4

Results and Discussion

The results pertaining to the study titled **"Computation of nutritional footprint of food consumed by selected subjects and creating awareness on planetary health diet using the developed e application"** has been discussed under the following headings,

4.1. Phase I - Analyzing the knowledge, attitude, and practice of planetary health diet among selected subjects.

4.2. Phase II - Elicit Information on food consumption pattern and Calculation of Carbon and Nutritional Footprint of the food consumed by the selected subjects.

4.3. Phase III - Development and Evaluation of an e-application to promote planetary health diet.

4.4 Phase IV - Creating awareness on the importance of planetary health diet using the developed e application and analyzing the Post awareness – knowledge of planetary health diet among selected subjects.

4.1. Phase I – Analyzing the knowledge, attitude, and practice of Planetary health diet among selected subjects:

It is anticipated that the world population may increase to 8.6 billion in 2030 and 9.8 billion in 2050 (UNDESA, 2017). As a result, food systems worldwide face enormous challenges in producing affordable and wholesome food for everyone. Since the advent of agriculture in the Neolithic Era, access to equality and the opportunity for equal resource accumulation have declined for most people. (Kohn, 2017).

According to Turner *et al.*, (2018), the human diet has changed in recent decades as a result of technological advancements, globalisation, and modifications to agricultural systems. The definition by Bene *et al*., (2019) for a healthy diet has also been examined and modified to incorporate planetary health concerns.

Considering this, the "Planetary Health Diet" has been recommended as a diet that is both sustainable and nutritious and strives to promote the health of the population as well as the planet by the EAT-Lancet Commission on "Healthy Diets from Sustainable Food Systems" (EAT-Lancet) (2019). This diet is based on high consumption of fruits, vegetables, whole grains, and green leafy vegetables and low consumption of livestock, refined cereals, and tubers.

The Interview Schedule was validated by Cronbach's alpha test.

Validation of Interview Schedule

Table: I show the reliability of Interview Schedule.

TABLE : I RELIABILITY OF INTERVIEW SCHEDULE

S. No	Variables	Mean ± S. D	Cronbach's Alpha test
1	Food and nutrition related knowledge	3.86 ± 0.33	0.766
2	Sociocultural Reasons on diet	5.03 ± 0.32	0.833
3	Psychopathology of planetary health diet	4.66 ± 0.09	0.739
4	Availability of plant-based diet	2.36 ± 0.66	0.627
5	Knowledge on Planetary Health Diet	3.10 ± 0.71	0.769
6	Attitude towards Planetary Health diet	5.20 ± 0.37	0.966

Table I depicts the reliability coefficient of the interview schedule for each section. The overall Cronbach's alpha, at 0.815, indicates a high level of internal consistency for the entire scale. However, it is worth noting that the section focusing on plant-based food exhibits a lower Cronbach's alpha, suggesting that it is less reliable within the context of this study. As a result, it may be advisable to exclude this particular section from the interview schedule. By doing so, we can improve the overall reliability and accuracy of the study's findings.

By considering this, the data was collected to analyse the knowledge, attitude, and practice of planetary health diet among selected women in Coimbatore, and the results are tabulated.

Table: II highlights the demographic profile of the subjects

TABLE: II DEMOGRAPHIC PROFILE OF THE SUBJECTS

	Number (N)	**Percentage (%)**
Age (in years)		
30 - 35	77	19.3
36 - 40	104	26.0
41 - 45	106	26.5
46 - 50	113	28.3
Religion		
Hindu	215	53.7
Muslim	109	27.2
Christian	76	19.1
Educational Qualification		
Illiterate	4	1
Literate	396	99
Elementary	45	11
SSLC	48	12
HSC	103	25.7
Undergraduate	115	28.9
Postgraduate	21	5.2
Diploma	57	14.2
Family Income (per year)		
≤2,640	2	0.5
2,641-7,886	5	1.2
7,887-13,160	5	1.2
13,161-19,758	13	3.3
19,759-26,354	19	4.9
26,355-52,733	23	5.7
≥ 52,734	333	83.2
Type of family		
Nuclear	372	93.0
Joint	28	7.0
Size of family		

1 – 3	160	40.0
4 – 6	210	52.5
7 – 9	21	7.25
10 – 12	1	0.25

Table: II projects the demographic details of the selected subjects, which shows that the majority of the selected women were in the age group of 46- 50 years followed by the age group 41 – 45 years. More than half of the subjects were Hindus, followed by Muslims and Christians. Nearly 93% of the subjects were from nuclear families and only 7% of them belonged to joint families. Ninety nine percent of the subjects were literate, whereas about 29 percent of the subjects had completed their undergraduate degree. More than 82% of the subjects earn more than 53,000 rupees in a year.

Figure I depict the socio-economic status of the selected subjects.

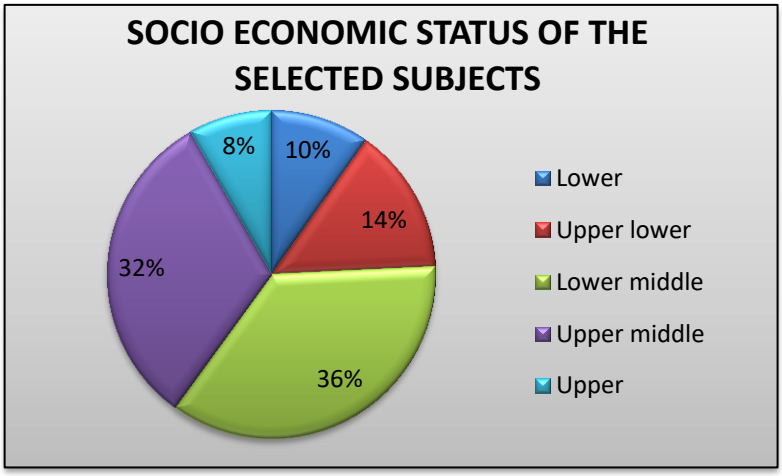


FIGURE : I SOCIO ECONOMIC STATUS OF THE SUBJECTS

Figure: I reveal the socioeconomic status of the subjects. It is clear that 36% of the subjects belonged to the lower middle class, followed by the upper middle class at 32%. Only 8 percent of the subjects belong to the lower class.

Figure II shows the diet pattern of the selected subjects

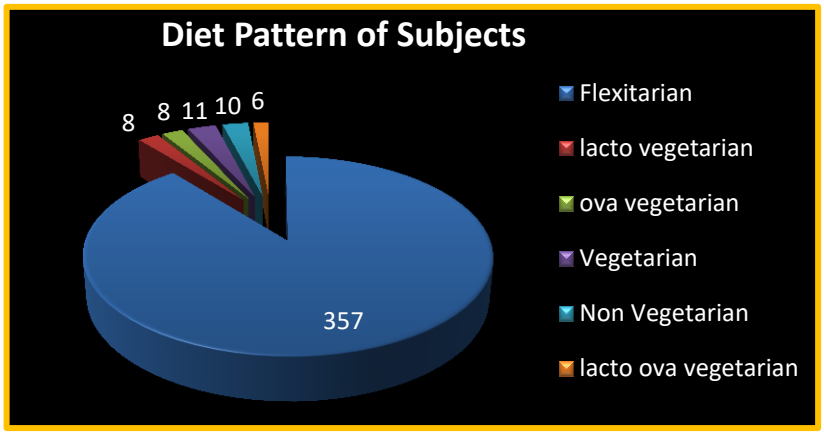


FIGURE : II DIET PATTERN OF THE SUBJECTS

It is clear from figure: II that three hundred fifty-seven subjects follow a flexitarian diet, and only very few subjects follow other diets such as non-vegetarian (10), vegetarian (11), lacto vegetarian (8), ova vegetarian (8) and lacto ova vegetarian (6) diet, which are relatively lower.

As per the study done by Khanna *et al*. 2006, among Indian sports women, non-vegetarianism (61.9%) was higher when compared to other diets like lacto vegetarian (22.2%) and ova lacto vegetarian (15.9%). None of them are pure vegetarians.

Table: III highlights the mean food expenses of the subjects in a month.

TABLE: III MEAN FOOD EXPENSES OF THE SUBJECTS IN A MONTH

Food groups	**Mean ± S.D (in Rs)**	**Per capita (in Rs)**
Cereals	1495.39 ± 2.39	213.62
Pulses	975.87 ± 1.87	139.41
Fruits	555.25 ± 0.62	79.32
Vegetables	425.12 ± 1.76	60.73
Milk	1200.00 ± 10.08	171.42
Poultry, Seafood, Meat and its products	2400.25 ± 13.91	342.85
Processed foods		

Snacks	1090.51 ± 0.99	155.78
Fast food	1115.21 ± 2.02	159.31
Outside meals	1525.25 ± 1.67	217.89
Other instant Products	1255.72 ± 1.48	179.38

Table: III reveals that the selected subjects spent more than 1000 rupees per month on fast food, meat, and cereals based on the mean food costs of the subjects. They don't spend much money on spices and ready-to-cook items. Even if consumed daily, they spend less on low-priced vegetables, which cost them Rs. 425 per month, which is relatively lower.

Table: IV presents the association between socio economic status and the diet patterns of the selected subjects.

TABLE: IV ASSOCIATION BETWEEN SOCIO ECONOMIC STATUS AND DIET PATTERN OF THE SUBJECTS

Variables	Flexitarian	lacto vegetarian	ova vegetarian	Vegetarian	Non-Vegetarian	lacto ova vegetarian	Total	Chi Square value	P value
Lower	33	1	0	2	0	3	39	-0.607*	0.026
Upper lower	53	3	0	2	0	0	58		
Lower middle	125	3	3	4	6	2	143		
Upper middle	115	1	4	3	4	0	127		
Upper	31	0	1	0	0	1	33		
Total	357	8	8	11	10	6	400		

Table: IV reveals that there was a relationship between the subject's socioeconomic level and dietary habits. The lower middle class, followed by the upper middle class, made up nearly 53 percent of the subjects who adopted a flexitarian diet. Six of the ten non-vegetarian participants were from the lower middle class, and four were from the upper middle class.

None of the subjects from the upper social classes were vegetarians, indicating that fewer subjects remain vegetarian as their socioeconomic position rises.

The study observation is similar to the study done by Kell *et al*., (2015), all the participants in the highest to lowest tiers of socio economic status were significantly more likely to adhere to a plant-based dietary pattern, but less likely to adhere to either sweets and fats or southern dietary patterns, followed by the participants more likely to adhere to the convenience dietary pattern.

Table: V highlights the association between body mass index and waist hip ratio of the selected subjects.

TABLE: V ASSOCIATION BETWEEN BODY MASS INDEX (BMI) AND WAIST - HIP RATIO (WHR)

Variables	**Correlation (n=400)**	
	r_p	**p value**
BMI vs WHR	0.829**	0.000

r_p – pearson's correlation, ** Correlation is significant at the 0.01 level.

Table: V illustrates the significant positive significant ($p<0.001$) association between Body Mass Index (BMI) and Waist Hip Ratio (WHR). This indicates that Waist Hip Ratio (WHR) increases with an increase in Body Mass Index (BMI). From the current study, it is understood that nearly 82 percent of the Body Mass Index is dependent on the Waist Hip Ratio.

A similar study shows that there is no correlation between Body Mass Index (BMI) and Waist Hip Ratio (WHR) among male participants. However, a significant correlation between Body Mass Index (BMI) and Waist Hip Ratio (WHR) among female participants exists (r value = 0.623) (Saied *et al*., 2016).

Table: VI presents the association between socio economic status and Body Mass Index of the selected subjects

TABLE: VI ASSOCIATION BETWEEN SOCIO ECONOMIC STATUS AND BMI OF THE SUBJECTS

Variables	Under Weight (<18.5)	Normal (18.5-22.9)	Over Weight (23.0-24.9)	Obesity Grade I (25.0-29.9)	Obesity Grade II (≥30.0)	Total	Chi square value	P value
Lower	5	3	8	16	7	39	0.838	0.026
Upper lower	11	0	13	17	17	58		
Lower middle	12	3	22	65	41	143		
Upper middle	14	7	21	56	29	127		
Upper	3	2	6	11	11	33		
Total	45	15	70	165	105	400		

Table: VI reveals that there was a significant association between the subject's socioeconomic level and their Body Mass Index (BMI), demonstrating that most subjects with normal BMIs and underweight conditions belonged to the upper middle class and were also second highest in overweight and obese subjects. Most overweight and obese-grade I, II, and III subjects were from the lower middle class.

The results were in line with the study conducted by Campbell *et al*., 2021 which shows that there is a high correlation between socio economic status and Body Mass Index (BMI). And it is also found that individuals with lower socio-economic status have a higher rate of overweight and obesity.

Similar findings were observed from the study done by Snezana., 2021 which presented that lower socio-economic status subjects tend to be overweight, especially boys, when compared to higher socio-economic status subjects.

Table: VII highlights the association between socio economic status and the waist hip ratio of the subjects.

TABLE: VII ASSOCIATION BETWEEN SOCIO ECONOMIC STATUS AND WAIST HIP RATIO (WHR) OF THE SUBJECTS

Variables	Normal (≥0.8)	Obesity (<0.8)	Total	Chi square value	P value
Lower	11	28	39	7.413	0.006
Upper lower	18	40	58		
Lower middle	28	115	143		
Upper middle	25	102	127		
Upper	11	22	33		
Total	93	307	400		

Table: VII depicts the association between the waist-hip ratio (WHR) and socioeconomic status. It is found to be statistically significant. The data indicates that most individuals classified as obese belonged to the lower middle-class category, followed by the upper middle class. This suggests that there may be a relationship between an individual's body shape and their socioeconomic background.

A similar study conducted by Youzi *et al.,* 2023 in China highlights that there is no association between the socio-economic status and the Waist Hip Ratio (WHR) of the subjects. But maternal educational level is significantly related to obesity and overweight among the subjects.

Table: VIII highlights the relationship between diet pattern and Body Mass Index (BMI) of the selected subjects.

TABLE: VIII RELATIONSHIP BETWEEN DIET PATTERN AND BODY MASS INDEX (BMI) OF THE SUBJECTS

Variables	Under Weight (<18.5)		Normal (18.5-22.9)		Over Weight (23.0-24.9)		Obesity Grade I (25.0-29.9)		Obesity Grade II (≥30.0)		Total		r_p	P value
	N	%	N	%	N	%	N	%	N	%	N	%		
Flexitarian	9	2.3	24	6	67	16.8	223	55.8	34	8.5	357	89.3	-0.274**	0.000
Vegetarian	2	0.5	4	1	1	0.25	3	0.75	1	0.3	11	2.75		
Non Vegetarian	0	0	3	0.8	1	0.25	5	1.25	1	0.3	10	2.5		
Lacto Vegetarian	2	0.5	6	1.5	0	0	0	0	0	0	8	2		
Ova Vegetarian	1	0.3	5	1.3	0	0	2	0.5	0	0	8	2		
Lacto Ova Vegetarian	1	0.3	3	0.8	1	0.25	1	0.25	0	0	6	1.5		
Total	15	4	45	11	70	17.5	234	58.5	36	9	400	100		

Table: VIII highlights the significant negative relationship between diet pattern and Body Mass Index of the subjects of about 27 percent. This indicates that individuals who adhere to a flexitarian diet have a much higher likelihood of experiencing overweight and obesity. Two of the 11 subjects who followed a vegetarian diet are classified as underweight, while four fall within the normal BMI range.

Similar findings have been observed by Mu *et al*., 2017 which depict that the highest categories of a sensible/healthy eating pattern showed a decreased risk of being overweight or obese when compared to the lowest categories. There was a higher incidence of overweight or obesity in the top categories of people who followed a western food pattern as compared to the lower categories.

The study observations are similar to the study done by Gutiérrez *et al*., 2016 which shows that the westernised diet pattern and the high protein and fat diet pattern both had positive correlations between BMI and the various dietary pattern scores, according to the Pearson correlation analysis. Contrarily, a negative association was discovered for the prudent dietary pattern. Similar to this, according to Khanna *et al*., (2006), lacto vegetarians had considerably more body fat (27.2 + 4.2%) than non-vegetarians (24.3 + 4.0%) and ova lacto vegetarians (23.1+1.92%).

Table: IX depicts the relationship between diet pattern and waist hip ratio of the selected subjects.

TABLE: IX RELATIONSHIP BETWEEN DIET PATTERN AND WAIST HIP RATIO (WHR) OF THE SUBJECTS

Variables	**Normal (≥0.8)**		**Obesity (<0.8)**		**Total**		**r_p**	**P value**
	N	**%**	**N**	**%**	**N**	**%**		
Flexitarian	70	17.5	287	71.75	357	89.25	-0.178	0.002*
Vegetarian	3	0.75	8	2	11	2.75		
Non Vegetarian	4	1	6	1.5	10	2.5		
Lacto Vegetarian	6	1.5	2	0.5	8	2		
Ova Vegetarian	7	1.75	1	0.25	8	2		
Lacto Ova Vegetarian	3	0.75	3	0.75	6	1.5		
Total	93	23.25	307	76.75	400	100		

From Table: IX, findings reveal a significant negative relationship between dietary patterns and waist-hip ratio. Essentially, this implies that individuals who adhere to a flexitarian diet tend to have a higher prevalence of obesity compared to those who embrace alternative dietary approaches.

The study results are similar to those done by Lavie *et al*., 2019 and Clemente *et al*., 2023 which depict that the risk of acquiring cardiovascular illnesses was significantly correlated (0.05) with dietary diversification, waist to hip ratio, obesity, and living a sedentary lifestyle.

Table: X depicts the association between health problems faced and the income of the subjects.

TABLE: X ASSOCIATION BETWEEN HEALTH PROBLEMS FACED BY THE SUBJECTS AND THEIR INCOME

Variables		**≤2,640**	**2,641 -7,886**	**7,887 - 13,160**	**13,161 - 19,758**	**19,759 - 26,354**	**26,355 - 52,733**	**≥52,734**	**Chi Square value**
Skin	Yes	22	41	35	55	46	32	24	32.589*
	No	26	33	33	64	41	43	18	
Nails	Yes	18	24	26	37	22	19	8	79.444**
	No	30	50	42	82	65	56	34	
Hair	Yes	35	46	45	69	64	47	27	13.594*
	No	13	28	23	56	23	28	15	
Eyes	Yes	46	71	67	109	85	70	39	21.088*
	No	2	3	1	10	2	5	3	
Oral	Yes	6	18	12	24	22	14	6	21.641*
	No	42	56	56	95	65	61	36	
Nervous	Yes	7	12	15	19	8	12	5	51.532**
	No	41	62	53	100	79	63	37	
Neck	Yes	19	25	24	59	24	37	18	84.531**
	No	29	49	44	60	63	38	24	
Heart	Yes	5	6	4	18	4	10	5	30.098*
	No	43	68	64	101	83	65	37	

Variables		≤2,640	2,641 -7,886	7,887 - 13,160	13,161 - 19,758	19,759 - 26,354	26,355 - 52,733	≥52,734	Chi Square value
Chest	Yes	22	30	30	45	32	29	17	38.233*
	No	26	44	38	74	55	46	25	
Abdomen	Yes	6	18	12	24	22	14	6	11.228*
	No	42	56	56	95	65	61	36	
Extremities	Yes	7	12	15	19	8	12	5	20.240*
	No	41	62	53	100	79	63	37	
Thorax	Yes	19	25	24	59	24	37	18	37.916**
	No	29	49	44	60	63	38	24	
General	Yes	46	71	67	109	85	70	39	65.567*
	No	2	3	1	10	2	5	3	

Table: X highlights the association between health problems faced by the subjects and their income. It is observed that middle-income individuals had poorer health compared to those with low or high incomes. The health status of low-income individuals, though not the best, was better than that of middle-income individuals. On the other hand, individuals with higher incomes exhibit significantly better overall health than those in the other two income categories. Furthermore, the results indicate that the most prevalent health problems among the subjects were related to their eyes, followed by issues with their hair.

A similar study has been done by Zhang *et al.,* 2019 however, highlights that those with greater incomes typically have more health-related issues. The disparity in access to healthcare services, the uneven distribution of health-related resources, and differences in health-related lifestyles between socioeconomic groups are only a few of the health-related inequalities that contribute to the income gradient and health-based issues.

The study is in line with the study conducted by Fritzell *et al*., 2004 which depicts that there is an association between income and health problems. Health problems are more common among high income subjects than in other groups.

Figure: III highlights the different types of medications taken by the subjects.

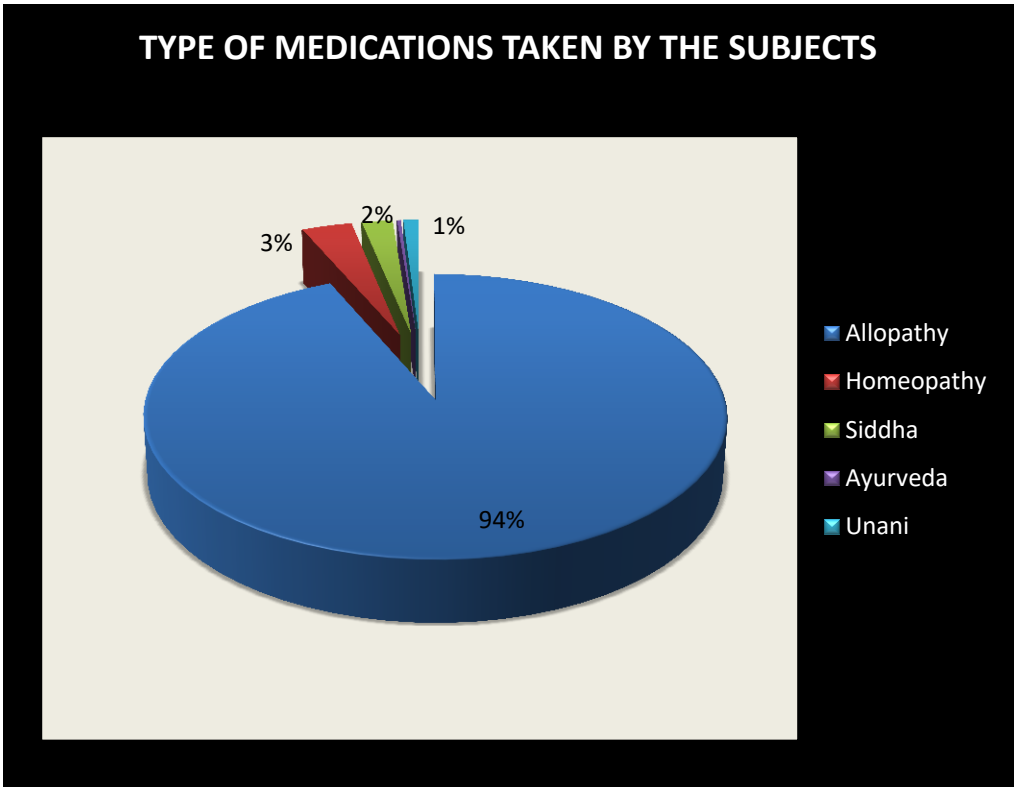


FIGURE: III TYPE OF MEDICATIONS CONSUMED OF THE SUBJECTS

Figure: III presents the types of medications used by the subjects. The results indicate that a vast majority of the subjects, about 94 percent, were undergoing allopathic treatment. Interestingly, only a small number of individuals reported using alternative medications such as Homeopathy (3%), Siddha (2%), Ayurveda (1%), and Unani (1%).

Table: XI depicts the association between medications taken by the subjects and their diet patterns.

TABLE: XI ASSOCIATION BETWEEN MEDICATIONS TAKEN BY THE SUBJECTS AND DIET PATTERN OF THE SUBJECTS

Variables	Allopathy	Homeopathy	Siddha	Ayurveda	Unani	Total	Chi square value	P value
Flexitarian	334	13	7	0	3	357	53.406[a]	0.000
lacto vegetarian	8	0	0	0	0	8		

ova vegetarian	7	0	1	0	0	8		
Vegetarian	10	0	0	0	1	11		
Non-Vegetarian	9	0	0	1	0	10		
lacto ova vegetarian	6	0	0	0	0	6		
Total	374	13	8	1	4	400		

Table: XI reveals the significant association between the medication choices of the subjects and their dietary patterns. The findings reveal approximately 90 percent of the subjects who opt for allopathic treatments are adhering to a flexitarian diet. Additionally, it has been observed that most of the subjects who take homeopathic medications, as well as Siddha and Unani also follow a flexitarian diet. This suggests a strong relationship between the type of medication chosen and the dietary preferences of the subjects.

Table: XII presents the relationship between knowledge and attitude towards planetary health diet with other aspects.

TABLE: XII RELATIONSHIP BETWEEN KNOWLEDGE AND ATTITUDE TOWARDS PLANETARY HEALTH DIET WITH OTHER ASPECTS

Variables	**r_p**	**P value**
Food and nutrition related knowledge vs Knowledge about Planetary Health Diet	0.345	0.016
Body Mass Index vs Knowledge about Planetary Health Diet	0.445	0.023
Knowledge about Planetary Health Diet vs Attitude towards Planetary Health Diet	-0.627	0.013
Availability of Plant based food vs Attitude towards Planetary health Diet	-0.913	0.000
psychopathology of planetary health diet vs Attitude towards Planetary health Diet	-0.969	0.001

Table: XII reveals that about 34% of the subjects had an awareness of both the environmental and nutritional aspects of food. There is a significant relationship of about 4% between the subjects BMI and their knowledge about the planetary health diet. Majority of the subjects were overweight and obese suggested that they were not following the planetary health diet, even if they aware about the significance of planetary health diet. In summary, the result emphasizes the importance of enhancing both food and nutrition related knowledge and promoting awareness of the planetary health diet to address the issue of obesity.

And the table also provides significant findings regarding the relationship between attitude and knowledge regarding the planetary health diet. There was a significant negative relationship of about 62%, despite being aware of the benefits of planetary health diet, the subjects did not follow it in their personal food choices. This illustrates the gap between the knowledge and practice of planetary health diet.

Additionally, a substantial negative relationship of almost 91% between attitude towards planetary health diet and the availability of plant-based food. Furthermore, there is a remarkable negative correlation of about 96% between psychopathology related to the planetary health diet and subjects' attitudes toward it. These results show that the individuals showed no interest in adopting the planetary health diet, even when plant-based food were readily available in local markets. Its' interesting to note that the subjects did not commit to adhere strictly to the planetary health diet, despite knowing it was better than a regular diet. When it comes to adopting a planetary health diet, this demonstrates a notable disconnect between awareness and action.

This implies that other factors such as individual preferences, cultural influences, or a lack of understanding about plant-based foods in their meals, can have an impact on their decision to not adhere to the planetary health diet. To encourage broader acceptance of the planetary health diet for the good of people and the environment, it is imperative to recognize and remove these obstacles.

Table: XIII highlights the relationship between food habits and knowledge of the subjects about planetary health diet

TABLE: XIII RELATIONSHIP BETWEEN FOOD HABITS AND KNOWLEDGE OF THE SUBJECTS ABOUT PLANETARY HEALTH DIET

Knowledge about Planetary Health Diet	**r_p**	**P value**
Enjoyment of food	-0.208**	0.002
Emotional over-eating	0.579	0.093
Emotional under-eating	0.148	0.097
Food fussiness	-0.665*	0.036
Food responsiveness	0.227**	0.000
Slowness in eating	0.553	0.201
Hunger	0.510	0.077
Satiety responsiveness	0.443	0.081

Table: XIII highlights the relationship between individuals' food habits and their knowledge of planetary health diet. It has been found that there is a significant relationship between knowledge about the planetary health diet and the enjoyment of foods as well as food fussiness and food responsiveness. However, no significant relationship is observed between knowledge about the planetary health diet and emotional overeating, under eating, slowness in eating, and hunger and satiety responsiveness. The subjects who are aware of the benefits of the planetary health diet not only exhibited less fussiness towards food but also displayed a positive responsiveness to it, indicating a potential improvement in their eating behaviors. It should be noted, though, that their enjoyment of the food seemed to be compromised.

This suggests that while knowledge about the planetary health diet may not directly impact emotional eating habits or hunger and satiety responsiveness, it does play a role in reducing food fussiness and increasing enjoyment of the food. These findings highlight the importance of educating individuals about the planetary health diet to promote healthier eating behaviors.

Table: XIV highlights the effect of attitude towards planetary health diet on health of the subjects.

TABLE: XIV EFFECT OF ATTITUDE TOWARDS PLANETARY HEALTH DIET ON HEALTH OF THE SUBJECTS

Variables		Sum of Squares	df	Mean Square	F	Sig.
Skin	Between Groups	1.600	175	.229	4.807	.008
	Within Groups	3.400	337	.283		
	Total	5.000	512			
Nails	Between Groups	1.033	175	.148	3.559	.045
	Within Groups	3.167	337	.264		
	Total	4.200	512			
Hair	Between Groups	1.383	175	.198	5.543	.038
	Within Groups	3.167	337	.264		
	Total	4.550	512			
Eyes	Between Groups	2.450	175	.064	5.749	.043
	Within Groups	1.500	337	.042		
	Total	3.950	512			
Oral	Between Groups	.833	175	.119	3.604	.043
	Within Groups	2.367	337	.197		
	Total	3.200	512			
Nervous	Between Groups	.850	175	.121	4.857	.004
	Within Groups	1.700	337	.142		
	Total	2.550	512			
Neck	Between Groups	1.933	175	.276	5.156	.003
	Within Groups	2.867	337	.239		
	Total	4.800	512			
Heart	Between Groups	.500	175	.071	1.659	.070
	Within Groups	1.300	337	.108		
	Total	1.800	512			
Chest	Between Groups	1.233	175	.176	2.593	.051

Variables		Sum of Squares	df	Mean Square	F	Sig.
		3.567	Within Groups	.297		
		4.800	Total			
Abdomen	Between Groups	.833	175	.119	3.604	.043
	Within Groups	2.367	337	.197		
	Total	3.200	512			
Extremities	Between Groups	.850	175	.121	3.857	.004
	Within Groups	1.700	337	.142		
	Total	2.550	19			
Thorax	Between Groups	1.933	175	.276	5.156	.003
	Within Groups	2.867	337	.239		
	Total	4.800	512			
General	Between Groups	.450	175	.064	5.543	.003
	Within Groups	.500	337	.042		
	Total	.950	512			

Table: XIV depicts the impact of attitudes towards planetary health diets on their overall health outcomes. While a significant number of subjects displayed a positive attitude towards adopting a planetary health diet, it has been observed that many of them still experienced specific health problems, particularly related to their eyes and hair. It is worth noting that these issues may be influenced by environmental factors that go beyond dietary patterns alone. On the other hand, only a small percentage (10%) of the selected subjects encountered cardiac and chest problems. The data suggests that subjects who maintain a positive attitude towards a planetary health diet tend to have fewer health problems, only displaying minor health issues that are not directly linked to their dietary habits. These minor health issues could be attributed to various factors, such as genetics, lifestyle choices, or even external environmental factors.

Figure: IV highlights the Health and Wellness Score According to Diet pattern of the subjects.

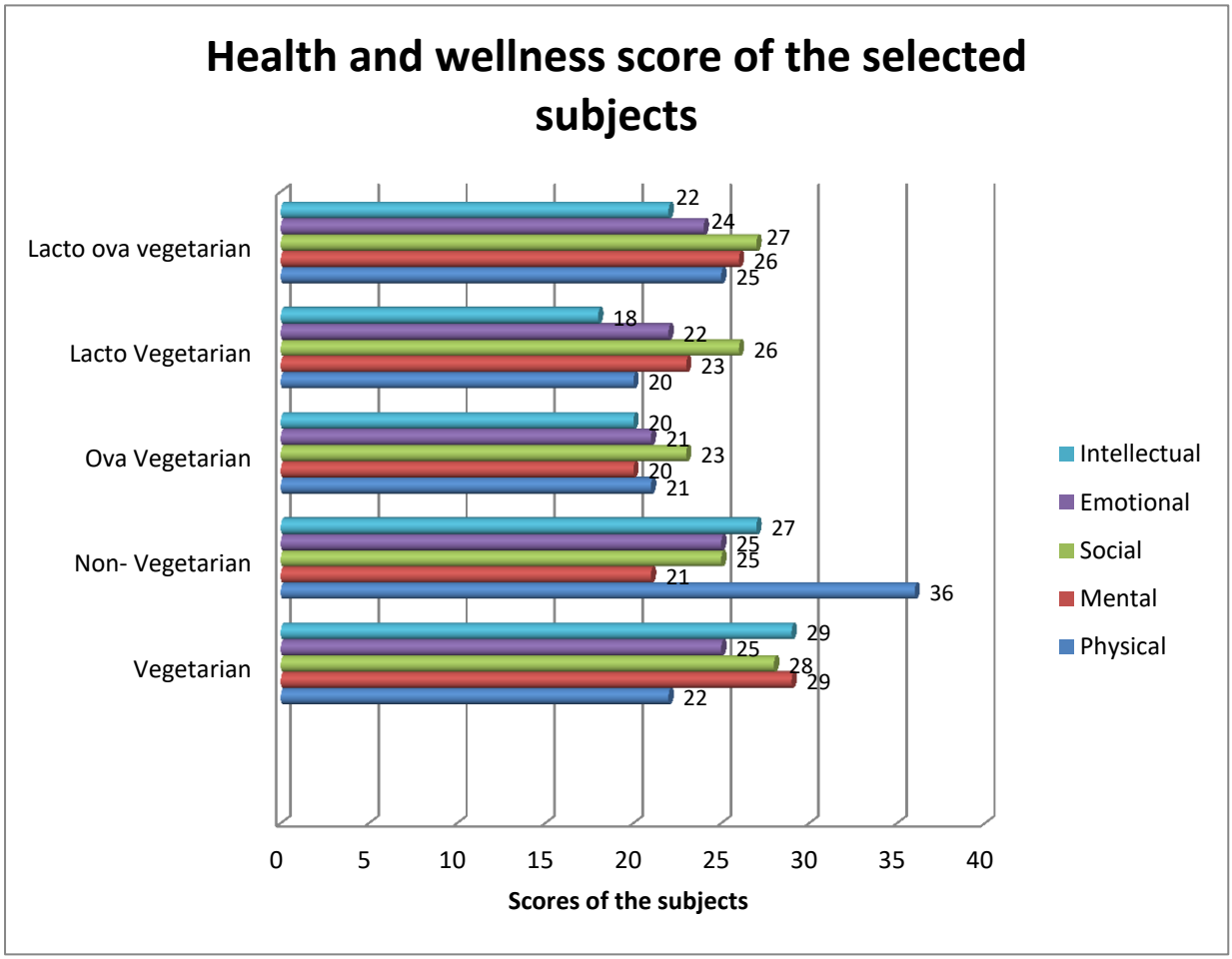


FIGURE: IV HEALTH AND WELLNESS SCORE OF THE SUBJECTS ACCORDING TO DIET PATTERN

Figure: IV reveals the health and wellness scores of subjects based on their dietary patterns. The results show that vegetarian subjects have performed better regarding their intellectual and mental health compared to their physical health. On the other hand, non-vegetarian subjects have displayed better physical health but faced challenges with their mental well-being. Additionally, when considering specific subgroups within the vegetarian category, individuals who have followed an ova vegetarian, lacto vegetarian, or lacto ova vegetarian diet exhibited positive social behavior but struggled with intellectual health. This

suggests a complex relationship between diets, different aspects of health, and social behavior.

The study observations are similar to the study done by Crego *et al*., (2021) which presents the integration of mental, professional, emotional, physical, spiritual and social wellbeing. Living consciously in all facets of life is the key to obtaining personal wellbeing, which will make one feel happier and more fulfilled. For example, subjects can enhance their wellbeing by consuming more plant-based meals and reducing their intake of highly processed foods. Additionally, people can enhance their nutritional status by improving their overall wellbeing by seeking out and participating in a spiritual group that promotes healthy living and looking for like-minded social and eating companionship.

Table: XV highlights the relationship between qualification and knowledge about the planetary health diet of the subjects.

TABLE: XV RELATIONSHIP BETWEEN QUALIFICATION AND KNOWLEDGE ABOUT PLANETARY HEALTH DIET OF THE SUBJECTS

Variables	**Correlation (n=400)**	
	r_s	**p value**
Qualification vs Knowledge about planetary health diet	-0.351*	0.030

r_s- spearman's correlation, * Correlation is significant at the 0.05 level (2-tailed).

This table: XV reveals the significant negative relationship between qualification and knowledge about the planetary health diet of the subjects, amounting to approximately 35 percent, between the level of qualification that individuals possess and their knowledge regarding the advantages of a planetary health diet. This suggests that despite the subjects' literacy, they needed more awareness about the benefits of adopting a planetary health diet, in order to encourage them to move towards the same.

Table: XVI illustrates the relationship between qualification and the psychopathology of planetary health diet.

TABLE: XVI RELATIONSHIP BETWEEN QUALIFICATION AND PSYCHOPATHOLOGY OF PLANETARY HEALTH DIET

Variables	Correlation (n=400)	
	r_s	p value
Qualification vs Psychopathology of planetary health diet	-0.606^{**}	0.001

r_s- spearman's correlation, * Correlation is significant at the 0.05 level (2-tailed).

From the table: XVI it is clear that there has been a significant negative relationship of around 60 percent between educational qualifications and the presence of psychopathology in relation to the adherence of a planetary health diet. This suggests that even though the individuals possessed literacy, they lacked the willingness to comprehend the advantages of a planetary health diet and were reluctant to follow it. Addressing this gap and promoting a better understanding of the benefits of planetary health diets among the general population is crucial.

Table: XVII presents the relationship between knowledge about the planetary health diet and the subjects' feelings about the planetary health diet.

TABLE: XVII RELATIONSHIP BETWEEN KNOWLEDGE ABOUT THE PLANETARY HEALTH DIET AND THEIR FEEL ABOUT PLANETARY HEALTH DIET OF THE SUBJECTS

Variables	R	R Square	S. E	F	Sig.
Knowledge about the planetary health diet and their feel about planetary health diet	0.830	0.007	1..53	2.784	0.033

Figure: V highlights the positive relationship between knowledge about the planetary health diet and the subjects' feelings about the planetary health diet.

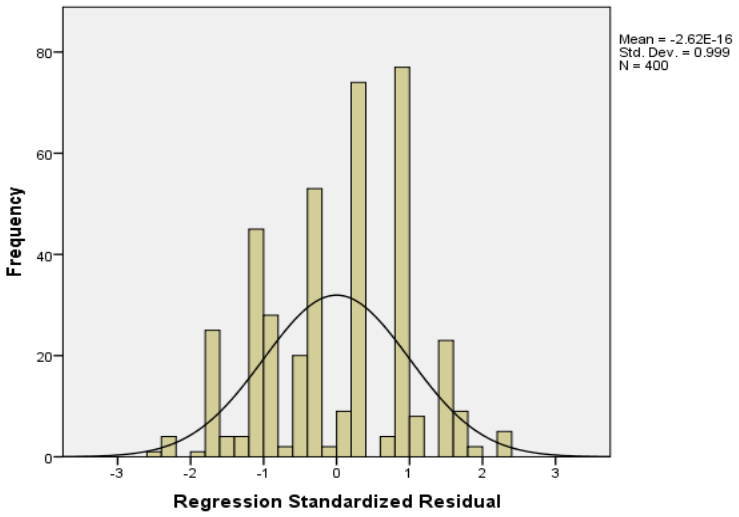


FIGURE: V RELATIONSHIP BETWEEN KNOWLEDGE ABOUT THE PLANETARY HEALTH DIET AND THEIR FEEL ABOUT PLANETARY HEALTH DIET OF THE SUBJECTS

From the table: XVII and figure: V, it shows the association between individuals' knowledge of the planetary health diet and their perception of it. In particular, those who are aware of the planetary health diet are more likely willing to implement this dietary strategy for the benefit of both the environment and their own health. Increased public adoption of this diet may result from education and awareness initiatives about the advantages of planetary health diet.

The Table: XVIII shows the relationship between diet pattern, sociocultural reasons for diet, and knowledge about the planetary health diet of the subjects.

TABLE: XVIII RELATIONSHIP BETWEEN DIET PATTERN, SOCIOCULTURAL REASONS ON DIET AND KNOWLEDGE ABOUT THE PLANETARY HEALTH DIET

Variables	**Diet pattern. r_s**	**p value**
Sociocultural reasons on diet	0.908	0.006
Knowledge about planetary health diet	- 0.272	0.000

Table: XVIII depicts the significant positive relationship between diet pattern and sociocultural reasons on diet of about 90 percent. This indicates that people tend to adopt dietary habits similar to those of their family members and peer groups and consider cultural practices rather than solely relying on their personal preferences. Additionally, the social aspect of eating, such as sharing meals and participating in cultural traditions, further reinforces the influence of family, peers, and cultural practices on dietary habits.

The table also shows a significant negative relationship between diet pattern and knowledge about the planetary health diet of about 27 percent. This means that even though the subjects possess awareness regarding the importance of the planetary health diet, they need to actively reduce their consumption of meat and other foods that have detrimental effects on the environment. Various socio-cultural factors could potentially influence this behaviour.

The Table: XIX illustrates the positive relationship between knowledge about the planetary health diet and the eating behaviour of the subjects.

TABLE: XIX RELATIONSHIP BETWEEN KNOWLEDGE ABOUT PLANETARY HEALTH DIET AND EATING BEHAVIOUR

Variables	**Correlation (n=400)**	
	r_s	**p value**
Knowledge about planetary health diet vs Eating behaviour	-0.201**	0.000

**. Correlation is significant at the 0.01 level (2-tailed).

Table: XIX reveals the statistically significant positive relationship between knowledge about the planetary health diet and eating behaviour of the subjects of about 20 percent. However, despite being aware of the principles of the planetary health diet, the subjects do not exhibit favourable eating behaviour, as they fail to embrace plant-based foods fully. This calls for enhancing awareness by emphasizing the need to follow an environmentally sustainable diet.

Table: XX shows the relationship between the knowledge of the subjects and the practice of a planetary health diet.

TABLE: XX RELATIONSHIP BETWEEN THE KNOWLEDGE OF THE SUBJECTS AND THE PRACTICE OF PLANETARY HEALTH DIET.

Variables	R	R Square	S. E	F	Sig.
Knowledge about the planetary health diet and their practice of the planetary health diet	-0.914	0.008	1.42	2.020	0.023

Figure: VI highlights the negative relationship between the knowledge of the subjects and the practice of a planetary health diet.

RELATIONSHIP BETWEEN THE KNOWLEDGE OF THE SUBJECTS AND THE PRACTICE OF PLANETARY HEALTH DIET

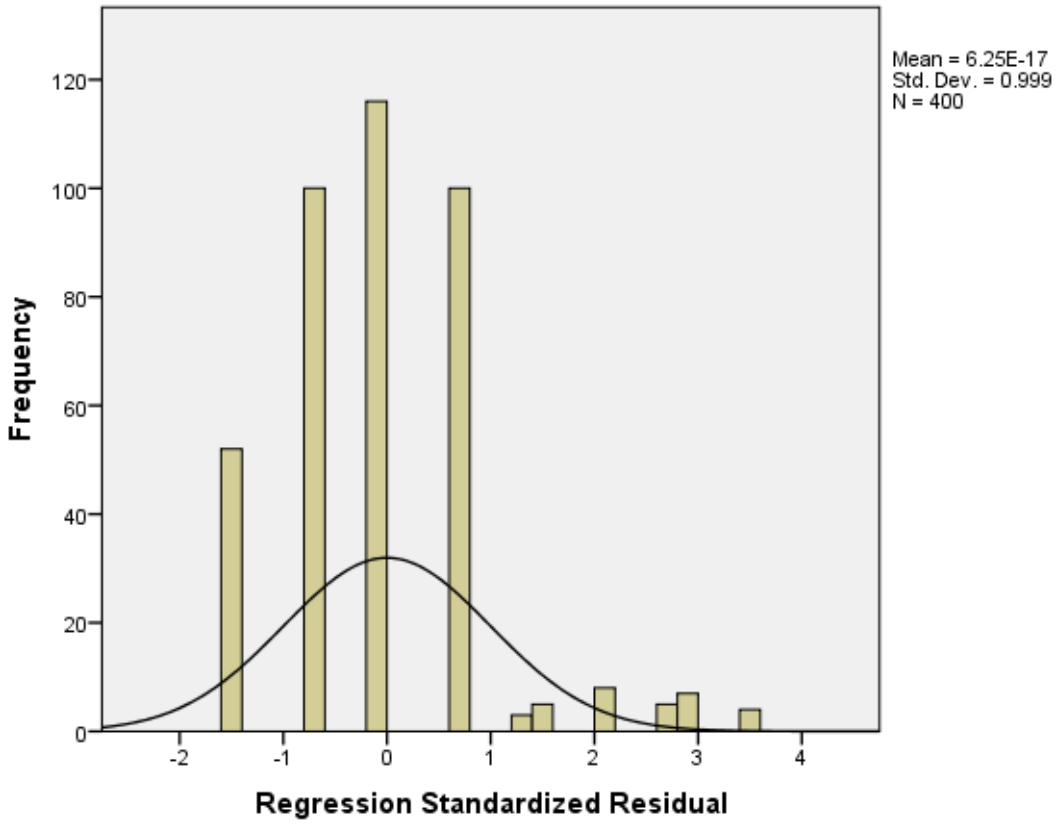


FIGURE: VI RELATIONSHIP BETWEEN THE KNOWLEDGE OF THE SUBJECTS AND THE PRACTICE OF PLANETARY HEALTH DIET

Table: XX and figure: VI demonstrates a statistically significant negative relationship between the knowledge of the subjects and their adherence to the planetary health diet. This indicates that as awareness about the diet increased, the practice of following the diet decreased. It has been observed that many subjects who were aware of the numerous benefits associated with the planetary health diet are still unwilling to eliminate or reduce the consumption of meat and its products, as well as milk and its derivatives, eggs, fish, and processed foods from their daily intake.

Table: XXI shows the mean difference between knowledge about the planetary health diet and meat consumption of the subjects

TABLE: XXI MEAN DIFFERENCE BETWEEN KNOWLEDGE ABOUT THE PLANETARY HEALTH DIET AND MEAT CONSUMPTION

Variables	N	Mean	Std. Deviation	F value	P value
Never	31	2.64	1.08	2.409	.020
Rarely	17	2.76	0.90		
Sometimes	7	3.14	0.69		
Fortnightly	85	3.12	1.45		
Monthly	55	2.52	1.06		
Weekly	72	3.38	1.91		
weekly twice	123	2.99	1.26		
Daily	10	3.60	1.71		
Total	400	3.01	1.41		

Table: XXI presents the significant mean difference between knowledge about the planetary health diet and meat consumption. It has been observed that subjects who score above three on the survey consume meat daily, weekly, or fortnightly, despite being aware of the negative impact of meat consumption on personal health and the environment. These findings suggest that there is reluctance among the subjects to eliminate meat from their diet, despite their awareness of its detrimental effects.

The table: XXII highlights the association between meat consumption and Body Mass Index of the subjects.

TABLE: XXII ASSOCIATION BETWEEN MEAT CONSUMPTION AND BODY MASS INDEX

Frequency of Consumption of Meat	Under Weight (<18.5)		Normal (18.5-22.9)		Over Weight (23.0-24.9)		Obesity Grade I (25.0-29.9)		Obesity Grade II (≥30.0)		Total		Chi square value	P value
	N	%	N	%	N	%	N	%	N	%	N	%		
Never	5	1.25	19	4.25	2	0.5	6	1.5	1	0.25	33	7.75	**128.37**	**0.023**
Occasionally	2	0.5	2	0.5	6	1.5	16	4	0	0	22	6		
Monthly	2	0.5	4	1	7	1.75	31	7.75	1	0.25	55	13.3		
Fortnightly	1	0.25	7	1.75	15	3.75	53	13.3	9	2.25	85	21.3		
Weekly	1	0.25	7	1.75	25	6.25	67	16.8	23	5.75	123	30.8		
Weekly Twice	5	1.25	6	1.5	14	3.5	46	11.5	1	0.25	72	18		
Daily	0	0	3	0.75	1	0.25	5	1.25	1	0.25	10	2.25		
Total	15	3.75	45	11.3	70	17.5	234	58.5	36	9	400	100		

Table: XXII depicts the significant association between meat consumption and Body Mass Index. Among the 31 individuals who do not consume meat, 17 of them have exhibited a normal Body Mass Index. Conversely, those who consume meat every week, twice a week, or every two weeks are more susceptible to obesity. This highlights the potential impact of meat consumption on weight gain and underscores the relevance of exploring this connection further.

Table: XXIII represents the association between meat consumption and the waist hip ratio of the subjects.

TABLE: XXIII ASSOCIATION BETWEEN MEAT CONSUMPTION AND WAIST HIP RATIO

Frequency of Consumption of Meat	Normal (≥0.8)		Obesity (<0.8)		Total		Chi square value	P value
	N	%	N	%	N	%		
Never	19	4.75	12	3	33	7.75	41.456	0.000
Occasionally	2	0.5	24	6	22	6		
Monthly	16	4	39	9.75	55	13.8		
Fortnightly	11	2.75	74	18.5	85	21.3		
Weekly	24	6	99	24.8	123	30.8		
Weekly Twice	19	4.75	53	13.3	72	18		
Daily	4	1	6	1.5	10	2.5		
Total	**93**	**23.3**	**307**	**76.8**	**400**	**100**		

From the table: XXIII, it is clear that there is a significant association between meat consumption and waist hip ratio. The data reveals that a significant majority of individuals who consume meat exhibit obese characteristics. At the same time, only a minimal proportion of non-meat eaters fall into the obese category. This correlation could also arise from various other factors, such as genetic predisposition, high consumption of fatty foods, dairy products, fast food, processed foods and underlying diseases and disorders. The intricate interplay of these elements contributes to the observed association between meat consumption and an individual's waist-to-hip ratio, thereby providing further insight into the complex relationship between dietary habits and obesity.

The study is in line with the study conducted by Wang *et al*., 2009 which depicts the positive association between meat consumption and Body Mass Index, waist circumference, obesity and central obesity, respectively. With an increase in meat consumption, there is a proportionate increase in Body Mass Index.

The study by Khodayari *et al*., (2022), also identifies a strong direct relationship between increased intake of red meat and poultry and the odds of overall obesity. Processed meat shows a 22% higher risk of central obesity, making it a significant predictor of central obesity among the subjects.

However, Daneshzad *et al*., (2021) highlights that the results of a pooled analysis of three research studies revealed no association between eating red meat and being overweight. The combined findings from 7 studies reveal a negligible association between eating red meat and obesity.

Phase: II Elicit Information on food consumption pattern and Calculation of Carbon and Nutritional Footprint of the diet of the selected subjects

Carbon footprint

The entire amount of GHG emissions that a product emits throughout its lifetime is known as its carbon footprint. It is frequently represented as the carbon dioxide equivalent of all released GHGs. A GHG emissions assessment can be used to determine a product's carbon footprint. The agricultural industry accounts for 18% of all GHG emissions in India (INCCA, 2010). Methane emissions from enteric fermentation in ruminants (63%) and rice fields (21%), nitrous oxide emissions from applying N to agricultural soil through manure and fertiliser (13%), and manure management and burning of crop residue (2.7%) are the main sources of emissions from agriculture.

Nutrient Balance Concept

The Nutrient Balance Concept was founded on a comparison of nutrient levels between those that are commonly believed to be harmful to health when ingested in excess (disqualifying nutrients) and those that are recognized to be essential or helpful for sustaining health (qualifying nutrients). The result has two quantitative indices, the Qualifying Index (QI) and the Disqualifying Index (DI), which were both rigorously equivalent irrespective of portion size due to their standardization to the energy content of the meal under examination.

Additionally, a third statistic called Nutrient Balance (NB) is included to show how well a product, meal, or diet can satisfy all the daily dietary needs for qualifying nutrients.

Table: XXIV presents the mean Nutrient Intake of Selected Subjects based on their age groups.

TABLE: XXIV MEAN NUTRIENT INTAKE OF SELECTED SUBJECTS BASED ON THEIR AGE GROUPS

Nutrients	Age Groups (in Years)				RDA*
	30-35	36-40	41-45	46-50	
Energy (Kcal)	1898±89.22	1957±17.32	1764±51.33	1532±21.16	**1650**
Carbohydrates (g)	211±53.33	217±50.19	198±45.76	172±43.13	**130**
Protein (g)	37±15.23	35±15.16	31±14.28	23±13.14	**45.65**
Fat (g)	21±7.08	27±7.12	20±6.53	16±2.87	**30**
Total fibre (g)	22±9.07	22±9.01	19±7.02	15±6.13	**25**
Calcium (mg)	666±57.76	612±51.88	586±49.08	504±48.93	**1000**
Iron (mg)	21±17.03	19±11.01	16±8.43	18±7.26	**29**
β- carotene (µg)	798±61.54	763±56.43	692±54.56	578±57.32	**840**
Folic acid (µg)	2.0±0.97	1.97±0.62	1.23±0.62	1.05±0.05	**2.2**
Vitamin – c (mg)	62±17.56	60±17.63	53±16.77	48±16.83	**65**

Table: XXIV depicts the mean Nutrient Intake of Selected Subjects based on their age groups. The energy intake of subjects belonging to the age group of 36-40 years (1957±17.32) has been found to be higher compared to other age groups. It is observed that subjects in all age groups except 46 – 50 years of age consume more calories than the Recommended Dietary Allowance (RDA). Furthermore, the subjects in all age ranges also have a higher consumption of carbohydrates compared to RDA guidelines. On the other hand, the subjects in the age group of 46-50 years are observed to consume a lesser quantity of food, indicating that their intake of protein, fat, and fiber was inadequate. None of the

subjects consume adequate amounts of calcium, iron, beta carotene, folic acid and vitamin C when compared to RDA.

Figure: VII highlights Qualifying (QI) and Disqualifying (DI) Indices for different food groups.

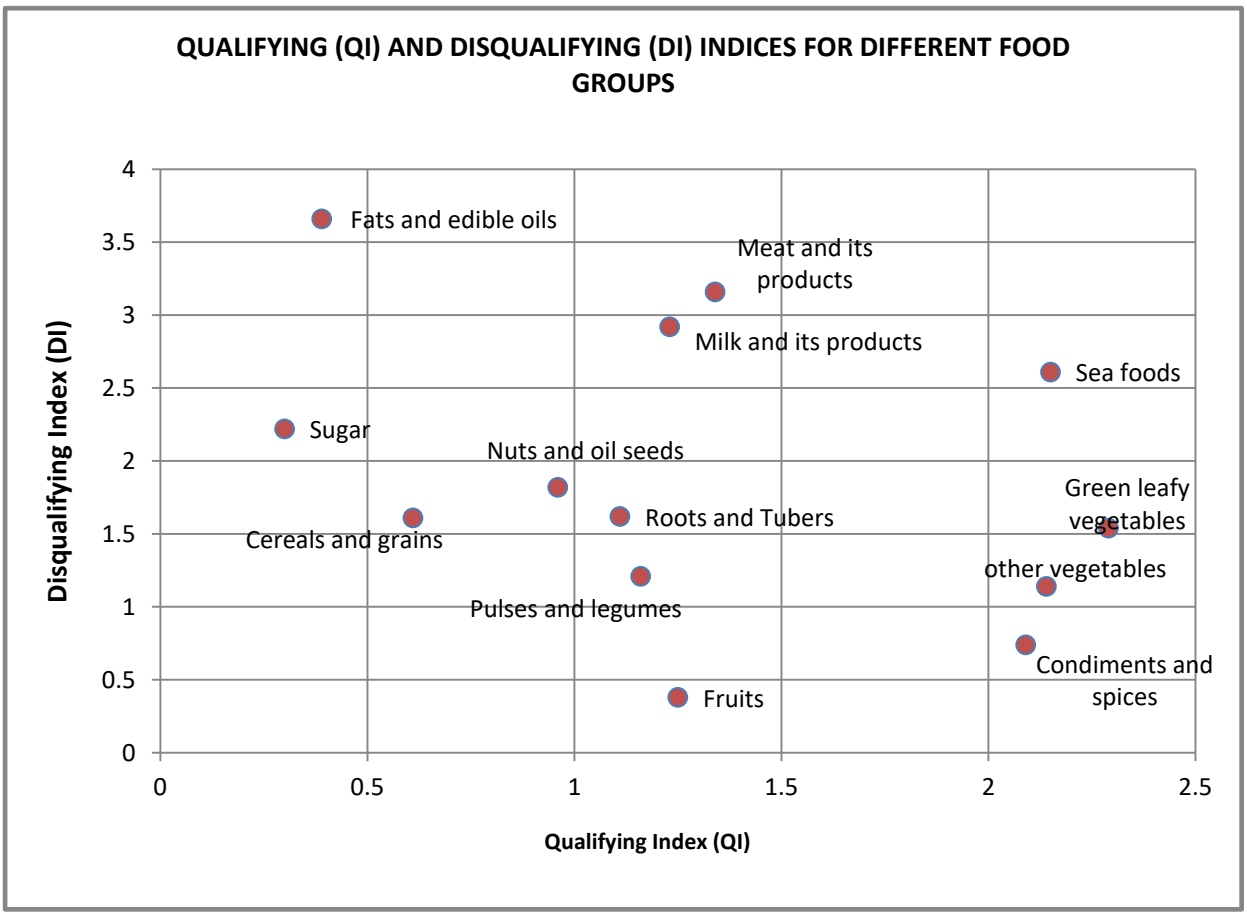


FIGURE: VII QUALIFYING (QI) AND DISQUALIFYING (DI) INDICES FOR DIFFERENT FOOD GROUPS

The provided Figure VII illustrates the Qualifying Index (QI) and Disqualifying Index (DI) values for various food groups. The figure highlights that foods such as green leafy vegetables, other vegetables, condiments, and spices have high QI values and low DI values, which is considered beneficial. Fruits have a medium QI value, but also have a low DI, which is desirable. So, fruits, vegetables, spices, pulses and legumes are considered very good in terms of high QI as well as low DI. On the other hand, seafood, meats, milk, and its products also show high QI values but exhibit higher DI scores as well. This disparity in sea foods, milk and meat can be attributed to the food groups' cholesterol, sodium or saturated fat. Moreover, foods that contain saturated animal fats, sugars, or sodium tend to have lower QI

scores. The figure further demonstrates that while the nutrient densities of different food groups align with existing knowledge, each food group can now be numerically characterized. This numerical characterization enables a more precise understanding of the varying qualities of different food groups.

Figure: VIII shows the carbon footprints of different food groups.

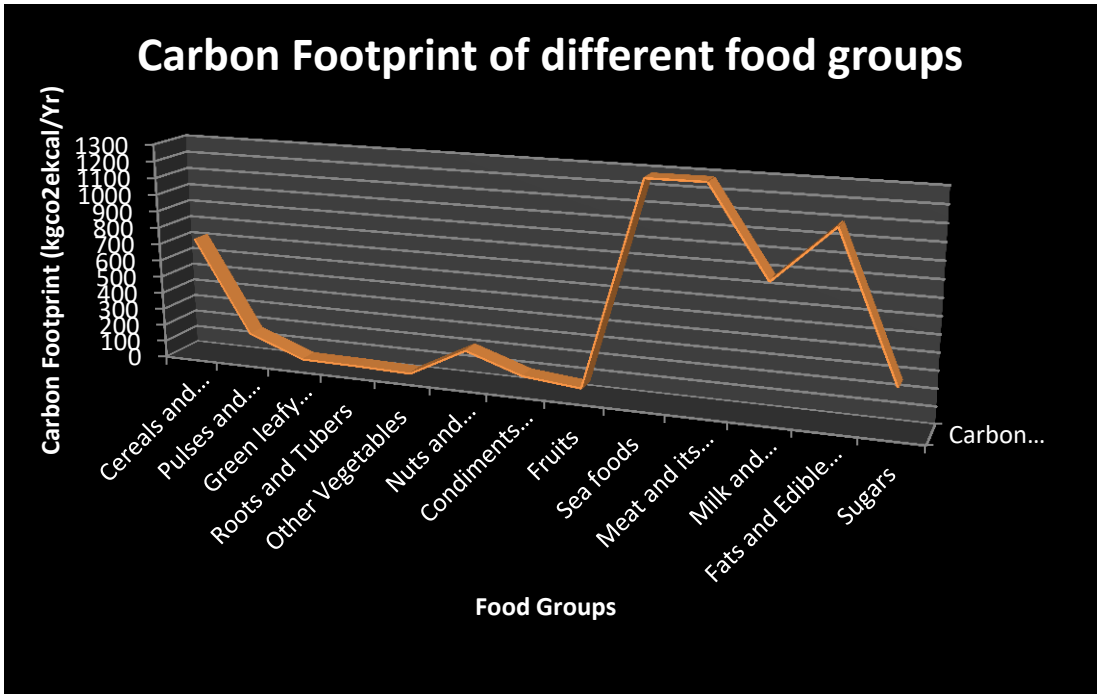


FIGURE: VIII CARBON FOOTPRINT OF DIFFERENT FOOD GROUPS

Figure: VIII highlights the carbon footprints of different food groups. Green leafy vegetables are one of the food groups with a significantly lower carbon footprint and cause the least negative impact on the environment compared to other types of food. Following closely behind are vegetables and fruits, which also have relatively low environmental impact. On the contrary, meat and meat products, as well as fish, contribute substantially to carbon emissions and have a high carbon footprint. Cereals, although an essential part of our diet, have a notably high impact on the environment by way of higher emissions.

The results are in line with the study done by Sonesson *et al*., (2009), Compared to the consumption of cereal grains and poultry products, mutton consumption results in higher GHG emissions. Additionally, research from Sweden and Spain found that vegetarian meals have a lower environmental effect than meals including animal protein.

Similar findings are observed in the study by Pathak *et al.*, (2010) where rice-based agricultural foods, such as rice, dosa, and idli, generate more greenhouse gases than wheat-based items. To reduce GHG emissions, rice consumption must decrease or be produced differently. Aerobic rice or direct-seeded rice can be grown differently, but direct-seeded rice has a lower Global Warming Potential. Maintaining a balanced diet and substituting meat with vegetables and pulses is more effective. Behavioural approaches, such as switching to fresh vegetables from canned, bottled, or frozen ones, can also help reduce GHG emissions.

Figure: IX depicts Qualifying Index (QI) of the food consumed by the subjects according to their age groups.

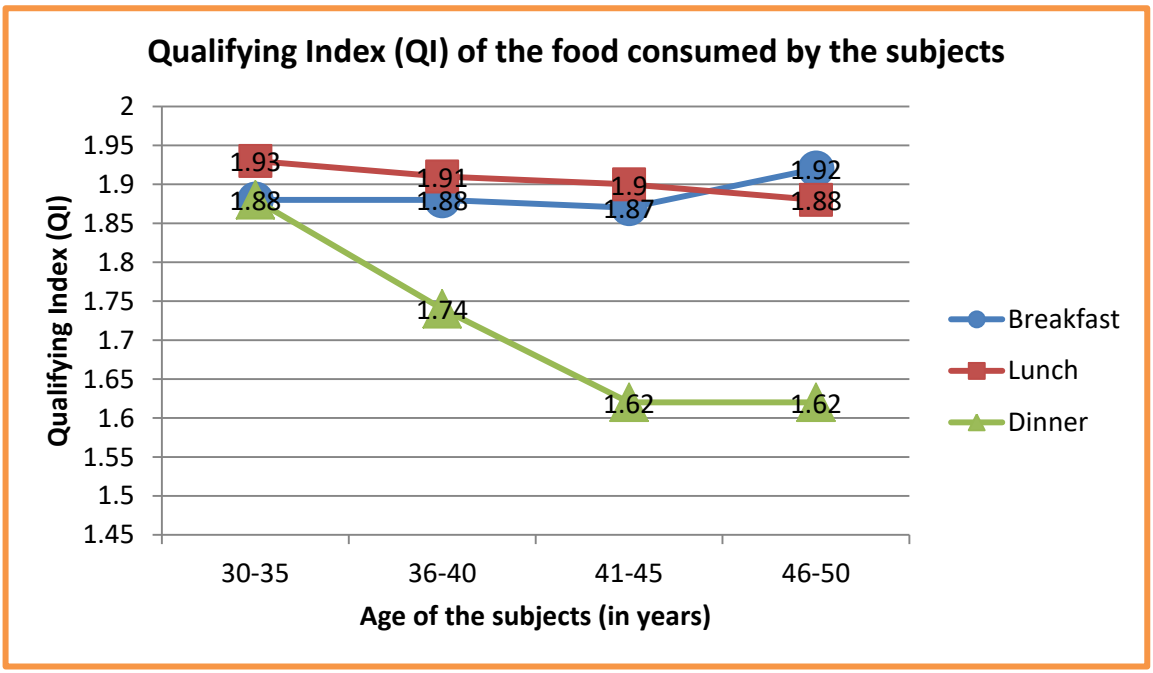


FIGURE: IX QUALIFYING INDEX (QI) OF THE FOOD CONSUMED BY THE SUBJECTS

Figure: IX shows Qualifying Index (QI) of the food consumed by the subjects according to their age groups. The Qualifying Index of the subjects is found to be higher during lunch compared to other meals for all age groups except 46-50 years. During breakfast, the qualifying index of individuals aged between 46 and 50 years is higher than other age groups, while it is comparatively less for those aged between 41 and 45. Similarly, during lunch, the qualifying index of subjects aged between 30 and 35 years is high. Lastly,

during dinner, the qualifying index of subjects aged between 30 and 35 was higher. Dinner has the lowest qualifying index for all age groups.

Figure: X highlights the Disqualifying Index (DI) of the food consumed by the subjects according to their age groups.

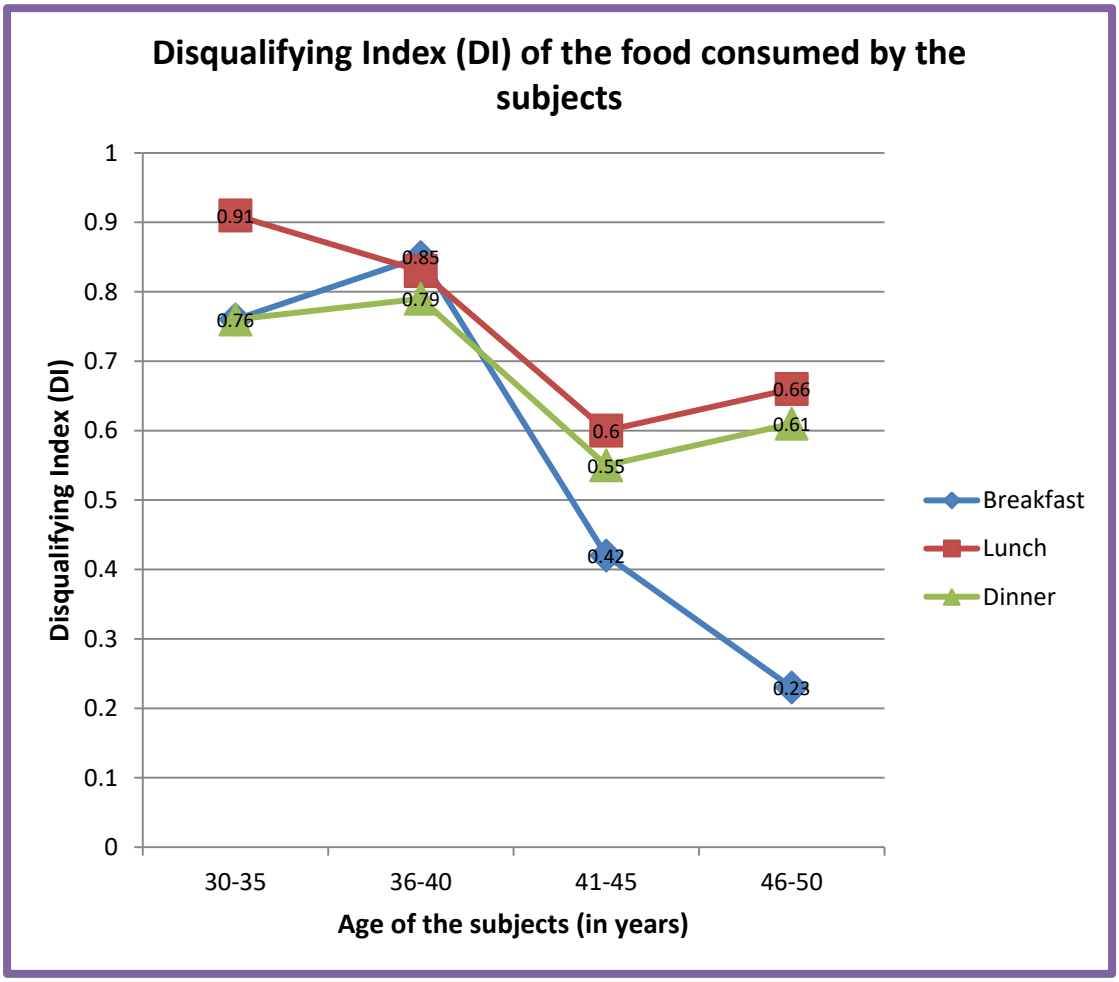


FIGURE: X DISQUALIFYING INDEX (DI) OF THE FOOD CONSUMED BY THE SUBJECTS

Figure: X depicts the Disqualifying Index (DI) of the food consumed by the subjects according to their age groups. The disqualifying index for breakfast was found to be the lowest compared to the other two meals. Additionally, when considering different age groups, the disqualifying index for the subjects in the 46-50 year age group is lower for breakfast, the 41-45 year age group exhibited a lower disqualifying index for lunch, and the same 41-45 year age group also display a lesser disqualifying index for dinner compared to other age

groups. These findings suggest the lowest DI for breakfast, particularly for individuals in the 46-50-year age group.

Figure: XI presents the Nutrient Balance Score of the food consumed by the subjects according to their age groups.

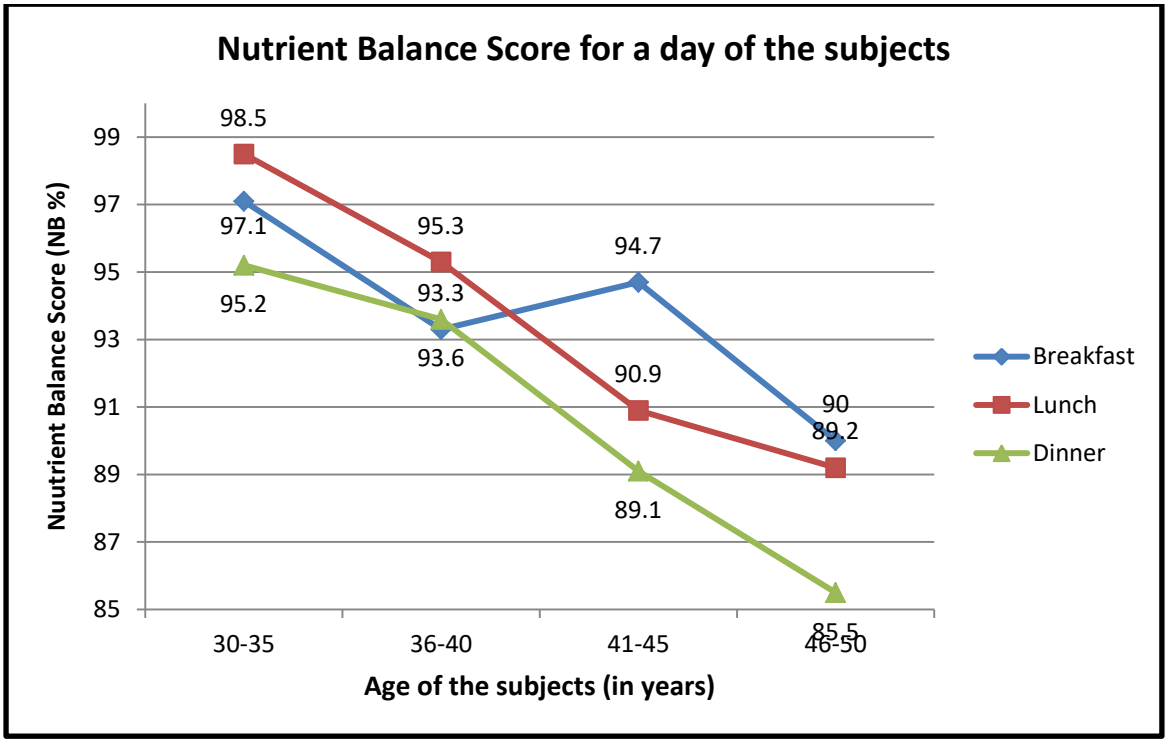


FIGURE: XI NUTRIENT BALANCE SCORE OF THE FOOD CONSUMED BY THE SUBJECTS

Figure: XI clearly shows the Nutrient Balance Score of the food consumed by the subjects according to their age groups. The breakfast meal consistently demonstrates a higher nutrient balance score than the other two meals for age groups 41 – 45 years and 46 – 50 years. Furthermore, individuals in the age group of 30-35 years have higher nutrient balance scores across all meals throughout the day.

Similar to the study done by Fern *et al*., (2015) shows the distinctions between the lunch menu, which had meals with generally high QI and DI ratings, and the morning menu, which did not have reasonable QI and DI, were particularly obvious. Despite this variation, the combined meals exhibited comparable values for all three Nutrient Balance Concept criteria for the lunch and breakfast, respectively: DI = 0.55 & 0.46, QI = 1.21 & 1.44, and NB = 83% & 81%.

The study by Fern *et al*., (2015) reveals a significant degree of complementarity between whole-wheat bread and fat-free milk, with the Nutrient Balance (NB) exceeding that of the meal with the highest NB score (whole-wheat bread) in all but two of the pairings. While whole-wheat bread provided 70% of the total calories the fat-free milk provided 30%, resulting in the greatest NB score (89%).

The fact that no combination of cooked brown rice and tofu had a nutrient balance (NB) value greater than that of the food with the highest NB score (tofu), and that brown rice could replace half of the tofu without changing the combination's NB, emphasises the lack of any complementarity in this situation. Both features demonstrate that brown rice is unable to supplement the nutrients already present in tofu with additional net quantities of any one qualifying nutrient.

Figure: XII depicts Qualifying and Disqualifying Indices (QI and DI) and the Nutrient Balance Score of the food consumed by the subjects.

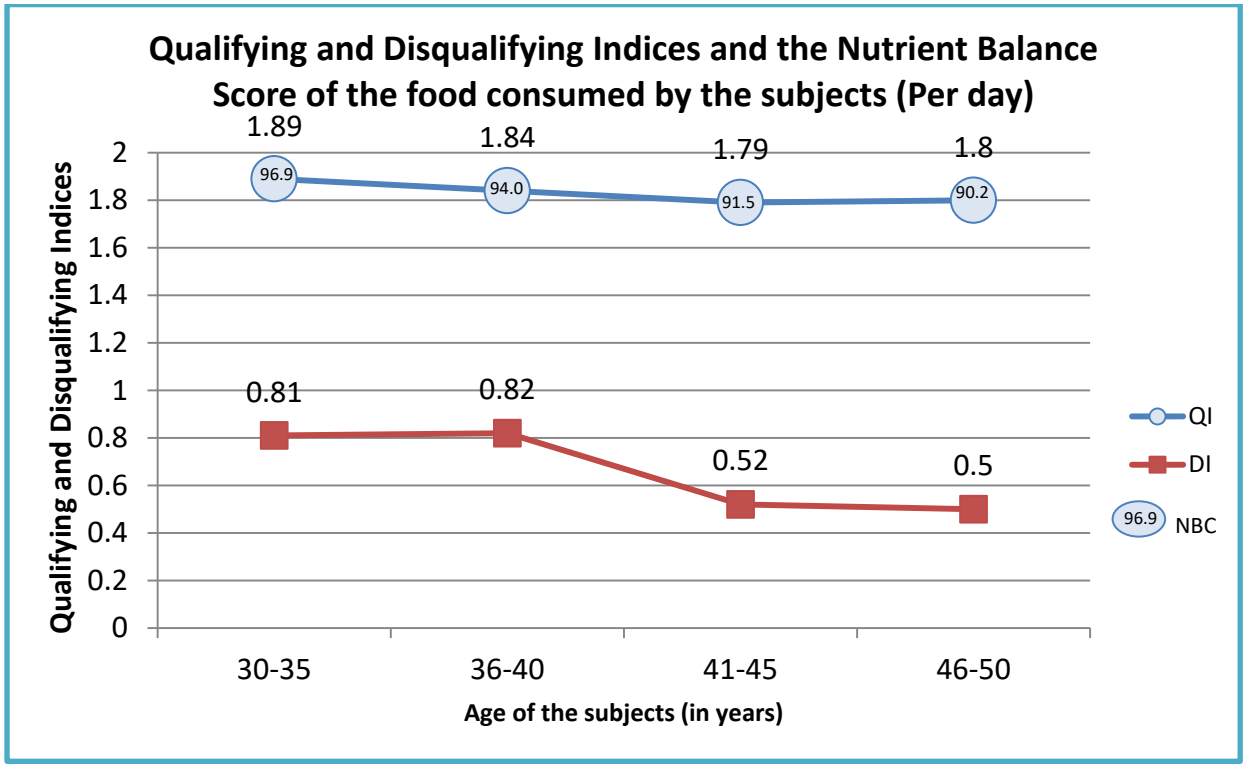


FIGURE: XII QUALIFYING AND DISQUALIFYING INDICES AND THE NUTRIENT BALANCE SCORE OF THE FOOD CONSUMED BY THE SUBJECTS (PER DAY)

Figure: XII highlights the values of qualifying and disqualifying indices and the nutrient balance score of the study subjects for a day according to their age groups. In the age group of 30-35 years, the subject has the highest qualifying index, indicating a favourable outcome. On the other hand, in the age group of 46-50 years, the subject has a lower disqualifying index. Additionally, the nutrient balance score of the subjects aged 30-35 years is higher compared to those in the other age groups, indicating that their diet is more balanced compared to other age groups.

Figure: XIII presents the carbon footprint of the food consumed by the subjects.

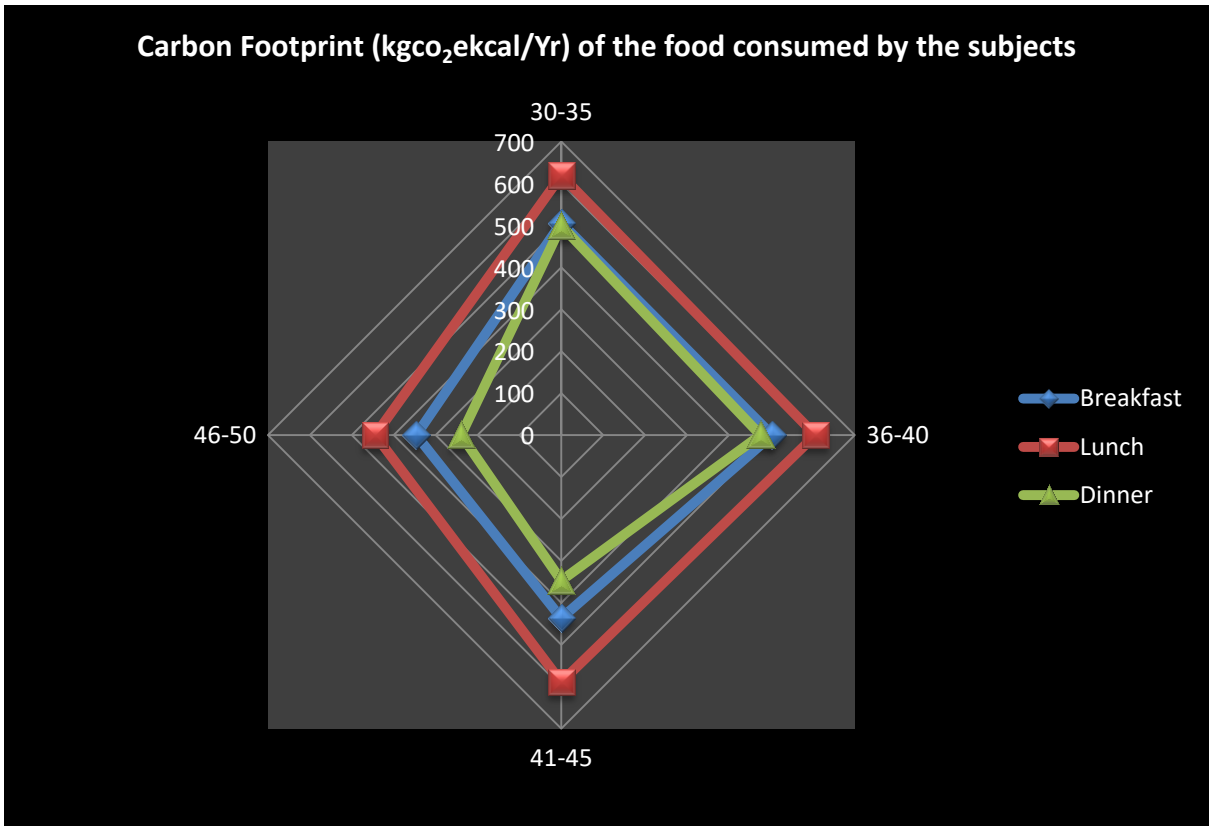


FIGURE: XIII CARBON FOOTPRINT OF THE FOOD CONSUMED BY THE SUBJECTS

Figure XIII reveals the carbon footprint of the food consumed by the subjects. The carbon footprint of breakfast is highest among individuals in the age group of 46-50 years, followed by those in the age group of 41-45 years. Additionally, when comparing the carbon footprints of the other two meals of the study subjects, it has been noted that individuals aged 30-35 years had higher carbon footprints than the rest of the subjects in other age groups.

Figure XIV represents the carbon footprint of the food consumed by the subjects per day.

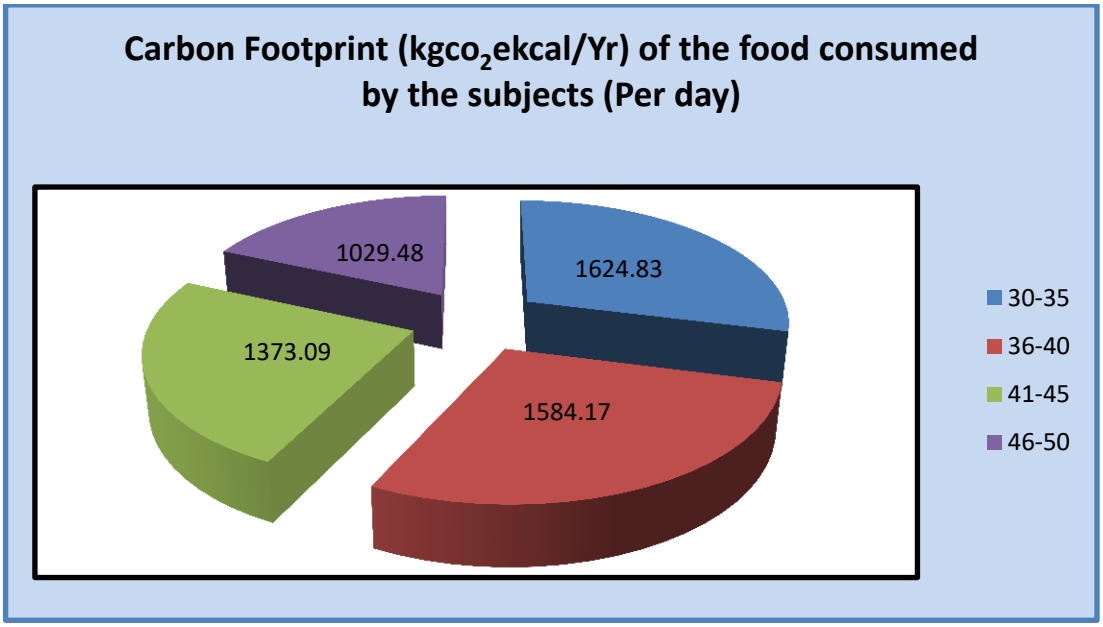


FIGURE XIV CARBON FOOTPRINT OF THE FOOD CONSUMED BY THE SUBJECTS (PER DAY)

Figure XIV depicts the carbon footprint of the food consumed by the subjects per day. The carbon footprint of the study subjects in the 30-35 age group is higher than all other age groups. Additionally, the 46-50 age groups have the lowest carbon footprint, followed by the 41-45 age group.

Phase III - Development and Evaluation of an e-application to promote planetary health diet:

Applications (apps) in health have become increasingly prevalent and are transforming the way healthcare is delivered, managed, and accessed. These health-based applications serve a wide range of purposes, from monitoring personal health and fitness to supporting healthcare professionals in clinical practice and research. The increasing use of mobile and digital technologies continues to drive innovation in healthcare, improving patient outcomes, accessibility, and the overall quality of care. Electronic applications (e Applications) can serve several useful purposes in promoting and supporting the adoption of the planetary health diet.

The initial page of the website presents two options for users: "log in" or "sign up." For new users, the first step is to create an account by signing in with their email ID. On the other hand, users who have already signed up and have an existing account can log in to access and utilize the platform's features. This login process ensures that both, new and existing users have a smooth entry into the developed app.

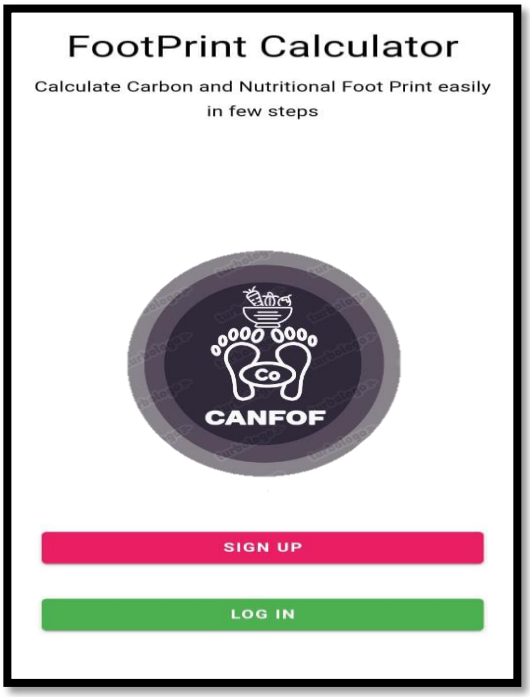


FIGURE XV LOG IN PAGE OF FOOTPRINT CALCULATOR

Users must provide their personal information, such as name, age, gender, phone number, email address, and so on, when they visit the profile page. Anthropometric data, including height and weight, must also be entered for additional computations. One of these computations is the Body Mass Index (BMI), for which the World Health Organization's (WHO) guidelines are shown in a pop-up window. Additionally, the waist-Hip Ratio (WHR) is computed when users input their hip and waist circumference measures, and a pop-up screen displaying the relevant reference standards is also displayed. Users can save their profile after entering all required information, and it will be saved with the supplied information.

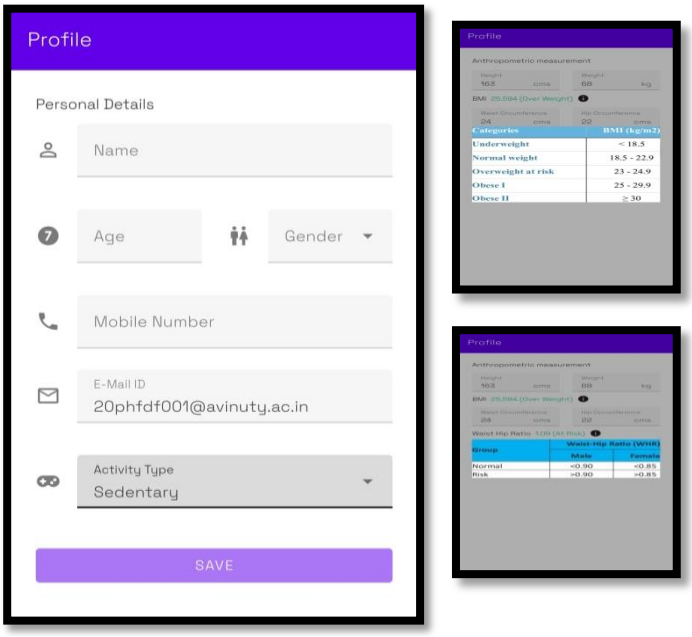


FIGURE XVI PROFILE PAGE OF FOOTPRINT CALCULATOR

The user will be taken to a website that displays two distinct calculators when they directed to the calculator program. In the upper left corner is a three -line menu symbol that is clearly visible. When the user clicks on this icon, a pop-up menu with a variety of option will appear. A comprehensive history section that saves calculation and data for up to two days, an incognito mode that guarantees private usage, the profile page that's lets users customize and update their personal information, a language selection feature that lets users choose

between three user-friendly languages such as Hindi, English and Tamil and lastly, a sign-out option that can be used whenever the user wants to exit the application.

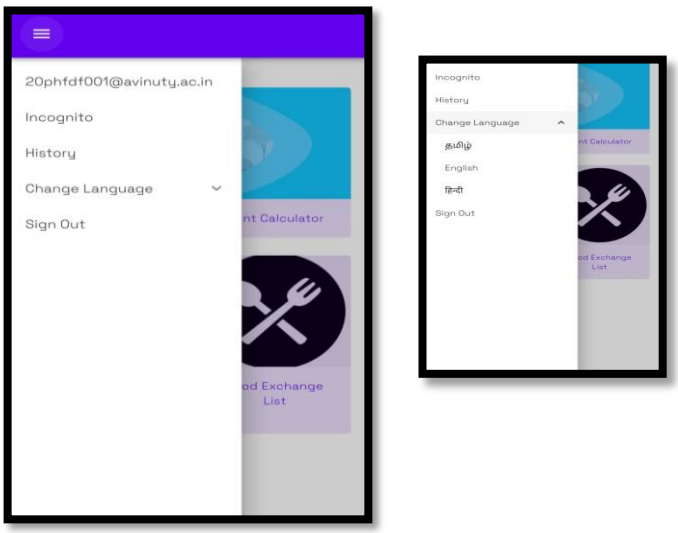


FIGURE XVII MENU PAGE OF FOOTPRINT CALCULATOR

The main interface is this page, which has three separate modules. The first module is an advanced calculator that can be used to evaluate the nutritional and carbon footprints of any kind of food. It gives users a thorough evaluation of the nutritional value and environmental impact of their consumption patterns. The planetary health diet is covered in detail in second module, which provides information on sustainable eating habits that are good for both people and the environment. And the third module is a carbon footprint food exchange list.

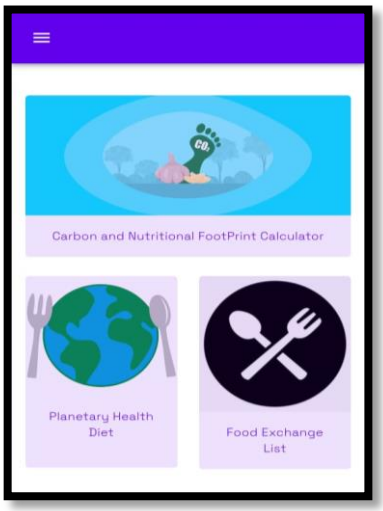


FIGURE XVIII MAIN PAGE OF FOOTPRINT CALCULATOR

The first module, the carbon and nutritional footprint module, consists of two meals that are required to calculate the carbon and nutritional footprint. Early morning, breakfast, mid-morning, lunch, mid-evening, supper, and bedtime are the seven options available for the first menu, which is the meal type menu. Users are required to select one of these options, which will then take them to the subsequent page where they need to choose the "add a food ingredient" menu. This particular menu is where users are expected to input the ingredients they consume and the corresponding quantities on a daily basis. The menu provides options for selecting food groups' specific ingredients and entering their respective quantities. This comprehensive system allows users to accurately track their carbon and nutritional intake based on the daily ingredients consumed throughout the day.

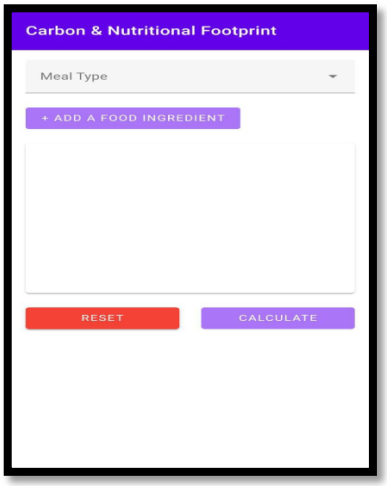


FIGURE XIX CARBON AND NUTRITIONAL FOOTPRINT CALCULATOR

The menu offers various enticing options for individual preferences and dietary needs. These options are categorized into various food groups, presenting diverse choices. The food groups option has different types of food groups like cereals, grains and their products, pulses and legumes, leafy vegetables, other vegetables, roots and tubers, nuts and oil seeds, fruits, fishes and other sea foods, meat and poultry, milk and milk products, fats and edible oils, sugars, alcoholic beverages and non- alcoholic beverages in which any one has to be selected by the users. With such a wide selection available, choosing one’s desired food group becomes enjoyable for the user, ensuring a satisfying and personalised meal planning experience.

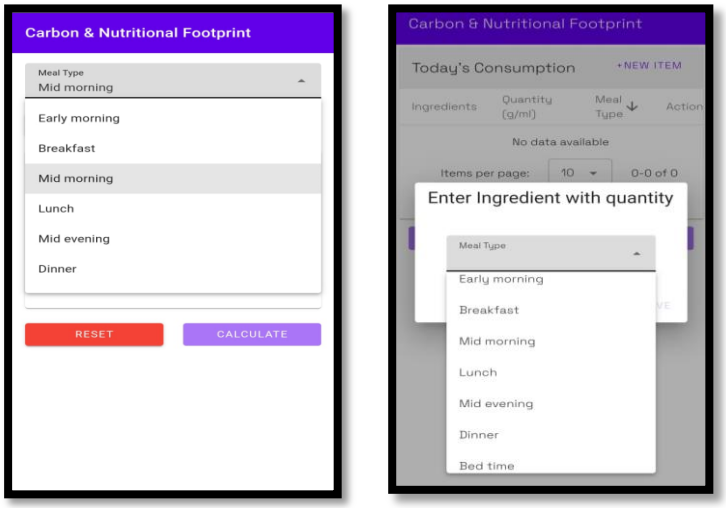


FIGURE XX MEAL TYPE PAGE OF CARBON AND NUTRITIONAL FOOTPRINT CALCULATOR

The next step is item choices, where one ingredient must be chosen from all the ingredients listed in the IFCT, 2017 book. The amount of that specific component should be explicitly entered into the app. On the screen, the chosen ingredients would show up. There are two choices marked "reset" and "calculate" at the bottom of that page. The reset menu allows you to undo and make modifications. Additionally, the user should choose the calculate menu to get the result page.

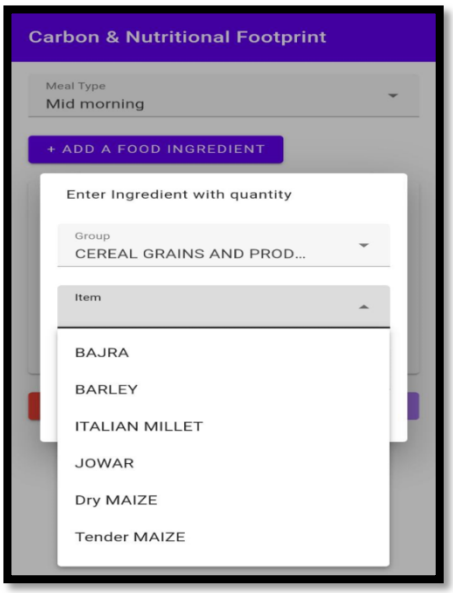


FIGURE XXI FOOD INGREDIENT SELECTION PAGE OF CARBON AND NUTRITIONAL FOOTPRINT CALCULATOR

This would lead to a three-part result page, the first of which contains information on the daily nutrients determined. The reference RDA for 2018 would also be displayed alongside. The user would thus be able to easily comprehend if their food consumption was adequate or inadequate by being told whether their intake was in surplus or deficit. The carbon calculator was in the second section. For each component, the carbon footprint has already been determined. According to the quantity of the specific component that the user specified as consumed, the outcome would be displayed. The third component of the outcome was the nutritional footprint, which was computed using three calculators: the qualifying index, the disqualifying index, and the nutrient balance score. For the users to determine if their intake was nutrient-dense or energy-dense, the outcome would be displayed alongside the standards. The percentage of the user's intake that was considered nutritious is shown by the nutritional balance score.

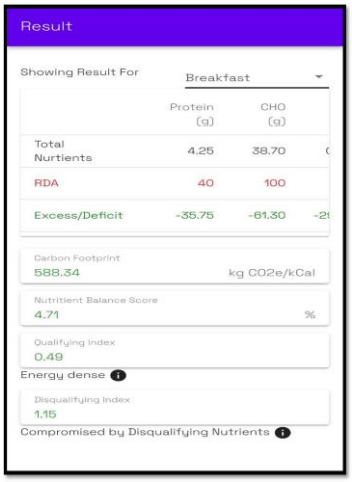
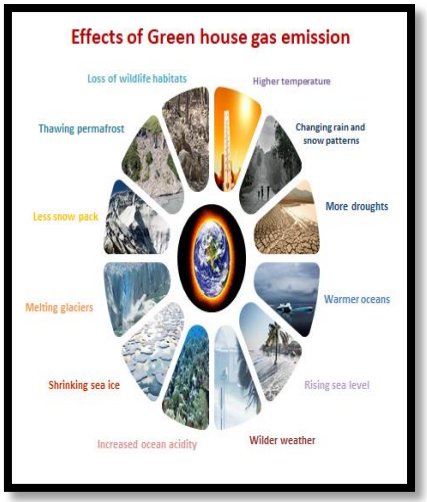
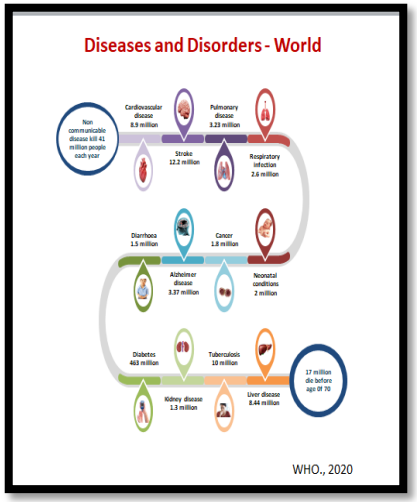
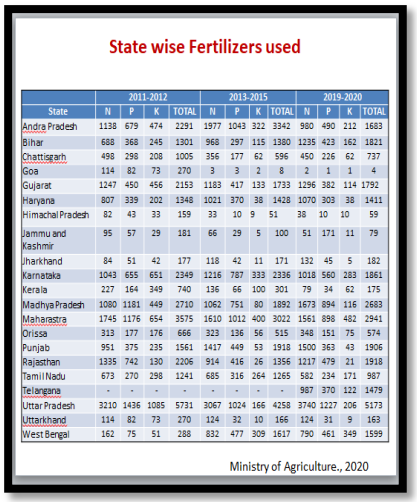


FIGURE XXII RESULT PAGE OF CARBON AND NUTRITIONAL FOOTPRINT CALCULATOR

The Planetary Health Diet is devised as a teaching tool in the second module. This module is a 52-slide PowerPoint presentation that discusses food consumption, food processing, greenhouse gas emissions and the carbon footprint that results from food processing, the sustainability of excessive meat consumption, diet for planetary health: tactics, Plate for planetary health Actions to be taken: the role of cities, health experts, and farmers in the change of the world's food supply, Estimated death prevention: diet for world health etc. For ease of comprehension, these were provided with voiceovers in both English and the regional language (Tamil).



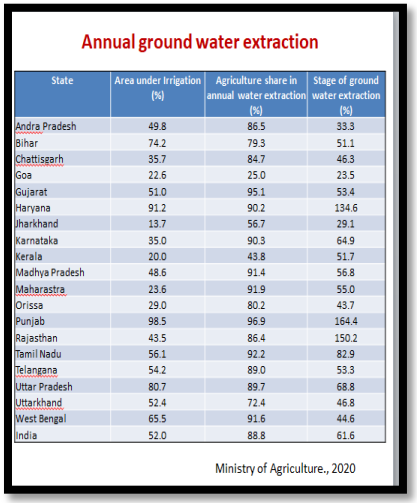




State wise Fertilizers used

State	2011-2012				2013-2015				2019-2020			
	N	P	K	TOTAL	N	P	K	TOTAL	N	P	K	TOTAL
Andra Pradesh	1138	679	474	2291	1977	1043	322	3342	980	490	212	1683
Bihar	688	368	245	1301	968	297	115	1380	1235	423	162	1821
Chattisgarh	498	298	208	1005	356	177	62	596	450	226	62	737
Goa	114	82	73	270	3	3	2	8	2	1	1	4
Gujarat	1247	450	456	2153	1183	417	133	1733	1296	382	114	1792
Haryana	807	339	202	1348	1021	370	38	1428	1070	303	38	1411
Himachal Pradesh	82	43	33	159	33	10	9	51	38	10	10	59
Jammu and Kashmir	95	57	29	181	66	29	5	100	51	171	11	79
Jharkhand	84	51	42	177	118	42	11	171	132	45	5	182
Karnataka	1043	655	651	2349	1216	787	333	2336	1018	560	283	1861
Kerala	227	164	349	740	136	66	100	301	79	34	62	175
Madhya Pradesh	1080	1181	449	2710	1062	751	80	1892	1673	894	116	2683
Maharastra	1745	1176	654	3575	1610	1012	400	3022	1561	898	482	2941
Orissa	313	177	176	666	323	136	56	515	348	151	75	574
Punjab	951	375	235	1561	1417	449	53	1918	1500	363	43	1906
Rajasthan	1335	742	130	2206	914	416	26	1356	1217	479	21	1918
Tamil Nadu	673	270	298	1241	685	316	264	1265	582	234	171	987
Telangana	-	-	-	-	-	-	-	-	987	370	122	1479
Uttar Pradesh	3210	1436	1085	5731	3067	1024	166	4258	3740	1227	206	5173
Uttarkhand	114	82	73	270	124	32	10	166	124	31	9	163
West Bengal	162	75	51	288	832	477	309	1617	790	461	349	1599

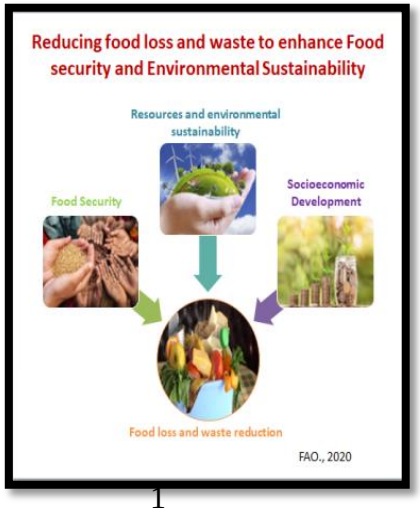
Ministry of Agriculture., 2020

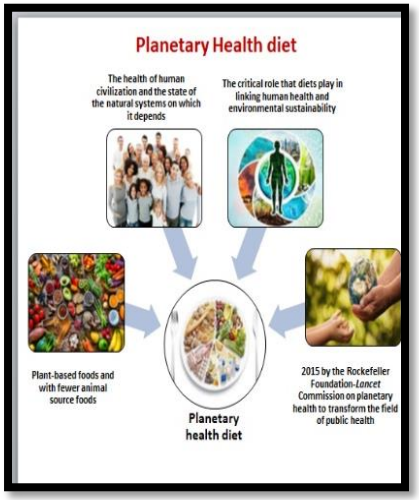


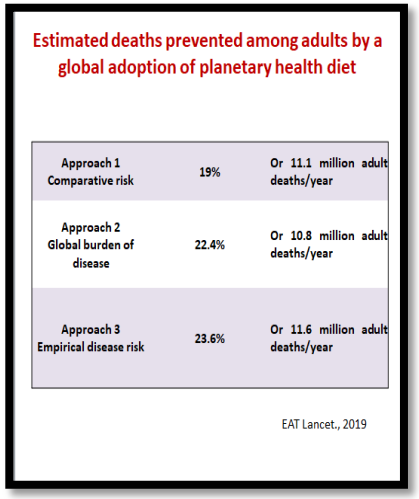
Annual ground water extraction

State	Area under Irrigation (%)	Agriculture share in annual water extraction (%)	Stage of ground water extraction (%)
Andra Pradesh	49.8	86.5	33.3
Bihar	74.2	79.3	51.1
Chattisgarh	35.7	84.7	46.3
Goa	22.6	25.0	23.5
Gujarat	51.0	95.1	53.4
Haryana	91.2	90.2	134.6
Jharkhand	13.7	56.7	29.1
Karnataka	35.0	90.3	64.9
Kerala	20.0	43.8	51.7
Madhya Pradesh	48.6	91.4	56.8
Maharastra	23.6	91.9	55.0
Orissa	29.0	80.2	43.7
Punjab	98.5	96.9	164.4
Rajasthan	43.5	86.4	150.2
Tamil Nadu	56.1	92.2	82.9
Telangana	54.2	89.0	53.3
Uttar Pradesh	80.7	89.7	68.8
Uttarkhand	52.4	72.4	46.8
West Bengal	65.5	91.6	44.6
India	52.0	88.8	61.6

Ministry of Agriculture., 2020







Estimated deaths prevented among adults by a global adoption of planetary health diet

Approach 1 Comparative risk	19%	Or 11.1 million adult deaths/year
Approach 2 Global burden of disease	22.4%	Or 10.8 million adult deaths/year
Approach 3 Empirical disease risk	23.6%	Or 11.6 million adult deaths/year

EAT Lancet., 2019

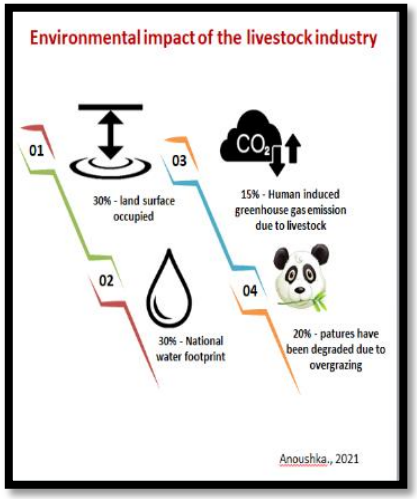


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FIGURE XXIII EDUCATIONAL TOOL PAGE OF FOOTPRINT CALCULATOR

The final element is the screen of food exchange list. When it is chosen, a page containing a list of foods that may be exchanged for the chosen one to lessen the carbon footprint of food, but containing the equivalent amount of nutrients like energy, carbohydrates, protein, fat, fiber, vitamins, and minerals is brought up. The user may choose food ingredients with a minimal carbon footprint and healthy food from this website.

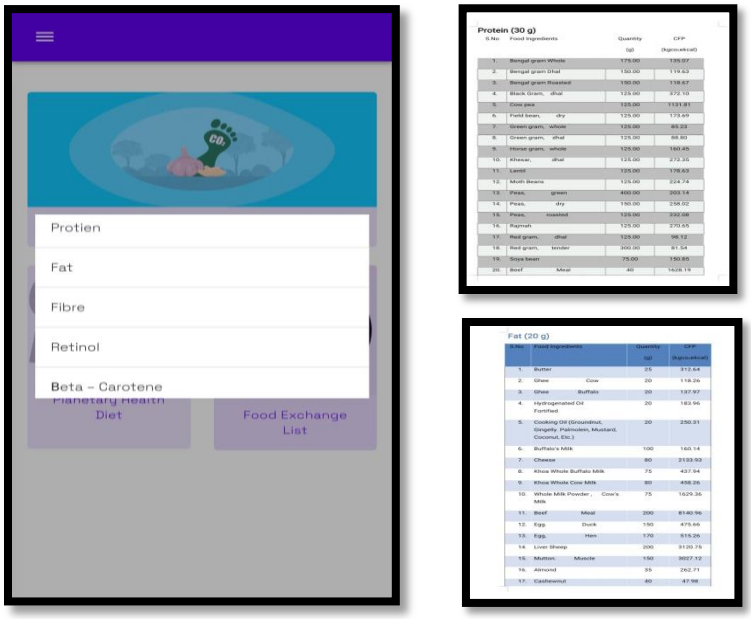

FIGURE XXIV FOOD EXCHANGE LIST PAGE OF FOOTPRINT CALCULATOR

Evaluation of developed e-application

Table: XXV reveals the demographic profile of the subjects

TABLE: XXV DEMOGRAPHIC PROFILE OF SUBJECTS (N=30)

	Number (N)	**Percentage (%)**
Age (in years)		
25-30	22	74
31-35	5	16
35-40	3	10
Gender		
Male	7	23
Female	23	77
Occupation (N=30)		
Computer Professional	10	33.3
Dietitian	10	33.3
Household women	10	33.3

Table: XXV presents a comprehensive overview of the demographic characteristics of the subjects involved in evaluating the newly developed e-application. The table indicates that the majority of the subjects belonged to the age group of 25-30 years and was predominantly female. The sample comprised 10 computer professionals, 10 dietitians, and 10 household women.

Table: XXVI reveals the result of evaluation of e-application

TABLE: XXVI EVALUATION OF e - APPLICATION

Questions pertaining to the evaluation of e-application	**YES (N = 30)**			**NO (N = 30)**		
	Computer professional	**Dietitian**	**Household women**	**Computer professional**	**Dietitian**	**Household women**
Are you using smart phones?	10	10	10	0	0	0
Are you using any diet, nutrition or food related apps?	3	10	5	7	0	5
Were there any specific features or functionalities that you found particularly useful?	10	10	10	0	0	0
Did you encounter any bugs or crashes while using this app?	0	0	0	10	10	10
Did the app provide motivation or support features?	7	2	0	3	8	10
Do you intend to use this app in future?	7	10	10	3	0	0
Would you recommend this app to others?	9	10	10	1	0	0
Did the app effectively track your diet?	10	10	10	0	0	0
Is it time consuming?	4	0	2	6	10	8

Are the fonts easy to read and understand?	10	10	10	0	0	0
Do you feel this app provides all required data that you needed?	10	10	10	0	0	0
Do you feel comfortable to calculate your BMI and WHR using this app?	10	10	10	0	0	0
Is the food exchange list is easy to understand?	7	10	6	3	0	4
Is the information in this app is clear and detail?	8	10	6	2	0	4
Are the contents and presentation of the app is appropriate?	10	9	7	0	1	3
Is this app is user friendly?	8	10	10	2	0	0
Did the app provide motivation or support features?	8	7	6	2	3	4
Do you feel this app is informative and beneficial for users?	10	10	10	0	0	0
Were the app's layout and navigation intuitive?	7	9	9	3	1	1
Did the app perform the tasks you expected it to perform?	8	9	9	2	1	1
Did the app respond quickly to your inputs and commands?	7	10	10	3	0	0
Whether the screen designing is good?	7	10	10	3	0	0
Did you find the content within the app valuable and relevant to your needs?	10	10	10	0	0	0
Do you feel this app would bring any behavioural change?	7	8	9	3	2	1
Do you think dieticians would be benefitted with this app?	7	9	7	3	1	3

Table XXVI provide the findings related to e-application usage. It was evident from the study that all the subjects utilized smartphones. Remarkably, none of the users encountered technical issues such as bugs or crashes while using the application. Moreover, dietitians and household women expressed their intention to continue using this e-application and even recommended it to others. Although a few respondents found the app slightly time-consuming, all subjects unanimously agreed that the fonts used in the interface were legible and easy to comprehend.

This table effectively demonstrates that the application fulfils the requirements for all subjects, allowing them to confidently calculate their Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR) using the app. The dietician expressed satisfaction with the app's data, making it comprehensible and user-friendly. The app's user interface was also considered intuitive and easily navigable. Overall, the data presented in the table confirms that the app is highly efficient in meeting their needs.

Based on the feedback received, it was evident that the app was perceived as informative and beneficial by all the subjects. The aspects of task performance, app responsiveness, screen design, and content relevance were positively evaluated by the dietitians

Phase IV - Creating awareness on the importance of planetary health diet and analyzing the Post awareness – knowledge of planetary health diet among selected subjects

A nutritional concept called the "Planetary Health Diet" was framed to promote environmental sustainability as well as human health. The report "Food in the Anthropocene: The EAT – Lancet Commission on Healthy Diets from Sustainable Food Systems" was published in 2019 and contains the findings of the EAT – Lancet Commission on Food, Planet and Health which is composed of a number of scientists and experts from various fields.

Promoting sustainable and healthy eating habits among women can be achieved by educating them about the planetary health diet. Women are important in taking initiatives to enhance the health of people and the earth because of their impact in their own families and communities. We may strive toward a more equitable and sustainable food system by empowering and educating women.

In order to determine the effectiveness of awareness and making well informed decisions for improvement, it is essential to evaluate its effect both before and after the awareness. A "pre and post knowledge, attitude and practices assessment" is the term used to describe the process of comparing awareness before and after implementation.

The pre-Assessment is the initial evaluation to record the knowledge, attitude, and practices of planetary health diet among selected subjects. It assists in addressing the gaps, misunderstandings, or behavioural patterns that the intervention aims to address.

Following the implementation of the awareness campaign, a post-assessment was carried out. It measures the shifts in knowledge, attitude, and practices among the same population. The impact of the intervention can be assessed by comparing the data from the pre- and post-assessments.

The pre—and post- KAP assessments is useful tool for assessing the impact of awareness session among the selected subjects. Researchers can well – informed decisions to improve their results and obtain important insights into the efficacy of their projects by methodically collected data before and after awareness.

Table: XXVII depicts the comparison of pre and post food and nutrition related knowledge of selected women.

TABLE: XXVII COMPARISON OF PRE AND POST FOOD AND NUTRITION RELATED KNOWLEDGE OF SELECTED WOMEN

Food and nutrition related knowledge	Mean	Std.dev	t value	p value
Pre-test	2.80	0.96	-68.16	0.000**
Post test	7.55	1.19		

Figure: XXV shows the comparison of pre and post food and nutrition related knowledge of selected women.

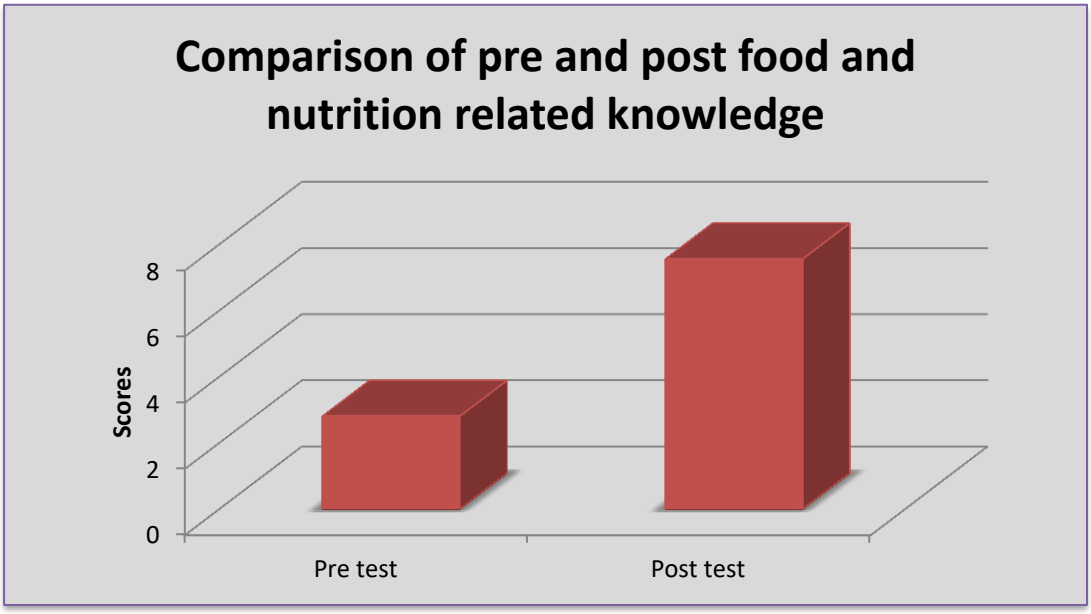

FIGURE: XXV COMPARISON OF PRE AND POST FOOD AND NUTRITION RELATED KNOWLEDGE OF SELECTED WOMEN

From table XXVII and figure: XXV, it is clear that there is a significant difference between pre and post food as well as nutrition related knowledge of selected women, which means that after being provided with awareness, the women subjects experienced a noticeable improvement in their understanding and knowledge of food and nutrition. This increase in knowledge signifies an enhanced level of awareness and comprehension of the food and nutrition concepts.

Table: XXVIII highlights the comparison of pre and post Socio cultural reasons on diet of selected women.

TABLE: XXVIII COMPARISON OF PRE AND POST SOCIO CULTURAL REASONS ON DIET OF SELECTED WOMEN

Socio cultural reasons on diet	Mean	Std.dev	t value	p value
Pre-test	3.87	0.68	-47.28	0.000**
Post test	5.05	0.59		

Figure: XXVI clearly shows the comparison of pre and post Socio cultural reasons on diet of selected women.

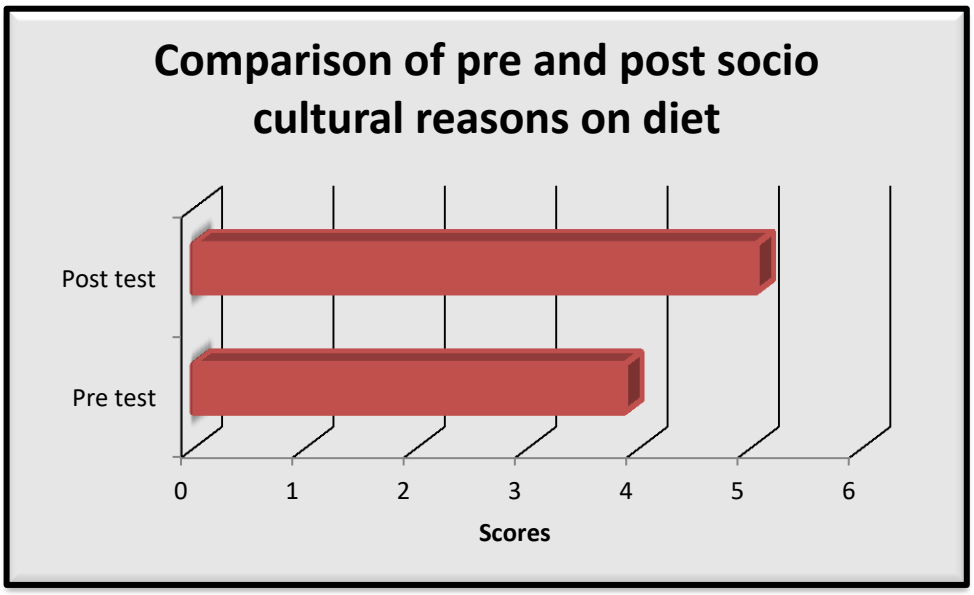

FIGURE: XXVI COMPARISON OF PRE AND POST SOCIO CULTURAL REASONS ON DIET OF SELECTED WOMEN

It can be inferred from the table: XXVIII and figure: XXVI that there was a significant difference between pre and post Socio cultural reasons on the diet of selected women. This disparity suggests that before raising awareness, women generally followed dietary practices followed by their family and friends, regardless of their health status. However, post-awareness, these women display a heightened sense of self-awareness and made dietary choices based on their individual preferences and health conditions.

Table: XXIX shows the comparison of pre and post psychopathology of planetary health diet.

TABLE: XXIX COMPARISON OF PRE AND POST PSYCHOPATHOLOGY OF PLANETARY HEALTH DIET

Psychopathology of Planetary Health Diet	Mean	Std.dev	t value	p value
Pre-test	3.82	0.67	-60.93	0.000**
Post test	5.75	0.66		

Figure: XXVII highlights the comparison of pre and post psychopathology of planetary health diet.

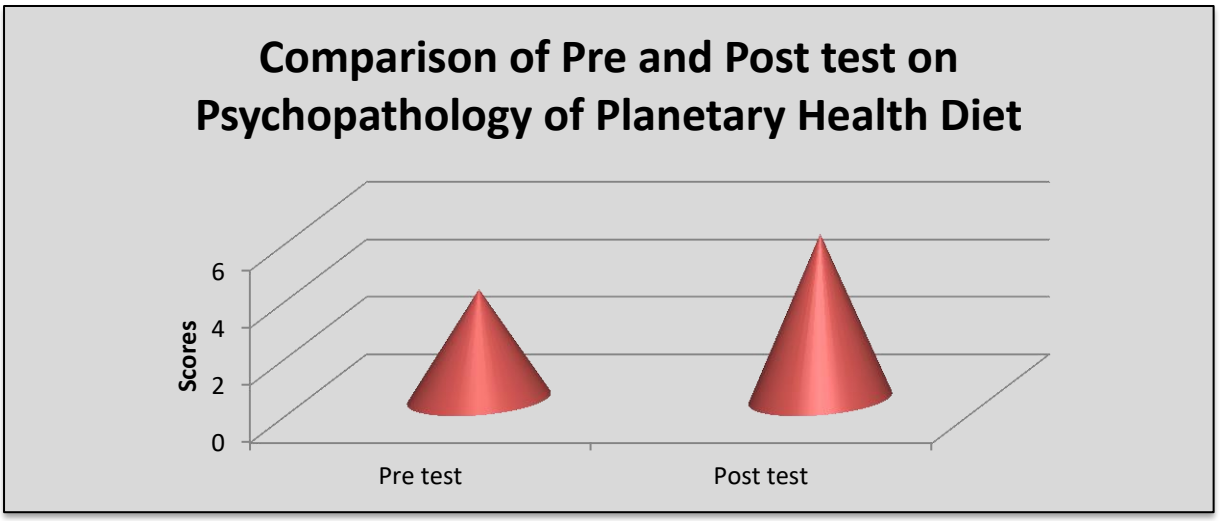

FIGURE: XXVII COMPARISON OF PRE AND POST PSYCHOPATHOLOGY OF PLANETARY HEALTH DIET

Table: XXIX and figure: XXVII reveal that there is a significant difference between pre and post psychopathology of the planetary health diet, which means Initially, many subjects believed that adhering to a planetary health diet is challenging and hence lack the necessary nutrients, possibly resulting in nutrient deficiencies and related issues. However, after the awareness session, they began to realize that the planetary health diet was indeed beneficial for both personal well-being and environmental health. It became apparent that this dietary approach serves as a significant contributor to nourishing not only the individual's health but also preserving the health and sustainability of our planet.

Table: XXX presents the comparison of pre and post knowledge on planetary health diet.

TABLE: XXX COMPARISON OF PRE AND POST KNOWLEDGE ON PLANETARY HEALTH DIET

Knowledge on Planetary Health Diet	Mean	Std.dev	t value	p value
Pre-test	4.00	0.78	-43.22	0.000**
Post test	6.07	0.69		

Figure: XXVIII shows the comparison of pre and post knowledge on planetary health diet.

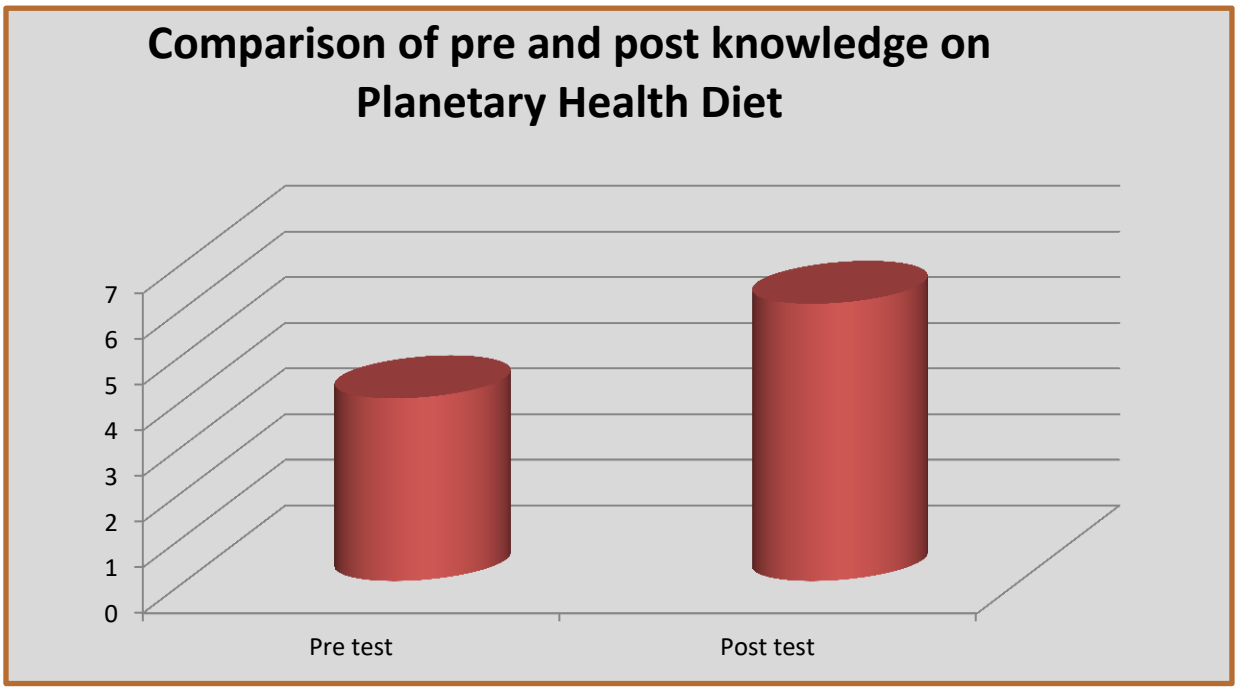

FIGURE: XXVIII COMPARISON OF PRE AND POST KNOWLEDGE ON PLANETARY HEALTH DIET

Table: XXX and figure: XXVIII highlight the significant difference between the differences between pre and post knowledge on planetary health diet. The understanding and awareness of women regarding the planetary health diet improved post awareness leading to an increase in their knowledge of the planetary health diet.

Table: XXXI depicts the comparison of pre and post attitude towards the planetary health diet.

TABLE: XXXI COMPARISON OF PRE AND POST ATTITUDE TOWARDS PLANETARY HEALTH DIET

Attitude towards Planetary Health Diet	Mean	Std.dev	t value	p value
Pre-test	4.87	0.93	55.76	0.340
Post test	5.22	1.18		

From Figure: XXIX it shows the comparison of pre and post attitude towards planetary health diet.

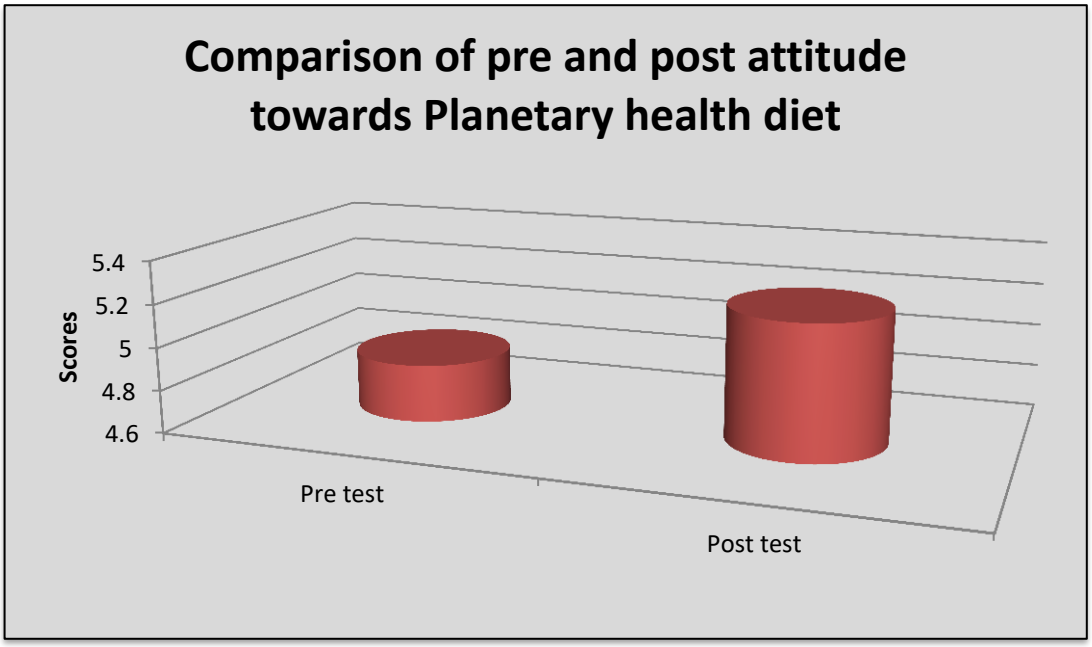

FIGURE: XXIX COMPARISON OF PRE AND POST ATTITUDE TOWARDS PLANETARY HEALTH DIET

Table: XXXI and figure: XXIX indicate that there is no significant difference between the attitude pre and post awareness of a planetary health diet, which means that despite gaining a greater understanding and knowledge of the benefits of a planetary health diet, subjects were reluctant to decrease their meat intake. While their knowledge about the importance of such a diet has been improved, their resistance to reducing meat consumption has remained unchanged.

Table: XXXII shows the comparison of pre- and post-practice of a planetary health diet.

TABLE: XXXII COMPARISON OF PRE AND POST PRACTICE OF PLANETARY HEALTH DIET

Practice of Planetary Health Diet	Mean	Std.dev	t value	p value
Pretest	0.30	0.02	-7.550	0.774
Post test	0.42	0.09		

Figure: XXX presents the comparison of pre- and post-practice of planetary health diet.

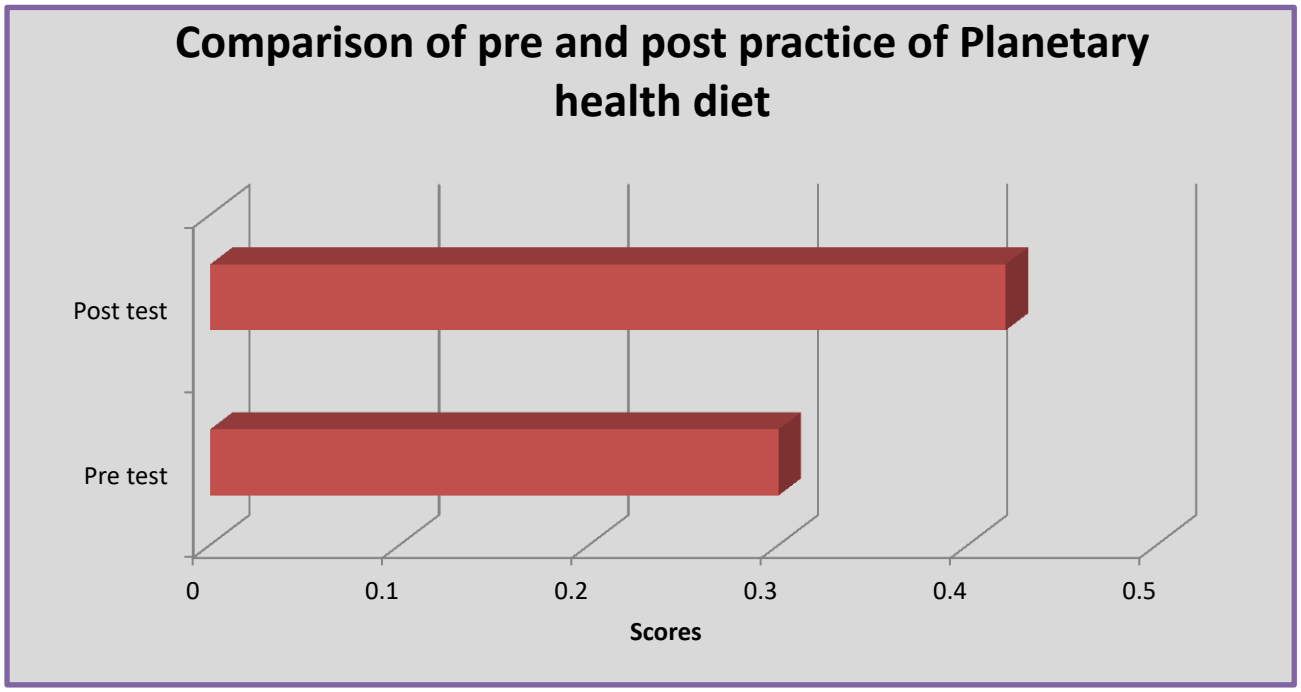

FIGURE: XXX COMPARISON OF PRE AND POST PRACTICE OF PLANETARY HEALTH DIET

Table: XXXII and Figure: XXX depict the comparison of pre- and post-practice of a planetary health diet. The findings indicate that there is no significant difference between the implementation of a planetary health diet before and after the awareness program. This implies that while the subjects are cognizant of the significance of a planetary health diet, they fail to put it into practice even after receiving the necessary information and guidance.

Table: XXXIII shows the comparison of pre and post awareness meat consumption.

TABLE: XXXIII COMPARISON OF PRE AND POST AWARENESS MEAT CONSUMPTION

Meat Consumption	Mean	Std.dev	t value	p value
Pretest	5.02	1.86	11.87	0.384
Post test	5.75	1.52		

Figure: XXXI presents the comparison of pre and post awareness meat consumption.

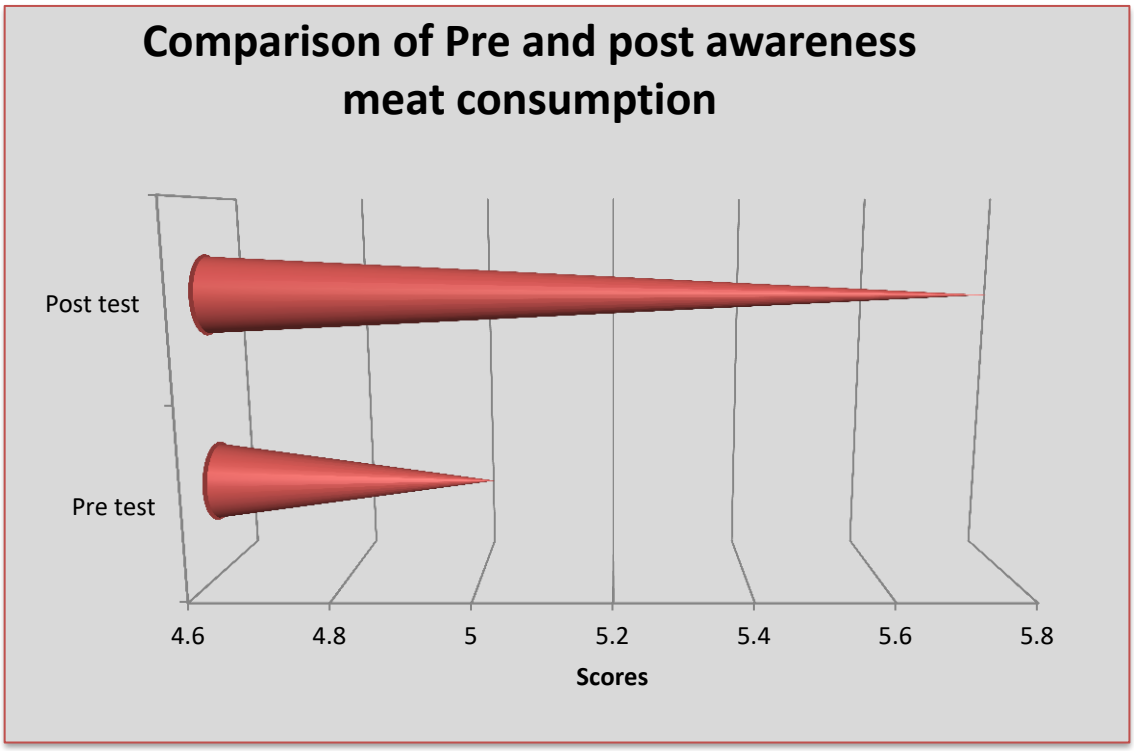

FIGURE: XXXI COMPARISON OF PRE AND POST AWARENESS MEAT CONSUMPTION

Table: XXXIII and Figure: XXXI indicate that there is no significant difference between pre and post awareness meat consumption. Despite being aware of the

environmental and personal impact of meat consumption, individuals did not make any efforts to limit or restrict their intake of meat in their diet.

Table: XXXIV depicts the relationship between the post knowledge, attitude, practice and meat consumption of selected subjects.

TABLE: XXXIV RELATIONSHIP BETWEEN THE POST KNOWLEDGE, ATTITUDE, PRACTICE AND MEAT CONSUMPTION OF SELECTED SUBJECTS

	Knowledge of Planetary health diet	**Attitude towards planetary health diet**	**Practice of planetary health diet**	**Meat consumption**
Knowledge of Planetary health diet	-	-0.162**	0.472	0.101
Attitude towards planetary health diet	-0.162**	-	-0.100*	-0.430**
Practice of planetary health diet	0.472	-0.100*	-	0.424
Meat consumption	0.101	-0.430**	0.424	-

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table: XXXIV highlights the matrix of relationships between the post knowledge, attitude, and practice and meat consumption of selected subjects. It is evident that there existed an adverse relationship between post-knowledge and attitude, as well as meat consumption. Additionally, attitude played a significant role in determining the relationship between meat consumption and knowledge. This implies that, despite increasing knowledge, there is no corresponding change in individuals' attitudes towards embracing a planetary health diet, nor did it affect their meat consumption habits.