



To evaluate Knowledge, Attitude and Practices in the elderly on the use of traditional Indian Prebiotics and Probiotics as an immune-booster during pandemic.

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Abstract

The aim of the study is to evaluate knowledge, attitude and practices regarding the use of traditional Indian prebiotics and probiotics as immune-boosters in the elderly during the pandemic. It targets to provide recommendation and insights by the elderly to curb the symptoms of COVID-19 infection. A cross-sectional study was conducted on 130 participants using Google Forms, Telephonic & personal interviews with elderly or their caregivers residing in old-age homes, living alone or with family members in city of Hyderabad. Education level, gender, socio-economic factors, health status and food frequency were considered as important variables in analysis. Statistical analysis of the results was done using Chi-Square and ANOVA. The results showed that Knowledge on term prebiotics and probiotics higher amongst the participants with degree (11.5%) level of education; while the females (71.2%) were more familiar with the benefits than the males (58.9%). Garlic, Kanji, Curd, Chickpea and Hulled barley were amongst the most preferred immune-boosting prebiotics and probiotics chosen by about 85-95% participants. Most popularly used recipes to alleviate the symptoms of COVID-19 were Chaddannam (63.8%), Ragi malt (56.1%), Besan ka Sheera (52.3%), Khameer daliya (40.7%) and Ghee-Pyaz (40.7%). Participants observed no significant impact on their immunity, pre and post pandemic, which suggests the potential protective role of the traditional Indian prebiotics and probiotics. Knowledge regarding the term was considerably average due to educational gap but their Indian traditional and cultural practices played crucial role in consumption of right combination of prebiotics and probiotics.

Keywords: COVID-19, Immune-boosters, Prebiotics, Probiotics, Traditional Indian

Introduction

The novel coronavirus pandemic of 2019 (COVID-19), an emerging infectious disease (EID) caused by multiple strains of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) spread to 216 countries and territories, with catastrophic impact on global health and economy.

Elderly people are at a higher risk of COVID-19 infection due to their decreased immunity and body reserves, as well as multiple associated comorbidities like diabetes, hypertension, chronic kidney disease and chronic obstructive pulmonary disease. Also, course of disease tends to be more severe in case of elderlies resulting in higher mortality [1]. In developing countries like India, older people face challenges in accessing medical care due to weak health systems or healthcare requiring out-of-pocket expenditure leaving millions of people, especially those in poorest groups and old age homes, without access to basic nutritional care.

Prebiotics are defined as natural or processed 'functional foods' which contain biologically active compounds that have documented clinical benefits on health, ranging from prevention of colorectal cancer to modulation of host defences to viral and bacterial infections by altering the interactions between pathogenic and beneficial bacteria [2].

Probiotics are non-pathogenic living microorganisms providing various health benefits to the human host. The use of probiotics in food such as fermented food is traditional knowledge and ascertained to improve nutrition and health by restoring microbial balance in the human gut. Studies suggest that dietary meals with fibre and probiotics supplementation support a stable host immune response system, preventing adverse effects of viral infections [3].

In such circumstances, knowledge, attitude and practices regarding traditional remedies using locally available food items and techniques of fermentation and preservation, as is in the case of prebiotics and probiotics, to increase the nutritive value and shelf life of the product, comes in handy, as it is cost-effective, easily accessible, acts as an immunity-booster during the pandemic, reduces the course and severity of the symptoms of the infection in the elderly caused by corona virus and requires minimum preparation or can be consumed directly like bananas, almonds, apple, yogurt and buttermilk [4].

To the best of our knowledge, there has been no study conducted to analyse the knowledge, attitude and practices specifically with respect to the use of traditional Indian prebiotic and probiotic foods as immunity boosters amongst the elderly population. Hence, the objective of this study is to evaluate knowledge, attitude and practices regarding the use of traditional Indian prebiotics and probiotics as immune-boosters in the elderly during the pandemic based on their mode of living, socio-economic status and beliefs. The study also provides an insight to the prebiotic and probiotic recipes that are traditionally used by the elderly to curb the symptoms of the COVID-19 infection.

Methodology

A rapid assessment survey was conducted using Google Forms in the city of Hyderabad. The form was distributed through various social media platforms such as WhatsApp, Facebook and Email to the elderly participants living alone or with family members and at old age homes. Aid of the caregivers for retrieving data was utilised when required. Personal and Telephonic interviews were conducted for the participants residing alone or at old age homes, had no access or inability to use modern tools and technology adopted for the survey.

Design of the study

A cross-sectional survey was conducted using simple random sampling technique.

Mode of Living

Data regarding mode of living was collected. Total data was collected from 130 elderly participants living in old age homes, living alone and those living with family members. Based on which, participants were clubbed into 3 categories:

- Elderly residing in old age homes (n= 64)
- Elderly living alone (n=22)
- Elderly living with family members (n= 44)

Ethical Criteria

The participants were selected purely through their own willingness to participate. The participants were informed about the study, it's purpose and its design. Informed consents were taken before the data collection from the old age homes, family members and the caregivers of the participants.

Demographic Data

Information regarding age, gender, religion, economic status, mode of income, education, mode of living and health status was collected using pre-structured questionnaire.

Data on Dietary practices

The questionnaire also included information on Food frequency, Eating habits and 24-hour dietary recall.

Knowledge, Attitude and Practice (KAP)

Knowledge regarding the term along with benefits and types of traditional Indian prebiotics and probiotics used as immunity boosters to help curb the symptoms of COVID-19 was assessed amongst the elderly population using a pre-structured questionnaire.

Attitude of participants was assessed based on their ratings provided in context to their immune system before and after the pandemic, whether there was any pronounced shift in the immunity and if foods like prebiotics and probiotics can have an impact on immunity was evaluated.

Practices adopted by participants during the covid lockdown to boost their immunity was assessed using a structured questionnaire too. An open-ended question was used to assess the traditional Indian prebiotic and probiotic recipes consumed by elderly participants based on their socio-economic status and religious and cultural beliefs.

Statistical Analysis

Knowledge on prebiotics and probiotics term based on education level, Knowledge regarding the benefits of prebiotics and probiotics was evaluated using Chi-square tests at p-value less than 0.05 which was considered statistically significant.

Two-way ANOVA test was applied to assess the Attitude of the participants towards their pre and post pandemic immunity along with immune suppressing practices present amongst the individuals at $p < 0.05$.

Results

Table 1 gives the demographic data of the study participants. About 40% were females while about 60% were males. Maximum participants were > 60 years of age.

Amongst 130 participants about 49.2% were living in the old age homes, 16.9 % were living alone and 33.85% were living with their family members.

Table 1: Demographic data of study participants

Demographic data	No. of Participants (N=130) N (%)
Age	
>60 years	106 (81.5%)
<60 years	24 (18.5%)
Gender	
Male	78 (60%)
Female	52 (40%)
Education	
Illiterate	10 (7.6%)
Matriculation	34 (26.1%)
Intermediate	46 (35.3%)
Degree	27 (20.7%)
Post graduate	13 (10%)
Mode of living	
Old age home	64 (49.2%)
Living alone	22 (16.9%)
Live with Family	44 (33.8%)

Health Status:

Table 2 gives information about the comorbidities (If present) in the participants. A majority of about 55.3 % were Diabetic followed by 47.6% hypertensive participants hypertensive and 20.7 % had respiratory problems, pre-dominantly asthma.

Table 2 also gives information about the number of participants affected by covid-19 that is 81.5 % individuals and the most commonly experienced symptoms by the participant during that period. Fever (92.4%), Loss of taste and smell (81.1%), Cold & Cough (86.7%) and Constipation (74.5%) were observed to be most prevalent symptoms.

Table 2: Health status of the participants

Health status	No. of Respondents (n=130) N (%)
Comorbidities	
Hypertension	62 (47.6%)
Cardiovascular Disease	47 (36.1%)
Diabetes	72 (55.3%)
Respiratory diseases	27 (20.7%)
Participants	
Affected by COVID-19	106 (81.5%)
Unaffected during COVID-19	24 (18.5%)
Symptoms present in COVID-19 infection	
Fever	98 (75.3%)
Loss of appetite	86 (66.1%)
Cold & Cough	92 (70.7%)
Diarrhoea	62 (47.6%)
Constipation	79 (60.7%)
Nausea & Vomiting	54 (41.5%)

Knowledge about the term prebiotic and probiotic:

Table 3 provides information about the knowledge and familiarity with the term prebiotic and probiotic. Degree (11.5%) holders were found to be better acquainted with the term prebiotic and probiotic while only 7.6% and 8.4% participants with matriculation and intermediate level of education respectively were found to be familiar with the terms. Based on chi-square analysis education level seemed to play a significant role ($p= 0.01$) in the knowledge regarding prebiotics and probiotics amongst the elderly.

Table 3: Knowledge about the term prebiotics and probiotics

Education Level	Aware of Prebiotics & Probiotics (n=130)		χ^2 Value
	Yes N (%)	No N (%)	
Illiterate	2 (1.5%)	8 (6.1%)	0.001
Matriculation	10 (7.6%)	24 (18.4%)	
Intermediate	11 (8.4%)	35 (26.9%)	
Degree	20 (11.5%)	7 (9.2%)	
Post graduate	8 (5.3%)	6 (4.6%)	

Benefits of Prebiotics and Probiotics:

Table 4 provides information regarding the knowledge on the benefits of prebiotics and probiotics amongst the male and female participants. Higher percentage of participants believed in the role of prebiotics and probiotics in enhancing the rate of recovery during the covid-19 infection and its role in reducing the constipation, diarrhoea and improving gut health. Percentage of female participants (71.2%) aware of the benefits of prebiotics and probiotics were higher when compared to the male participants (58.9%). Gender played a significant role ($p =0.0002$) in the knowledge of the benefits of prebiotics and probiotics in the elderly population. This could be attributed to the fact that Indian women spend majority of the time in the kitchen besides inheriting the traditional and cultural knowledge on various food items from ancestors of the family and henceforth tend to be better acquainted with their benefits.

Table 4: Knowledge on benefits of Prebiotics and Probiotics

Benefits	No. of Respondents (n=130)		χ^2 Value
	Male (n=78)	Female (n=52)	
Relieves constipation	26 (20%)	36 (27.6%)	0.0002
Reduces diarrhoea	22 (16.9%)	35 (26.9%)	
Maintains healthy gut	23 (17.6%)	37 (28.4%)	
Increases immunity	20 (15.3%)	20 (15.3%)	
Reduces duration of fever	23 (17.6%)	36 (27.6%)	
Enhances rate of recovery in COVID-19 infection	26 (20%)	31 (23.8%)	
I don't know	46 (35.3%)	15 (11.5%)	

Knowledge regarding prebiotic and probiotic foods that boost immunity

Table 5 provides information about the percentage of participants (85-95%) who believe Garlic, Kanji, Curd, Chickpea and hulled barley (chauker) to possess immune-boosting abilities. While, very low percentage (30-35%) of people consider the potential of buttermilk, pickle, dhokla, dosa and apple cider vinegar in enhancing the immunity during the pandemic.

Table 5: Knowledge regarding immunity boosting Prebiotics & Probiotics

Prebiotics	No. of Respondents (n=130) N(%)
Garlic	117 (90%)
Onion	92 (70.7%)
Hulled barley (chauker)	121 (93%)
Ragi	86 (66.1%)
Lentil	54 (41.5%)
Chickpea	111 (85.3%)
Horse gram	97 (74.6%)
Probiotics	
Curd	118 (90.7%)
Idli	95 (73%)
Dosa	48 (36.9%)
Kanji	124 (95.3%)
Pickle	40 (30.7%)
Dhokla	42 (32.3%)
Buttermilk	53 (40.7%)
Apple cider vinegar	39 (30%)

Source of information regarding the use of prebiotics and probiotics

Figure 1 shows that Television, Family members, Culture and tradition are the main contributors of information regarding the use of prebiotics and probiotics during the COVID-19 infection amongst the participants. While fewer participants have received the information via newspapers, social media and education. About 10% of the participants were unaware of the uses of prebiotics and probiotics.

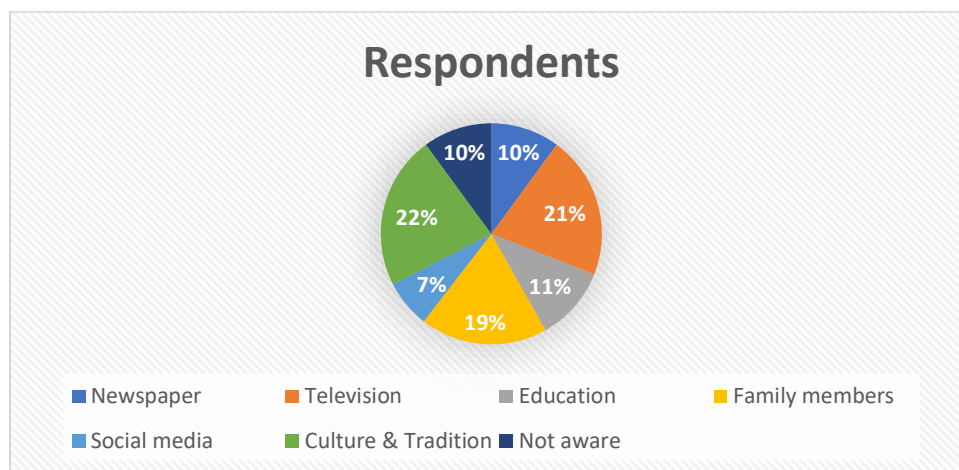
Fig 1: Source of information regarding prebiotics and probiotics**Attitude of participants regarding immunity**

Table 6 gives information regarding rating of the immune system of the participants before and after COVID-19 infection. There was no significant pre-pandemic and post-pandemic difference in the participant's rating of their immune system $p > 0.05$.

Table 6 also provides information regarding the attitudes of the participants towards immunity. 41.5% reported that they feel immunity can be boosted within a short span of time. 35.3% participants reported that they need to improve immunity after suffering from COVID-19. 50% participants believe that prebiotics and probiotics can improve immune response. Almost 86.1% participants reported that strong immunity is necessary to fight disease, 40% reported that people with co-morbidities have relatively low immunity and 90.7% participants reported that healthy gut leads to good immunity.

Table 6: Attitude of participants regarding immunity

Rate your immune system	No. of Respondents (n=130)		χ^2 Value
	Pre-pandemic N (%)	Post- pandemic N (%)	
1	4 (3%)	12 (9%)	1.12
2	10 (7.6%)	34 (26.1%)	
3	30 (23%)	73 (56.1%)	
4	76 (58.4%)	8 (6%)	
5	10 (7.6%)	3 (2%)	
Attitude towards immunity		No. of Respondents (n=130) N (%)	
Immunity can be boosted in short period		54 (41.5%)	
Do you need to improve your immunity?		46 (35.3%)	
Eating healthy has kept immune system strong during pandemic		112 (86.1%)	
Can improve immune system through prebiotic & probiotic foods		65 (50%)	
Strong immunity is necessary to fight disease		99 (76.1%)	
People with co-morbidities have relatively low immunity		52 (40%)	
Healthy gut leads to good immunity		118 (90.7%)	

Immune suppressing practices of the participants

Table 7 gives information regarding immunity suppressing practices of the participants based upon their current living situation, that is those residing at old age home, living independently and those living with their family. The intake of caffeine was found to be the highest amongst all the three groups. Consumption of high fat diet was seen more predominantly in old age home participants (30.7%) and the rate of depression was also found to be higher in this group that is about 25.3% individuals suffered with depression. Alcohol consumption was more

(21.5%) amongst those living with their family. Upon Two-way ANOVA analysis it was determined that the immune suppressing practices significantly varied depending upon the mode of living ($P = 0.02$) as well as each immune suppressing practice percentage was significantly influenced by the living mode of the individuals ($p = 0.03$)

Table 7: Immune suppressing practices of the participants

Immune suppressing practices	No. of Respondents (n=130)		
	Old age home (n=64)	Living alone (n=22)	Living with Family (n=44)
	N (%)	N (%)	N (%)
Lack of sleep	39 (30%)	14 (10.7%)	16 (12.3%)
Smoking	18 (13.8%)	15 (11.5%)	9 (6%)
Alcohol consumption	9 (6%)	12 (9%)	28 (21.5%)
Depression	33 (25.3%)	12 (9%)	8 (6%)
High caffeine intake	49 (37.6%)	16 (12.3%)	37 (28.4%)
Consumption of high fat diet	40 (30.7%)	15 (11.5%)	28 (21.5%)

Consumption Frequency of Prebiotics and Probiotics

Table 8 gives information about the consumption frequency of prebiotics and probiotics during the pandemic. The most frequently consumed prebiotics by the participants are garlic, onion, lentils and pigeon pea. Curd, Idli, pickle and buttermilk are the most frequently consumed probiotics by the participants during the pandemic.

Table 8: Consumption Frequency of prebiotics & Probiotics during the pandemic

Prebiotics	1-2 times/day N (%)	2-3 times/week N (%)	Weekly once N (%)	Occasionally N (%)	Never taken N (%)
Garlic	67 (51.5%)	49 (37.6%)	8 (6%)	-	6 (4%)
Onion	96 (73.8%)	34 (26.1%)	-	-	6 (4%)
Hulled barley	37 (28.4%)	58 (44.6%)	9 (6%)	12 (9%)	14 (10.7%)
Ragi millet	14 (10.7%)	38 (29.2%)	20 (15.3%)	47 (36.1%)	11 (8%)
Lentil	46 (35.3%)	72 (55.3%)	12 (9%)	-	-
Chickpea	12 (9%)	46 (35.3%)	59 (45.3%)	13 (10%)	-
Horse gram	13 (9%)	43 (33%)	58 (44.6%)	16 (12.3%)	-
Green gram	29 (22.3%)	38 (29.2%)	42 (32.3%)	21 (16.1%)	-
Pigeon pea	49 (37.6%)	57 (43.8%)	19 (14.6%)	5 (3%)	-
Probiotics	1-2 times/day N (%)	2-3 times/week N (%)	Weekly once N (%)	Occasionally N (%)	Never taken N (%)
Curd	59 (45.3%)	43 (33%)	16 (12.3%)	12 (9%)	-
Idli	42 (32.3%)	38 (29.2%)	27 (20.7%)	19 (14.6%)	4 (3%)
Dosa	18 (13.8%)	22 (16.9%)	56 (43%)	29 (22.3%)	5 (3%)
Kanji	22 (16.9%)	29 (22.3%)	17 (13%)	32 (24.6%)	30 (23%)
Pickle	49 (37.6%)	32 (24.6%)	16 (12.3%)	33 (25.3%)	-
Dhokla	-	14 (10.7%)	13 (10%)	57 (43.8%)	46 (35.3%)
Buttermilk	57 (43.85%)	36 (27.6%)	10 (7.6%)	19 (14.6%)	8 (6%)
Apple cider vinegar	6 (4%)	23 (17.6%)	4 (3%)	22 (16.9%)	75 (57.6%)

Traditional Prebiotic and Probiotic recipes used during COVID-19

Table 9 shows the traditional Indian recipes used by the elderly, to treat the symptoms of COVID-19 infection and to boost immunity. Fermented curd rice (Chaddanam) was found to be a popular traditional recipe used by 63.8% participants as an immunity booster during the pandemic. Followed by, Besan ka Sheera used by 56.1% participants, Ragi malt used by 52.3% participants, 49.2 % reported to use Khameer Daliya and 40.7% participants used Ghee-Pyaaz.

Table 9: Traditional Indian prebiotic and probiotic recipes used during COVID-19

Recipe name	Purpose of consumption	No. of respondents (n=130) N (%)
1. Fermented curd rice (chaddanam)	1. Boosts immunity, cures constipation and diarrhoea	83 (63.8%)
2. Ragi malt	2. Treat dysbiosis and promotes gut health	73 (56.1%)
3. Besan ka sheera	3. Boosts immunity, cures respiratory tract infections	68 (52.3%)
4. Khameer daliya	4. Wards off cold, cough and flu	64 (49.2%)
5. Ghee-pyaaz	5. Strengthens immune system, cures sore throat, cough, chest congestion & improves gut health	53 (40.7%)

Discussion

In the current study, knowledge, attitude and practices regarding the use of traditional Indian prebiotics and probiotics as immunity boosters among elderly was presented.

Knowledge and familiarity with the term prebiotics and probiotics was found to be significantly superior among the participants with higher level of education. Degree (11.5%) holders were found to be better acquainted with the term prebiotic and probiotic while only 7.6% and 8.4% participants with matriculation and intermediate level of education respectively were found to be familiar with the terms. This showed that the level of education has a significant role ($p=0.01$) to play with regards to being acquainted with terminologies of the traditional food items used in our daily Indian diet.

It was observed that 71.2 % of the female participants were aware of the benefits of the prebiotics and probiotics whilst 58.9% of the male participants admitted to not know about the benefits. This may be due to the fact that Indian women are more invested in looking after their family's health and well-being and possess better knowledge about the benefits of Indian foods which was passed on to them over the generations via traditional and cultural practices.

Lack of drastic shift in the pre-pandemic and post-pandemic rating of the immune system ($p>0.05$) highlights the preventive role of these traditional prebiotics and probiotics in maintaining and sustaining the immune health irrespective of the otherwise potentially fatal pandemic. About 23-58% participants claimed to have had a fit immune system prior as well as post pandemic. The current study bowls the previous research which suggests, the brunt of severe illness from Covid-19 is being borne by aging adults, as age reduces the attention span of the innate and adaptive immune responses making it harder for the body to respond to viral infection as such caused by COVID-19 [5]. Another important fact to be taken into account is that 41.5% participants believe that immunity can be boosted in a short period of time and only 40% participants consider that presence of comorbidities reduce immunity while the majority remains unaware of the adverse effects of the underlying comorbidities which reflects the misconception present in this age-group due to lack of nutrition education and dire need to initiate one at the earliest in this testing times of pandemic.

Information obtained regarding mode of living represented that about 49.2% of the elderly participants were residing in the old age homes or were living alone (16.9%) highlighting the increasing negligence by children

towards their old parents during the pandemic, giving rise to immense pressure on this group leading to higher prevalence rate of depression found in 40.7% and a majority included participants from the old age homes and those living alone.

The rate of depression was found to be higher amongst those living in old age homes. A survey found that older persons suffering medical complications and are living alone are unable to interact and share their worries with friends or family which has made their life more critical. Elderly are using alcohol and smoking as a coping mechanism when faced by unfavourable experiences [1].

Participant's Consumption frequency of Garlic, Onion, Lentils and Pigeon pea among the prebiotics and Curd, Idli, pickle and buttermilk in that of the probiotics was noticed to be highest during the pandemic. While the use of traditional Indian prebiotic grains such as Hulled barley and Ragi surfaced to be prominent amongst this group of participants. Which leaves us with an afterthought, that despite possessing access to best of education it's our elderly population's cultural and traditional knowledge that outpaces what we hold today in the modern world.

An open-ended question was asked to unearth the traditional Indian prebiotic and probiotic recipes that are used by the elderly to strengthen the immune system and cure symptoms of COVID-19 infection like, cold, cough, fever, constipation, diarrhoea and fatigue. Chaddanam, hailing from the state of Telangana, is a traditional fermented rice recipe which was found to be a favourite with the participants during the pandemic used to boost immunity and to cure constipation and diarrhoea as suggested by the elderly participants, preferred by about 63.8%. Ragi malt was another recipe that was suggested by 52.3% participants and is known to alleviate dysbiosis and promote gut health. The underrated remedy, looming threat of extinction due to lack of interest amongst the younger population to adopt traditional prebiotics and probiotics is Ghee-pyaaz. Known to few (40.7%) but serves as an asset in the times of the COVID-19 pandemic, as it helps to strengthen the immune system, cures sore throat, cough, chest congestion & improves gut health.

There isn't adequate information available on the usage and benefits of our traditional Indian prebiotics and probiotics as immune-boosters and to cure the symptoms posed as a result of the COVID-19 infection despite the potency that our prebiotics and probiotics withhold. This study aims to highlight our age-old, native prebiotics and probiotics used, its benefits and the importance of traditional and cultural knowledge and practices of our elderly that serves as a shield against the rise of the pandemic, making this study one of its kind.

Due to the small sample size as a result of time and ethical constraints apart from the lack of cooperation from the participants the data collected could not cover all the prebiotic and probiotic foods native to our culture and tradition. Hence, a further detailed survey on a larger sample size needs to be conducted across India taking into consideration all the regions, urban, tribal and rural to encapsulate data on varied forms of prebiotics and probiotics used based on their culture, tradition, availability and socio-economic status.

Conclusion

The traditional Indian prebiotics and probiotics used by the elderly needs to be promoted and adopted by people of all generations as they are affordable, locally available, easy to prepare & serves as an immune-boosters during COVID-19. The lack of significant shift in the immunity rate in pre and post pandemic era amongst the elderly serves as a motive to bring attention towards the benefits of local traditional foods. The right usage of these prebiotics and probiotics as remedial therapies should be promoted in local public health centres and Anganwadi institutions. There is a need to conduct education, awareness and intervention programs with respect to nutrition and social-welfare of the elderly to ensure better health and living standards that's taken a steep fall during the pandemic, to boost immunity, to reduce the rate of abandonment ensued depression and anxiety and to promote the usage, benefits and increase the consumption frequency and accessibility of our traditional Indian prebiotics and probiotics to curb the severity of the COVID-19 infection and to prevent future immune crises mediated via disease outbreaks.

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Conflict of Interest

The author declares no conflict of interest.

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