2019).

Abbreviations: PS, Persimmon Sauce; DPPH, 1,1-diphenyl-2-picrylhydrazyl; GAE, Gallic Acid Equivalent; NCD, Non-Communicable Diseases; SEM, Scanning Electron Microscope; LDPE, Low Density Polyethylene; AOAC, Association of Official Analytical Collaboration; TSS, Total Soluble Solids; AAS, Atomic Absorption Spectrometer; TPC, Total Phenolic Content.

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ORIGINAL ARTICLE

Domestic Meat Handling Practices and Listeriosis Risk Assessment in Delhi: A Brief Survey

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Abstract

Listeria monocytogenes are the causative pathogen of listeriosis. The infection is associated with a high mortality rate and is detrimental to pregnant and immune-compromised populations. Numerous researches reported the widespread presence of *listeria* in the Indian environment, indicating a potential outbreak threat. This study surveyed the public to gather information and understand perceptions regarding standard meat handling practices of the Delhi population. Most respondents followed hygienic methods while procuring and processing meat and its products at home.

Further interrogations revealed that a significant portion of the population was largely uninformed of foodborne pathogens, specific traits, and peculiarities. The survey sample seemed oblivious to listeriosis and its hazards. Our findings prove the need to develop food safety education programs in India. The Indian public should be educated regarding the disease preventive measures to establish a clear understanding and rationalize their routine actions.

Keywords: Food-borne, India, *Listeria monocytogenes*, Listeriosis, Public, Survey

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Original Research

Determinants of Food Choices among Adults (20–40 Years Old) Residing in Delhi, India

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ABSTRACT

Background: India has seen a rise in consumption of foods high in fat, sugar, and salt that increases risk of diet-related noncommunicable diseases. Information on the drivers that determine food choices among adults will provide insights for policymakers to promote healthier food selection.

Objective: This study assessed the determinants of food choices among adults in India.

Methods: A cross-sectional study with a nonprobability purposive sampling technique in which adults were selected from residential colonies belonging to the 4 geographic zones of the city Delhi, India. Data was collected using a mixed methods approach on a total of 589 adults (20–40 y) belonging to upper-middle-income and high-income groups. Data was analyzed by the principal component analysis, chi-squared test, and logistic regression with a level of significance set at P value of < 0.05.

Results: Most influential factors of food choices were brand (30%), nutritive value (22%), and taste (20%). The 3 factors that emerged from principal component analysis that determine food choices among adults were "individual," "social," and "food quality/wholesomeness." Focus group discussions also showed that the majority of participants were influenced by the "brand," "nutritive value," and "taste" of the food product while making food choices. Food choices were influenced by the company the person was eating food with, i.e., family members or friends. The cost of the food product was also an important driver of food choices among younger adults.

Conclusion: Public health policy should utilize the determinants of food choices to bring about changes in the food environment by increasing the availability of healthier yet tasty food, bearing the cost in mind.

Keywords: determinants, food choices, factors, public health, market policy

Introduction

India has witnessed major growth in the food processing sector as the sale of packaged food products grew by 11% in 2019 [1]. Many of these foods are high in fat, salt, and sugar and regular consumption can increase risk of diet-related non-communicable diseases [2]. In a cross-sectional study conducted in Delhi, the majority of food prepared in restaurants exceeded the sodium (96%), fat (42%), and saturated fat (53%) thresholds when profiled using nutrient profiling models such as Choices and the WHO South-East Asia Regional Office model [3]. Mapping the drivers of food choices among adults can provide information to policymakers for improving the food environment [4].

Food purchase behavior of consumers in developing countries, such as India, occurs because of changes in lifestyle and family structure and an increase in per capita income and awareness about health [5, 6]. Consumer's perceptions of food products are based on their personal experiences and emotions, which influence their food choices [7]. The consumer may be influenced by health benefits, nutritional value, taste, appearance, price, and familiarity [8]. A conceptual model suggested that determinants of food choices firstly include changes in lifestyle, for example, staying away from their hometown for work or studies; secondly, social influences, such as the presence of friends or family; and thirdly, personal food choices, which are dependent on sensory appearance, price, convenience, nutritive value, and health benefits of the food [9]. Food choices are

Abbreviations: FGD, focus group discussion.

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Riya Semar[1] and Neha Bakshi[1]

Abstract

Background and aim: Excessive screen time (ST) negatively impacts physical activity and eating behavior among children <5 years. There is a dearth of data on older Indian children; hence, the present study aimed to assess the effect of ST on eating behavior among older children.

Methods: The present cross-sectional study purposively recruited 100 school-going children. E-questionnaire was prepared to gather information regarding the demographic profile and self-reported weight and height. For the assessment of ST, the SCREENS questionnaire was used. Eating behavior was assessed using the Children Eating Behavior Questionnaire, and for physical activity, the PAQ-C was used. The nutrition status of children was assessed using body mass index (BMI) for age cut-offs.

Results: The results revealed that 52% of the children were using screens for > 4 hours per day excluding school-related activities and online classes. ST of children was directly proportional to the parent's ST ($P < .05$). There was a negative correlation between ST and the physical activity of children ($P < .01$). A positive correlation was observed between ST and emotional overeating, desire to drink, slow eating, satiety responsiveness, food fussiness, and emotional undereating ($P < .01$). BMI was positively associated with ST and negatively associated with physical activity, though the results were not significant. Satiety responsiveness (a food-avoiding subscale) was negatively associated with BMI ($P < .05$).

Conclusion: The present study concludes that excessive ST among 8 to 10 years old school-going children has been associated with physical inactivity and poor eating behavior which could lead to an increased risk of being overweight and obese.

Keywords

Screen time, children, physical activity, eating behavior, BMI, school-going children

Introduction

Digitalization of the world is making screen devices such as smart phones, tabs, laptops, etc, a necessity at a household level. Unfortunately, the usage of these screens is not restricted to any particular age group. With the COVID-19 pandemic, the practice of digital media devices has increased not only for leisure or professional work but also for academics.[1] Excessive screen time (ST) negatively impacts physical activity and eating behavior among children.[2]

According to the Indian Academy of Pediatrics (2020–2021), screens have become an important part of children's daily lives. Children under the age of 2 should not exceed any type of ST, except for occasional video calls with relatives. ST for children aged 2 to 5 years should not exceed 1 hour. For children >5 years, it is critical to strike a balance between ST and other activities that are necessary for overall development. If physical activity/playtime, adequate sleep duration, schoolwork time, mealtime, hobbies, and family

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Literature Review

Appetite self-regulation in infancy - The role of direct breastfeeding

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Keywords: appetite, appetite regulation, infant obesity, breastfeeding, bottle feeding, nutritive sucking, non-nutritive sucking

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Infant feeding practices have a vital role to play in shaping the eating behaviour and overall health of individuals in both childhood as well as adulthood. A lesser-known advantage of breastfeeding in the global obesogenic environment, is its role in self-regulation of an infant's appetite. Research demonstrates that children fed exclusively from the breast (that is, they are never bottle fed) develop the capacity for self-regulation of breastmilk intake – after all, mothers cannot possibly observe the quantity of milk the infant ingests. This encourages the infant to gain control, thus avoiding any overconsumption. On the other hand, bottle fed infants (whether mother's milk or formula milk) are subjected to mother's or other caregivers encouragement of bottle emptying. Since the regulation largely lies externally with the parent/caregiver on scheduled or timed feeding versus a cue feeding, this allows the possibility of such children being prevented from developing their own appetite responsiveness independently. Studies do find differences in satiety responses of children fed human milk with a bottle and those who were directly breastfed. Research has shown that directly breast-fed infants do not consume extra milk once their appetite stimulation phase ends. However, the teaching of bottle emptying during early infancy is positively associated with the weight gain. Such distinctions clearly emphasize the importance of breast feeding, but whether it is the milk composition (human or formula) or the mode of feeding (directly from breast or using bottle) that plays a bigger role in signalling appetite control warrants further examination. Considering that an infant's weight gain or growth has a multifactorial causation, this review will highlight the association of direct breastfeeding with appetite signalling in infancy.

INTRODUCTION

Self-regulation consists of automatic (bottom-up) and deliberate (top-down) processes focused on adjustment of one's mental and physiological state, thereby altering emotion, cognition, or behaviour adaptively to context. However, inclusion of homeostatic processes in self-regulation remains debatable (Nigg 2017). Appetite regulation involves homeostatic and hedonic mechanisms through interactions between the brain, gut and the adipose tissue (Russell and Russell 2021). Its biological elements include nutrient sensing and availability, long-term energy reserves, food and taste preferences, metabolic requirements, genetic predispositions, neurocognitive and neuroendocrinological processes, along with the homeostatic processes responsible for energy balance through regulation of intake and expenditures. All of this influences the development of appetite self-regulation (ASR) in children. Both homeostatic and non-homeostatic factors interact. Breastfed infants appear to have a unique ability to self-regulate both the breast milk intake and energy intake from solid foods (Agostoni 2005).

ASR can be conceptualised in terms of a "Satiety cascade" consisting of three phases: (1) pre-consumption, involving hunger cues, food choices and food cue responsiveness; (2) during consumption, involving satiation and habituation; and (3) post-consumption, that includes central and peripheral post-ingestive and post-absorptive mechanisms influencing satiety and satiety cues. Both satiation and satiety are significant processes involved in regulation of appetite. Russell and Russell (2021), have presented six components of ASR: (1) eating when not hungry, (2) delay of gratification, (3) responsiveness to food cues, (4) calorie compensation, and (5) fussy eating (6) dysregulated eating. Similar to general self-regulation (GSR), development of ASR also involves both automatic and deliberate avoidance processes. ASR development across childhood exhibits large inter-individual differences and

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Influence of the Covid 19 Pandemic on Dietary Habits and Nutritional Status

Pulkit Mathur

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Risk of Developing Antimicrobial Resistant *Listeria monocytogenes* in India: A Short Narrative Review

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Abstract

Background and Objective: Rampant application of antimicrobial drugs in food sectors triggered the development of resistance within the microorganisms in the surrounding environment. Due to the reduced susceptibility towards existing drugs, these microorganisms have an increased survival rate when treated. The emergence of this complication in the common food-borne pathogens is worrisome. Several antimicrobial-resistant variants of known infectious bacteria have been discovered. *Listeria monocytogenes* is one among those 'superbugs' bringing such public health challenges to be tackled. This article aims to review India's current situation and stance regarding the progressive issue of antimicrobial resistance and listeriosis.

Results and Conclusion: The issue of antimicrobial resistance has been recognized at all food industry and health care domain levels. Solutions are constantly being made to combat the obstacle, but the antibiotic resistance crisis does not seem to retard. Despite the awareness, regulations, and restraints implemented across the globe, researches hint towards rising antimicrobial usage and the ensued more threatening infections. India's step towards curbing antimicrobial resistance is at par with other global policies and intends to lower the resistance development rate among all pathogens. Till now, Indian authorities and the public have shown insouciance towards listeriosis. There are no special rules targeting *Listeria monocytogenes* in India, as opposed to stringent regulations in many western countries. The Indian government and all associated authorities must study and develop plans to establish standards and statutes to control listeriosis. Above all, set up a surveillance system to monitor the causes of food-related illnesses across the country.

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1. Introduction

Food-borne illnesses are a significant public health threat. The World Health Organization (WHO) reported that approximately 600 million people are infected with a food-borne disease yearly[1]. An individual's health is hampered, but from a more comprehensive outlook, it also affects the overall socio-economic development of the population [2]. It strains the healthcare system and even harms the country's economic activities and trade. Chemicals, heavy metals, parasites, fungi, viruses all cause food-borne illness, but bacterial food infection cases are the common causation[3]. More than 90 percent of food poisoning is caused by *Staphylococcus aureus, Salmonella, Clostridium perfringens, Campylobacter, Listeria monocytogenes, Vibrio parahaemolyticus, Bacillus cereus,* and entero-pathogenic *Escherichia coli* every year [4]. *Listeria monocytogenes* is a food-borne bacterium. Table 1 summarises the food products likely to be contaminated by *Listeria*. *Listeria (L.) monocytogenes* is an opportunistic pathogen, meaning those with a low immune system are most likely to suffer from infection [9].

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Scope of Banana By-Products: A Potent Human Resource

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A B S T R A C T

India is the largest producer of bananas globally, contributing to 27% of the world's banana production. As of 2020, banana production in India was 31.5 million tonnes, which accounts for 26.23% of the world's banana production. The top five countries (China, Indonesia, Brazil, Uganda and Ecuador) account for 53.47 per cent. In 2020, global banana production was expected to reach 120 million tonnes. Also, it's the second-largest produced fruit after citrus, contributing about 16% of the world's total fruit production. Edible bananas are derived from Australimusa and Eumusa series, with different origins from the same genus. Most edible bananas are cultivated mainly for their fruits; thus, banana farms generate several tons of underused by-products and waste. A lot of research has been done to improve the usage of banana by-products. Recycling these agricultural wastes proves to be of great importance as raw materials for other industries. This would prevent an ultimate loss of a vast amount of untapped biomass and environmental issues.

Introduction

Bananas are one of the earliest crops to be produced in human history. The plant family's origins can be traced from India to Papua New Guinea, encompassing the Southeast Asian region (Assani, *et al.*, 2003; Frida, Pramafisi, Cahyana, 2020). With an estimated total production of over 139 million tonnes, it has become the world's second-largest fruit crop in recent decades due to widespread cultivation and consumption (FAO, 2010a). The vast production of bananas also leads to a massive generation of agricultural waste residues. The indigenous people have used these plants for more than simply food purposes, and they have begun to explore the potential of using banana plants for different possibilities. Agricultural waste is one of the most untapped residues, and waste valorization strategies have received significant attention from academics in recent years (Kareem and Rahman, 2013). The recycled agricultural waste serves as an excellent raw material for generating massive by-

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Eating Behaviour and Lifestyle Changes Among Elderly During COVID-19 Pandemic

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ABSTRACT

This web-based cross-sectional survey aimed to explore the changes in eating behaviour and lifestyle pattern among elderly residing in Delhi during the Covid-19 pandemic. 113 elderly persons(46 males and 67 females), age varying from 61yrs. to 75yrs., were purposely selected in this study. The data was collected using Google Form and the participants were asked to fill in the online Google Form whose link was shared via email and WhatsApp. Telephonic interviews were conducted for those who did not have android mobile phones. The findings of the study revealed that 44.44 per cent elderly were consuming healthier meals in joint families. 23.01 percent of participants were often skipping meals. 66.37percent of participants reported neutral mood. 61.06per cent of participants reported that emotions influence their eating pattern. Participants' meals were based on their health status (66.37%), likes and dislikes (56.64%), hunger (53.1%), and family (44.25%). A significant relationship was observed between gender and skipping meals ($p<0.05$) in which the frequency of skipping meals was higher in males (61.53%). Only 35.4per cent of the participants was physically active in which most of them were going for a walk (69.91%) while 37.17per cent of participants were engaged in extracurricular activities. Thus, this study shows an impact of the Covid-19 pandemic on the psychological and emotional responses in the

IMPACT OF NUTRITION KNOWLEDGE ON EATING BEHAVIOR AMONG COLLEGE GOING GIRLS (18-23 YEARS)

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ABSTRACT

Maintaining healthy eating behavior in college is demanding due to various factors depending on their knowledge, peer pressure, living away from home, financial conditions and many more. Hence, its paramount to analyze the eating behavior of youngsters. The aim of this present cross-sectional comparative study was to analyze the eating behavior of college going girls (18-23 years) in Delhi. Information regarding nutrition knowledge, and eating behaviour using a Three-Factor Eating Questionnaire (TFEQ) were gathered. 200 college going girls (100 each from nutrition and non-nutrition studying group) participated in the study. Study ramified that nutrition studying students exhibits more nutrition knowledge which was positively associated with increase in restraint eating (propensity to restrict the food intake in order to control body weight) and negatively associated with disinhibition eating behaviour (overconsumption of food in response to various stimuli) in non-nutrition studying students. On the other hand, restraint eating was significantly and inversely correlated to TBF% and BMI ($p=0.03$) and disinhibition tends to positively associated with TBF% and BMI, especially habitual disinhibition ($p=0.001$). Inter-correlation among TFEQ factors revealed rigid restraint and susceptibility to hunger both have significant and positive correlation with dis-inhibition ($p<0.05$). The present study showed that girls studying nutrition had better eating behavior practices than non-nutrition group. Hence, basic nutrition knowledge among non-nutrition students can improve their eating behavior which will help them to follow only flexible restraint eating instead of rigid eating practices. The study gives a key message that Nutrition knowledge can improve eating behaviour of both nutrition and non-nutrition studying students.

Key Words: Nutrition knowledge, three factor eating questionnaire, eating behaviour

INTRODUCTION

"Eating behaviour is a complex interplay of physiological, psychological, social and genetic factors that influence meal timing, the quantity of food intake, and food preferences and food selection" (Grimm &Steinle 2011). Food choices of today's youth have been changed from nutrition dense to calorie dense which predisposes them to overweight and obesity that can trigger onset of many non-communicable diseases (Baker &Friel 2014; Bhongir, Nemani& Reddy 2011; Pengpid&Peltzer 2014).

Healthy eating remains arduous among adolescents or youth, be it reducing fast food intake or consumption of fruits and vegetables (Bakshi & Singh ,2012) Eating behaviour of a college student can be very different from a school student whose food choices are dependent on the choices of their parents.

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IDF21-0099 Development of self-management program with carbohydrate counting for Type 1 Diabetes delivered during Covid-19 pandemic

L. Gupta, R., P. Rishi Lal

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Research Article

Effect of Different Processing Conditions on the Carotene Content of Different Vegetables

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ABSTRACT

Benefits of β-Carotene are well known, most important being the pro vitamin A activity but experimental evidences are lacking regarding the effect of processing on β-Carotene. Processing is critical in determining the bioavailability of β-Carotene from foods and there is a perception that β-Carotene is destroyed by the heat process involved in cooking of vegetables. This study is intended to determine the stability of β-Carotene when selected vegetables are subjected to various processing techniques. Carrot and spinach were chosen for this study since they are the two most important sources. β-Carotene was quantified from vegetables by Reversed phased High Performance Liquid Chromatography (HPLC) System. The result indicated the control sample reading of carrot and spinach was 16833 µg/100 g and 19383 µg/100 g, the β-Carotene level increased substantially in all the processing conditions. Tray drying proved to be the best processing technique with highest percentage gain. Among the samples, Spinach was found to be the richest source of β-Carotene.

Keywords: β-Carotene; Vitamin A; Reversed Phased High Performance Liquid Chromatography (HPLC); Processing; Tray drying

INTRODUCTION

Carotenoids are pigments that can be found in higher plants, algae, fungus, bacteria, and animals like birds and crustaceans. Because plants and microorganisms can only synthesize carotenoids, their presence in animals is due to ingestion via food and accumulation in specific tissues, such as flamingo feathers, egg yolk, and invertebrate exoskeletons. They are found in subcellular organelles in plants i.e. Chloroplasts and chromoplasts Carotenoids are deposited in crystalline form (e.g., in carrot roots and tomato) or as oily droplets (e.g., in mango and paprika) in chloroplasts and serve as accessory pigments in photosynthesis, photo protective pigments, and membrane stabilizers, whereas in chromoplasts, they are deposited in crystalline form (e.g., in carrot roots and tomato) or as oily droplets (e.g., in mango and paprika) [1].

Carotenoids are an essential source of colors and vitamins, and researchers are interested in finding efficient ways to produce them. Both plants and microorganisms are utilized as raw resources in the technological process. However, chemically synthesized carotenoids created in the 1950s were the primary source of carotenoid colors for a long time.

Carotenoids are derived from the leaves, flowers, fruits, seeds, roots, and tubers of plants. They are present in vegetables like carrots, pumpkins, spinach, tomatoes, and fruits like watermelon and raspberries. Carotenoids are significant for their metabolism as provitamin A, with α-Carotene and β-Carotene being the most abundant in plant tissues and having the highest activity (β-Carotene has a biopotency of 100 % while α-Carotene has a biopotency of 53%). Human plasma contains oxygenated carotenoids (xanthophylls), which lack vitamin A activity in general, but their exact function, if any, is not defined.

β-Carotene is a carotenoid compound found in abundance in the human diet and, as a result, in all human tissues, including blood. It is also frequently utilized in medicine due to its potent bioactivity. Among the many roles of β-carotene in the human body, the most significant is provitamin a supply, affecting embryonic development, proper growth, and vision. β-Carotene is used as an approved color in many products in the food industry, including nonthermally treated nonalcoholic beverages with a tropical fruit taste, edible fats, cheese, pastry, and ice cream. It acts as a gene inhibitor, as well as having anticancer and antioxidant effects. Orange carrots are the most common source of β-Carotene have shown that when vegetables are subjected to various heat treatments before consuming, factors such as heat, light, chemical treatments, and oxygen exposure may have detrimental effect on several bioactive constituents [2]. Thermal processing affected trans-cis-isomerization of β-Carotene in carrot juice produced on a pilot plant and β-Carotene-containing preparations. While pasteurization and sterilization at 121°C only resulted in minor isomerization, sterilization at 130°C. And blanching resulted in

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Review Article

Food fortification strategies to deliver nutrients for the management of iron deficiency anaemia

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ABSTRACT

A rising trend in the global prevalence of anaemia is still prevailing. To combat micronutrient deficiencies, World Health Organization/Food Agriculture Organization (2006) guidelines recommended four chief strategies – supplementation, fortification, nutrition education and dietary diversity. Of the four strategies, food fortification has been considered as the most efficacious and economical approach. However, it is the directives themselves that highlight two major bottlenecks associated with conventional fortification - uniform dissemination of the fortifier in food vehicle that mostly include staple foods, and internal and external compliance evaluation of fortification regulations and standards by the producers. As a result, researchers envisaged a new strategy - Food-to-food fortification that complements conventional fortification. This strategy involves fortification of food vehicles with nutrient rich food-based fortifiers. The major advantage of utilizing food-based fortifiers is that they hold the potential of enhancing the bioavailability of the fortified food and providing additional nutrients and thus, resulting in dietary diversification. It also facilitates the utilization of underutilized crops as food-based fortifiers. Underutilized crops have been recognized as potential beneficial food source accounting to their nutritional, ecological, and fiscal benefits. This review paper delves into the strengths and shortcomings of conventional iron fortification. It delineates the concept of food-to-food fortification, while precisely discussing about the best practices to be followed to address the possible challenges associated with this strategy. It also promotes the utilization of underutilized iron rich foods to develop fortified foods and avert global food insecurity. Furthermore, it provides a summary of the studies conducted around the world to develop fortified foods using iron compounds and iron-rich foods, and to investigate their efficacy in managing iron deficiency anaemia.

1. Introduction

Anaemia is a condition diagnosed by reduced levels and atypical morphological characteristics of erythrocytes, or by insufficient blood haemoglobin (Hb) levels in the human body. The reduced Hb levels have been recognised as a causal factor for an inadequate oxygen supply in the human body. This has been ascribed to suboptimal production of erythrocytes (erythropoiesis), amplified erythrocyte annihilation, loss of blood, or due to combination of all these aspects (da Silva Lopes et al., 2018). World Health Organization (WHO) defines anaemia as Hb levels less than 13.0 g/dl in men and less than 12.0 g/dl in women of reproductive age (WRA) (World Health Organization, 1972). The global burden of anaemia among all age groups was reported to have dropped by 4.2 percentage points, i.e., from 27% in 1990 to 22.8% in 2019 (Gardner and Kassebaum, 2020). Although, the global prevalence has declined over nearly three decades, a rise in the total number of anaemia cases by 0.32 billion, that is from 1.42 billion cases (1990) to 1.74 billion cases (2019) was reported. In 2019, the maximum burden of anaemia was reported in children below the age of 5 years (39.7%). The global age-standardized point prevalence of mild, moderate, and severe anaemia was reported as 54.1%, 42.5% and 3.4% cases, respectively. Furthermore, global anaemia was accounted for 58.6 million Disability Adjusted Life Years in 2019. Reportedly, the maximum age-standardized point prevalence of anaemia was found in Western [40977.0 (95% UI: 29,789.3–42,154.8)] and Central [36861.4 (95% UI: 35,218.3–38,434.2)] Sub-Saharan Africa as well as South Asia [41646.1 (95% UI: 41,034.3–42,208.3)] (Gardner and Kassebaum, 2020). Based on National Family Health Survey (NFHS) – 4 (2015–16), anaemia affected 53% WRA (15–49 years), 23% men and 50% pregnant women in India. During the same period, Government of India committed to Global

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Food safety knowledge and changes in practices and concerns of Indian families during the COVID-19 pandemic

Sunaina Thakur, Pulkit Mathur

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Abstract

Purpose Unsafe food can lead to various foodborne diseases and even death, especially among children. This paper aims to assess food safety knowledge and changes in practices and concerns among adults ≥ 18 years during the coronavirus disease 2019 (COVID-19) pandemic.
Design/methodology/approach A cross-sectional, web-based survey was conducted among 325 adults living in Northern India. Demographic data and information regarding their knowledge, practices and concerns about various food safety issues were collected to see if there were any changes due to the COVID-19 pandemic. Findings The results showed that the participants had slightly higher than average knowledge and good food safety practices with mean scores of 9.75 ± 2.23 and 24.87 ± 2.28, respectively. Contracting COVID-19 from food and food packaging materials was of high concern for more than 70% of the participants. Majority (> 80%) of them reported an increase in the frequency of handwashing. About 16% of the participants used chemical disinfectants for washing fruits and vegetables. An increase (57.5%) in the frequency of food label reading was also noted during the pandemic. Freshness and the general quality of food items (49.5%), safety of food (30.8%) and cost (18.2%) were the top drivers that influenced the purchase decision.
Originality/value This study highlighted the need to send out clear messages on safe food handling practices and keeping the tempo up for sustaining good hygienic practices. This will help in reducing the risk of foodborne diseases.

Understanding of nutrition information on food labels among higher income adults in India

Objectives This study assessed food label reading habits and understanding of nutrition information on food labels by higher income adults in India. Design It involved a cross-sectional study using non-probability purposive sampling. Setting Data were collected by mixed methods approach between March 2019 and February 2020. Adults were selected from housing colonies in four geographical zones of Delhi, India. Method A total of 589 adults (20–40 years) belonging to upper middle-income and high-income groups were selected. Associations between gender, family income, age, marital status, and label reading habits were assessed using Chi-square tests. Demographic predictors of food label reading habits were identified using binary logistic regression with a level of significance set at $p < .05$. Results Participants read the food labels (79%) and noticed the nutrient claims (76%) on food labels. Female participants were more likely to understand nutrition information as compared with male participants (odds ratio [OR] = 1.52, $p = .04$). Female participants were also more likely to notice the nutrient claims on the packet of food products (OR = 1.99, $p < .01$) as compared with male participants. The majority of participants found the 'traffic light scheme' format easy to understand. Conclusion Consumers look for nutrition information on food labels. They value healthier food alternatives but most are unable to decipher the nutrition labels. Food labels should communicate the healthfulness of products in a straightforward manner to enable better food choices.

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Use of Nutritional Ergogenic Aids by Adults Training for Health-Related Fitness in Gymnasia- A Scoping Review

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Abstract

Globally, availability and usage of supplements by recreational young people in gymnasia is on the rise. Although certain aspects related to nutritional ergogenic aids and supplements prescribed in traditional Indian medicine, have been reported, no comprehensive global review is yet available. This Scoping Review was, therefore conducted in view of the gaps in research, needs for capacity building of concerned professionals, strengthening of knowledge, attitudes of trainees and for policy / regulations. A total of 16 key words were framed and 5 search engines were explored for this review. Through this search procedure 278 research papers were scrutinized (from 2000-to date) of which 31 were included, highlights higher prevalence of supplement use amongst males v/s females attending gymnasia. The most used supplements were nutrients and pharmacy (multivitamins, creatine), proteins (whey, amino acids), rationale of intake, dietary adequacy with respect to nutrients were not reported in the study. Main reason for use was a quest for increased immunity, weight gain and increased strength. The main sources of influence were gym coaches, medical supervisors and family-friends. Most common places of purchase were stores, gym / fitness centres and the internet. The review concludes that there is further scope of researching all age groups, gender differences in supplement use, basis of goal setting, efficacy of supplements in meeting the desired goals, KAP of influencing professional, mapping constructs for capacity building and potential suggestions for policy and regulations within fitness centres, especially in the Indian context.

Keywords: *Nutritional supplements, food supplements, health supplements, ergogenic aids, fitness, health and exercise*

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Characterisation of anaemia amongst school going adolescent girls in rural Haryana, India

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Abstract

Objective: High burden of anaemia exists amongst rural adolescent girls in India. The objective of this study was to characterise anaemia in school going adolescent girls in rural Haryana, India.

Design: Linear and multiple logistic regression analysis of data collected prior to an intervention trial was conducted. Participants were classified into anaemic (haemoglobin <12 g/dl) and non-anaemic group and were further classified into deficiencies of Fe, folate or vitamin B_{12}, mixed, anaemia of other causes and inflammation.

Setting: Three schools in Ballabgarh block of Faridabad District, Haryana, India.

Participants: One hundered and ninety-eight non-anaemic and 202 anaemic adolescent girls (12–19 years).

Results: Anaemic girls had 29·6 % Fe deficiency, 28·1 % folate or vitamin B_{12} deficiency, 15·8 % mixed deficiency and 9·7 % acute inflammation. Anaemia of other causes was found in 16·8 % of the anaemic participants. Girls with Fe and isolated folate deficiency had 2·5 times and four times higher odds of developing anaemia, respectively, as compared with non-anaemic girls. Fe deficiency with no anaemia was found amongst 11 % non-anaemic girls. Non-anaemic girls had a high prevalence of combined deficiency of folate or vitamin B_{12} (29·5 %) and acute inflammation (14·4 %).

Conclusions: The current strategy of Fe and folic acid supplementation alone will not suffice for achieving the desired reduction in the prevalence of anaemia as unknown causes and anaemia of inflammation contribute to a substantial proportion of anaemia. Integrating other nutrition-specific components like improving water, sanitation and hygiene practices with the ongoing micronutrient supplementation program will comprehensively tackle anaemia. Unknown causes of anaemia warrant further research.

Keywords
Anaemia
Haemoglobin
Iron
Folate
Adolescent

Anaemia in adolescent girls is a major public health problem in India with 40 % being afflicted[1]. Adolescent girls are vulnerable to anaemia due to regular loss of Fe through menstrual blood in addition to the overall accelerated increase in requirements for Fe due to rapid pubertal growth. Functional consequences of anaemia on growth and development occur even at mild levels or prior to onset of clinical stage of anaemia, making it the third leading cause of disability in the world[2].

Some recent evidence challenges the earlier notion that Fe deficiency is the predominant contributor to anaemia globally[3,4]. Estimates suggest that less than half the cases of anaemia are due to Fe deficiency, and the other causes are unknown[3–5]. Anaemia due to inflammation has been

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Review

Diet Quality, Nutritional Adequacy and Anthropometric Status among Indigenous Women of Reproductive Age Group (15–49 Years) in India: A Narrative Review

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Abstract: In India, indigenous communities are nutritionally vulnerable, with indigenous women suffering the greater burden. Studies and surveys have reported poor nutritional outcomes among indigenous women in India, yet systematic documentation of community-specific nutrition data is lacking. We conducted a narrative review of 42 studies to summarise the nutritional profile of indigenous women of India, with details on their food and nutrient intakes, dietary diversity, traditional food consumption and anthropometric status. Percentage deficits were observed in intake of pulses, green leafy vegetables, fruits, vegetables, flesh foods and dairy products when compared with recommended dietary intakes for moderately active Indian women. Indices of diet quality in indigenous women were documented in limited studies, which revealed poor dietary diversity as well as low consumption of diverse traditional foods. A high risk of nutritional inadequacy was reported in all communities, especially for iron, calcium, and vitamin A. Prevalence of chronic energy deficiency was high in most communities, with dual burden of malnutrition in indigenous women of north-eastern region. Findings from this review can thus help guide future research and provide valuable insights for policymakers and program implementers on potential interventions for addressing specific nutritional issues among indigenous women of India.

Keywords: dietary intake; food consumption; nutrient intake; nutritional status; diet quality; indigenous women; Indian tribal women

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1. Introduction

Indigenous Peoples, who represent five percent of the global population, are amongst the most vulnerable and marginalized human populations in the world. They face extreme poverty in all spheres and dimensions, suffer from poor health and nutrition outcomes, and have a compromised quality of life than their non-indigenous counterparts [1]. India, a land of numerous cultures and people, is home to 104 million Indigenous Peoples, who constitute 8.6% of the total national population [2]. These Indigenous Peoples, identified as 'Scheduled Tribes (STs)' in India, constitute the second largest indigenous population in the world [3]. The Government of India identifies these STs or indigenous communities based on their traditional traits, distinctive culture, geographical isolation, and lack of progress on the social and economic front [4].

There are around 705 different Indian indigenous communities living in 15% of the country's area, predominantly in forests, hills and inaccessible regions (including deserts and plain areas) [5]. Among these indigenous communities, 75 communities are identified as particularly vulnerable tribal groups (PVTGs) due to their pre-agricultural technology, declining or stagnant population, low literacy and dependence on subsistence economy [6]. Although, indigenous communities in India differ from one another in terms of their racial traits, dialects, socio-cultural customs, and patterns, they face common day-to-day challenges due to their location in geographically isolated areas and their dependence

on natural ecosystems for basic livelihood [6]. They face discrimination than other social groups, in terms of economic development, social status, income distribution and access to basic health facilities [6,7]. Further, indigenous communities have access to diverse natural food sources that provide wild traditional foods that are native to a particular region and are rooted in social and cultural identities of indigenous populations [8–10]. However, despite possessing traditional ecological knowledge (TEK) about their unique local food systems, indigenous communities in India are nutritionally vulnerable [6]. Surveys conducted by National Nutrition Monitoring Bureau (NNMB) in nine states, have reported poor nutrient intakes among the indigenous population, particularly for essential micronutrients such as vitamin A, iron, and riboflavin [11]. Consumption of most food groups among these communities was found to be below the recommended dietary intake of Indians [12] and has reduced over the years, indicating the risk of rising food and nutrition insecurity among the indigenous population [6,11].

Although malnutrition is prevalent across all segments of the indigenous population in India, the group that gets most affected is indigenous women and children [7,13,14]. Indigenous women in India participate in all types of activities, including household work, agricultural work and child rearing, and contribute to the local economy by participating with men in subsistence activities [14–16]. According to the literature, indigenous women are considered an economic asset in the society, yet face greater disadvantage than their male counterparts in terms of food consumption and access [14,15]. A case study in a tribal district of Jharkhand revealed that female headed households are more vulnerable to nutritional insecurity, as they often face problems related to food starvation and food procurement [16], while two review studies have reported poor calorie intake among indigenous women of central-eastern India which falls short to compensate for their heavy physical workload [17,18]. A study by UNICEF found that indigenous women make up a disproportionately large number of maternal deaths in some states, which has been attributed to the high incidence of chronic energy deficiency (CED) and anemia among these women [19]. According to recent National Family Health Survey (NFHS)-5, 2019-21, about 25% of the indigenous women are chronically energy deficient (Body Mass Index (BMI) < 18.5 kg/m^2) among which 15% are mildly thin and 10.6% are moderately/severely thin [20]. This is slightly higher than the national prevalence reported for CED in Indian women (18.7%), with 11% as mildly thin and 7% as moderately/severely thin [20]. The recent NFHS-5 data also suggests a wide gap in the prevalence of CED and anemia between indigenous men and women. All these factors might further contribute to overall poor nutritional status among indigenous women, who in the future, maybe likely to give birth to low-weight infants, thus leading to a vicious cycle of malnutrition.

Although studies and surveys have been carried out on dietary intake and nutritional status of indigenous women in India, there exists a near absence of community-specific nutrition data for indigenous women of reproductive age group. This is a crucial information gap as baseline nutritional data on non-pregnant indigenous women may aid in the development of future strategies to improve maternal and child health outcomes among indigenous communities of India. Further, there is lack of data on consumption of local traditional foods among women belonging to indigenous communities of India. The impact of seasonality on dietary intake of indigenous women have also not been explored to a desired extent. This could be a critical opportunity to research as changes in temperature, wind and rainfall patterns influence the crop production and wild food availability. This may have an impact on food consumption patterns of indigenous communities of India, who are predominantly smallholder subsistence farmers. Since the last national nutrition survey on indigenous populations of India (NNMB) was conducted more than a decade back, there is a need for a more recent overview on nutritional outcomes among indigenous women of India. Given the fact that indigenous women in India constitute one of the most nutritionally vulnerable groups, it is important to understand their current nutritional profile and explore the factors responsible for poor nutritional outcomes. The present paper thus aims to provide an overview of the nutritional profile of non-pregnant women

in reproductive age groups belonging to various indigenous communities in India, by bringing together available information on on (1) their food intake; (2) dietary diversity; (3) their consumption of traditional foods; (4) specific nutrients of concern in their diets; and (5) prevalence of CED and overweight/obesity.

2. Materials and Methods

The objective of the paper was to conduct a narrative review on the nutritional outcomes of non-pregnant women belonging to different indigenous communities of India. A narrative approach was chosen over the commonly used systematic approach, since the aim of this review was to describe and synthesize the findings from the published articles and place them to supplement the current lack of knowledge on nutritional scenario among indigenous women. However, we followed a systematic search to avoid subjective selection bias. A literature search was conducted in PubMed and Google Scholar databases, using various combinations of keywords like "nutrition", "nutritional status", "nutrient intake", "dietary intake", "dietary patterns", "anthropometry", "tribal women", and "India" to identify all studies published between 2010 and 2022. References from retrieved articles were reviewed to identify additional relevant publications. The inclusion criteria were (1) studies conducted on non-pregnant women in the reproductive age group of 15–49 years belonging to a recognized ST as per Article 342 of the Indian constitution [4]; and (2) studies reporting any one of the following outcomes: Food group intake, nutrient intake, traditional food consumption, dietary diversity, and/or BMI classification of indigenous women. The exclusion criteria were studies that did not specify the name of the indigenous communities, as well as review articles of all kinds (narrative and systematic).

The data from selected articles were extracted in MS Excel to record the key variables from each selected study. The data on food group consumption were compared with recommended dietary intakes (RDIs) [21] for moderately active Indian women (based on the principle that indigenous women across India have usually moderate activity levels) to compute the percentage deficit and/or excess in food group intake among indigenous women. In the case of nutrient intakes, the data were compared with estimated average requirements (EARs) for moderately active Indian women [21], wherein the women were categorized as having a very high risk of inadequate intakes when intakes were ≤EAR; or likely a low risk of inadequate intakes when intakes were >EAR. This qualitative classification system has been adapted from a previous study [22], and is useful for estimating the prevalence of nutrient adequacy within the population [22]. The proportion of indigenous women consuming traditional foods and the mean/median dietary diversity scores of indigenous women from different communities were also documented. The estimates of CED and overweight/obesity among women from different indigenous communities were extracted as percentages reported for each category. Women with BMI < 18.5 kg/m^2 were classified as having CED [23] and women with BMI ≥ 25 were classified as overweight/obese based on international recommendations [24]. These data were further compared with the NFHS-5 findings [20] on indigenous women of respective states.

3. Results and Discussion

A total of 42 publications that matched the inclusion criteria were included in the final review (Figure 1). An overview of the publications is provided in Supplementary Table S1. The following sections discuss the published literature on various nutritional outcomes in indigenous women belonging to different ethnic communities of India. These findings are further dissected and compared with existing literature to explore the possible factors that influence the diets and nutritional status of indigenous women in India.

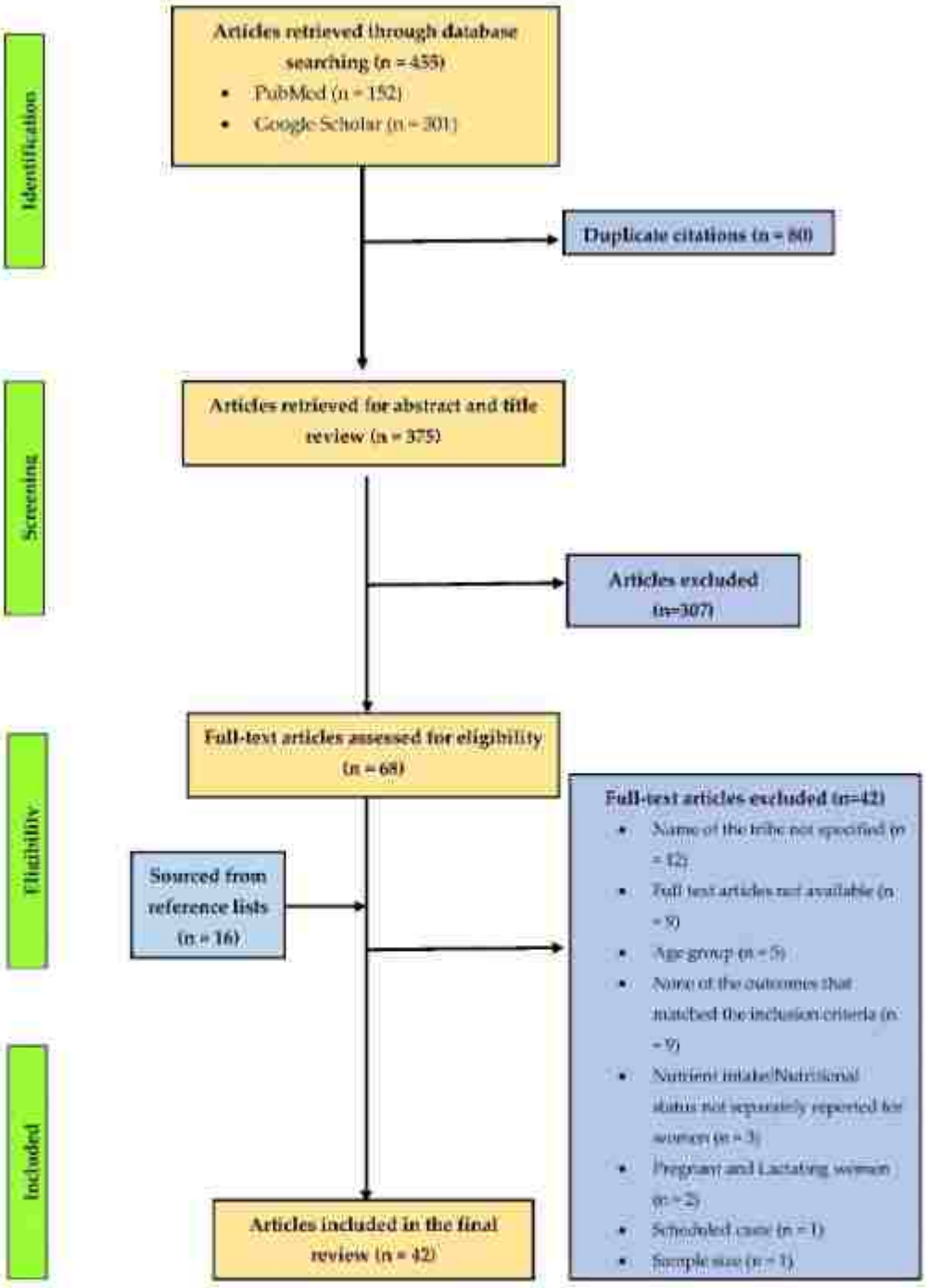

Figure 1. Flow diagram reporting the screening and selection process used in identification of nutritional studies conducted among non-pregnant indigenous women aged 15–49 years in India.

3.1. Food Group Consumption in Indigenous Women of India

The information on food group intakes were reviewed for indigenous women belonging to six ethnic communities of India: Munda (Jharkhand) [25], Khasi (Meghalaya) [26], Saharia and Meena (Rajasthan) [27], Irula (Kerala) [28] and Irular (Tamil Nadu) [29]. Based on our review, we found exceptionally low intakes of pulses, GLVs, other vegetables, fruits and flesh foods among indigenous women across all six communities (Supplementary Table S2). In all communities, cereals as well as roots and tubers provided the greatest intakes among the indigenous women, with Khasi women of Meghalaya [26] reporting an excess consumption of cereals in their diet (Figure 2). The relatively better intake of cereals (comprising

mostly rice) among all the six communities may be attributed to its better availability at the household level, as they are usually grown at the farm-level by these communities for household consumption [25,26,30] and can be accessed at subsidized rates through the national food security program—Targeted Public Distribution System (TPDS) [25,30]. This is a concerning issue, as national food security programs and agricultural policies in India have largely focused on ensuring adequate food supply through energy-dense staple crops (such as wheat and rice), which, may fail to address the widespread micronutrient deficiencies among vulnerable sections of the population including women [31–33]. As evident in our review, this approach is leading to a shift in dietary patterns among the vulnerable indigenous communities, by reducing their diets to monotonous, cereal-based meals, with poor consumption of other food groups [31,34]. Reorienting the TPDS to deliver nutrient-dense foods such as various millets and sorghum, could be a potential strategy for improving the diet quality of the vulnerable populations.

Tribe	Cereals	Pulses	Green Leafy Vegetables	Roots & Tubers	Other Vegetables	Fruits	Flesh Foods	Milk and Milk Products	Oils & Fats
Munda [25]	−3.80%	−74.5%	−72.2%	−43.4%	−73.9%	−94.2%	−58.3%	No data	No data
Khasi [26]	39.70%	−84.3%	−83.6%	−4.4%	−75.2%	−97.9%	−42.7% *	−96.8%	−66.0%
							−79.2% ‡	No data	No data
Saharia [27]	−8.20%	−69.0%	−76.7%	−56.5%	−91.6%	−93.4%	No data	−67.6%	−36.0%
Meena [27]	−7.80%	−77.5%	−74.6%	−67.4%	−80.3%	−91.8%	No data	−42.9%	−20.0%
Irula [28]	−24%	−32.2%	−96.6%	−9.0%	−87.0%	−39.3%	No data	−62.6%	50.0%
Irular [29]	−35%	−63.3%	−72.0%	No data	−27.5%	−76.0%	No data	−58.6%	0.0%

* intake of meat and poultry, ‡ intake of fish and seafoods. Note: Deficit and excess has been calculated with respect to recommended dietary intake for moderately active Indian women [21]. Dark green shading represents an excess in the intake of food group. Light green shading represents a low deficit (<50%) in the intake of food group. Yellow shading represents a moderate deficit (50–70%) in the intake of food group. Light and dark red shading represents a high deficit (>70%) in the intake of food group, with the darkest shades representing a deficit >90%.

Figure 2. Heat map indicating the percentage deficit/excess in food group consumption among indigenous women of India.

Further, in our review, a very high percentage deficit was observed across non-staple food groups like fruits, GLVs and other vegetables in nearly all six communities (Figure 2). Fruits, in particular, were found to be consumed in the least amounts, with a percentage deficit ranging between 39% to 98%. Irula women of Tamil Nadu reported the highest deficit in consumption of GLVs (96.6%) [29] while Khasi women reported the highest deficit in consumption of pulses (84.3%) and fruits (97.9%) [26]. These findings are in line with the NNMB tribal survey data (2009), which reported suboptimal intakes (<50% of RDI) of non-staples like pulses, GLVs, other vegetables in about 50–85% indigenous women across nine states in India [11]. The particularly high deficit in consumption of fruits and vegetables could be attributed to high price inflation and their insufficient domestic production. According to a research on food affordability [35], it was estimated that around 63–76% of the rural Indian population could not afford a recommended diet in 2011, with the cost of a nutritious diet exceeding the expected female wages. Inflation in food prices could, therefore, be a major hindrance towards the affordability of nutritious foods among the indigenous communities, who are already marginalised and face the generational burden of poverty. Studies have suggested agricultural diversification as a feasible strategy for reorienting the food systems away from staple grains towards horticulture crops, thereby improving incomes and access to nutrient-dense non-staple foods [35–37].

Although indigenous communities in India are known to consume a predominantly non-vegetarian diet, our review shows a different picture. The daily food consumption data of Khasi women (Meghalaya) [26] shows a diet deficient in meat, poultry and fish (Figure 2),

which is in contrast to the wide diversity of ethnic meat based delicacies that are known and consumed by indigenous communities across North-east India [38–42]. The study on Munda women of Jharkhand has also reported a high deficit in flesh food consumption and highlights that the consumption of meat, poultry and fish is mostly limited to 1–2 times a week at the household level [25]. Similar trends have been also reported in Santhal [43], Oraon [44] and Sauria Paharia [30] communities of Jharkhand and Bhil and Bhilala communities of Madhya Pradesh [45]. Consumption of another protein rich source, i.e., the milk and milk products- is also nearly non-existent in all communities, with a percentage deficit of >50% (except in Meena women). It is thus crucial to understand the factors limiting the consumption of animal source foods in indigenous women of India. An article on indigenous communities of Madhya Pradesh [45] has reported that the poor financial conditions of the indigenous populations, along with their overdependence on TPDS, are the two primary reasons for declining meat consumption in indigenous communities across India. Further, the low intake of dairy products in indigenous women could be attributed to the local cultural values of indigenous communities in India, wherein they believe that animal milk is meant for its progeny and is not intended for human use as it is considered a sin [46,47]. In this context, more detailed research on food consumption in indigenous communities would be desirable to understand the current trends and determinants.

3.2. *Traditional Food Consumption in Indigenous Women of India*

Traditional foods refer to foods native to a region, that are mainly accessed from natural food environment (i.e., forests, rivers, ponds, lakes, farms, kitchen gardens, wastelands, pastures and roadsides). Considering the globalization of current food systems, traditional foods may also be procured through local markets [48–50]. There are only a few studies that have documented traditional food consumption in indigenous women of India; these include studies conducted on Santhal [43], Oraon [44], Sauria Paharia [30] and Munda women [25] of Jharkhand state of India. Some popular traditional foods consumed by the indigenous communities of Jharkhand include, Red rice, Horse gram (legume), Red amaranth leaves, Koinaar leaves, Basella leaves, Bamboo shoot (vegetable), Kusum (fruit), Eggs of red ants, Snails, among many others [25,30,43,44]. Upon review, we found that the consumption of traditional foods (during the dietary recall period) was reported in >50% of women in all four communities at different time points (monsoon and winter season), with the highest consumption reported in Munda women (73% in monsoon season) (Figure 3). The consumption amounts of traditional foods in Santhal, Oraon and Munda women were found to be quite low in comparison to recommended intakes [21] yet corresponded to significantly higher micronutrient intake in the indigenous women of all the three communities [25,43,44]. Existing literature suggests that indigenous communities in India have access to a variety of wild and cultivated traditional foods that are known to be rich in several nutrients like protein, iron, calcium, zinc, vitamin A, vitamin C, and folate [51], yet their utilization among indigenous communities is on a constant decline [8,9,26,43,44,52]. Different studies have reported several factors contributing to the underutilization of traditional foods in indigenous populations of India- ranging from high opportunity cost of accessing wild foods, limited access to forests and shift towards chemical-intensive agriculture, to changing social values and loss of TEK associated with agro-ecosystems and production practices among younger generations [8,9,53–55]. Additionally, indigenous communities in India are gradually shifting from diverse traditional diets to modern diets, comprising cheap and convenient sources of calories. Qualitative studies conducted with Munda community of Jharkhand [8], Khasi community of Meghalaya [33] and Chakhesang community of Nagaland [33] have revealed that wage labour, increased purchasing power and influence of media and urban lifestyles are leading to an increased dependence on market foods in these communities. However, there is an extensive literature gap on quantitative estimates of ultra-processed food consumption in indigenous communities of India and future research in this domain would be desirable.

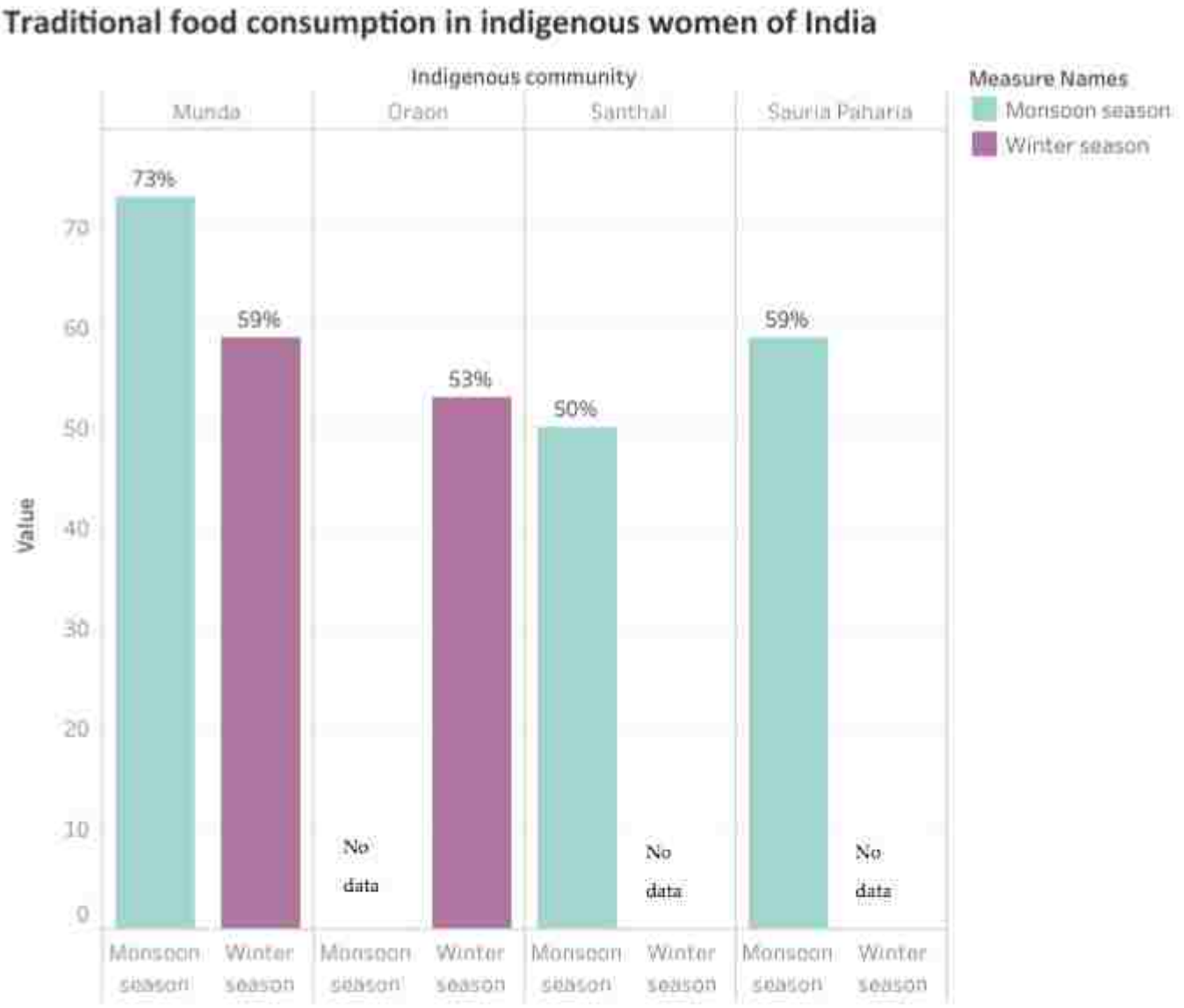

Figure 3. Estimates of traditional food consumption in indigenous women of Jharkhand, India [25,30,44,45].

The existing TEK in indigenous communities needs to be leveraged, for maximising the consumption of traditional foods. A few studies have reported issues related to deprivation of TEK among indigenous communities, which may be addressed through specific interventions like systematic documentation of local IFs consumed by the tribes, their scientific evaluation in terms of consumption and nutritional content, sustainable utilization and planned advocacy. Additionally, national policies in India may need to devise strategies to mainstream the use of traditional foods in daily diets of indigenous populations. A few state level organizations have taken initiatives to revive indigenous food consumption; for example, Odisha's FAARM (Food and Agro-Ecological Approaches to Reduce Malnutrition) [56], and Rajasthan's VAAGDHARA project [57] (supported by NABARD) are working with indigenous communities towards improved access to nutri-gardens and wild habitats and use of agro-ecological approach for promoting sustainable food systems. Similar approaches need to be replicated in other states as well, for reversing the shift from traditional foods to modern diets, in indigenous communities. With initiatives like the National Horticulture Mission ("Mission for Integrated Development of Horticulture (MIDH)") [58] and POSHAN Atlas [59], efforts may be undertaken to diversify the existing

food systems by promoting access to locally sourced wild foods, encouraging agricultural diversification and providing incentives to local farmers to grow nutritionally superior traditional crops [31,60].

3.3. Dietary Diversity of Indigenous Women in India

Studies reviewed on dietary diversity of indigenous women in India, reveal the consumption of poor quality diets, with very low individual dietary diversity scores (i.e., minimum diet diversity score for women or MDD-W [61]). In women belonging to Sauria Paharia [30] and Munda communities [25] of Jharkhand, the mean and/or median MDD-W scores were reported to be as low as 3 (ideal score is 5 or more) (Supplementary Table S3). However, even at low dietary diversity scores, a significantly higher intake of both macronutrients and micronutrients was reported in women with MDD-W scores ≥ 3 [25,30]. On the other hand, relatively higher mean MDD-W scores were reported in indigenous women of Meghalaya [62], including Khasi women (mean score of 3.7) and Garo women (mean score of 4.8). It was interesting to note that a majority (60%) of Garo women in Meghalaya reported the consumption of at least 5 food groups during the reference recall period, while only a few (1 or 2) Munda women in Jharkhand reported the consumption of a diverse diet. The findings on Garo women of Meghalaya are consistent with the findings from another study [63] in the same community, that has reported a household dietary diversity score of 5.82, with majority of the households (70%) having a score between 4.41 to 7.23, respectively.

The positive influence of literacy on improved dietary diversity is well documented in the literature, which could be one of the reasons for higher dietary diversity scores in indigenous women of Meghalaya, as their literacy rates were substantially higher (92.6% in Garo and Khasi) in comparison to indigenous women of Jharkhand (50.3% in Sauria Paharia and 64.1% in Munda women) [25,30,62]. Improved socioeconomic household profile was also found to be a significant predictor for dietary diversity in Garo women, while among Munda and Sauria Paharia women, no such association was observed [25,30,62]. Other studies in rural settings of India [36,64] have also identified a significant impact of nutritional awareness on women's dietary diversity scores, although the evidence in indigenous women is lacking. This could be a crucial point for future interventions as the existing nutrition schemes in India have solely focused on improving nutrition by increasing food availability and/or accessibility without generating nutritional awareness and attempting behavioural change interventions among the beneficiaries.

Majority of the indigenous communities are engaged in subsistence agriculture for their food and livelihood [9,10,26,33,52,62,63,65,66], yet evidence of its impact on women's diets is limited. In Sauria Paharia and Munda communities of Jharkhand, the Food Accessed Diversity Index (FADI) [25,30], did not show any association with the MDD-W scores, while no such associations were explored in Khasi and Garo women of Meghalaya [62]. A research using production data from rural parts of Bihar, Uttar Pradesh, Odisha, Telangana and Maharashtra, also found a non-significant association between production diversity (including kitchen garden and livestock rearing) and household dietary diversity [67]. These findings highlight that while diversity in food production and access is crucial for improved dietary diversity, there exists other cofounding factors that influence this relationship and hence, need to be explored. Previous studies conducted on Indian rural populations have determined that food markets have a positive and greater impact (than crop diversity) on rural women's dietary diversity, especially through purchases of pulses/fruits/vegetables [37,64,68,69]. In this context, improving the access of indigenous populations to local markets that offer diverse and affordable food options, could prove to be a viable strategy for improving dietary outcomes.

Another factor that possibly determines dietary diversity among indigenous women is intrahousehold food allocation. An analysis study on Indian rural populations [36] has identified that women in Bihar, Uttar Pradesh and Odisha, consume fewer nutritious food groups (like pulses, GLVs and fruits) than other household members, which was primarily

attributed to gender differences in intrahousehold food allocation. A similar scenario is reflected in the NFHS-5 survey findings [20], which reveal that a slightly higher proportion of indigenous men in India reported weekly consumption of fruits (46.5% vs. 37.4%), eggs (57,1% vs. 47.4%) and meat, poultry and fish (58.8% vs. 46%) in comparison to the indigenous women, although the weekly consumption of pulses and GLVs was comparable in both groups. Hence, a more focused and exclusive research on dietary diversity of indigenous communities, at both individual and household levels, would be crucial to understand the gender dynamics of intrahousehold food allocation.

3.4. Nutrient Intake of Indigenous Women in India

The nutrient intake data in women was reviewed for 14 indigenous communities of India, which revealed that nearly all communities had reported lower mean/median intakes than EAR for several nutrients (Table 1). Almost all communities (n = 12) had calorie intake lower than EAR, with the lowest calorie intake reported in Sauria Paharia women of Jharkhand [30], followed by Saharia and Meena women of Rajasthan [27]. Protein intakes were found to be slightly higher, with indigenous women in 10 out of 14 communities having a low risk of protein inadequacy (i.e., intake > EAR) (Table 2). These findings are in contrast with the lower intake of pulses, flesh foods and milk and milk products reported in indigenous women from the same communities. As previously discussed in our review, most indigenous communities in India consume a predominantly cereal based diet, which may be contributing to a higher protein intake in these women, resulting in low risk of protein inadequacy. An analysis of protein intakes [70] utilizing the NNMB tribal survey (2009) data revealed that about 70% of the total protein intake in indigenous women was contributed through cereals, while the individual contribution of pulses, flesh foods and milk and milk products was found to be less than 10%., resulting in a PDCAAS score of 76 among indigenous women. Although, a high consumption of cereal based protein is also reported in urban Indian women, contribution from cereals to their total protein intake was lower than 60% with a higher protein contribution from other food groups (especially milk), resulting in a diet with better protein quality [70]. It is, however, important to note that these inferences are drawn from a decade old NNMB survey data and hence, there is a need for more recent comprehensive diet surveys in different sections of the Indian population. Nonetheless, these findings suggest that while indigenous women may be meeting their EAR for protein, the quality of their dietary protein could be a potential cause of concern.

The poor intake of non-staples and low dietary diversity scores in indigenous women, is reflected in their extremely low micronutrient intakes (including vitamin A, folate, iron, calcium and zinc). A high risk of micronutrient inadequacy was reported in indigenous women of Jammu & Kashmir [71,72], Jharkhand [25,30,43,44], Madhya Pradesh [73], Meghalaya [26], Rajasthan [27], Tamil Nadu [28] and Uttar Pradesh [74] (Table 2), especially for vitamin A, iron and calcium. These findings are consistent with the NNMB tribal survey (2009) findings [11], which revealed that majority (80%) of the indigenous women in Tamil Nadu, Odisha and Madhya Pradesh were not able to meet 50% of the RDA for iron, calcium and vitamin A. Results from NNMB rural survey (2012) [75] also highlighted a deficit of 77–80% in vitamin A and folate intake, followed by 47–48% deficit in iron and calcium intake among rural adult women in ten Indian states. The poor nutritional intakes among indigenous women are also reflected in their anaemia status at state levels, particularly in West Bengal (82.3%), Jharkhand (72%), Madhya Pradesh (64.2%), Odisha (71.7%), Rajasthan (61.6%), Uttar Pradesh (51%), Tamil Nadu (59%) and Meghalaya (53.3%) [76], where low intakes of iron, folic acid and vitamin B_{12} were documented. Further, the comparison between NFHS-4 and NFHS-5 data suggest that anaemia prevalence has increased in non-pregnant women across India, with the highest jump reported among indigenous women in West Bengal, Odisha and Jammu and Kashmir [20,76]. Since anaemia is caused by both dietary and non-dietary factors (parasitic infections, gastrointestinal conditions, faulty red-blood cell production), its increasing prevalence in indigenous women is worrisome as

it points towards the deteriorating nutritional as well as health conditions of indigenous women across India.

As discussed previously, poverty could be one of the main contributing factors to inadequate micronutrient intake in indigenous communities, as it limits their access to diverse diets, and increases their risk of nutritional insecurity [77,78]. In this context, the functioning of employment schemes like the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) becomes particularly crucial for marginalised indigenous communities. The uptake of MGNREGA has been highest in indigenous communities across India, especially among women, who earn better wages through MGNREGA than market, leading to better economic independence and improved food consumption [79,80]. However, some authors [81,82] have opined that work engagement through MGNREGA leads to 'feminization of poverty'. A qualitative study [80] conducted in rural areas of Kerala, Tamil Nadu and Odisha, found that women faced a lot of discrimination in work offered through MGNREGA- in terms of lower wages (than men), irregular payment, mistreatment by supervisors, and most importantly, the additional workload (as they are single-handedly burdened with child rearing and domestic responsibilities). A study on rural women of Maharashtra [83] found that women devote equal time as men towards agricultural activities during the peak seasons, but spend a disproportionately higher time in food preparation, domestic work and care activities. The impact of these time trade-offs were found to be significantly associated with a reduced intake of calories, protein, iron, zinc and vitamin A in the women's diets, with particularly worse nutritional deficits observed among landless women, who resort to working on other people's farms for additional income [83]. This decrease in nutrient intake was mainly linked to the time constraints faced by the rural women for preparing nutritious meals during the peak agricultural season [83]. Based on these findings, the existing safety net programs may incorporate a more gendered focus to address the disproportionate impacts on women.

Table 1. Mean nutrient intakes among indigenous women of India.

Tribe	N	EAR [a]	Energy (kcal/d)	Protein (g/d)	Vitamin A (µg/d)	Vitamin C (mg/d)	Thiamine (mg/d)	Riboflavin (mg/d)	Niacin (mg/d)	Folate (µg/d)	Vitamin B12 (mg/d)	Iron (mg/d)	Calcium (mg/d)	Zinc (mg/d)	Dietary Assessment Method	Random Sample
			2130	36	390	55	1.4	2	12	180	2	15	800	11		
Jammu & Kashmir																
Gujjar Bakerwal [71]	410	Mean	1421	40.2	-	-	-	-	-	-	-	7.9	277	-	1	No
		SD	264	7.3								2.3	152.9			
Gujjar [72]	50	Mean	1862	39.4	-	-	-	-	-	-	-	7.8	337.3	-	1	No
		SD	1461	12.8								4.4	292.6			
Jharkhand																
Santhal [43]	147	Mean	1969	43.5	923.5	98.9	0.9	0.6	20.9	85.8	0.2	13.9	325.3	7.8	1	Yes
		SD	778	18.9	1364.8	115.9	0.6	0.3	8.7	65.9	0.1	18.9	578.1	3.2		
Oraon [44]	138	Mean	2365	58.3	146.4	61.6	0.7	0.6	27.2	100	0.1	10.1	277.3	9.6	1	Yes
		SD	918	40.3	207.6	46.5	0.3	0.3	13.7	56.4	0.5	8.9	171.03	3.8		
Oraon [84]	100	Mean	2092	41.2	219	25.5	-	-	-	-	-	20.5	288.7	-	1	Yes
		SD	34	4.03	2.03	1.63	-	-	-	-	-	1.4	7.1	-		
Munda [84]	100	Mean	2179	38.9	231.2	27.5	-	-	-	-	-	21.6	305.5	-	1	Yes
		SD	38	4.9	10.2	1.4	-	-	-	-	-	1.1	3.2	-		
Munda [25]	282	Mean	1495	35.6	68.7	48.9	0.5	0.4	7.2	114.2	-	7	120.7	5.6	1	Yes
		SD	269.3	5.3	34.7	9	0.5	0.2	1.5	13.9	-	1.7	7.6	1		
Sauria Paharia [30]	204	Mean	1092	31.6	15.7	12.4	0.3	0.2	5.3	79.4	-	5.2	90.6	4.4	1	Yes
		SD	86.3	3.5	27.6	82.8	0.1	0.1	0.7	22.9	-	1.5	19.4	0.6		
Madhya Pradesh																
Saharia [85]	209	Mean	1478	51.7	45 (20, 79) *	6 (2, 13) *	1.9	0.7	17.3	55.2	-	20.5	254	-	1	Yes
Korku [73]	602	Mean	1822	37.7	93	16.9	0.7	0.6	9.2	-	-	15.7	170.3	-	2	No

Table 1. *Cont.*

Tribe	N	EAR [a]	Energy (kcal/d)	Protein (g/d)	Vitamin A (µg/d)	Vitamin C (mg/d)	Thiamine (mg/d)	Riboflavin (mg/d)	Niacin (mg/d)	Folate (µg/d)	Vitamin B12 (mg/d)	Iron (mg/d)	Calcium (mg/d)	Zinc (mg/d)	Dietary Assessment Method	Random Sample
			2130	36	390	55	1.4	2	12	180	2	15	800	11		
Meghalaya																
Khasi [26]	47	Mean	1890	59.2	191.2	33.4	0.7	0.5	13.1	-	-	13.8	322.8	-	1	Yes
		SD	438.3	29.3	279	31.7	0.4	0.2	3.9			10.9	386.2			
Odisha																
Desia Khond [86]	80	Mean	2225	33.46	134.5	10.1	0.9	0.6	10.7	47.4	0.15	13.7	195.3	4.8	1	Yes
		SD	262	11.17	228	15.6	0.3	0.53	6.6	15.1	0.42	4.9	56.7	1.3		
Rajasthan																
Saharia [27]	93	Mean	1335	42.2	291	23.4	1.6	0.7	13.1	168	0.5	16.1	438.5	6.9	1	No
		SD	287	10.4	281	19.5	0.4	0.2	3.3	54	0.1	4.7	154.3	1.9		
Meena [27]	92	Mean	1386	44.4	442	26.1	1.5	0.8	12.8	166.9	0.2	15.3	531.2	6.7	1	No
		SD	252	8.2	397	18.9	0.1	0.2	2.3	60.3	0.1	3.2	203.5	1.3		
Tamil Nadu																
Irula [28]	30	Mean	1830	35.2	558	20	0.4	0.7	8	48	-	12	158	-	2	No
Uttar Pradesh																
Bhoksa [74]	120	Mean	1638	42.4	-	-	-	-	-	-	-	13.8	335	-	1	Yes
		SD	243	6.81								2.8	176.4			
West Bengal																
Santhal [87]	45	Mean	2180	18	-	-	-	-	-	-	-	-	-	-	3	Yes
		SD	472	2	-	-	-	-	-	-	-	-	-	-		

[a]—[21]. EAR: Estimated average requirements, RDA: Recommended dietary allowances, SD: Standard deviation, * median and IQR presented. 1—24 h recall. 2—Food weighment method. 3—Quantitative food frequency questionnaire [88].

Table 2. Risk of nutritional inadequacy among indigenous women of India.

Tribe	Energy	Protein	Vitamin A	Vitamin C	Thiamine	Riboflavin	Niacin	Folate	Vitamin B12	Iron	Calcium	Zinc
Jammu & Kashmir												
Gujjar Bakerwal [71]	High risk	Low risk	No data	No data	No data	No data	No data	No data	No data	High risk	High risk	No data
Gujjar [72]	High risk	Low risk	No data	No data	No data	No data	No data	No data	No data	High risk	High risk	No data
Jharkhand												
Santhal [43]	High risk	Low risk	Low risk	Low risk	High risk	High risk	Low risk	High risk	High risk	High risk	High risk	High risk
Oraon [44]	Low risk	Low risk	High risk	Low risk	High risk	High risk	Low risk	High risk	High risk	High risk	High risk	High risk
Oraon [84]	High risk	Low risk	High risk	High risk	No data	No data	No data	No data	No data	Low risk	High risk	No data
Munda [84]	Low risk	Low risk	High risk	High risk	No data	No data	No data	No data	No data	Low risk	High risk	No data
Munda [25]	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk		High risk	High risk	High risk
Sauria Paharia [30]	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk		High risk	High risk	High risk
Madhya Pradesh												
Saharia [85]	High risk	Low risk	High risk	High risk	Low risk	High risk	Low risk	High risk	No data	Low risk	High risk	No data
Korku [73]	High risk	Low risk	High risk	High risk	High risk	High risk	High risk	No data	No data	Low risk	High risk	No data
Meghalaya												
Khasi [26]	High risk	Low risk	High risk	High risk	High risk	High risk	Low risk	No data	No data	High risk	High risk	No data
Odisha												
Desia Khond [86]	Low risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk
Rajasthan												
Saharia [27]	High risk	Low risk	High risk	High risk	Low risk	High risk	Low risk	High risk	High risk	Low risk	High risk	High risk
Meena [27]	High risk	Low risk	Low risk	High risk	Low risk	High risk	Low risk	High risk	High risk	Low risk	High risk	High risk
Tamil Nadu												
Irula [28]	High risk	High risk	Low risk	High risk	High risk	High risk	High risk	High risk	No data	High risk	High risk	High risk
Uttar Pradesh												
Bhoksa [74]	High risk	Low risk	No data	No data	No data	No data	No data	No data	No data	High risk	High risk	High risk
West Bengal												
Santhal [87]	Low risk	High risk	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data

3.5. Nutritional Status of Indigenous Women in India

The data on CED prevalence among indigenous women were available for 36 indigenous communities belonging to sixteen states of India (Figure 4). Upon review, it was found that indigenous women from sixteen ethnic communities of India reported a CED prevalence of >40%, with the highest prevalence (90.7%) reported in Gujjar Bakerwal women of Jammu & Kashmir [71]. Indigenous women, belonging to PVTGs, were particularly observed to have a higher prevalence of undernutrition than other indigenous women. These include, Bhuyan (77%), Juang (62.9%) and Mankirdia (59.5%) women of Odisha [89–91], Toto women (72%) of West Bengal [92], Saharia women (68%) of Rajasthan [27], Bhoksa women (64.2%) of Uttar Pradesh [74], Katkari women of Maharashtra [93] and Sauria Paharia women of Jharkhand [30]. The proportion of CED levels among these women is observed to be far greater than the state averages reported for indigenous women in the recent NFHS-5 (2019-21) [20] survey findings, except in Uttarakhand and Nagaland. Although, it is important to consider that most of these studies used different methodologies for anthropometric measurements and a few studies included in our review were conducted on small sample sizes.

A comparatively lower CED prevalence (<15%) is reported in the studies reviewed on indigenous women from north-eastern region (Manipur, Nagaland and Arunachal Pradesh), which is comparable with the NFHS-5 state-level prevalence on indigenous women. A moderate prevalence of CED is reported in the studies reviewed on indigenous women belonging to Karbi, Mishing, Thengal Kachari and Meitei communities of Assam, and Anal community of Manipur, but this is also accompanied with a moderately high prevalence of overweight and/or obese in these women (Figure 4). The coexistence of over-and undernutrition among indigenous women can also be seen in the NFHS-5 state-level data of Assam, Manipur and Nagaland, which reveal a higher prevalence of overweight and/or obesity in indigenous women, as compared to the total female population in these states. Similar trends are also reported in the NFHS-5 data for Jammu and Kashmir, Uttarakhand, Kerala and Tamil Nadu. The reason for this dual burden of malnutrition in indigenous communities could be attributed to the growing urbanization, which is leading to a shift in occupational patterns, resulting in better household income, reduced physical activity levels, and consequently, a shift from local food consumption towards energy-dense foods among the indigenous communities [94–96]. These rapid changes in diet and lifestyles are contributing to nutrition transition among indigenous populations in India as well as across the globe [97–99].

Many selected studies in this review have also reported better nutritional status among indigenous men in comparison to women, with substantially lower levels of CED (in indigenous communities of Santhals, Sabars and Birhors from West Bengal, Bhuyans, Juangs, Bhumij and Mankidias from Odisha, Meities, Mishing and Thengal Kachari from Assam, Korku from Madhya Pradesh and Kharwar from Uttar Pradesh) [73,89–91,95,100–104,104–106]. Similar results are documented in national survey findings, which report a lower prevalence of CED among indigenous men (19.2%), as opposed to women (25.5%) [76]. The reason for better nutritional status among indigenous men could be attributed to physiological factors [107] and better literacy levels [73,95,100] which coincides with the national figures that report higher literacy rate among indigenous men (68.5%) than women (49.4%) [108]. As previously discussed, gender discrimination could also be one of the possible factors affecting independent access to food by indigenous women [109]. These socio-economic issues are further compounded with heavy work demands, early marriage, childbearing, and rearing, in indigenous women of India, thus increasing their vulnerability to poor nutrition and health outcomes [18,83,92].

State	Indigenous communities	Type of community	CED: Percentage of women with BMI <18.5 (indigenous communities)	Overweight or obese: Percentage of women with BMI ≥ 25 (indigenous communities)	CED: Percentage of women with BMI < 18.5 (state prevalence* for indigenous women)	Overweight or obese: Percentage of women with BMI ≥ 25 (state prevalence* for indigenous women)	CED: Percentage of women with BMI < 18.5 (state prevalence* for total population)	Overweight or obese: Percentage of women with BMI ≥ 25 (state prevalence* for total population)
North region								
Jammu & Kashmir	Gujjar Bakerwal (n=410)	Non-PVTG	40.7	9.1	8.5	21.1	9.2	29.8
Uttar Pradesh	Kharwar (n=44)	Non-PVTG	36.6	9.2	No data	No data	19	21.8
	Bhokta (n=120)	PVTG	64.2	5.8				
	Tharu (n=89)	Non-PVTG	19	18.5				
Uttarakhand	Mancha (n=624)	Non-PVTG	7.8	17.9	15.1	25.6	14.9	29.7
	Tolcha (n=413)	Non-PVTG	10.2	18.4				
East region								
Jharkhand	Santhal (n=139)	Non-PVTG	48.9	0	28	6.7	16.2	11.9
	Oraon (n=135)	Non-PVTG	35.2	2.2				
	Sauria Paharia (n=201)	PVTG	41.3	9.5				
	Munda (n=282)	Non-PVTG	33	1.4				
West Bengal	Santhal (n=317)	Non-PVTG	63.4	No data	22.7	11	14.8	22.7
	Santhal (n=45)	Non-PVTG	33.3	0				
	Santhal (n=283)	Non-PVTG	46.4	2.7				
	Santhar (n=103)	Non-PVTG	9	3				
	Sabar (n=115)	Non-PVTG	69	No data				
	Sabar (n=89)	Non-PVTG	35.8	0				
	Oraon (n=114)	Non-PVTG	58.3	No data				
	Birhor (n=66)	PVTG	36.4	6.1				
	Toto (n=50)	PVTG	72	0				
	Lodha (n=124)	PVTG	44	0				
Odisha	Juang (n=342)	PVTG	62.9	0.9	30.6	8.7	20.8	23
	Bhuyan (n=324)	PVTG	27.7	3.1				
	Bhumij (n=73)	Non-PVTG	54.8	1.4				
	Mankidia (n=41)	PVTG	56.1	7.5				

(**a**): Heat map depicting the prevalence of chronic energy deficiency and overweight/obese in indigenous women from north and east regions of India.

State	Indigenous communities	Type of community	CED: Percentage of women with BMI <18.5 (indigenous communities)	Overweight or obese: Percentage of women with BMI ≥ 25 (indigenous communities)	CED: Percentage of women with BMI < 18.5 (state prevalence* for indigenous women)	Overweight or obese: Percentage of women with BMI ≥ 25 (state prevalence* for indigenous women)	CED: Percentage of women with BMI < 18.5 (state prevalence* for total population)	Overweight or obese: Percentage of women with BMI ≥ 25 (state prevalence* for total population)
North-east region								
Assam	Karbi (n=830)	Non-PVTG	35	13	11.8	16.7	17.6	19.2
	Meita (n=173)	Non-PVTG	32.5	6.9				
	Mishing (n=90)	Non-PVTG	29.1	8				
	Thengal Kachari (n=48)	Non-PVTG	21.8	10.1				
Manipur	Tangkhul Naga (n=351)	Non-PVTG	11	18.6	8.2	26.5	8.2	34.3
	Anal (n=85)	Non-PVTG	30	21.3				
Meghalaya	Khasi (n=454)	Non-PVTG	18.7	8	10.9	20.6	12.8	12.9
Nagaland	Chokhesang (n=540)	Non-PVTG	10.3	12	10.9	13.9	11.3	14.4
Arunachal Pradesh	Nyishi (n=541)	Non-PVTG	10.9	8.6	4.2	23	5.7	23.9
Central region								
Madhya Pradesh	Korku (n=200)	Non-PVTG	29.5	3	27.4	8	23	30.6
	Saharia (n=500)	PVTG	42.4	No data				
Western region								
Rajasthan	Saharia (n=93)	PVTG	68	3	14.8	4.8	19.6	12.9
	Meena (n=60)	Non-PVTG	23.9	4				
Maharashtra	Katkari (n=197)	PVTG	48.2	8.6	30.2	13.7	20.8	23.4
South region								
Kerala	Paniya (n=170)	Non-PVTG	38.4	No data	18.9	20.4	10.1	38.1
Tamil Nadu	Irular (n=402)	PVTG	35	20.4	19.6	30.2	14.9	40.4

(**b**): Heat map depicting the prevalence of chronic energy deficiency and overweight/obese in indigenous women from north-east, central, western and southern regions of India.

Figure 4. (**a**,**b**) Heat map depicting the prevalence of chronic energy deficiency and overweight/obese in indigenous women from selected states of India. Note: Red shading indicates a high prevalence (>40%) of chronic energy deficiency or overweight/obese, with darker shades representing a higher prevalence. Orange shading represents a moderate prevalence of 29–39%; Yellow shading represents a prevalence of 16–28%, with green yellowish shades representing a lower prevalence. Green shading represents a low prevalence (<16%), with darker shades representing a lower prevalence. * NFHS-5 (2022) [20].

In this context, a multi-sectoral approach is highly desirable to address malnutrition in indigenous women of India. Although, India has a plethora of national programs that

aim to improve nutrition outcomes by addressing both nutrition-specific and nutrition-sensitive interventions [110], many of these schemes have limited coverage in remote and tribal regions [3,7,43,85,111]. Studies included in our review have cited several operational challenges in the functioning of Integrated Child Development Services (ICDS) and National Health Mission (NHM) in tribal regions, such as non-functional nutrition and health centres, absence of health workers, lack of basic infrastructure, irregular supply of supplementary nutrition to mothers and children, non-transparent reporting system with lack of accountability among many others [43,85,89]. Low access to TPDS was also reported in the indigenous communities of Rajasthan, Meghalaya, Madhya Pradesh and Jharkhand [26,27,43,85]. While some states like Maharashtra (APJ Abdul Kalam Amrut Aahaar Yojana) and Andhra Pradesh (YSR Sampoorna Poshana Plus and Girl Poshana scheme) have taken initiatives by introduction of specific schemes and programmes for indigenous women [112,113], the efforts remain largely fragmented at the national level and lack effective coordination and implementation across different sectors [7,114]. Further, some initiatives by state governments have not considered the cultural eating patterns of the indigenous communities, while planning the interventions. For example, the "Amma Maternity Nutrition Kit Scheme" of Tamil Nadu, provides nutrition kits containing *ayurvedic* (herbal) supplements, ghee, and protein powder, to new mothers; but these items remain underutilised as indigenous populations do not consume ghee, and have no knowledge on incorporation of ayurvedic supplements and protein powder in the diet [55]. The implementation of such schemes reveals a clear disconnect between the planned interventions and the actual support needed by the marginalized populations.

4. Limitations

There are some study limitations that must be highlighted. First, our search strategy was limited to PubMed and Google Scholar databases, which may have resulted in the exclusion of any local institutional reports published outside of academia. Second, while our search strategy was based on a wide range of keywords, it may have resulted in the exclusion of relevant studies and research themes. Third, the studies included in our review used different methodologies for data collection, thus making it difficult to compare the findings across different studies. Fourth, most studies included in the review did not capture the seasonality component in dietary data collection, which might have influenced the food and nutrient intakes among indigenous women. Fifth, usual nutrient intakes (probability of consumption on a given day multiplied by the usual intake amount for the day the food is consumed) were not reported in most studies (except in two studies), which is considered ideal for calculating nutrient adequacy at a population level [115]. Sixth, some of the included studies were conducted on a very small sample size, which might not be a true representation of the actual population. Seventh, in our review, we compared the nutrient intake of indigenous women with EAR for a moderately active woman (>18 years), However, there could be a possibility that women from some indigenous communities had heavy or sedentary activity levels, and thus, our interpretation may have over- or underestimated their risk of nutritional inadequacy. Further, the studies included in the review had clubbed the nutrient intake data of women in the age group of 15–49 years, with no segregation in the age-range. This may have impacted the generalizability of the results as the nutritional requirements of adolescent girls in the age range of 15–17 years are different than the requirements prescribed for adult Indian women (>18 years).

5. Conclusions

Indigenous women in India contribute substantially to the local economy and share equal responsibilities with men in subsistence activities yet are vulnerable to various forms of malnutrition. In the present review, we selected a total of 42 studies to generate a comprehensive synthesis on food and nutrient intakes, diet quality and anthropometric status among indigenous women from different ethnic communities of India. Our findings showed high percentage deficits in the intake of several food groups, along with poor intake

of macronutrients and micronutrients among indigenous women residing in different states of the country. Indices of diet quality in indigenous women were documented in limited studies, which revealed poor dietary diversity as well as low consumption of diverse traditional foods. CED among indigenous women was particularly observed to be a major problem in many ethnic communities across the country, with a dual burden of malnutrition in indigenous women of north-east India. Studies have determined several potential contributing factors toward the poor nutritional outcomes in indigenous women, such as: poverty, high illiteracy in indigenous women, excessive reliance on food grains distributed through TPDS, price inflation of non-staple foods and their insufficient production, gender discrimination in intrahousehold food allocation, high opportunity costs for preparation of nutritious meals, and limited outreach of national food supplementation programs in remotely located regions.

Improving nutrition outcomes for indigenous women thus requires investments to be made in changing the determinants of poor nutrition and health, using a variety of policy instruments and other efforts. The existing higher rates of malnutrition in indigenous communities (particularly in women) than their non-indigenous counterparts may be corrected through leveraging the treasure trove of TEK about the indigenous food systems. In this context, there is a need to acknowledge the significance of Indigenous Peoples' food systems that make use of various edible and nutritious species of flora and fauna, and hence, may play an important role in enhancing the food and nutritional security of indigenous communities in India. Thus, both targeted (indigenous-specific) and universal (population-wide) policy actions will be essential in improving the nutritional status of indigenous women in India. Targeted approaches must be combined with interventions that improve diet quality, promote agricultural diversification and traditional food consumption, address behaviour change, and focus on strengthening the services and structure of existing nutrition and safety-net programs. Further, despite malnutrition being a persistent problem in indigenous communities over the years, there is no specific Indian policy that focuses on this issue. Therefore, a streamlined indigenous nutrition program, with consideration of local dietary patterns, cultures and livelihoods, could be instrumental in addressing the larger issues of poverty and household food insecurity for improving the overall nutritional outcomes in indigenous populations. POSHAN Abhiyaan, that aims to adopt a holistic approach for improving the functioning of existing services at the grassroots levels-could also be critical in influencing the future nutritional outcomes of indigenous populations. Findings from the present review may thus be crucial for detailed future research on nutritional outcomes in indigenous women, including an in-depth exploration of the disparities faced by them. This is likely to facilitate relevant measures for nurturing the nutritional health of indigenous women in India. The inclusion of indigenous communities in policies and programs and recognition of the various dimensions of their food systems, could be a crucial step towards creating lasting impacts on the nutritional status of indigenous women and children across India.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/dietetics2010001/s1, Table S1: List of studies included in review; Table S2: Daily consumption of food group among indigenous women of India; Table S3: Dietary diversity scores in indigenous women of India.

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Research Article **Open Access**

Processing induced changes on coarse cereals (majorly millets) derived antioxidant compounds - a review

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ABSTRACT

Coarse cereals also known as nutricereals contain several bioactive components that provide many health-promoting and disease-preventing properties. This paper presents a review of the effect of processing on the various antioxidant compounds present in coarse cereals. Polyphenols, phenolic compounds, flavonoids, tannins, avenanthramides, vitamins, and phytoestrogens are the major categories that contribute to the antioxidant properties of coarse cereals. As per the literature, processing technologies like fermentation, boiling, malting, hydrolysis, soaking and germination, heat treatment, microwaving and extrusion, etc, have a significant effect on these antioxidant compounds present in coarse cereals. Coarse cereals and their processed products could be of potential benefit to human health, but extensive research is required to optimize the dietary recommendation for realizing these health benefits.

Keywords: Millets; flavonoids; polyphenols, processing techniques

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Energy Availability and Macronutrient Intake of Elite Indian Adolescent Boxers

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Abstract:

Purpose: Energy availability (EA) has been evidenced to influence health and performance outcomes of elite athletes. However, this has not been reported sufficiently amongst Indian adolescents. Hence, this study aimed to report the daily energy availability of elite Indian adolescent boxers. Methods: This descriptive cross-sectional study recruited 32 state level boxers (females:14; males:18) aged 10–19 years using purposive, saturation sampling and assessed their energy availability. Weight, height, and skinfolds at 4 sites (biceps, triceps, subscapular and suprailiac) were taken to calculate body fat using Siri's equation & Fat free mass (FFM) calculated. Energy intake was assessed using a 24-hour recall method for one day and exercise energy expenditure by activity record method for the same day of training. Boxers were classified as moderate EA (30–45 kcal·kg−1 FFM·day−1) and low EA (< 30 kcal·kg−1 FFM·day−) and compared based on gender using Manwhitney-U test. Results: Among 32 boxers 43.75% were females and 56.25% were males. The mean energy intake of boxers was 2571 ± 609.7 (Females:2137 ± 266.9; Males: 2908 ± 592.5, p=0.0001), exercise energy expenditure was 1369 ± 251 (Females:1260 ± 106; Males: 1453 ± 299, p=0.0006) and energy availability was 24.1 ± 9.1 kcal/Kg FFM (Females: 19.5 ± 5.6; Males:27.8 ± 9.8, p=0.006) per day respectively. The mean carbohydrate intake was 371.8 ± 92.9 (Females:323.8 ± 58.4; Males:409.2 ± 98.8; p=0.013), protein was 88.8 ± 21.8 (Females: 71.3 ± 10.9; Males: 102.5 ± 18.1; p=0.00001) and total fat was 77.1 ± 22.8 (Females: 58.5 ± 6.5; Males: 91.5 ± 20.4; p=0.00001) respectively. 87.5% were categorized to have low EA and the rest 12.5% had optimal EA. No boxer consumed recovery meals within one hour of training, while the LEA group consumed meals less

Original Article

Impact of Pretransplant Malnutrition on Short-Term Clinical Outcomes of Liver Transplantation - An Exploratory Study

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Abstract

Introduction: Malnutrition is highly prevalent among patients undergoing liver transplantation (LT) and can affect various clinical factors. The present study focuses on the impact of pretransplant malnutrition on various short-term outcomes of LT. **Methods:** Ninety LT recipients undergoing elective living donor LT were recruited in the study. Based on subjective global assessment (SGA), they were grouped as normal, moderate, and severely malnourished. Information regarding prognostic factors (Child-Turcotte-Pugh [CTP] and Model for End-Stage Liver Disease [MELD] scores), biochemical parameters (hemoglobin, TLC, platelets, bilirubin [T], serum glutamic-oxaloacetic transaminase, serum glutamic-pyruvic transaminase, albumin, creatinine, and sodium), dietary intake, % weight loss, and short-term outcomes (hospital stay, intensive care unit days, blood unit usage during surgery, and dead and alive status after 1 year) were gathered. **Results:** The recipient evaluation showed that 54.4% of the patients were moderately malnourished and 27.8% of the patients were severely malnourished. The prognostic scores, CTP, and MELD significantly had higher scores in moderately and severely malnourished patients ($P < 0.001$ and $P = 0.003$). Among the biochemical parameters, hemoglobin, albumin, and sodium showed significantly lower levels in moderately and severely malnourished patients ($P < 0.001$, $P = 0.02$, and $P = 0.01$). The data also showed a significantly higher degree of ascites, % weight loss, and lower calorie intake among malnourished patients. A higher degree of malnutrition was associated with poor outcomes of LT; higher hospital stay ($P = 0.014$), packed red blood cell unit usage during surgery ($P = 0.005$), and deaths after 1 year of LT ($P = 0.03$). **Conclusion:** Pre-LT malnutrition by SGA was associated with poor short-term outcomes of LT with higher hospital stay and deaths. Hence, the present data emphasize the need for early nutrition intervention for improved surgery results.

Keywords: End-stage liver disease, liver transplantation, malnutrition, surgery outcomes

Introduction

According to the Institute of Health Metrics and Evaluation, Global burden of deaths from cirrhosis and other liver diseases is 1.74% in all groups by the year 1990 which increased to 2.87% in the year 2019 among Indians. Hence, an increasing death from cirrhosis is seen in the Indian population over a period of time.[1]

Liver transplantation (LT) is the sole treatment for end-stage liver disease (ESLD) irrespective of the etiology.[2] LT in India is a relatively recent medical development for patients with liver failure after the year 1990. The prevalence of ESLD in India is not available.[3,4] In India, 318 liver transplants were performed by the year 2007.[4]

Malnutrition is universally present in ESLD patients undergoing LT and has a multifactorial etiology.[5] Malnutrition has been associated with poor surgical outcomes and higher morbidity and mortality.[6-8] ESLD patients exhibit varied metabolic abnormalities of carbohydrate, lipid, and protein metabolism that increase the complications.[9] An absolute treatment program is incomplete without addressing all these nutrition-related issues both before and after LT.[5,10,11]

Despite the crucial role of nutrition in the prognosis of liver disease, the nutrition status assessment is challenging.

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REVIEW
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Indigenous Foods of India: A Comprehensive Narrative Review of Nutritive Values, Antinutrient Content and Mineral Bioavailability of Traditional Foods Consumed by Indigenous Communities of India

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India is endowed with several indigenous foods (IFs), that hold special cultural significance among local and ethnic caommunities, yet no attempts have been made till date to systematically compile their nutritive values. As per FAO's recent mandate on creation of *"Global-Hub on Indigenous Food Systems,"* IFs have received renewed global recognition for their potential to contribute to improved food security while enhancing biodiversity across the world. Hence, the useful properties of wild IFs require proper study and documentation in order to bridge the gap between scientific evidence generation and indigenous peoples' ancestral knowledge. For this purpose, we conducted a literature search in two scientific databases: PubMed and Google Scholar, between July 2020 and December 2021, to identify studies reporting nutritive values and/or antinutrient content of IFs (not included in Indian food composition database), consumed by Indian indigenous communities. A total of 52 Indian research articles were included, from which data was selected and extracted, to create a compendium on nutrient ($n = 508$) and antinutrient ($n = 123$) content of IFs, followed by computation of antinutrient-to-mineral molar ratios for 98 IFs to predict their mineral bioavailability. Maximum nutritive values were available for green leafy vegetables ($n = 154$), followed by other vegetables ($n = 98$), fruits ($n = 66$), cereals ($n = 63$), roots & tubers ($n = 51$) and nuts and legumes ($n = 36$). Several IFs seen to have better nutritional content than conventional foods and were found to be rich (i.e., >20% Indian recommended dietary allowances per reference food serve) in iron (54%), calcium (35%), protein (30%), vitamin C (27%), vitamin A (18%), zinc (14%) and folate (13%). Some IFs displayed high levels of antinutrients, however, anti-nutrient-to-mineral molar ratios were found to be low (for mainly leafy vegetables, other vegetables, and roots and tubers), thus indicating high mineral bioavailability. Hence, efforts are desirable to encourage the inclusion of these nutritionally superior IFs into the usual diets of indigenous communities. The IF database collated in our review can

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CURRENT STATUS OF MILLET SEED PROTEINS AND ITS APPLICATIONS: A COMPREHENSIVE REVIEW

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HIGHLIGHTS

- Millets are protein source for food, pharma and biopolymer manufacturers
- Protein properties are analyzed by fractionation or total protein extraction
- Isolated proteins are useful in processing additives and dietary supplements
- Applications of millet proteins is extended to bio-based materials

ABSTRACT

The world's ever-increasing protein demand for food, feed and other applications require us to seek cheaper, renewable, sustainable proteins, and cereal crops such as millets are emerging as a potent protein source. Millets are group of tiny seeds obtained from annual plants that are widely cultivated in semi-arid and dry land regions of the world. These highly nutritious seeds are rich in protein content, fat and fiber. The main goal of this review is to discuss the distinctive advantageous properties of millet seed proteins and various potential fractionation methods available for extracting them. For instance, in addition to the conventional methods such as Osborne's classical scheme and Landry and Moureaux's scheme that are well adopted for sequential protein fractionation protocols, advanced green technologies such as ultrasonication, microwaves, hydrostatic pressure, etc. have been discussed in depth. We have also described several solvent-based extraction methods that have been established specifically for preparing concentrate from millet protein. The review paper also discusses the current status and potential applications of millet proteins in the food, pharma, nutritional supplement, and bio-based industries.

RESEARCH PAPER

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Development of Functional Academic Skills through Smartphones: A Field Experience

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Abstract

This paper is based on the researcher's experience during his PhD. The paper's main aim was to share the field experience of the development of functional academics among persons with intellectual disabilities through the usage of smartphones. The storytelling method and qualitative design were used to explicit the story of the researcher's experience during an ongoing PhD in education. The researcher explained how he had been admitted to PhD in education after six years of working experience. He also shared about the phases of research in which he completed the assigned task while facing many difficulties. He emphasized how he collected the review of related literature and pre-pilot study for the tool preparation with patience during the COVID-19 pandemic and collected the data from the reputed institute in rehabilitation. At last, he discussed the difficulties faced in publishing. Supervisors had been the role model for the researcher who shaped the researcher as a philosopher in his subject.

Keywords: *Functional Academics; PhD; Storytelling; Smartphones; Qualitative*

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Introduction

People rightly say, completing PhD is like chewing raw gram. After working for six years, it was not an easy task to do research by taking enrolment in PhD in the Central University through the regular mode. One year of coursework seemed like a waste of time, but during this, the researcher learned a lot of good research secrets with the help of all faculty members, especially the PhD supervisors who worked with the researcher as a lamp in the darkness. He worked as a lecturer and assistant professor in reputed institutions, and He knows that the professors can only be impressed by genuine and hard work. He did so by completing assignments, practical work, presentations, participating in culture & sports activities, being a member of the election committee of the student council, and winning prizes for the school of education. He tried to develop the competencies and skills within. He learned many ICT-based applications attended workshops and presented papers. During the coursework, a mentor was assigned to every scholar. Fortunately, he is one of his PhD—supervisors as he wished.

The development of functional academic skills among persons with intellectual disabilities through smartphones was a similar area of his PhD research. Special educators frequently fail to find effective ways to stimulate active engagement in academic pursuits (Bobzien, 2014). Functional academics are adaptive abilities that have been developed sufficiently to allow persons with intellectual disabilities (PWID) to succeed in daily activities both inside and outside of the classroom, to gain independence, and promote their potential to succeed in a less

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Role of ICT to Search Schemes and Benefits for Persons with Disabilities with reference to Scheduled Caste and Scheduled Tribes in India

Role of ICT to Search Schemes and Benefits for Persons with Disabilities with reference to Scheduled Caste and Scheduled Tribes in India

*Ram Niwas**
*Suranjan Kumar***
*H.B. Patel****
*Shankar Lal Bika*****
*Shamim A. Hussain******

Abstract

ICT has played a magnificent role not only in using social media but also education and training of individuals with disabilities. But there is a gap between the use of ICT among PwDs especially belonging to the SC and ST categories. This paper aimed to study the role of ICT in searching for schemes and benefits for persons with disabilities, especially for scheduled caste and scheduled tribes in the Indian context. The problems related to the use of ICT by persons with disabilities were identified directly and indirectly through contact with the PwDs and their families. The information was collected from different articles, acts, policies, schemes and benefits on different reputed and faithful websites. Mostly government websites were given preference. The study's key findings showed that PwDs in the SC and ST categories can find numerous schemes and benefits at minimal cost by using ICT equipment, such as the internet, smartphones, laptops, etc. Further comparative research can be conducted on the use of ICT in looking up programmes and benefits provided by other nations. This study can be implied on the use of ICT on people with disabilities and other disadvantaged groups, i.e., OBC.

Keywords : ICT, SC, ST, PwDs, Schemes, Benefits, Special education, India

Introduction

Information and communication technology (ICT) has played a magnificent role not

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SMARTPHONES AS TEACHING AND LEARNING TOOL FOR PRE-SERVICE AND IN-SERVICE SPECIAL EDUCATION PROFESSIONALS DURING PANDEMIC

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ABSTRACT

As a result of the coronavirus shutdown, the bulk of the world's population became agitated. Courses have been rescheduled. As a result, we complete the course with the help of technology, particularly smartphones. The study's primary purpose was to examine the advantages and disadvantages of using smartphones to attend and organize online classes for teacher trainees and master trainers. The 50 participants came from a teacher training institute that offers D.Ed. Special Education (Intellectual Disability) and B.Ed. Special Education (Intellectual Disability). The study's primary finding highlighted how essential and beneficial smartphones are in helping teachers give lectures and complete their syllabus on time. Smartphones can save costs and are readily available to the majority of students. However, delivering exams is difficult due to inadequate internet availability in rural areas. This study can be used in various courses and at the school level.

Keywords: *Smartphones, Special education, ICT, Teacher trainees, Master trainer, CWSN.*

INTRODUCTION

A third of the world's population has been quarantined (Rehman et al., 2020) because of the Coronavirus and most extensive and most restrictive mass quarantines have been implemented by India, China, Italy, France, New Zealand, Poland, and the United Kingdom (A Third of the Global Population Is on Coronavirus Lockdown — Here's Our Constantly Updated List of Countries and Restrictions, 2020). Over 1.3 billion people in India are locked inside their houses due to the pandemic. All universities, colleges, schools, and other teaching and learning institutions are closed to maintain social distance. Students, particularly scientific students and teacher trainees with primarily practical foundations, suffer from not finishing courses on time. When updated with technology, self-monitoring approaches significantly boost on-task behaviour across educational contexts and different categories of disabilities (Niwas et al., 2018). When revised with different types of technology, self-monitoring strategies maintain favourable activated effects on behaviour and deliver similar outcomes (Bedesem, 2012). According to the authors, the employment of new technologies in the classroom as a means of helping literacy development in the field of digital media is becoming increasingly important. The Internet has delivered many educational resources during the last two decades, including books, scientific research, lectures, video classes, and instructive games. Since the introduction of social networks, online engagement between people has risen, allowing learners to comment and collaborate. (Herrington and Parker, 2013).

In special education, the goal of technology is to allow kids to study in a way that suits their unique learning styles and limitations (The Use of Technology in Special Education | UT Permian Basin Online, 2020). In the classroom, the impact of information and communication technology (ICT) is growing, and practice demonstrates that individual work is necessary for the educational process (Iskrenovic-Momcilovic & Momcilovic, 2021). Students may use their smartphones and the Internet to access their study materials from anywhere, thanks to technologies. Smartphone devices assist e-books, handheld audio and multimedia guides, gaming consoles, personal digital assistants (PDA), tablet computers, mobile phones, and smartphones (Kljunic &Vukovac, 2015). Because laptops are too large and heavy to be carried when walking or travelling, they are not typically referred to as smartphones. The smartphone was provided with leisure activity files that could be accessed or engaged and a list of contactable acquaintances to converse with the smartphone using specific voice inputs (Lancioni,

772.Usage of Smartphones for Transition and Employment of Persons with Disabilities concerning Indian Union Budget 2022-23

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ABSTRACT

The study's main objective is to explore how smartphone usage can be helpful in the transition and employment of persons with disabilities concerning the Indian union budget 2022-23. The researcher also tried to learn from the experts the utilization of existing and upcoming schemes and benefits provided by the government of India. The information was acquired from the limited available academic articles, websites, individual semi-structured interviews with experts, data from social media, and reputable journals. In this paper, it was discussed that persons with disabilities could benefit from Indian Union Budget 2022-23 through the usage of smartphones. The ASEEM portal, PM eVIDYA, digital university, virtual laboratories and e-labs, post offices, digital bank units, and Saksham Anganwadi's can play a vital role in teaching and training persons with disabilities. As rehabilitation professionals, we should organize the transition and vocational training for PwDs to avail the above-given benefits related to the Union budgets 2022-23 and other schemes.

Keywords:Employment; Transition; Intellectual disability; Policy Perspectives; Smartphone usage; Union Budget

Introduction

According to the Census 2011, there were 2.68 crore people categorized as "persons with disability," accounting for 2.21 per cent of the entire population of India's 121 million people. Males are 56 per cent, and females are 44 per cent of the disability population. More than one million students are enrolled in courses that do not suit them (How to Transition Special-Needs Students into the Workforce, 2016). Information and Communication Technology (ICT) has played an outstanding role in the training and evaluation of persons with disabilities. ICT has emerged as a panacea for persons with disabilities, and smartphones have contributed significantly to this regard during pandemics. Understanding the concept of 'transition' is critical to developing a successful strategy. School-based transition programs are critical in assisting students with disabilities in achieving effective post-school outcomes, especially in the case of transitioning to work, when employment is the primary goal after graduation from secondary school, however, compared to children without impairments, post-school job results for students with disabilities remain poor (Azizah, 2022). Desirable outcomes for all students increasingly focus on workplace and transition outcomes (Phelps & Maxwell,1997).

Recently, Ms Nirmala Sitaraman, the Finance minister of India, presented the Union Budget of India 2022-23 in the parliament of India. The main aim of the Indian union budget is to enhance India's objectives as it approaches its 100th anniversary of freedom In Amrit Kaal. This budget focuses on the growth and all-inclusive welfare of Indian citizens; Advancing technology-assisted development, energy transition, and climate action and private investment fuels a virtuous cycle crowded by public capital investment (*Budget 2022: Full Text of FM Nirmala Sitharaman's Address in Lok Sabha*, 2022). Eight effective transition approaches for intellectual and developmental disabilities, i.e., self-determination, clear expectation, family-centred, individualized, early, collaborative and including the active involvement of the person with intellectual disability, systematic & structured (Everyone Can Work, n.d.), career development & skills training, work experience and long-term perspective.

KUND SYSTEM OF RAIN WATER HARVESTING: A STUDY IN DISTRICT JHUNJHUNU, RAJASTHAN

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ABSTRACT

Water scarcity is a serious problem throughout the world for both urban and rural communities. As the world population is increasing, the demand increases for quality drinking water. India has a long tradition of water harvesting. Each region of the country has its own water harvesting techniques, reflecting the geographical peculiarities and cultural uniqueness of the communities. In Rajasthan, a highly water deficient state, various methods of water harvesting have been used for centuries. The aim of the present study was to understand the traditional KUND system of rainwater harvesting with respect to implementation, operation, and maintenance. It aimed at understanding the experiences of the KUND owners associated with the same and thereby collecting suggestions for better implementation, operation, and maintenance of the KUND system.

Keywords- KUND system, Traditional rain water harvesting system, Rajasthan, India

INTRODUCTION

Water is crucial for advancing human rights, reducing poverty and inequality, and enabling peace, justice, and sustainability (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2017). Freshwater is the most important resource for mankind, cross-cutting all social, economic, and environmental activities. To achieve water security, we must protect vulnerable water systems, safeguard access to water functions and services and manage water resources in an integrated and equitable manner (UNESCO, 2021).

Water being the core of sustainable development covers seventy percent of our planet, among which only three percent of the world's water is freshwater, and two-third of that is tucked away in frozen glaciers or otherwise unavailable for our use (World Wildlife Fund [WWF], 2020). There are eight out of ten people without access to clean water living in rural areas and about one hundred forty-four million people who are dependent on surface water (World Health Organisation [WHO], 2019).

Solar Energy Policies for Commercial Buildings in India: Perspective of Government Officials

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Meenal Jain[1], Meenakshi Mital[1] and Matt Syal[2]

Abstract

India is a developing nation with urban populations growing exponentially and rural villages being electrified. Thus, India is expected to have a high growth rate in energy demand over the coming years for which the nation is heavily dependent on fossil fuels. Solar energy presents an attractive solution to growing energy challenges as it is abundant, inexhaustible and environment friendly. Many programmes and policies have been initiated at both the national and state level for promoting solar energy across all sectors. This article comprehensively assesses various government initiatives for off-grid solar photovoltaic (SPV)/solar water heating (SWH) systems for commercial establishments and brings forth the government perspective in terms of implementation of these initiatives, need for improvements and the lacunas in availing the incentives. The article also presents suggestions given by government officials for better acceptance and implementation of such initiatives.

Keywords

Commercial establishments, government officials, government policies, policy framework, solar energy

Introduction

Global Energy Scenario

Energy is indispensable for growth of economies. At the same time, it is crucial for sustenance of human life and modern societies (Bureau of Energy Efficiency [BEE], 2012; Planning Commission, Government of India, 2014). However, the world today is facing enormous challenges when it comes to supplying adequate and clean energy to all. The growing world population and economic development put immense pressure on the existing resources. It is anticipated that there will be a further growth of about three- to five-fold in the world economy by the year 2050, which is going to put further pressure on energy

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A STUDY ON STATUS OF MENSTRUAL HYGIENE PRODUCTS IN INDIA

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Abstract : This research was conducted to identify the status of menstrual hygiene products in India, the benefits of using biodegradable sanitary napkins and the obstacles regarding the usage of these napkins considering their high preferability over cloth and synthetic napkins coming under menstrual hygiene products. These sanitary napkins are environment friendly and current trends show rising growth in the Indian market. Both primary and secondary research was carried out for collection of data. On analysis of the database so collected the results from secondary research displayed an exhibited climb as high as 78% in usage of menstrual hygiene products amongst young women (15-24 years of age) mostly using these sanitary napkins due to various factors mentioned in the study. Primary research has revealed the benefits and obstacles regarding the usage of biodegradable sanitary napkins that are mentioned further in the study.

Index Terms - Sanitary napkins, biodegradable sanitary napkins, menstrual hygiene products, environment-friendly, National Family Health Survey, Menstrual Hygiene Alliance of India

I. INTRODUCTION

As the world is experiencing the dilemma of plastic waste management, the utilization of disposable sanitary napkins amidst Indian females is 48% in rural women and 70% in urban women which makes it 57.6% comprehensively (The National Family Health Survey [NFHS], 2016). The Menstrual Hygiene Alliance of India (MHAI) has estimated that there are 336 million menstruating women in India out of which 36% use disposable sanitary napkins making it a figure of around 121 million women. On an average, a woman could utilize up to 10,000 sanitary napkins from menarche to menopause, if the figure of sanitary napkins used per menstrual cycle is conservative eight. This implies that India has 12.3 billion disposable sanitary napkins to look after every year most of which are synthetic sanitary napkins.

Synthetic sanitary napkins are fabricated by utilizing thermoplastic fibers, hydrophilic absorbent fiber, super absorbent polymers (SAP), plastic covering and adhesives/glue; most of these elements do not degrade easily and stay behind in the environment, polluting water sources, spoiling soil and also penetrating the food chain, thereby, introducing toxins into the food humans and animals eat. Synthetic sanitary napkins comprise of over 90% plastic and each napkin is equal to four plastic bags (WaterAid India, 2019), While Biodegradable sanitary napkins are made up of natural fibers like bamboo and banana fibers and disintegrate without causing any damage to the environment and health.

The Indian market for biodegradable sanitary napkins is currently exhibiting healthy growth. There are various non-governmental organizations (NGOs) and self-help groups that are generating biodegradable sanitary napkins but the scale of manufacturing is low. However, manufacturers of biodegradable sanitary napkins are considering distinctive marketing perspectives and adding value to improve their products to develop and expand their customer base. The market has been sorted into bamboo, banana fiber, cotton and others. By holding the largest share, bamboo is presently ruling the Indian market.

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Stubble waste management: Policies and programmes in India

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Abstract
India is a major agricultural producer in the world, generating more than 500 million tonnes of agricultural waste per year (World Bank, 2012). The generation of stubble waste (agricultural waste) is rising rapidly, which leads to mismanagement of stubble, increasing pollution, and other negative effects on the country's economy and community. The country presently practices various methods for reducing stubble waste but the efforts are not satisfactory. The review paper was prepared from information gathered through discussions with farmers in Northern States of India and secondary research on programmes and policies available in the country for stubble waste. The government of India has launched numerous programmes and policies at State and National level to benefit farmers and manage stubble in the most effective and appropriate ways possible. However, the underlying reality of the government's policies and programmes was found to be mainly limited to few sectors. It is imperative to reduce pollution and increase economic remittance by managing stubble waste in an adequate and competent manner.

Keywords: Stubble waste, stubble waste management, government programmes and policies

Introduction
Agriculture is the nation's most significant economic sector. It employs more than a billion people and produces food worth more than $1.3 trillion per year. Croplands and pastures cover roughly half of the world's land area, providing a home and a source of food for many animal and plant species, including humans (World Wildlife Fund, 2022) [7].

Agriculture production has more than tripled in the last 50 years due to advances in agronomy (the study of soil and crop) and technological contributions that influence productivity to meet the accelerated growth of population (Climate-Smart Agriculture, 2022) [14]. The agriculture industry produces 23.7 million tonnes of food per day on average around the world (Convention on Biological Diversity, 2018) [15].

India is a major agricultural producer around the world. It is a leading producer of milk, legumes, and spices in the world. It also has the world's largest cattle herd (buffalo) and the most significant acreage of wheat, rice, and cotton production (World Bank, 2012) [8]. India was the world's second-largest agro-based economy in 2012, and it currently ranks fifth (2022), with year-round agricultural cultivation in which grains such as rice, wheat, cotton, sugarcane, fruits, and vegetables are produced annually to support the country as well as for exports (Table 1) (World Bank, 2012) [8].

The country has approximately 195 million hectares of arable land, of which nearly 63% (about 125 million hectares) is rain fed and about 37% (70 million hectares) is irrigated (World Bank, 2012) [8]. Each year, a significant amount of agricultural waste, including crop residue, is produced as a by product of agricultural production. The country generates over 500 million tonnes of agricultural waste per year (figure 1), posing a number of difficult management challenges. It is significantly higher than in other developing countries such as Bangladesh, Indonesia, and Myanmar, posing a serious threat. The fact that the country is responsible for feeding approximately 17.6% of the world's population highlights the fact that our natural resources are under severe strain. (Bhuvaneshwar, 2019; Chauhan, 2015) [1, 2].

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Mobile Phone Applications addressing Mental Health Literacy: A Systematic Review

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Abstract

The aim of this paper is to systematically review literature based on Information and Communication Technologies (ICTs) and Mental Health Literacy with the objective of understanding the uses of ICT-based technologies, like mobile phone applications, in promoting mental health literacy. To conduct this review of literature, the authors systematically searched relevant databases with the key terms such as mental health literacy, ICT-based interventions, mHealth, mobile phone applications and mental health in India. The articles were filtered based on their relevance and access. This paper highlights the concept of mental health literacy and its promotion in using ICT-based interventions, ICTs in health and specifically in mental health, mHealth, specifically mobile phone applications in mental health literacy, advantages of mHealth and mobile phone applications and the limitations of the same in mental health literacy.

Keywords: *Mental health literacy, Information and Communication Technologies (ICTs), mHealth, Mobile phone applications.*

Introduction

The World Health Organization (2001) defines Mental Health as "a state of well-being in which the individual realizes his or her own abilities, can cope up with the normal stresses of life, can work productively and fruitfully, and is able to make contribution to his or her community" (as cited in Gaur & Ram, 2016). Mental health is the maintenance of daily activities that are productive for the person and relationships with people around the individual. One is said to be mentally healthy if he/she is able to manage the stresses and adapt to the change around them. Promotion of well-being, preventing mental health disorders and the treatment of people suffering from mental health disorders – this is what mental health comprises of (Sharma & Srivastava, 2013).

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YOUNG ADULTS WITH VISUAL IMPAIRMENT: THE CHALLENGES IN SOCIAL INCLUSION

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ABSTRACT

The study was undertaken to document the challenges that young adults with visual impairment (YAVI) face in getting socially included in their day-to-day life. For collecting the data, in-depth interviews and a self-constructed checklist were administered on 20 participants aged 18-35 years, the participants were residing in New Delhi (India), and were selected through purposive and snowball sampling techniques. The data was analysed descriptively using thematic analysis. Various themes emerged from the findings: attitudinal challenges at majorly three levels: self, familial and societal, discrimination and exclusion, infrastructural challenges, and perceived limited prospects.

Keywords: visual impairment, social inclusion, challenges, young adults, thematic analysis

INTRODUCTION

Strength lies in differences, not in similarities- it is how each unique individual can be valued. Their individualized unique experiences and strengths can prove beneficial for themselves and for the society they are a part of. Hence, the essence of mainstreaming individuals with visual impairment should be multi-tiered such as intrapersonal, interpersonal, infrastructural, and in terms of socio-cultural, political, and economic activities.

The focus of social inclusion is to create a better space emphasizing the persons with disability so they can make use of their abilities and feel like a part of society. Social inclusion can be looked upon as an approach which tries to put forward efforts that ensure equal opportunities to bring out the full potential of individuals. It is a kind of multi-dimensional process which aims to create accommodations for increasing participation and decision making in all spheres of life. As a consequence, enable individuals with disabilities to have an independent life ahead, a positive sense of self, more involvement, and interactions with others, benefits from support services for their betterment, and brings them from the verge of marginalization to mainstream society.

The inclusion of people with disabilities is increasingly prioritized in development programs and national agendas (UN Flagship Report on Disability and Development, 2018, p. 41).

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IMPACT OF MATERNAL FACTORS ON NUTRITION STATUS IN JENU KURUBA CHILDREN

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Abstract:

A health and nutrition status of women before conception and during pregnancy assists the growing fetus in being nourished and helps the mother create the best bodily reserves in anticipation of nutrition needs of the fetus. Maternal malnutrition poses serious health effects on fetus leads intrauterine growth retardation and increases the risk of poor pregnancy outcomes such as premature, low-birth weight babies and delay in development. A cross-sectional study was conducted in Jenu Kururba Tribal Haadies of H.D Kote and Hunsur Talukas of Mysore district to assess the relationship between maternal factors and nutritional status of children. A random sampling technique was used to recruit 1307 young children (birth to 5 years) and their mothers for the study. Self-structured questionnaire was used to elicit personal information of children and maternal information and WHO growth reference was used to grade the nutrition status of the children. The results of the study indicated that, out of 1307 children, 709 (54.25%) of them were males and 598 were females. The highest percentage (31.52%) of the children were in the age group of 3+ years. More than half (51.49%) of the mothers were in the age group of 18-21 years at data collection time. About 68.41% of the mothers were not educated against and 46.52% of the mothers were daily wagers. Regarding maternal history, majorities of the mothers were conceived before 18 years (58.38%) and 62.13% had a spacing of 1-2 years between pregnancies. About 40% of mothers underwent cesarean delivery. About 75% of the mothers suffered from anemia and 59.26% of mothers gained less weight gain during pregnancy. With reference to nutrition status of children, 31.52% were moderately underweight followed by 28.77% of them were severely underweight. About 40.63% and 27.92% of the children were moderately and severely stunted respectively. According to BMI for age, majority (73.60%) of the children were undernourished. Age at marriage, age at conception, type of marriage and hemoglobin during pregnancy was significantly correlated with nutrition status of the children.

Keywords: Nutrition, underweight, Body Mass Index

Introduction

Nutrition is a key determinant of good health and is critical for survival, good quality of life and well-being. Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development. Poverty contributes to child malnutrition which impacts cognitive function of individuals' ability to lead productive lives. Malnutrition in India has been called 'The Silent Emergency'. This is reflected by the fact that the prevalence of underweight children in India is among the highest in the world (Shahnawaz *et al.*, 2014). Each year approximately 23 million deaths among children of 6-60 months are associated with malnutrition in developing countries, which is about 41% of the total deaths in this age group. India is committed to halving the prevalence of underweight children by 2020 as one of the key indicators of progress towards the Millennium Development Goal (MGD). In spite of unprecedented economic growth, improvements in childhood nutritional status in India over the last decade have been slow. Currently in India, the prevalence of stunting among under five is 48% and wasting is 19.8% and with an underweight prevalence of 42.5% (Mahure *et al.*, 2017).

Maternal malnutrition is a serious public health concern in many parts of the world, including India. A woman's health and nutrition before, during, and after pregnancy influences her child's early growth and development. Maternal undernutrition contributes to maternal mortality, foetal growth retardation, and neonatal death; it sets up a life cycle of undernutrition for the child. In India, maternal undernutrition is estimated to account for one-fifth of all incidence of

Menstrual knowledge among adolescents in Siddi tribal population

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Abstract

Siddhis are a community that migrated from east Africa to India between 15th to 19th century. Siddhis are an ethnic group inhabiting India. The study was conducted with an objective of to assess the menstrual knowledgeamong adolescents in Siddi tribal population and to know the relationship between personal characteristics with menstrual knowledge.A community based cross-sectional study was undertaken in Siddi tribal areas of Gadag district. The self-prepared questionnaire was used to elicit the information regarding personal information of the adolescent and their knowledge regarding menstrual care and hygiene. A snowball sampling technique was used to recruit the adolescents for the study. Door to door survey was conducted to select 85 adolescent females for the study. More than 70% (71.76%) were had low level of knowledge about menstrual hygiene. While 28.23% were had high level of knowledge about menstrual hygiene.Age, education and SES of the family were significantly correlated with knowledge regarding menstrual health and hygiene. It indicated that adolescents in the age group of 16-17 years and educated were had better knowledge.

Keywords: Menstruation, Knowledge, Hygiene

Introduction: -

Siddhis are a community that migrated from east Africa to India between 15th to 19th century. Siddhis are an ethnic group inhabiting India. Members are descended from Bantu peoples from SouthestAfrica that were brought to the Indian subcontinent as slaves by Portuguese merchants and Arab traders. The siddhi's have settlednow in the states ofhave settled now in the states of Karnataka, Goa, Gujarat, Maharashtra and Andhra Pradesh. Siddi culture is not rigid or uniform, they speak various languages such Konkani, Kannada, Hindi, Urdu and Gujarati. Siddhis are known to practice Islam, Hinduism as well as Christianity. In Karnataka they are concentrated about Yellapur, Haliyal, Ankola, Joida, Mundgod and sirsi taluks of Uttara Kannada and Khanpur of Belgaum and Kalghatgi of Dharwad district. Thesiddhis are non-

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HISTORIC INDIAN TEXTILES OF GOLD AND SILVER

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ABSTRACT

Precious metals have held a status of their own ever since their discovery. Their use has not only been an indication of power, status, and luxury, but also an example of intricate craft skills exhibited by artisans worldwide. Gold and silver, perhaps the oldest precious metals and also the most popular have had a diverse use in various fields, including textiles. The incorporation of these metals in textiles led to the production of a plethora of textile crafts, each demonstrating a unique feature, skill, and technique. Due to the unique qualities exhibited by the crafts; each textile holds an importance of their own. The terms of many of these textiles are often used interchangeably, however, important minute differences distinguish these textiles from one another, which is often times overlooked. Over the years, these various forms of crafts gained popularity, flourished and were even favourites among the Indian rulers and royalties of the yesteryears. However, with the loss of royal patronage and the decline in investment in the handicraft sector, most of these art forms are either languishing or are not produced anymore. To retain the culturally rich arts of India, the significance associated with them, and most importantly the techniques employed to create such masterpieces, it thus becomes important to document these artforms. This article explores the various textiles that incorporate gold and silver with respect to the technique used to produce exquisite fabrics which depict the dexterity of Indian craftsmanship.

Keywords: Woven Textiles of India, Embroidered Textiles of India, Printed Painted Textiles, Danka Work, Tilla Work, Mukke-Ka-Kaam, Kaamdani Work, Fardi-Ka-Kaam, Tinsel Printing, Warak Printing, Kodalikarrapur, Sarees of India, Gold and Silver Embroidery, Gold Lace

1. INTRODUCTION

Metals have been a part of the earth since its creation. Birthed from the planet itself, each element has its own properties. Upon contact of these metals with humans, and the subsequent discovery of their properties, metals became a useful component in the human existence. Certain metals are classified as base metals, forming an important group containing elements such as copper, tin, iron, lead, mercury etc. as important as they are, they present limited use, either due to their nature of being extremely brittle, soft, or hard, or are adversely affected by contact with acids and alkalis. Then there are the precious metals, including gold and silver, metals which are not only rare to find, but their superior qualities combined with

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Indian Handlooms: Present Scenario and Future Directions

Ashima Anand & Seema Sekhri

Abstract

Indian handloom textiles are the most exquisite, diverse, versatile sustainable products made with excellent craftsmanship. These have a history of more than 5000 years. Each state of India offers a unique handloom product produced by incorporating a weaving technique of its own. Handloom is one of the oldest and largest employment sector, after agriculture. Responsible for employing lakhs of weavers and allied workers, it has been an important contributor to India's economy. Despite its many advantages, this sector is facing huge challenges which are affecting its growth and have a direct bearing on its sustenance. This essay focuses on the vision of the Government of India towards strengthening the handloom sector for its unprecedented development through its institutional support and initiatives and its ways forward.

Keywords : Government Initiatives for Handlooms; Handloom Future Prospects; Handloom Scenario; Indian Handlooms.

Introduction

Indian handloom textiles are the treasure trove of the Indian subcontinent where each region offers one of its kind textiles. The textiles produced in each part of the country have been very well adapted to suit the climate. Influences of culture and location can be seen in the vibrant textures and the exclusive handloom weaves of each region. The history of handlooms dates back to the Indus Valley civilization. The discovery of bone needles, wooden spindles, and woven cotton fragments at the excavation sites of Harappa and Mohenjo-Daro suggest the antiquity of the tradition of hand spinning and weaving. References to weaving have been made in the *Vedas* and *Upanishads*. The ancient Hindu epics, the Ramayana and the Mahabharata mention a variety of fabrics in vogue during those times (Rana,

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UNLATCHING THE RETICENT CLOTHING DEMANDS OF GROWING ELDERLY SEGMENT: PROBLEMS, NEEDS AND SOLUTIONS

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ABSTRACT

Ageing is an ongoing process that can lead to loss of functional ability and with a higher risk of morbidity and mortality. Disability becomes a significant concern as people age because it severely restricts daily functioning, adding to the responsibility of care giving. The clothes we wear are a reflection of our culture, personality, identity, age and fashion. It is through our clothes that our body is presented and perceived, therefore how dress operates in the context of age, is significant for understanding how cultural expectations act directly at a bodily level (Nyong &Duze, 2011). It has been observed that India's elderly population is growing with enhanced awareness regarding health issues, which are expected to put considerable pressure on the health care system in general and geriatric care in particular. With this rapidly growing elderly population in India there is a corresponding increase in related issues due to the age or lifestyle. Keeping their specific requirements in mind it is important to generate knowledge about the problems faced by the senior population and then develop targeted solutions in terms of clothing for them. There is a pressing need for first-generation entrepreneurs and healthcare practitioners, who would sense a gap in terms of products and services designed specifically for the 60-plus age group, giving them a true sense of autonomy amidst the changing physiological conditions.

Keywords: Ageing, Care-giving, Clothing, Elderly population, Geriatric care

INTRODUCTION

India is a developing country whose demographics have been changing. From being a country with highest percentage of young cohorts it is reaching at a potential where it will be termed as country with largest percentage of elderly as well (India Ageing Report, 2017).

In developing countries like India, the well-being of older persons greatly depends on whom they live with, particularly where the elderly has little resources to access formal welfare systems. Living arrangements among the elderly was not an issue in India till a few decades ago because their families were expected to take care of them; but with the reduction in fertility rate and increased life expectancy at old age, conventional living arrangements have been undergoing transformation. With declining informal social support systems, older persons who live alone are increasing (India Ageing Report, 2017).

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Barriers and facilitators in dietary and physical activity management of type 2 diabetes: Perspective of healthcare providers and patients

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ABSTRACT

Background and aims: Type 2 diabetes (T2DM) is a chronic disease that requires continuous management and daily self-care activities. The purpose of the study was to identify the barriers and facilitators in dietary and physical activity management of T2DM by patients.
Method: Two focus group discussions with patients with T2DM (n = 12) and interviews with healthcare providers (HCPs, n = 15) were done, to identify the barriers and facilitators experienced by patients towards lifestyle management in T2DM. Data were analyzed using qualitative data analysis software Atlas ti. version 8.
Result: Three major themes were identified as barriers and facilitators viz., Personal barriers and facilitators, social barriers and facilitators, and barriers and facilitators related to the healthcare provider. Major barriers were denial of illness, low level of knowledge of the disease, excess use of gadgets, poor infrastructure, gender issues, and lack of time. Major facilitators identified were patient education and motivation, continuous counseling and regular follow-up, family and peer support, and recreational and indoor activities.
Conclusion: Based on the findings of the study, a multifaceted approach is required to address these barriers and facilitators. These findings will help in developing novel intervention strategies and making policy-level changes, which are required to improve diabetes self-management practices in people with T2DM.

1. Introduction

Type 2 diabetes (T2DM) is a chronic disorder of multiple etiologies and is associated with many long-term complications which involve many organs like eyes, kidneys, nerves, heart, and blood vessels [1]. T2DM is a disease that requires continuous management and daily self-care activities [2]. Simple lifestyle measures are effective in the management of T2DM and in delaying the onset of diabetes-related co-morbidities. Much of the diabetes burden can be prevented or delayed by behavioral changes favoring a healthy diet and regular physical activity [3]. It is reported in multiple previous studies that it is managed poorly by patients and adherence to the recommendation given by healthcare providers (HCPs) is low in India as well as in other countries [4–6]. The factors which potentially inhibit effective management include lack of knowledge about diabetes, time constraint, lack of diabetes education, social stigma, etc. Patients' ability for optimum self-care depends largely on their knowledge, social support, attitude, and self-efficacy [7–9]. In addition to several other factors like available resources, social support and patient-HCPs relations also affect their self-care practices [9–11]. Strategies and activities to promote adherence should be patient-centric, collaborative, and multi-disciplinary to bring positive behavioral changes. It is essential to understand the barriers and facilitators associated with adherence to diet and physical activity to prioritize the area which requires more attention for the clinical care of the patient and developing future interventions [12,13]. The following study was conducted because of the aforementioned factors, to understand the barriers and facilitators faced by patients residing in Delhi NCR, India, from the perspective of the patient themselves and their HCP.

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Association of nutrient intake with non-alcoholic fatty liver disease and liver steatosis in adult Indian population – A case control study

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ABSTRACT

Background: Dietary and nutrient intake is an important factor in the development and management of non-alcoholic fatty liver disease (NAFLD) however, optimal dietary and nutrient composition remains unclear. Data on detailed nutrient intake of NAFLD patients from India is scarce. There are no studies on the relationship between nutrient intake and markers of liver health (liver fibrosis and liver steatosis) in Indian adults diagnosed with NAFLD.

Objectives: The objectives of this study were to (i) Assess the intake of macro and micro nutrients between NAFLD Cases and Controls (ii) to compare the nutrient intake of adult participants with the EAR (Estimated Average Requirements for Indians) (2020) (iii) to study the association of nutrients with NAFLD (iv) to explore the relationships between select nutrients and markers of metabolic and liver health (liver fibrosis and liver steatosis).

Methods & materials: 160 NAFLD Cases and 160 Controls (n = 320) from Gastro and Medicine OPD of AIIMS hospital were recruited for the study.24 h nutrient intake for 2 days, anthropometrics, blood biomarkers, Fibro scan to study both hepatic fibrosis and steatosis was undertaken to assess Liver stiffness measurement (LSM) and Controlled attenuation parameter (CAP score).Nutrient intake was compared with EAR 2020 for Indians. Association between NAFLD and nutrient intake was done by logistic regression.

Results: The NAFLD Cases showed significantly higher amounts of SFA(g), percent SFA (%), PUFA(g), percent PUFA (%), n6 (g) and n6/n3 ratio compared to controls ($p < 0.05$). In Controls as compared to Cases significantly higher amounts of percent proteins was recorded ($p < 0.05$). Analysis of micronutrient intake revealed that controls had a significantly higher intake of Vitamin K, Vitamin B6,magnesium and calcium compared to NAFLD patients ($p < 0.05$). More than 50% of subjects had macro and micronutrient inadequacies below EAR. SFA(g) remained positively and significantly associated with NAFLD. The risk for NAFLD increased by 1.5 times when SFA was consumed at > 8% of the total calories. Significant inverse association of percent proteins (5–15%) with NAFLD was observed($p < 0.05$). Percent carbohydrates and percent SFA (saturated fatty acid) emerged as significant risk factors for increase in CAP score (liver steatosis) of NAFLD subjects, whereas percent proteins, magnesium and Vitamin C were inversely associated with liver steatosis ($p < 0.05$).

Conclusion: The overall nutrient intake in NAFLD cases and Controls was low suggesting lower diet quality. High intake of SFA (g) increases the risk of NAFLD and increasing proteins in the diet may be protective against NAFLD. Associations between select macro and micronutrients and liver health markers warrant further investigation.

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ORIGINAL ARTICLE

Knowledge, Attitude, Practices and Self-Efficacy in Newly Diagnosed Type 2 Diabetes Patients Towards Dietary and Lifestyle Factors

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ABSTRACT **Background:** Type 2 Diabetes is one of the leading causes of morbidity and mortality in India and globally. Increasing awareness towards diabetes management at early stage is extremely important to develop better practices in the area of diabetes management. The present study was conducted to determine the knowledge, attitude, practices and self-efficacy of type 2 diabetes patients towards dietary and lifestyle factors, attending private Diabetes clinics in Delhi, NCR. **Material Methods:** The study was conducted on 100 newly diagnosed diabetic subjects, using pre-tested questionnaires. The questionnaire was designed to assess the socio-demographic, knowledge (DKQ), attitude (DAS), practices and self-efficacy (DSFS) of patients with type 2 diabetes. Data was analyzed using t-test, one way ANOVA and multiple regression to understand the determinants of knowledge, attitude, practices and self-efficacy in patients with type 2 diabetes. **Results:** 100 T2 DM patients comprising 73 males and 27 females. Patients obtained score 13.16±4.18 out of 24 in knowledge assessment, 3.56±0.2 out of maximum 5 in attitude scale. Patients had suboptimal practices when compared to guidelines and obtained score of 6.02±1.57 out of maximum 10 in Diabetes self-efficacy scale. Use of internet is found to be positively associated with attitude with coefficient of 0.1 (CI 0.03-0.22). Educational qualification of study participants was associated with greater self-efficacy with coefficient of 0.38 (CI 0.008-0.76). **Conclusion:** Thorough and continuous patient education is required to bring changes in the knowledge and practices of patients and increase their self-efficacy towards type 2 diabetes management.

Keywords: Digital technology, Digital nutrition platforms, Artificial Intelligence, Cloud based digital health solution, Hand-held device users, Personalized nutrition

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1. INTRODUCTION

Diabetes is one of the largest health emergencies of the 21st century with a worldwide prevalence of 422 million[1]. It is predicted by International Diabetes Federation (IDF) that this number will reach 642 million by 2040, i.e. one in every ten adults[2] (International Diabetes Federation, 2017). The largest increase is taking place in regions where economies are moving from low- to middle-income levels. About 75% of people with diabetes live in low- and middle-income countries (LMIC)[3]. In India, an estimated 8.7% of the population between 20-70 years of age are diabetic[4]. Recently released National Family Health Survey-4 (NFHS 4) reports have highlighted that 6% women and 8% men between the age of 18-49 years have blood glucose level more than 140 mg/dl[5].

Knowledge plays a vital role in any future disease development and its early detection and prevention. Good knowledge, attitude and practice and self-efficacy (KAP, SE) are important

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DEVELOPMENT AND CHARACTERIZATION OF PHYSICO-CHEMICAL AND FUN GREEN TEA YOGHURT

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ABSTRACT

The present study aimed at developing a low-fat, low-sugar green tea yoghurt. The final similar, but the lactic acid count in green tea yoghurt ($5.8*10^7$ cfu/g) was twice of that in that the tea extract buffered pH lowering during fermentation. Sensorially, the green t yoghurt. The total phenolic content of green tea yoghurt was significantly higher (397.9 µg GAE/ mL). These polyphenols have proven health benefits like gut health, weight lo

Keywords: *Green tea, Yoghurt, Antioxidant capacity, Total phenolic content*

INTRODUCTION

The Indian snacking market is booming and is expected to grow annually at a CAGR of 18% (**Bhattacharya 2019**). This is due to increased emphasis on long-term wellness and health management and evolving consumer habits around traditional meals and snacking. The big dedicated meals have been replaced by snacks at frequent occasions. These snacks are expected to not only deliver pleasure, but also fulfil the physical and mental performance needs.

Amongst healthy snacks, yoghurts have gained high consumer acceptance owing to their easy digestibility and superior nutritional profile. They contain proteins of high biological value and are an excellent source of B-vitamins and minerals (calcium, phosphorus, magnesium, and zinc) (**Mckinley *et al.* 2005**). Yoghurts are commonly added with fruit, vegetable, or plant extracts (e.g. caffeine, guarana, green tea extract, coenzyme Q10, ginseng, aloe vera, cranberry, pomegranate pulp, flaxseed powder, and plant fibres) to enhance its nutritional benefits (**Najgebauer-Lejko *et al.* 2014; Kumar *et al.* 2018**). Tea infusion, in particular, is a promising ingredient since tea is widely consumed around the world. It has several functional benefits and has low pH of 4.2, which makes it easily compatible with yoghurts. Some reported health benefits of tea consumption are anticariogenic properties (**Krahwinkel *et al.* 2000; Otake *et al.* 1991**), improvement in bone density

This was due to the use of m polyphenols in the yoghurt fo industrially inefficient because o contamination with yeasts, mou increase. Therefore, from the per feasibility, a faster fermentation Next, it is important to understa because of the addition of the gre The objective of our study wa physicochemical characteristics, amongst Indian consumers.

MATERIAL AND METHODS

Ingredients

Homogenized and pasteurized to Taaza), milk powder (18% fat, 1 flavoured green tea (Twinings™ containing tartrazine and brilliant

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Special Report

Nutritional requirements for the elderly in India: A status paper

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Advances in the medical field and healthcare sector during the last few decades have resulted in increased longevity. Increased lifespans have in turn led to a rapid global rise of the elderly population. However, ensuring the health and quality of life, especially in the context of chronic age-related ailments, among the growing geriatric population is a challenge. Ageing is associated with several changes in body composition including a decline in the lean body mass usually accompanied by an increase in body fat content which have a bearing on the nutrient requirements for the elderly. The nutrient requirements currently recommended for Indian adults are primarily computed using a factorial approach, that considers the cumulative loss of nutrients and is adjusted for optimal body weights and bioavailability. It is logical that physiological and metabolic changes associated with ageing influence several of these factors: body weight, lean mass, energy expenditure, nutrient retention and bioavailability and thus alter nutrient requirements compared to the adult population. Acknowledging these age-related changes, some international organizations have suggested nutrient requirements specific to the elderly. Given the contextual differences in physiology, caution needs to be exercised in adopting these guidelines for the Indian elderly. In addition, in the Indian context, there is sparse information on the diet and nutrient intakes *vis-à-vis* nutritional status and physiology of the elderly. This status paper highlights some of the pertinent issues related to nutritional requirements for the elderly that advocate a need for deriving nutritional requirements for the elderly in India.

Key words Dietary intakes - elderly - geriatric population - nutritional requirements - nutritional status - older adults - physiology

Population ageing reflects an inevitable and irreversible demographic transition. Ageing is characterized by progressive deterioration in several biological functions along with the natural age-related changes in viability and increased vulnerability[1]. In general, the term 'elderly' or 'old age' or 'senior citizens' apply to people with ages nearing or surpassing the average lifespan of human beings, which may vary with geography and population groups. Thus, there is no universal cut-off for old age, and it may not convey the same meaning across societies. The measures and indicators commonly used to relate the sizes of different age groups are based on people's chronological age, stereotypically defining older persons as those aged

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Indian Handlooms: Present Scenario and Future Directions

Ashima Anand & Seema Sekhri

Abstract

Indian handloom textiles are the most exquisite, diverse, versatile sustainable products made with excellent craftsmanship. These have a history of more than 5000 years. Each state of India offers a unique handloom product produced by incorporating a weaving technique of its own. Handloom is one of the oldest and largest employment sector, after agriculture. Responsible for employing lakhs of weavers and allied workers, it has been an important contributor to India's economy. Despite its many advantages, this sector is facing huge challenges which are affecting its growth and have a direct bearing on its sustenance. This essay focuses on the vision of the Government of India towards strengthening the handloom sector for its unprecedented development through its institutional support and initiatives and its ways forward.

Keywords : Government Initiatives for Handlooms; Handloom Future Prospects; Handloom Scenario; Indian Handlooms.

Introduction

Indian handloom textiles are the treasure trove of the Indian subcontinent where each region offers one of its kind textiles. The textiles produced in each part of the country have been very well adapted to suit the climate. Influences of culture and location can be seen in the vibrant textures and the exclusive handloom weaves of each region. The history of handlooms dates back to the Indus Valley civilization. The discovery of bone needles, wooden spindles, and woven cotton fragments at the excavation sites of Harappa and Mohenjo-Daro suggest the antiquity of the tradition of hand spinning and weaving. References to weaving have been made in the *Vedas* and *Upanishads*. The ancient Hindu epics, the Ramayana and the Mahabharata mention a variety of fabrics in vogue during those times (Rana,

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Effect of α-dl tocopherol acetate (antioxidant) enriched edible coating on the physicochemical, functional properties and shelf life of minimally processed carrots (*Daucus carota* subsp. *sativus*)

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ABSTRACT

The present study was carried out to investigate the effect of varying sodium alginate-based edible coating (1, 2, and 3 %, w/v) supplemented with α- tocopherol acetate (antioxidant) at different concentrations (0.5 and 1 % w/v) on minimally processed carrot slices during 15 d storage at 10 °C and 65 % relative humidity. Seven different formulations (T_1- T_7) comprising different alginate and antioxidant combination were tested for selecting the best formulation maintaining the physicochemical attributes, antioxidant potential, carotenoid content, and overall acceptability (microbial counts) of carrot slices. Treatment T_4 (2% sodium alginate + 1% α-tocopherol acetate) served as the best formulation in maintaining the quality, acceptability, nutritive value of minimally processed carrots. The T_4 treated carrot samples showed minimum variation in weight loss, TSS, pH, whiteness index, reducing sugar, ascorbic acid content, TPC, antioxidant activity, total carotenoids, total aerobic bacterial count and yeast and mold counts, respectively in comparison to other treatments during storage. The statistical analysis also confirmed the significant ($p<0.05$) variation in physicochemical properties, antioxidant potential, carotenoid content and microbial count in control samples than edible coating formulations during storage.

1. Introduction

Carrot (*Daucus carrota* subsp.*sativus*) is a root vegetable, usually orange in color, though purple-black, red, white and yellow cultivars exist. It is a domesticated form of wild carrot *D. carrota*, native to Europe and southwestern Asia. It is one of the most popular consumed vegetables and is in demand throughout the year. Its roots contain high quantities of α- and β-carotene and are a good source of vitamin K, vitamin B6, phenolic compounds (Alasalvar et al. 2001). Consumption of carrots helps in lowering cholesterol, risk of heart attacks, anticancer effects, reduces signs of premature aging. It is also enriched in phenols like chlorogenic, hydroxyl cinnamic acids (caffeic acid, coumaric acid, ferulic acid), and anthocyanins (da Silva Dias, 2014). In todays' era, minimally processed produce, for example, fresh cuts fruits and vegetables are in more demand than whole produce due to an increase in health consciousness and purchasing power of the consumers (Conduruso et al. 2020). But the maintenance of the quality of fresh produce is still a major challenge for the food industry. To maintain and preserve its fresh quality for a longer duration there is a need to develop preservation technologies such as edible coating, refrigeration and plastic packaging with an idea to effectively enhance the shelf life and preserve the nutritional and physicochemical attributes of fresh-cut produce (Cha and Chinnan 2004; Vu et al. 2011). Certain processing measures, such as removing the skin from the surface or altering the size of fruits and vegetables lead to nutrients loss, accelerated enzymatic reactions, rapid microbial growth, color change, texture change and weight losses, resulting in quality deterioration of the product. Preservation strategies based on low-temperature storage, controlled and modified atmosphere packaging and edible coatings have been previously used to extend the shelf life of fresh produce (Parreidt et al. 2018). Edible coatings based on alginate, chitosan, and other biopolymers have advantages, as they act as moisture and gas barriers to control the microbial growth, preserve the color, texture and also enhanced the shelf life of the product (Nisperos-Carriedo et al. 1992; Petriccione et al. 2015). Alginate based edible coatings possess good film-forming properties and minimizes weight loss, maintain firmness and extend the shelf life of fruits and vegetables (Amanatidou et al. 2000; Senturk Parreidt et al. 2018; Sarker and Grift, 2021). Alginate and gellan based coating acts as a texture enhancer and maintains the initial firmness of fruits during refrigerated storage (Rojas-Graue et al., 2007a, 2007b and Tapia et al. 2008). The problems associated with the minimally processed carrots include

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Original Article e-ISSN: 23

Quality and Content of Online Information F "Immunity Boosting" During COVID-19 Pa Comparison of Google and DuckDuckGo

Anu Shrivastava, Aparna Agarwal, Swati Jain*

Abstract

Use of internet for assessing health-related information has been growing exponentially in the pa was to assess the quality of information on the websites on Google and DuckDuckGo. A total of 12 DuckDuckGo using the search terms "immunity booster," "immunity boosting foods," and "immunit three independent raters using DISCERN tool. The average ratings for the DISCERN questions were ir of the websites were of moderate quality. There was excellent inter-rater reliability among the rate immunity boosting as beneficial. About 11% of the websites recommended use of supplements fo adequate sleep were the most commonly recommended strategies for immunity boosting. Vitamin (commonly recommended dietary components for immunity boosting. Overall, there was no statisti of websites on Google and DuckDuckGo. Most of the websites suffered from shortcomings in the q quality criteria.

Keywords: DISCERN tool, Immunity boosting, Information quality, Internet, Online health informatic

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Introduction

Online health information has become one of the most sought after source of information in the present times. It is estimated that almost 7% searches on Google are health related.[1] The key attributes of internet that attract a large number of health information seekers are that it is convenient, provides privacy and anonymity, enables access to large amount of information in less time, and is economical.[2,3] As the COVID-19 emerged as a global cause of concern, anxiety among people to know more about the virus and ways to protect themselves from it also increased simultaneously as can be seen from the analysis of Google trends, which shows a subsequent increase in searches related to coronavirus and ways to strengthen the immune system to fight off the novel virus. Several products on various media platforms were advertised as being protective against the novel coronavirus. The concern can be clearly seen from the statement of the WHO General Director, "We're not just fighting a pandemic, we're fighting an infodemic."[4] During the times of any pandemic, accurate and reliable health information, at right time, is of vital importance as it also influences people's reactions to such situations and enables them to make well-informed health related decisions.[5]

A person's capability to identify poor quality information and the proportion of such information are the two important factors that together determine the chances of coming across

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in its quality and accurac enable the people to use t channels for improving th of the people to acquire, from electronic sources tc poor health literacy skills e leading to poor health out

The quality of online h cause of concern for health of many researches and t

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Review Article

Food fortification strategies to deliver nutrients for the management of iron deficiency anaemia

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ABSTRACT

A rising trend in the global prevalence of anaemia is still prevailing. To combat micronutrient deficiencies, World Health Organisation/Food Agriculture Organisation (2006) guidelines recommended four chief strategies – supplementation, fortification, nutrition education and dietary diversity. Of the four strategies, food fortification has been considered as the most efficacious and economical approach. However, it is the directives themselves that highlight two major bottlenecks associated with conventional fortification - uniform dissemination of the fortifier in food vehicle that mostly include staple foods, and internal and external compliance evaluation of fortification regulations and standards by the producers. As a result, researchers envisaged a new strategy - Food-to-food fortification that complements conventional fortification. This strategy involves fortification of food vehicles with nutrient-rich food-based fortifiers. The major advantage of utilising food-based fortifiers is that they hold the potential of enhancing the bioavailability of the fortified food and providing additional nutrients and thus, resulting in dietary diversification. It also facilitates the utilisation of underutilised crops as food-based fortifiers. Underutilised crops have been recognised as potential beneficial food source accounting to their nutritional, ecological, and fiscal benefits. This review paper delves into the strengths and shortcomings of conventional iron fortification. It delineates the concept of food-to-food fortification, while precisely discussing about the best practices to be followed to address the possible challenges associated with this strategy. It also promotes the utilisation of underutilised iron rich foods to develop fortified foods and avert global food insecurity. Furthermore, it provides a summary of the studies conducted around the world to develop fortified foods using iron compounds and iron-rich foods, and to investigate their efficacy in managing iron deficiency anaemia.

1. Introduction

Anaemia is a condition diagnosed by reduced levels and atypical morphological characteristics of erythrocytes, or by insufficient blood haemoglobin (Hb) levels in the human body. The reduced Hb levels have been recognised as a causal factor for an inadequate oxygen supply in the human body. This has been ascribed to suboptimal production of erythrocytes (erythropoiesis), amplified erythrocyte annihilation, loss of blood, or due to combination of all these aspects (da Silva Lopes et al., 2018). World Health Organisation (WHO) defines anaemia as Hb levels less than 13.0 g/dl in men and less than 12.0 g/dl in women of reproductive age (WRA) (World Health Organization, 1972). The global burden of anaemia among all age groups was reported to have dropped by 4.2 percentage points, i.e., from 27% in 1990 to 22.8% in 2019 (Gardner and Kassebaum, 2020). Although, the global prevalence has declined over nearly three decades, a rise in the total number of anaemia cases by 0.32 billion, that is from 1.42 billion cases (1990) to 1.74 billion cases (2019) was reported. In 2019, the maximum burden of anaemia was reported in children below the age of 5 years (39.7%). The global age-standardised point prevalence of mild, moderate, and severe anaemia was reported as 54.1%, 42.5% and 3.4% cases, respectively. Furthermore, global anaemia was accounted for 58.6 million Disability Adjusted Life Years in 2019. Reportedly, the maximum age-standardised point prevalence of anaemia was found in Western [40977.0 (95% UI: 39,789.3–42,154.8)] and Central [36861.4 (95% UI: 35,218.3–38,434.2)] Sub-Saharan Africa as well as South Asia [41646.1 (95% UI: 41,034.3–42,208.3)] (Gardner and Kassebaum, 2020). Based on National Family Health Survey (NFHS) – 4 (2015–16), anaemia affected 53% WRA (15–49 years), 23% men and 50% pregnant women in India. During the same period, Government of India committed to Global

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RESEARCH ARTICLE

Optimization of biofunctional jaggery yogurt: It's physicochemical and antioxidant properties

Pankaj[1], Abhishek Dutt Tripathi and Aparna Agarwal[2]

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Abstract: In addition to the standard healthy diet needs, balance food is taught to be a healthier diet that will promote human health. It's also known as functional food, which is food that clearly claims to have health advantages as well as the ability to enhance the immune system. Yoghurt is a fermented dairy product that is in great demand for its nutrient content, bacterial activity and wide product range in terms of flavours and textures. In this study, physicochemical, microbiological and sensory differences of probiotic set yoghurt incorporated with different concentration of Jaggery were evaluated, as well as the changes taking place during storage at 4°C for 21 days. During the storage, the addition of jaggery improved survival of *Lactobacillus delbrueckii* subspecies *bulgaricus* (ABT-7) and *Streptococcus thermophiles* (YoFlex Express 1.0) from CHR HANSEN, Denmark were used as starter culture for yogurt preparation. All yogurts exhibited a decrease in pH accompanied by an increase in titratable acidity during storage. Therefore, this study revealed that jaggery could be used to produce probiotic set yoghurt with improved physicochemical, microbiological and sensorial attributes.

Keywords: Jaggery; Milk; Microbial Analysis; Physicochemical; Sensorial; Yoghurt

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Introduction

Sugarcane (*Saccharum spp.*) is a major cash crop grown in more than hundred nations, mostly for sugar and bioethanol. Despite the fact that India is the world's second largest producer of sugarcane, after Brazil, its output must be increased to meet the growing need for renewable energy and green energy (Aguiar et al. 2016). Sugarcane is extremely important to the country's economy. In 2018, 79.9% of India's total sugarcane production went into the manufacturing of white sugar, 11.29 percent went into the production of jaggery, and 8.80 percent went into seed and feed materials. Jaggery, also known as Gur, is an unrefined, unpurified sugar that has been consumed throughout the Asia, Africa, Latin America, and the Caribbean for thousands of years (Pandraju et al. 2021; Revathy et al. 2021; Rao and Singh, 2021). According to FSSAI (2018), "Gur or Jaggery means the product obtained by boiling or processing juice pressed out of sugarcane or extracted from palmyra palm, date palm or coconut palm". It is natural sweetener with win fragrance and flavour. A quality jaggery is golden yellow in colour, hard in texture, crystalline in structure, sweet in taste and low in moisture. A good quality Jaggery/Gur contains over 70% sucrose, below 10% glucose and fructose (invert sugars), less than 5% minerals and under 3% moisture (Ghosh et al. 1998). Most of traditional sweets use jaggery as a sweetener. Jaggery has number of advantages in comparison to conventional table sugar as it is, high in minerals like calcium, potassium, and magnesium (Chandrakanth et al. 2019). Magnesium, which is contained in jaggery, has been shown to improve our neurological system, help with muscular relaxation, reduce fatigue, and protect our blood vessels. Magnesium, when combined with selenium, acts as an antioxidant, scavenging free radicals from our body. Jaggery contains potassium and a trace of sodium, which aid in the maintenance of the acid–base balance in our cells, as well as the regulation of acids, acetone levels, and blood pressure. It is a good source of iron and helps to prevent anaemia (Jaffe, 2012). Thus, jiggery contains variety of nutrients that are essential for growth and maintenance of human body. (Shori et al. 2021). However, in the majority of sweet items such as bread, confectionery, dairy, and beverages, the processed food industries mainly relies on refined sugar as a sweetener and bulking agent. Milk and Milk products have been an important part of Indian culture because of their health-promoting properties

Research Article

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Risk of Developing Antimicrobial Resistant *Listeria monocytogenes* in India: A Short Narrative Review

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Abstract

Background and Objective: Rampant application of antimicrobial drugs in food sectors triggered the development of resistance within the microorganisms in the surrounding environment. Due to the reduced susceptibility towards existing drugs, these microorganisms have an increased survival rate when treated. The emergence of this complication in the common food-borne pathogens is worrisome. Several antimicrobial-resistant variants of known infectious bacteria have been discovered. *Listeria monocytogenes* is one among those 'superbugs' bringing such public health challenges to be tackled. This article aims to review India's current situation and stance regarding the progressive issue of antimicrobial resistance and listeriosis.

Results and Conclusion: The issue of antimicrobial resistance has been recognized at all food industry and health care domain levels. Solutions are constantly being made to combat the obstacle, but the antibiotic resistance crisis does not seem to retard. Despite the awareness, regulations, and restraints implemented across the globe, researches hint towards rising antimicrobial usage and the ensued more threatening infections. India's step towards curbing antimicrobial resistance is at par with other global policies and intends to lower the resistance development rate among all pathogens. Till now, Indian authorities and the public have shown insouciance towards listeriosis. There are no special rules targeting *Listeria monocytogenes* in India, as opposed to stringent regulations in many western countries. The Indian government and all associated authorities must study and develop plans to establish standards and statutes to control listeriosis. Above all, set up a surveillance system to monitor the causes of food-related illnesses across the country.

Conflict of interest: The authors declare no conflict of interest.

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1. Introduction

Food-borne illnesses are a significant public health threat. The World Health Organization (WHO) reported that approximately 600 million people are infected with a food-borne disease yearly[1]. An individual's health is hampered, but from a more comprehensive outlook, it also affects the overall socio-economic development of the population [2]. It strains the healthcare system and even harms the country's economic activities and trade. Chemicals, heavy metals, parasites, fungi, viruses all cause food-borne illness, but bacterial food infection cases are the common causation[3]. More than 90 percent of food poisoning is caused by *Staphylococcus aureus, Salmonella, Clostridium perfringens, Campylobacter, Listeria monocytogenes, Vibrio parahaemolyticus, Bacillus cereus*, and entero-pathogenic *Escherichia coli* every year [4]. *Listeria monocytogenes* is a food-borne bacterium. Table 1 summarises the food products likely to be contaminated by *Listeria*. *Listeria (L.) monocytogenes* is an opportunistic pathogen, meaning those with a low immune system are most likely to suffer from infection [9].

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RESEARCH ARTICLE

Development of probiotic tomato *kulfi*

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Abstract: *Kulfi* is a traditional Indian frozen dessert with nutritional significance but, lacks therapeutic properties. *Kulfi* can be used as a vehicle for probiotics and prebiotics, with the added advantage of being appreciated by the people of all age groups. This study involves the production of *kulfi* by incorporating probiotic culture of *Lactobacillus acidophilus* La-5 (10^7 – 10^8 CFU/g) and tomato juice (prebiotic) (25% and 37.5%) to enhance its functional value and create a synbiotic system. The effect of tomato juice concentration was evaluated for physiochemical properties, culture's survival, and sensory characteristics. Data revealed a reduction in pH of *kulfi* variants with high tomato juice concentration. It was also found that, the probiotic tomato *kulfi* variants (25% and 37.5% variants) possessed high acidity (0.225% and 0.216%) and sucrose content (13.98% and 13.50%), respectively. The protein content was found to remain constant in all the *kulfi* variants, indicating no association between probiotic culture, tomato and *kulfi*. A decrease in fat content was observed with an increasing concentration of tomato juice. A reduction in viable counts was noted in 25% and 37.5% *kulfi* variants during one week of frozen storage. All *kulfi* variants received a fair score in the organoleptic evaluation, however, probiotic *kulfi* containing 25% tomato juice attained the highest score for all the parameters. Hence, proving that the incorporation of probiotic culture and tomato not only enhanced the nutritional properties of the *kulfi*, but also improved the sensory properties of the product.

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Keywords: *Kulfi, Lactobacillus acidophilus,* Probiotic, Tomato, Value-addition,

Introduction

Kulfi, or Malai-ka-baraf, a traditional Indian frozen dairy-based dessert which is an Indian analogue of ice cream, is the most savoured frozen dessert attributing to its palatability as well as low cost (Aneja et al. 2002). The chief difference between ice cream and *kulfi* is that the former is whipped with air or overrun, while the latter is not and hence, comprises no air (Kumar et al. 2017). Traditionally, *kulfi* is prepared using sweetened milk (containing 20-25% added sugar and concentrated to about half of its volume) and *malai*/cream, crushed nuts (almonds and pistachios) as well as flavouring ingredients (vanilla and/or rose essence. Subsequently, the prepared mix is poured and frozen in small conical shaped containers till consumption (Siva et al. 2019). At industrial level, a *kulfi* mix is composed of milk fat (10-16%), milk solids-not-fat (9-12%), sucrose (9-12%), corn syrup solids (4-6%), stabilizers/ emulsifiers (0-0.5%), total solids 36-45%, and water 55-64% (Kumar et al. 2017).

In the recent past, sociodemographic transition across the globe has resulted in major modifications in the dietary behaviours and health index of populations of both developed and developing countries. Reportedly, over the past few decades, global consumption of diets high in fat, especially saturated fat, low in unrefined carbohydrates, free sugars or salt/sodium has increased, in comparison to consumption of fruit, vegetables and dietary fibre (Agarwal et al. 2016; World Health Organization, 2015). This trend has resulted in the rising prevalence of various metabolic disorders, cancers, and other ailments. Considering these challeneges, the scientists are now aimed at developing functional foods that possess nutritive and therapeutic values (Putnik et al. 2018; Granato et al. 2020). Various studies conducted in past few years have emphasised on the significance of fruits, vegetables, whole grains, pre-and probiotics in mitigating several ailments. This has subsequently contributed to the burgeoning of the functional food market. A functional food may be defined as a food to which a component has been supplemented (macronutrient, micronutrient, phytochemicals or probiotics) or

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REVIEW ARTICLE

Repercussion of COVID-19 on Health and Nutritional Status of

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Abstract | Introduction | Methodology | Results | Conclusion | Referenc

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Citation

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Background

Ageing is an inevitable process with numerous changes in a physiological, biological, co
COVID-19 pandemic has posed an unprecedented public health crisis globally. Both
nutritional and health status of the elderly. Malnutrition, increase risk of chronic morbidi
with social deprivations influence the health and well-being of old age. Lack of physic
skeletal muscle mass and an increase of fat mass eventually causes functional inability. Th
of Covid-19 on the health and nutritional status of the elderly. A thorough recent lite
PubMed, Science Direct, and Google Scholar databases using specific keywords relat
published on COVID-19 during 2020 and their effect on health and nutrition in the elde
that nutritional status influences mortality and co-morbidities among the elderly during t
the study found that though nutritional indicators, that is, overweight or obese, signific
conditions among older adults, good nutrition reduces the risk of all-cause mortality
process, it is never too late to start practicing a healthy behavioral lifestyle for achieving

Keywords

Nutritional Status; Malnutrition; Functional Ability; Physical Activity; Elderly

Introduction

Ageing is a programmed senescence. It is an irreversible and degenerative process. Ageing is defined in many ways- Chronological ageing i.e. person's age, Social ageing as the society's expectations of how people behave as they grow old, and Biological ageing which focuses on the

(2019) reported that
the world population
it is predicted that i
proportion, a threefc
people of 80 years
account for over t

Case Report

Mealtime Behavior in Autism Spectrum Disorder: A Case Report

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Departments of Home Science and [1]Education, Lady Irwin College, Delhi University, New Delhi, India

Abstract

Autism spectrum disorder is a neurodevelopmental disorder characterized by impaired social and communication skills and repetitive and restricted behaviors or interests. No exact cause has been determined that may be responsible for its occurrence. However, genetic and environmental factors could be responsible for this disorder. Autism spectrum disorder is one area where little research has been done regarding mealtime behavior and increasing prevalence of this disorder indicated a dire need to study this area. The study aimed to observe the mealtime behavior of 15-year-old adolescent boy during his mealtime and understanding the factors that might be responsible for the idiosyncratic mealtime behavior. Nonparticipatory observation method was used for about 1 month, and data were collected till the point of saturation, where the data collection process no longer offered any new or relevant data. Speech impairment, restricted interest, vestibular difficulties, interference, sensory issues, lack of social interest, and self-absorbed behavior were some of the factors that might be responsible for his idiosyncratic behavior during mealtimes. The study recommended that nutrition-based intervention programs must be initiated by the professionals as early as possible to minimize the effect of such factors during mealtime of people with autism spectrum disorder.

Keywords: *Adolescence, idiosyncratic behavior, mealtime, sensory difficulties, and autism spectrum disorder*

Introduction

Autism spectrum disorder is a group of neurodevelopmental disorder characterized by deficits in mainly three areas, i.e., communication, social interaction, and repetitive and restricted behaviors (Centre for Disease and Control (CDC) Prevention, 2016). Diagnosis of autism spectrum disorder has been made at the age of 2 years by the experienced professionals. No single cause has been determined that is responsible for its occurrence. There may be several reasons that make a child more sensitive to have autism spectrum disorder including environmental, genetic, and biological reported by CDC. About one in 54 children has been identified with autism spectrum disorder according to the estimates from CDC's Autism and Developmental Disabilities Monitoring Network, 2016. Boys are four times more prone to have autism spectrum disorder than girls. Research highlights that children who are on the autism spectrum can present with unique mealtime challenges that make them more prone to nutritional deficiencies. Nutrition is an important aspect in every age group, especially in childhood because it is related to growth and development and also interferes in health and illness. Way of eating, the preferred types of food represent their mealtime behavior.[1] Autism spectrum disorder is a neurodevelopmental disability that may affect nutritional management of children with this disorder as they are especially, at higher risk of malnutrition, since poor nutrition can often lead them to be either overweight or underweight due to limited nutrient intake.[2] Evidence indicated that eating problems at five times more among children with

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ORIGINAL PAPER

Reducing childhood stunting in India: Insights from four subnational success cases

Rasmi Avula[1] · Phuong Hong Nguyen[1] · Lan Mai Tran[2] · Supreet Kaur[3] · Neena Bhatia[4] · Rakesh Sarwal[4] · Arjan de Wagt[5] · Deepika Nayar Chaudhery[6] · Purnima Menon[1]

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Abstract

Global success case analyses have identified factors supporting reductions in stunting across countries; less is known about successes at the subnational levels. We studied four states in India, assessing contributors to reductions in stunting between 2006 and 2016. Using public datasets, literature review, policy analyses and stakeholder interviews, we interpreted changes in the context of policies, programs and enabling environment. Primary contributors to stunting reduction were improvements in coverage of health and nutrition interventions (ranged between 11 to 23% among different states), household conditions (22–47%), and maternal factors (15–30%). Political and bureaucratic leadership engaged civil society and development partners facilitated change. Policy and program actions to address the multidimensional determinants of stunting reduction occur in sectors addressing poverty, food security, education, health services and nutrition programs. Therefore, for stunting reduction, focus should be on implementing multisectoral actions with equity, quality, and intensity with assured convergence on the same geographies and households.

Keywords Stunting · Multisectoral actions · Nutrition interventions · Household conditions

1 Introduction

Globally, the past decade has witnessed an unprecedented focus on undernutrition, particularly on stunting, which gained traction with the extension of ambitious World Health Assembly's (WHA) 2012 nutrition target of 40% reduction in the number of children under 5 who are stunted (World Health Organization, 2014) by its inclusion into the Sustainable Development Goals (United Nations, 2015). This in turn created demand for guidance on achieving stunting reduction at the national and subnational levels.

There is an extensive body of literature examining various determinants of stunting. Analyses based on large-scale data sets have found that stunting is associated with maternal stature (Li et al., 2020; Wali et al., 2020) and education (Dorsey et al., 2018; Li et al., 2020; Subramanyam et al., 2010), household wealth (Li et al., 2020; Subramanyam et al., 2010) and sanitation status (Larsen et al., 2017) across multiple countries and in India. Recent evidence from various geographies indicates changes in a combination of these determinants contributed to improvements in height-for-age Z scores (HAZ). For example, improvements to maternal and newborn health had contributed to 28% change in HAZ in Senegal (Brar et al., 2020) and in Peru (Huicho et al., 2020) but only 11.5% in Nepal (Conway et al., 2020). Improved maternal nutrition contributed to 26% change in HAZ in Peru (Huicho et al., 2020), but only 5% in Ethiopia (Tasic et al., 2020), and parental education contributed to 25% change in HAZ in Nepal (Conway et al.,

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Guest Editors: Stuart Gillespie, Nicholas Nisbett, Mara van den Bold, Jody Harris

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ORIGINAL ARTICLE e-ISSN: 23

Meal Pattern of Urban Adolescents of Differ Socio-economic Status Groups in Delhi

Preeti Kamboj[1], Neena Bhatia[1]*, G. S. Toteja[2]

Abstract

Introduction and Methods: A community-based cross-sectional, descriptive study was carrie 11–18 years, 62.0% girls) residing in Delhi. Information pertaining to their detailed meal pattern wa adolescents from urban slums (US), low income group (LIG), and middle income group (MIG) were vegetarians (27.4%) and ovo-vegetarians (19.9%) belonged to high income group (HIG). Adolescer number of meals (weekdays – 5.16 ± 0.887 and weekends – 4.85 ± 1.026) and adolescents from LIG re (weekdays – 4.31 ± 0.777 and weekends – 4.26 ± 0.846). Dinner was the main meal consumed by ≥ on weekdays and weekends. Highest proportions of adolescents from LIG were consuming other m lunch (97.0%) on weekdays and weekends. Adolescents from HIG reported the lowest daily breakfas other groups. Fixed times for main meals were reported by 62.6% and 54.5% adolescents on weekd. of adolescents having fixed times for main meals on weekdays and weekends belonged to HIG (74.0% of adolescents commonly skipping main meals on weekdays and weekends belonged to MIG (53.1% that the adolescents from LIG, who reported consuming the lowest mean total number of meals percentage of skipping main meals on weekends (21.5%).

Keywords: Adolescents, Breakfast, Meal pattern, Socio-economic status, Urban
Asian Pac. J. Health Sci., (2022); DOI: 10.21276/apjhs.2022.9.1.20

Introduction

India is home to 253 million adolescents (10–19 years).[1] According to Census 2011, adolescents constitute 236.5 million or 19.6% of the total population of India.[2] The period of adolescence pertains to rapid changes in body weight and height, hormonal changes, sexual maturity, and mood swings.[3] This period provides a window of opportunity for improving nutritional deficiencies occurred in childhood, for catching-up on growth, and for establishing recommended dietary behaviors.[1] Dietary guidelines for Indians formulated by ICMR-National Institute of Nutrition, Hyderabad suggest intake of a balanced diet during adolescence for optimum growth and boosting immunity.[3] Adolescents who do not confirm to healthy eating habits are prone to diet-related non-communicable diseases.[4] Faulty dietary habits make adolescents susceptible to obesity which, in turn, increases the risk for non-communicable diseases such as diabetes mellitus, hypertension, cardiovascular disorders, and hormonal imbalances in future.[5] The report on "Adolescent, Diets and Nutrition" by Comprehensive National Nutrition Survey revealed that malnutrition peaks during early adolescence. The report also highlights the rising problem of micronutrient deficiencies, unhealthy diets, overweight, and anemia among Indian adolescents aged 10–19 years.[6] Awareness among adolescents to cut down fat, salt, and sugar consumption can have a major impact at the population level.[4] Thus, it is

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Not much data are ava Indian adolescents. This p on the meal pattern of ur different SES groups.

Methodology

The study was conducted

ORIGINAL ARTICLE

Knowledge, Attitude, Practices and Self-Efficacy in Newly Diagnosed Type 2 Diabetes Patients Towards Dietary and Lifestyle Factors

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ABSTRACT **Background:** Type 2 Diabetes is one of the leading causes of morbidity and mortality in India and globally. Increasing awareness towards diabetes management at early stage is extremely important to develop better practices in the area of diabetes management. The present study was conducted to determine the knowledge, attitude, practices and self-efficacy of type 2 diabetes patients towards dietary and lifestyle factors, attending private Diabetes clinics in Delhi, NCR. **Material Methods:** The study was conducted on 100 newly diagnosed diabetic subjects, using pre-tested questionnaires. The questionnaire was designed to assess the socio-demographic, knowledge (DKQ), attitude (DAS), practices and self-efficacy (DSES) of patients with type 2 diabetes. Data was analyzed using t-test, one way ANOVA and multiple regression to understand the determinants of knowledge, attitude, practices and self-efficacy in patients with type 2 diabetes. **Results:** 100 T2 DM patients comprising 73 males and 27 females. Patients obtained score 13.16±4.18 out of 24 in knowledge assessment, 3.56±0.2 out of maximum 5 in attitude scale. Patients had suboptimal practices when compared to guidelines and obtained score of 6.02±1.57 out of maximum 10 in Diabetes self-efficacy scale. Use of internet is found to be positively associated with attitude with coefficient of 0.1 (CI 0.03-0.22). Educational qualification of study participants was associated with greater self-efficacy with coefficient of 0.38 (CI 0.008-0.76). **Conclusion:** Thorough and continuous patient education is required to bring changes in the knowledge and practices of patients and increase their self-efficacy towards type 2 diabetes management.

Keywords: Digital technology, Digital nutrition platforms, Artificial Intelligence, Cloud based digital health solution, Hand-held device users, Personalized nutrition

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1. INTRODUCTION

Diabetes is one of the largest health emergencies of the 21st century with a worldwide prevalence of 422 million[1]. It is predicted by International Diabetes Federation (IDF) that this number will reach 642 million by 2040, i.e. one in every ten adults[2] (International Diabetes Federation, 2017). The largest increase is taking place in regions where economies are moving from low- to middle-income levels. About 75% of people with diabetes live in low- and middle-income countries (LMIC)[3]. In India, an estimated 8.7% of the population between 20-70 years of age are diabetic[4]. Recently released National Family Health Survey-4 (NFHS-4) reports have highlighted that 6% women and 8% men between the age of 18-49 years have blood glucose level more than 140 mg/dl[5].

Knowledge plays a vital role in any future disease development and its early detection and prevention. Good knowledge, attitude and practice and self-efficacy (KAP, SE) are important

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Impact of pretransplantation malnutrition risk on the clinical outcome and graft survival of kidney transplant patients

Impacto do risco de desnutrição pré-transplante no desfecho clínico e na sobrevida do enxerto de pacientes transplantados renais

Authors

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ABSTRACT

Introduction: The prevalence of malnourished patients before transplantation and the influence of malnutrition on graft and patient outcomes remain underestimated, despite being associated with higher postoperative morbidity and mortality. This study aimed to develop an easy nutritional screening tool and evaluate the impact of nutritional status on clinical outcome, graft survival (GS) and mortality risk in kidney transplant patients (KTP). **Methods:** In this retrospective cohort study including 451 KTP, we developed a score by using anthropometric, clinical, and laboratory measures performed in the pretransplant evaluation. The patients were stratified into 3 groups according to the final score: G1 (0 or 1 point)=low risk, G2 (2 to 4 points)=moderate risk, and G3 (>5 points)=high risk of malnutrition. The patients were monitored after transplantation at least 1 to 10 years. **Results:** Stratifying the 451 patients based on the pretransplant risk score, G1, G2, and G3 were composed of 90, 292, and 69 patients, respectively. Patients from G1 maintained the lowest serum creatinine levels at hospital discharge when compared with others (p = 0.012). The incidence of infection in the patients from G3 was higher than patients from G1 and G2 (p = 0.030). G3 recipients showed worse GS than G1 patients (p = 0.044). G3 patients showed almost threefold higher risk for graft loss (HR 2.94, 95% CI 1.084-7.996). **Conclusions:** KTP with higher malnutrition risk score were associated with worse outcomes and GS. The nutritional screening tool is easy to be used in clinical practice to evaluate the patient in preparation for kidney transplant.

Keywords: Kidney Transplantation; Malnutrition; Nutrition Assessment; Renal Dialysis; Renal Insufficiency, Chronic.

RESUMO

Introdução: A prevalência de pacientes desnutridos antes do transplante e a influência da desnutrição nos desfechos do enxerto e do paciente permanecem subestimadas, embora estejam associadas a maior morbimortalidade pós-operatória. Este estudo buscou desenvolver uma ferramenta simples de triagem nutricional e avaliar o impacto do estado nutricional no desfecho clínico, sobrevida do enxerto (SE) e risco de mortalidade em pacientes transplantados renais (PTR). Métodos: Neste estudo de coorte retrospectivo incluindo 451 PTR, desenvolvemos um escore usando medidas antropométricas, clínicas e laboratoriais tomadas na avaliação pré-transplante. Os pacientes foram estratificados em 3 grupos segundo a pontuação final: G1 (0-1 ponto) = baixo risco, G2 (2–4 pontos) = risco moderado e G3 (>5 pontos) = alto risco de desnutrição. Eles foram monitorados por pelo menos 1 a 10 anos após o transplante. Resultados: Os 451 pacientes foram estratificados em G1, G2 e G3, que consistiram em 90, 292 e 69 pacientes, respectivamente. Os pacientes do G1 mantiveram os menores níveis de creatinina sérica na alta hospitalar em relação aos demais (p = 0,012). A incidência de infecção nos pacientes do G3 foi maior que nos pacientes do G1 e G2 (p = 0,030). Os pacientes do G3 apresentaram SE pior do que os pacientes do G1 (p = 0,044) e um risco quase três vezes maior de perda do enxerto (HR 2,94; IC 95% 1,084-7,996). Conclusões: PTR com maior escore de risco de desnutrição foram associados a piores desfechos e menor SE. A ferramenta de triagem nutricional é fácil de usar na prática clínica para avaliar pacientes em preparação para transplante renal.

Descritores: Transplante de Rim; Desnutrição; Avaliação Nutricional; Diálise Renal; Insuficiência Renal Crônica.

Public Health Nutrition: 25(12), 3499–3508 doi:10.1017/S1368980022000210

Characterisation of anaemia amongst school going adolescent girls in rural Haryana, India

Aakriti Gupta[1,*], Harshpal Singh Sachdev[2], Umesh Kapil[3], Shyam Prakash[4], Ravindra Mohan Pandey[5], Hem Chandra Sati[5], Lokesh Kumar Sharma[6] and Priti Rishi Lal[1]

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Abstract

Objective: High burden of anaemia exists amongst rural adolescent girls in India. The objective of this study was to characterise anaemia in school going adolescent girls in rural Haryana, India.

Design: Linear and multiple logistic regression analysis of data collected prior to an intervention trial was conducted. Participants were classified into anaemic (haemoglobin <12 g/dl) and non-anaemic group and were further classified into deficiencies of Fe, folate or vitamin B_{12}, mixed, anaemia of other causes and inflammation.

Setting: Three schools in Ballabgarh block of Faridabad District, Haryana, India.

Participants: One hundered and ninety-eight non-anaemic and 202 anaemic adolescent girls (12–19 years).

Results: Anaemic girls had 29·6 % Fe deficiency, 28·1 % folate or vitamin B_{12} deficiency, 15·8 % mixed deficiency and 9·7 % acute inflammation. Anaemia of other causes was found in 16·8 % of the anaemic participants. Girls with Fe and isolated folate deficiency had 2·5 times and four times higher odds of developing anaemia, respectively, as compared with non-anaemic girls. Fe deficiency with no anaemia was found amongst 11 % non-anaemic girls. Non-anaemic girls had a high prevalence of combined deficiency of folate or vitamin B_{12} (29·5 %) and acute inflammation (14·4 %).

Conclusions: The current strategy of Fe and folic acid supplementation alone will not suffice for achieving the desired reduction in the prevalence of anaemia as unknown causes and anaemia of inflammation contribute to a substantial proportion of anaemia. Integrating other nutrition-specific components like improving water, sanitation and hygiene practices with the ongoing micronutrient supplementation program will comprehensively tackle anaemia. Unknown causes of anaemia warrant further research.

Keywords
Anaemia
Haemoglobin
Iron
Folate
Adolescent

Anaemia in adolescent girls is a major public health problem in India with 40 % being afflicted[1]. Adolescent girls are vulnerable to anaemia due to regular loss of Fe through menstrual blood in addition to the overall accelerated increase in requirements for Fe due to rapid pubertal growth. Functional consequences of anaemia on growth and development occur even at mild levels or prior to onset of clinical stage of anaemia, making it the third leading cause of disability in the world[2].

Some recent evidence challenges the earlier notion that Fe deficiency is the predominant contributor to anaemia globally[3,4]. Estimates suggest that less than half the cases of anaemia are due to Fe deficiency, and the other causes are unknown[3–5]. Anaemia due to inflammation has been

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Clinical Nutrition
&
Hospital Dietetics

Case Study

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Frequent consumption of savory snacks is associated with NAFLD in Indian adult population: A case control study

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ABSTRACT

Introduction: Non-Alcoholic Fatty Liver Disease (NAFLD) has emerged as a public health problem in India against the backdrop of diabetes, dyslipidemias, and central obesity. It is related to lifestyle factors including diet and physical activity.

Aim: To study the association between lifestyle factors and NAFLD, in an adult Indian population.

Materials and Methods: The study included 320 subjects, comprising 160 cases (patients with NAFLD) and 160 controls (without NAFLD), and were recruited from a tertiary care hospital in North India. Data on socio-demographic profile, clinical, and anthropometric parameters, biochemical measurements, dietary pattern and physical activity patterns were obtained

Results: Risk factors for NAFLD included central obesity (waist circumference >80 cm in females and >90 cm in males), high consumption of edible oil (>25 g for males and >20 g for females), evening snack intake, intake of savory intake more than twice a week, intake of alcohol (even less than the cut-off).

Conclusion: The lifestyle risk factors of the present study can be incorporated as components of nutrition and lifestyle education programs on preventive strategies for NAFLD at both clinical and community level.

Keywords: NAFLD, Evening snacks, Savory snacks, Food frequency questionnaire, Lifestyle risk factors, Edible oil.

ABBREVIATIONS

DM: Diabetes Mellitus; CVD: Cardiovascular Disorders; HT: Hypertension WHR: Waist-to-Hip Ratio; WHtR: Waist-to-Height Ratio; BP: Blood Pressure; PP: Postprandial; HDL-C: High-Density Lipoprotein Cholesterol; LDL-C: Low-Density Lipoprotein Cholesterol; VLDL-C: Very Low-Density Lipoprotein Cholesterol; SGOT: Serum Glutamic Oxaloacetic Transaminase; SGPT: Serum Glutamic Pyruvic Transaminase.

INTRODUCTION

Non-Alcoholic Fatty Liver Disease (NAFLD) has emerged as one of the most common chronic liver diseases globally. It includes a histological spectrum of diseases, such as Non-Alcoholic Fatty Liver (NAFL), Non-Alcoholic Steatohepatitis (NASH), advanced fibrosis, cirrhosis, and hepatocellular carcinoma in the absence of alcohol intake [1]. The progression of NAFLD is associated with lifestyle factors mainly improper diets and lower physical activity and is mainly due to modernization and urbanization across the globe.

Studies have suggested the associations of NAFLD with obesity, abdominal obesity, components of metabolic syndrome, improper quality of food (high intake of total

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Environmental Research and Public Health

MDPI

Review

Gender Transformative Interventions for Perinatal Mental Health in Low and Middle Income Countries—A Scoping Review

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Abstract: Perinatal mental health problems are linked to poor outcomes for mothers, babies and families. In the context of Low and Middle Income Countries (LMIC), a leading risk factor is gender disparity. Addressing gender disparity, by involving fathers, mothers in law and other family members can significantly improve perinatal and maternal healthcare, including risk factors for poor perinatal mental health such as domestic violence and poor social support. This highlights the need to develop and implement gender-transformative (GT) interventions that seek to engage with men and reduce or overcome gender-based constraints. This scoping review aimed to highlight existing gender transformative interventions from LMIC that specifically aimed to address perinatal mental health (partner violence, anxiety or depression and partner support) and identify components of the intervention that were found to be useful and acceptable. This review follows the five-stage Arksey and O'Malley framework and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist. Six papers that met the inclusion criteria were included in the review (four from Africa and two from Asia). Common components of gender transformative interventions across studies included couple-based interventions and discussion groups. Gender inequity and related factors are a strong risk for poor perinatal mental health and the dearth of studies highlights the strong need for better evidence of GT interventions in this area.

Keywords: perinatal mental health; gender transformative interventions; scoping review; LMIC

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1. Introduction

Research and policies related to perinatal mental health have demonstrated how poor mental health both in pregnancy and postpartum is prevalent in the form of anxiety and depression, and may influence pregnancy outcomes and the health of the foetus and infant [1,2]. Untreated depression during pregnancy is also associated with a risk for suicide especially in those with a severe problem or when there is associated partner violence [2–4]. When studied through a socio-cultural context, women generally have reported high levels of anxiety, depression and higher levels of trauma during pregnancy as well as the postpartum period [5–7]. Rates of anxiety and depression in pregnancy from Low and Middle Income Countries (LMIC) range between 9–65% [8], indicating the importance of addressing mental health outcomes during pregnancy as well as post-pregnancy in the region [9].

Some of the well-established risk factors for poor perinatal mental health, particularly anxiety and depression, are related to gender inequity, especially in LMIC settings. These include partner violence (Intimate partner violence (IPV), Domestic violence (DV) and Gender-based Violence (GBV)), younger age, poor social support, low education and male infant preference [10–12]. Other gender-based risk factors include low

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Special Report

Nutritional requirements for the elderly in India: A status paper

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Received September 14, 2021

Advances in the medical field and healthcare sector during the last few decades have resulted in increased longevity. Increased lifespans have in turn led to a rapid global rise of the elderly population. However, ensuring the health and quality of life, especially in the context of chronic age-related ailments, among the growing geriatric population is a challenge. Ageing is associated with several changes in body composition including a decline in the lean body mass usually accompanied by an increase in body fat content which have a bearing on the nutrient requirements for the elderly. The nutrient requirements currently recommended for Indian adults are primarily computed using a factorial approach, that considers the cumulative loss of nutrients and is adjusted for optimal body weights and bioavailability. It is logical that physiological and metabolic changes associated with ageing influence several of these factors: body weight, lean mass, energy expenditure, nutrient retention and bioavailability and thus alter nutrient requirements compared to the adult population. Acknowledging these age-related changes, some international organizations have suggested nutrient requirements specific to the elderly. Given the contextual differences in physiology, caution needs to be exercised in adopting these guidelines for the Indian elderly. In addition, in the Indian context, there is sparse information on the diet and nutrient intakes *vis-à-vis* nutritional status and physiology of the elderly. This status paper highlights some of the pertinent issues related to nutritional requirements for the elderly that advocate a need for deriving nutritional requirements for the elderly in India.

Key words Dietary intakes - elderly - geriatric population - nutritional requirements - nutritional status - older adults - physiology

Population ageing reflects an inevitable and irreversible demographic transition. Ageing is characterized by progressive deterioration in several biological functions along with the natural age-related changes in viability and increased vulnerability[1]. In general, the term 'elderly' or 'old age' or 'senior citizens' apply to people with ages nearing or surpassing the average lifespan of human beings, which may vary with geography and population groups. Thus, there is no universal cut-off for old age, and it may not convey the same meaning across societies. The measures and indicators commonly used to relate the sizes of different age groups are based on people's chronological age, stereotypically defining older persons as those aged

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ORIGINAL PAPER

Reducing childhood stunting in India: Insights from four subnational success cases

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Received: 12 July 2021 / Accepted: 29 December 2021 / Published online: 1 April 2022

Abstract
Global success case analyses have identified factors supporting reductions in stunting across countries; less is known about successes at the subnational levels. We studied four states in India, assessing contributors to reductions in stunting between 2006 and 2016. Using public datasets, literature review, policy analyses and stakeholder interviews, we interpreted changes in the context of policies, programs and enabling environment. Primary contributors to stunting reduction were improvements in coverage of health and nutrition interventions (ranged between 11 to 23% among different states), household conditions (22–47%), and maternal factors (15–30%). Political and bureaucratic leadership engaged civil society and development partners facilitated change. Policy and program actions to address the multidimensional determinants of stunting reduction occur in sectors addressing poverty, food security, education, health services and nutrition programs. Therefore, for stunting reduction, focus should be on implementing multisectoral actions with equity, quality, and intensity with assured convergence on the same geographies and households.

Keywords Stunting · Multisectoral actions · Nutrition interventions · Household conditions

1 Introduction

Globally, the past decade has witnessed an unprecedented focus on undernutrition, particularly on stunting, which gained traction with the extension of ambitious World Health Assembly's (WHA) 2012 nutrition target of 40% reduction in the number of children under 5 who are stunted (World Health Organization, 2014) by its inclusion into the Sustainable Development Goals (United Nations, 2015). This in turn created demand for guidance on achieving stunting reduction at the national and subnational levels.

There is an extensive body of literature examining various determinants of stunting. Analyses based on large-scale data sets have found that stunting is associated with maternal stature (Li et al., 2020; Wali et al., 2020) and education (Dorsey et al., 2018; Li et al., 2020; Subramanyam et al., 2010), household wealth (Li et al., 2020; Subramanyam et al., 2010) and sanitation status (Larsen et al., 2017) across multiple countries and in India. Recent evidence from various geographies indicates changes in a combination of these determinants contributed to improvements in height-for-age Z scores (HAZ). For example, improvements to maternal and newborn health had contributed to 28% change in HAZ in Senegal (Brar et al., 2020) and in Peru (Huicho et al., 2020) but only 11.5% in Nepal (Conway et al., 2020). Improved maternal nutrition contributed to 26% change in HAZ in Peru (Huicho et al., 2020), but only 5% in Ethiopia (Tasic et al., 2020), and parental education contributed to 25% change in HAZ in Nepal (Conway et al.,

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Guest Editors: Stuart Gillespie, Nicholas Nisbett, Mara van den Bold, Jody Harris

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Research Paper

Water, sanitation, and hygiene facilities: enabling or impeding handwashing? An assessment of a primary school infrastructure in Palwal, India

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ABSTRACT

The importance of water, sanitation, and hygiene (WASH) facilities in school cannot be ignored in protecting children from communicable diseases. However, reports from UNICEF suggest that there is a lack of adequate WASH facilities and a dearth of adequate data on available facilities, particularly from developing countries. The present study sought to address this gap and build on the evidence-base of school hygiene and sanitation facilities in rural India. The study also assessed the association between available facilities and the handwashing behavior of students. Data were collected from 28 schools using a modified Joint Monitoring Program (JMP) observation checklist and a self-administered questionnaire. Results indicate a universal coverage of WASH facilities in the sampled schools, though the sufficiency and usability of the infrastructure were inadequate. The study also found better hand hygiene KAP scores among students in schools that had handwashing stations closer to toilets ($p = 0.018$). We conclude that while India has improved access to facilities under the recent National policy push, there needs to be a continued focus on increasing sufficiency, maintenance and usability of the facilities. Additionally, health promotion activities that include teachers, parents and the community are required to improve the hygiene and sanitation behavior of school children.

Key words: hygiene, rural, sanitation, schools, WASH

HIGHLIGHTS

- Adds to the evidence-base of the school WASH facilities available to rural, primary school children in India.
- There are hardly any studies that benchmark the available WASH facilities against global standards. The present study maps the findings on the basis of the WHO/UNICEF JMP's new service ladder for WASH in schools.
- Explores the association between the quality of WASH services and students' handwashing behavior.

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Trends in Food Science & Technology
Volume 123, May 2022, Pages 233-250

Hydrothermal treatment of lignocellulose waste for the production of polyhydroxyalkanoates copolymer with potential application in food packaging

Abhishek Dutt Tripathi [a], Pradeep Kumar Mishra [b], Kianoush Khosravi Darani [c], Aparna Agarwal [d], Veena Paul [e]

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Highlights

- The agro-waste rich in lignocellulose are potential substrate for PHA production.
- The hydrothermal pretreatment of lignocellulosic waste promotes the PHA production.
- Biodegradability of produced PHA expands its application value.
- ASTM standards and biodegradability of PHAs.

Abstract

Background

Bio-plastics are eco-friendly biopolymer finding tremendous application in food and pharmaceutical industries. Biodegradable polymer-based plastic such as PHAs (plyhydroxyalkanoates) possesses similar physicochemical and mechanical properties as posed by conventional plastic. PHAs does not cause any type of hazardous pollution upon disposal. However, the high production cost of PHAs makes its wider acceptability unsuitable at commercial level. This can be minimized by screening potential PHAs producing strains, selecting inexpensive raw material, optimized cultivation condition and by adopting efficient recovery and purification strategies.

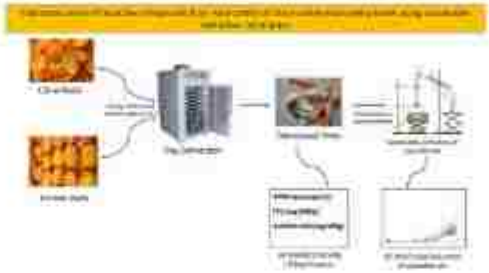
Scope and approach

The PHA upstream processing is expensive and contributes approximately 40% of total production cost. This can be minimized to greater extent by using inexpensive raw materials such as agro-industrial waste and lignocellulose waste (LCW). In recent time, LCW has gained more attention in bioprocess-based production owing to its nutritional composition. LCW is rich in complex polysaccharides such as lignin, cellulose, hemicellulose which are not easily digested. Hydrothermal processing of lignocellulosic materials causes a variety of effects including extractive removal,

Valorization of essential oils from citrus peel powder using hydro-distillation

Sustainable Chemistry and Pharmacy (/paperList/1/1661) (IF 6) **Pub Date: 2023-02-21** , DOI:10.1016/j.scp.2023.101038

Diksha Shaw, Abhishek Dutt Tripathi, Veena Paul, Aparna Agarwal, Pradeep Kumar Mishra, Mohit Kumar



Citrus species exhibit many important natural bioactive compounds, such as ascorbic acid, essential oils, and antioxidant substances. Citrus esse complex mixture of volatile and non-volatile compounds obtained from the citrus fruit peel, which are discarded as waste. These citrus peels are a essential oils having medicinal benefits such as antioxidant, anticancer, antidiabetic, and anti-inflammatory properties. An experiment was carried species (*Citrus reticulata* cv. (kinnow) and *Citrus X sinensis* (orange)) peel powder to study the essential oil composition. The kinnow and orange using the sun and tray drying method and were compared. The peel powder obtained by sun and tray drying was tested for antioxidant activity (DPI activity, and ascorbic acid activity). The essential oil was extracted from peel powder using a sustainable hydro-distillation technique. The results re highest yield was obtained in tray-dried orange peel powder (9.96%), followed by tray-dried kinnow peel powder (9.70%). The bioactive compositi essential oils was analyzed by gas chromatography-mass spectrometry (GC-MS). The kinnow and orange peel essential oil composition was pred limonene, terpenoids, and sesquiterpenes, enhancing its medicinal value. Thus, this study developed a green, sustainable, and eco-friendly hydro- for citrus essential oil extraction.

References

Full-text link

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Aya S. Shalaby, Hanaa H. Eid, Riham A. El-Shiekh, Fadia S. Youssef, Ahmed A. Al-Karmalawy, Nahla A. Farag, Amany A. Sleem, Fatma Adly Morsy, Khaled M. Ib

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Anti-Inflammatory Effects of Essential Oils from the Peels of Citrus Cultivars

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Scope, nutritional aspects, technology, and consumer preferences toward seafood alternatives

Abhishek Dutt Tripathi [a], Aparna Agarwal [b]

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Highlights

- The paper reviews about the Scope, nutritional aspects, technology, and consumer preferences toward seafood alternatives.
- Consumer needs for seafood alternatives and plant proteins for mimicking sea foods.
- Fungi: source of protein as a sea food alternative.
- Functional ingredients in manufacture and production of seafood alternatives.
- Technology for structuring seafood alternatives.
- Consumer preferences towards these products.

Abstract

Sustainability, human health, and animal welfare are three broad areas that pose a greater impact on mankind. The increased consumption of animal-based foods such as fish or seafood has threatened the ecosystem due to rising greenhouse gas emissions, biodiversity loss, diseases, and consumption of toxic metals contained in fish by cause of water pollution. This has led to increased awareness among consumers to adopt seafood alternatives for a sustainable future. It is also not well known whether consumers are ready to switch from traditional seafood towards a safer and sustainable seafood alternative. This encourages the in-depth study of the scope of seafood alternatives in consumers' food choices. This study

Vegetos
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REVIEW ARTICLES

Herbs-derived phytochemicals – a boon for combating COVID-19

Veena Paul[1] · Abhishek Dutt Tripathi[1] · Aparna Agarwal[2] · Dipendra Kumar Mahato[3] · Kartikeya Srivastava[4] · Kamlesh Kumar Maurya[1]

Received: 11 March 2022 / Revised: 20 February 2023 / Accepted: 25 February 2023

Abstract
The recent pandemic, the novel coronavirus (COVID-19), has put the whole world on alert with the threat of the virus that targets the human respiratory system. The disease has affected more than 633.6 million people globally and caused 6.5 million deaths since November 18, 2022. About 12.94 billion people are vaccinated as of November 18, 2022. Due to varied climatic conditions, SARS-CoV-2 has shown rapid mutation in recent years. Because of the lack of appropriate therapeutic drugs, inadequate diagnostic mechanisms, life-supporting medical facilities, and lack of awareness, the spread of SARS-CoV-2 has become severe. Thus, the most efficient strategy to control this disease is to follow preventive measures. However, treating SARS-CoV-2 cases in Wuhan using traditional Chinese herbs has set an example to show how traditional health can contribute to treating this novel virus. Medicinal herbs are known for their antimicrobial, antibacterial, antiviral, immunomodulatory, immunoadjuvant, and anti-inflammatory properties. These medicinal herbs are used during cooking and consumed regularly worldwide. In this view, medicinal herbs gained evident attention. These herbs can serve as a potential and economical remedy for combating the lethal effects of COVID-19. The present review highlights the phytochemicals and their mechanisms of action in preventing SARS-CoV-2.

Keywords COVID-19 · SARS-CoV-2 mode of action · Medicinal herbs · Antioxidant and functional attributes · Immunomodulator · Antiviral

Introduction

Since December 2019, the whole world has faced an outbreak of COVID-19 (novel coronavirus disease-2019), starting and reporting in Wuhan, China. The World Health Organization (WHO) declared this novel virus a pandemic on March 11, 2020, because of its high transmissibility and pathogenicity. The novel coronavirus infection is mainly due to Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) and affects the respiratory system. The evidence-based treatment of COVID-19 has supported the statement that a more robust immune system helps fight against this novel virus (Rastogi et al. 2020). Our daily food habits relate to boosting our immune systems.

Coronaviruses (CoV) can be classified as Alpha-CoV, Beta-CoV, Gamma-CoV, and Delta-CoV (Li 2016). Scientists have reported six various human CoVs, which involve Alpha-CoV (HCoV-NL63 and HCoV229E) and Beta-CoV (SARS-CoV and MERS-CoV) (Tang et al. 2015). SARS-CoV-2 is a novel β-coronavirus that is different from the previously identified SARS-CoV (Severe Acute Respiratory Syndrome Coronavirus) outbreak in 2002 and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) outbreak in 2012 that was responsible for the pulmonary failure and lethal respiratory-tract infections (Zhang et al. 2020). The genomic sequence of the SARS-CoV-2 shows a 96.2% resemblance to the SARS-CoV (Astuti and Ysrafil 2020). The symptoms are fever, cough, sore throat, muscle pain,

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ANSF APPLIED AND NATURAL SCIENCE FOUNDATION

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Research Article

Quality assessment of value-added Indian recipe from composite flour and sesame seeds.

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How to Cite

Garg, M. *et al.* (2023). Quality assessment of value-added Indian recipe *pedakiya* prepared f seeds.. *Journal of Applied and Natural Science*, 15(2), 767 - 776. https://doi.org/10.31018/jan

Abstract

The present study was designed to enhance the nutritional value of the Indian recipe *pedakiy* fried dumpling, by utilizing the beneficial properties of composite flour (oat and peas flour) anc study aimed to investigate the effects of partial substitution of refined wheat flour with oat and and microbiological parameters as affected by different cooking (deep-fat frying, baking, an was developed by partially substituting a high percentage of refined wheat flour with oat flo and based on the different treatments, these were coded as P_0 (control), P_1 (value-added *ped* at 120 °C /5 minutes), P_2 (air-fried at 120 °C /30 minutes), and P_3 (baked at 200 °C /25 minut sample P_1 was the most acceptable by the sensory panel. Chemical analyses revealed that t sesame seeds substantially increased the nutritional parameters of the product. The prod vealed that, up to a 15-day storage period, the product was well within safe levels. Aluminu suitable packaging material for storing the value-added *pedakiya* based on the water activit acceptability scores. This study has provided an alternative approach for preparing traditio

International Journal of Food Science +Technology

Original article

Analysis of Bisphenol A migration from microwaveable polycarbonate cups into coffee during microwave heating

Aparna Agarwal, Shivika Gandhi, Abhishek Dutt Tripathi, Marco Iammarino, Snigdha Homroy

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Citations: 2