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Assessing trends of dietary diversity among women in Chhattisgarh, emphasizing on locally available foods

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Abstract

Background : Chhattisgarh has a rich culture of consumption of a wide variety of vegetables, specially green leafy vegetables. However, a large number of the women of Chhattisgarh still are anemic. Purpose: The study aimed to evaluate the dietary diversity of women of Chhattisgarh and to compare the data with that recommended by FAO in Minimum Dietary Diversity for Women. Method: The data was collected from women of Chhattisgarh through an online questionnaire form. 100 samples were targeted, 103 forms were collected. The data was analyzed on google sheets and compared with the information from NFHS-5. Result: The average overall dietary diversity score of Chhattisgarhi women came up to be about 8 which is very good. Consumption of green leafy vegetables by women in Chhattisgarh has reduced minimally (by 5.1%) when compared with data collected in 2021 (NFHS-5), but is still above average than that was consumed by population of India (90.63%). Conclusion: Dietary diversity of women in Chhattisgarh was good, however, the data does not match with the health conditions. Therefore improvement in diets should be made to improve nutrient absorption.

Keywords: Minimum Dietary Diversity - Women, MDD - W, Chhattisgarh, Malnutrition, Nutrition Assessment

1. Introduction/Background

Current scenario: India is facing a burden of both forms of malnutrition, i.e. undernutrition and overnutrition. Micronutrient deficiency, i.e. hidden hunger also exists among the population.(Chand et al., 2022) About 2/3rd of India's population was estimated to be micronutrient deficient in a study in 2018. The BMI of about 23% Indian women between 14 to 49 years of age was below normal in 2015 - 16 (NFSH, 2017). Overweight, obesity and undernutrition more often lead to non-communicable diseases, and are major public health issues. According to the NFHS – 5, while the proportion of thin women aged between 15-49 declined from 23% in 2015 - 16 to 19% in 2019 - 21; the proportion of overweight or obese women increased from 21% to 24%. (NFSH-5, 2021). Thinness in women decreased with age, i.e. 40% for women aged between 15 - 19 were found to be thin, while only 9% for women aged between 40-49 were found to be thin . Overweight or obesity in women increased steadily from 5% in women aged between 15-49 to 37% in women aged between 40-49. (NFHS-5, 2021).

Women of reproductive age are considered nutritionally vulnerable due to the extra physiological demands of pregnancy and lactation, and therefore their nutrient requirements also are more than their male counterparts. This specially the case for some special nutrients like iron. (*Minimum Dietary Diversity for Women- A Guide to Measurement*, n.d.) However, 57% of Indian women were anemic according to the NFHS-5, among which 25.6% of women were mildly anemic, 28.7% were moderately anemic, and 2.7% were found to be severely anemic. The prevalence of anemia among women of Chhattisgarh was found to be more than 60%, with 27.1% women being mildly anemic, 31.2% women being moderately anemic and 2.6% women being severely anemic.

Dietary diversity: The consumption of a wide variety of nutritious foods is necessary for good health . For an adequate and proportional intake of nutrients , i.e. carbohydrates , proteins , fats, vitamins and minerals , a well - balanced diet is required. The report of NFHS- 5 shoes the consumption pattern of various food groups among women to be good in case of pulses, beans , dark green leafy vegetables . More than half of women consume dark green , leafy vegetables daily and an additional 39 % consume them weekly. Almost half of women consume pulses or beans daily and 43 % of women consume them weekly. Milk or curd is consumed daily by 49 % of women daily and weekly by 24 % of women , but about 6 % never consume milk or curd and 22 % consume milk or curd only occasionally . Consumption of fruits is less common being about 12 % women consuming fruits daily . 49 % of women consume fruits occasionally . Very few women consume chicken , meat , fish , or eggs daily , although about 1/3rd of women consume these types of food weekly . 7 % of women consume fried foods daily and 36 % weekly. The calorie intake among the population decreased even when there is undernutrition. However, this can be linked to the increasing number of meals taken outside the house the calorie consumption of which is more often ignored in consumed - calories calculations." (Chand et al., 2022)

Importance of diversity in diet: For good health consumption of all nutrients in appropriate proportions is necessary . These nutrients are sourced from a variety of foods (Arimond & Ruel, 2004) . Therefore , inclusion of a wide variety of foods in regular diet is associated with a balanced diet and a healthy individual. Dietary diversity is the number of different food groups consumed on a given period of time. (Kennedy et al., n.d.) Diversity in diet has been recognized as an important element of good - quality diets long ago.

Why MDD-W: The MDD-W for Women of Reproductive Age is based on a single 24-hour recall. It has been demonstrated to be successful in predicting adequacy for 11 micronutrients across a number of datasets from various nations. (Verger et al., 2021). The model of MDD-W is based on recall methods of dietary assessment. It offers 2 of ways to dietary assessment, namely list-based method and open recall method. List-based method offers a list of foods within all food groups, preferably including the region specific foods, and the respondent has to acknowledge any and all among the options that the respondent had consumed during the specified period, often last day and night. It is easy to use and takes less time to capture data. The Open recall method, is the less quantitative version of the MDD-W assessment options,

where the respondent recalls all that he/she had consumed in the last 24 hours starting from when he/she woke-up till he/she went to bed. Both the options are convenient and have been used to assess dietary diversity and dietary intake of the various population samples. (Chakona & Shackleton, 2017; Hanley-Cook et al., 2020; Kimuli et al., 2024; *Minimum Dietary Diversity among Women of Reproductive Age in Urban Burkina Faso - Custodio - 2020 - Maternal & Child Nutrition - Wiley Online Library*, n.d.; Rotella et al., 2024; Saaka et al., 2021).

2. Methods

The methodology of any research paves the way for its successful conduction and result. It is the way one goes about handling the research problem and coming to a conclusion or result at the end . It includes the steps of the research process , tools and methods used , and the justifications for these choices.

The research methodology used for this study is described under the following heads:

1 Study Design

2 Location of the study

3 Study population

4 Sample size and sampling method

5 Criteria for selection of subject

6 Tools for data collection

7 Statistical Analysis

Study Design – The study was a cross - sectional study of women of Chhattisgarh state between 15 and 60 of age.

Location of the study – The samples were selected from Chhattisgarh state.

Study population – Study population constituted of women between 15 and 60 years of age residing in Chhattisgarh.

Sample size and Sampling method – 110 samples were selected . The samples were sent online questionnaire , 103 forms were returned.

Criteria of selection of subjects –

1. Inclusion Criteria –
a. Only women were selected
b. Women between 15 to 60 years of age were selected
c. Women who reside in Chhattisgarh were only sent the questionnaire
d. Those who used smartphones were only sent the questionnaire.
2. Exclusion criteria -
a. Males were not selected as subjects
b. Women below 15 and above 60 years of age were not selected as subjects
c. Women residing outside Chhattisgarh were not selected

Tools for data collection - Self-prepared online questionnaire was used to enquire the name , age , contact information , location , and dietary intake. Multiple - choice based 24-hr recall was used to collect data. An extensive list of foods commonly consumed by the people of Chhattisgarh was prepared with expert consultation. The dishes were then classified among the food groups as per FAO-MDD-W classification. Since the questionnaire method was much easier to fill through online mode, and also because it was time saving and respondent friendly when compared to open ended 24-hr dietary recall, it was chosen. In every food group section an option "OTHER" was added to include all that might have been missed. An online questionnaire was created and the link was shared among the subjects. The questionnaire included the food groups according to the MDD-W guidelines. The list of foods were distributed among the food groups. The participants were supposed to check the check-box of foods in the concerned food groups consumed at different meal timings on the previous day. This would give the list of food groups consumed on the previous day.

The names of the foods in the options were written in Romanized forms of their local Hindi names for ease of understanding and filling of the Google form

Statistical Analysis – Simple scoring based on FAO-MDD-W (*Minimum Dietary Diversity for Women- A Guide to Measurement*, n.d.; *Minimum Dietary Diversity - Women*, n.d.) was used to analyze the data was used . Simple statistics like average , percentage were calculated.

3. Results

After the analysis of the data collected , the following results were found:

- Mean score of the population was 7.97.
- Out of the Samples collected , 94% of the population scored well , i.e. scored above 5 , in dietary diversity , while only about 6% of the population scored below 5 points in dietary diversity.
- Mean score of consumption of unhealthy foods was 3.84.
- Out of the Samples collected , 79.61% of the population scored above 2.5, in consumption of unhealthy foods, while only about 20.39% of the population scored below 2.5 points in consumption of unhealthy foods.
- Green leafy vegetable consumption by women of Chhattisgarh was decreased from the data collected by NFHS-5, i.e. NFHS-5 – 97.3% to MDD-W – 92.2%.

4. Discussion

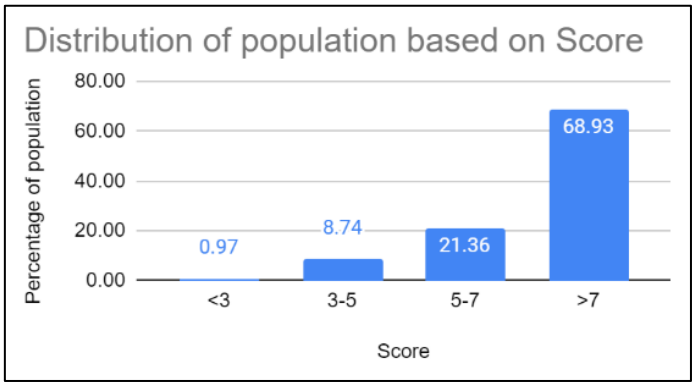
Overall, women of Chhattisgarh have a good dietary diversity score. Millets were consumed 67 times distributed among 4 meals of 103 people i.e. out of 412 meals , 67

included millets. While rice and wheat were consumed equally by the population, i.e 180 times in 412 meals. The population of Chhattisgarh consumes a wide variety of green leafy vegetables. Moring leaves consumption was found to be 77 times in 412

meals. Overall 302 out of 412 meals included at least one green leafy vegetable, in one or another form.

The scores were categorized into 4 categories – Poor (less than 3), Average (3 - 5), Good (5 - 7) and Very - good (more than 7). According to this classification about 69% of the women sampled had a Very - good dietary diversity score , and only 1% of the women had a poor dietary diversity score. (Figure 1)

Figure 1

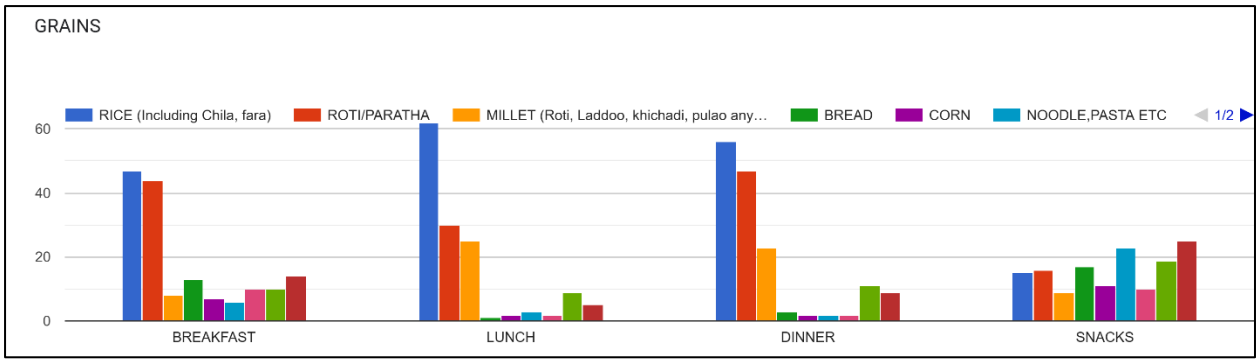


When studying the consumption patterns of the sample population of various food groups, it was observed that Lunch included maximum diverse food groups, while Snacks included the least amount of variety of foods. However, snacks did include the maximum consumption of unhealthy foods such as fried foods and instant foods.

Consumption of foods from various food groups: Grains -The population consumes rice in any of its forms in almost all their meals, especially in the lunch snacks included maximum variety of grains. Rice and wheat dominate majority of meals. Millets consumption has increased in India and Chhattisgarh specially after the drive by the Government to include more and more millets in diets. 46.60% of the population sample in this present data consumed millets in any of its form at least once in their day. 16.26% meals included millets. (Figure 2) Roots and Tubers - Potatoes were a part of majority of diets, especially in lunch. More than half (59.22%) of the sample population consumed potato in lunch. (Figure 3). Only 0.05% of the sample population did not consume any starchy roots and tubers at any of the meals. Beans and Legumes - Beans and legumes consumption by the sample population was subpar, mostly seen in lunch and dinner. 17.5% of the sample population consumed pulses and legumes in two or less meals. Tur dal consumption was seen with the major meals, while consumption of mung and chana dal were consumed majorly in breakfast. (Figure 4). Nuts and Seeds – 17.5% of the population does not consume any sorts of nuts and seeds. 65%, 36%, and 40% of the population consumed peanuts, almonds and cashew on the day before. Consumption of nuts and seeds was observed maximum (74.8%) in breakfast. (Figure 5). Milk and Milk Products - Consumption of milk was observed to be maximum during Breakfast and at the end of the day. Curd is most often consumed in lunch. (Figure 6). Eggs - Majority of the population covered as sample did not consume eggs. Those who did, consumed it majorly in breakfast. About 35% of the breakfasts included eggs in any of its forms. (Figure 7). Meat - Majority of the population covered as sample did not consume eggs. Those who did, consumed it majorly in dinner.

71.85% of the population did not consume meat. (Figure 8). Green Leafy Vegetables - Green leafy vegetables were consumed in all three major meals of the day, mostly in lunch and dinner. Spinach was consumed the most, followed by moringa and then *pyaj bhaji*. Lunch and dinner included a wide variety of green leafy vegetables. (Figure 9). Other Vegetables - Other vegetables were also consumed mainly with lunch and dinner. A wide variety of vegetables are consumed by people of Chhattisgarh. The foods majorly consumed from this food group were tomato, okra, bottle gourd, cauliflower, bitter gourd, etc. (Figure 10). Vitamin-A Rich Vegetables – 77.67% of the population consumed vitamin A rich vegetables in the previous day. 13% of the population's vitamin-A rich vegetables were limited to carrots. (Figure 11). Vitamin-A Rich Fruits – 72.81% of the population consumed vitamin A rich fruits in the previous day. (Figure 12). 84.5% of the population consumed at least one of the vitamin-A rich vegetables or fruits, on the previous day. Other Fruits - 86% of the sample population consumed fruits in the previous day in at least 1 meal. Maximum consumption of fruits was observed during snacks (where 67% of the population consumed fruits) followed by during breakfast (where 66% of the population consumed fruits). A wide variety of fruits were consumed in snacks. (Figure 13).

Figure 2



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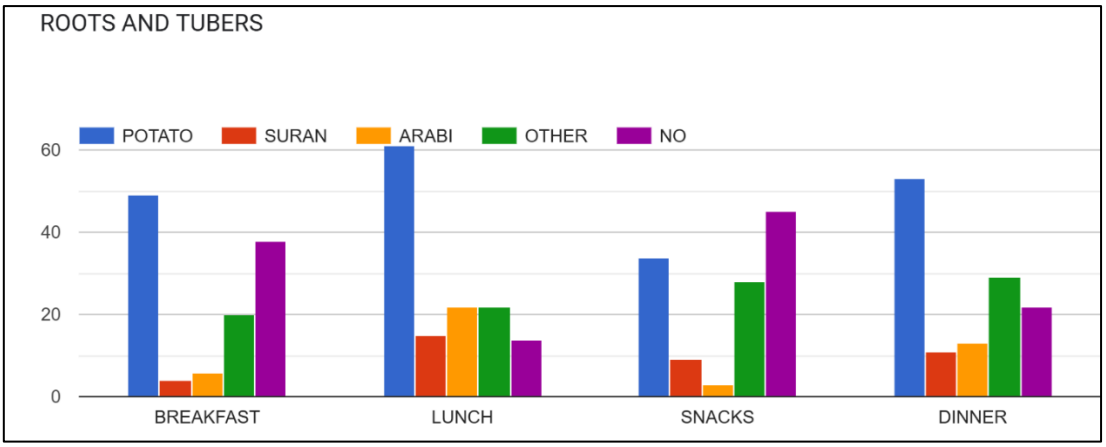

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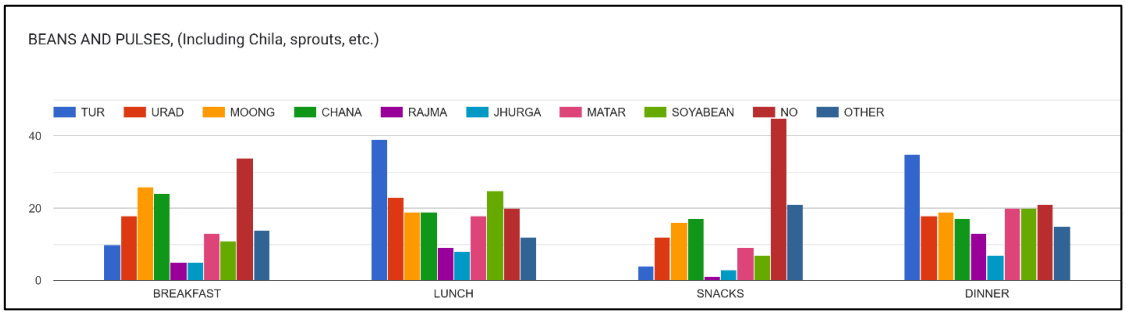

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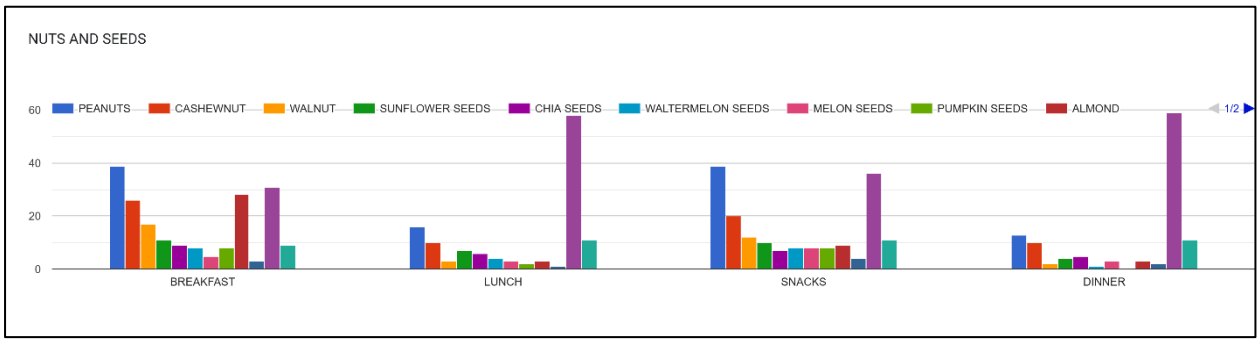

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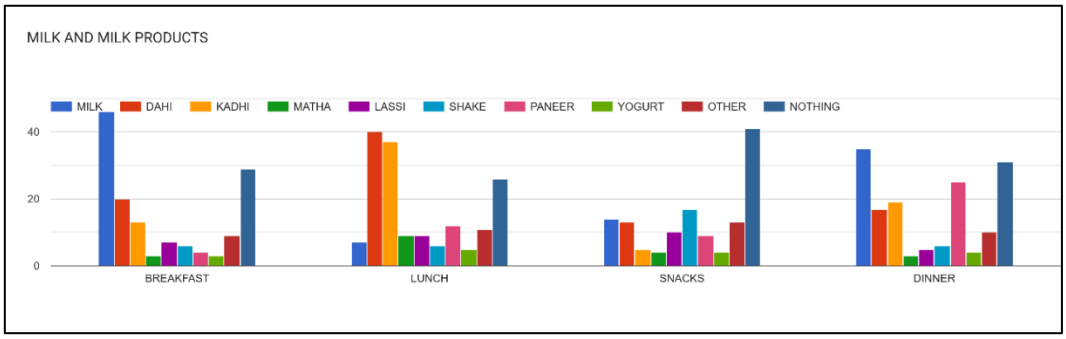

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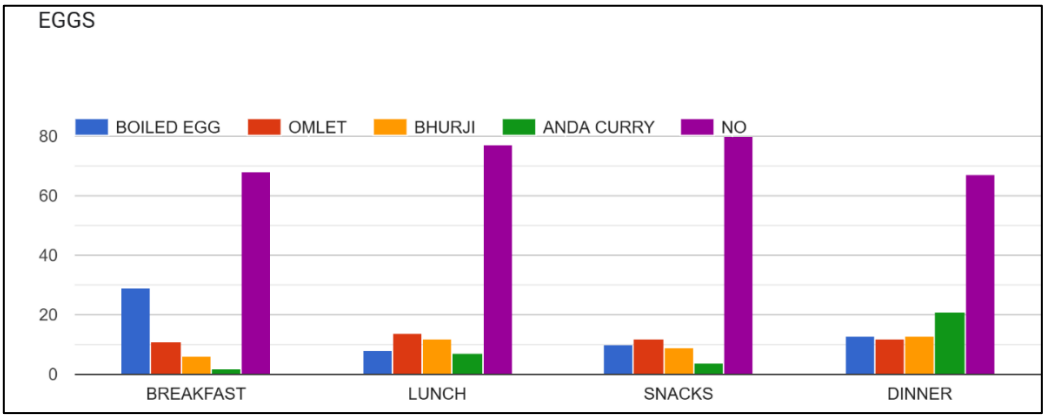

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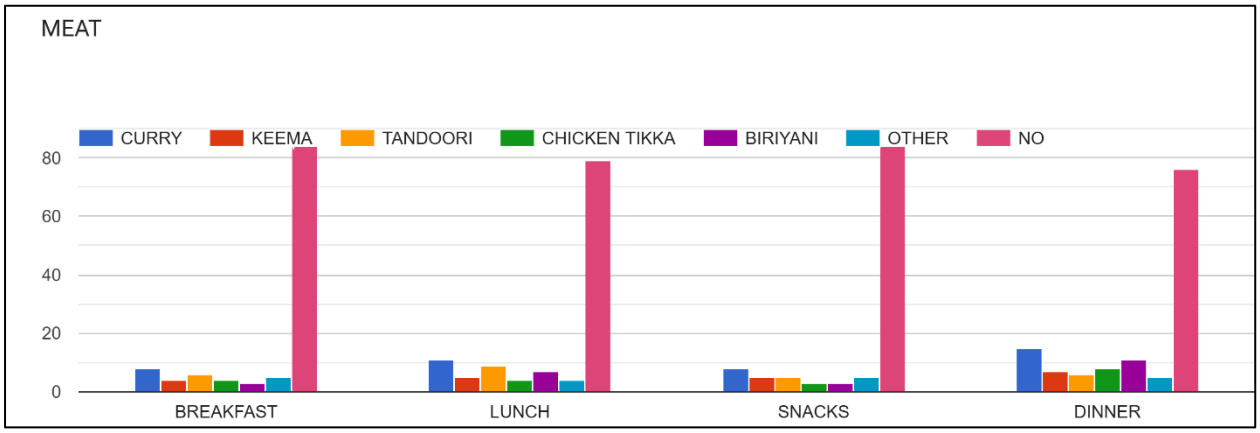

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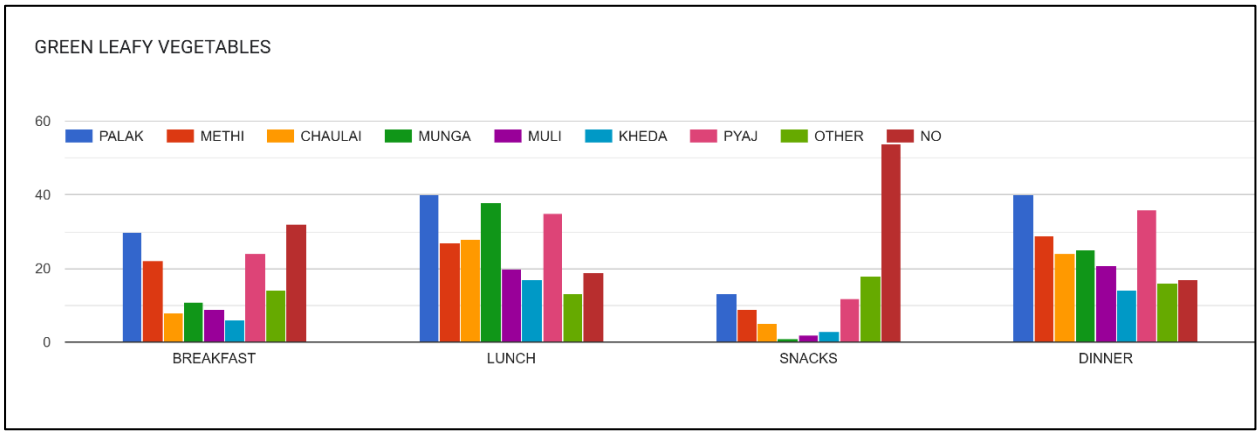

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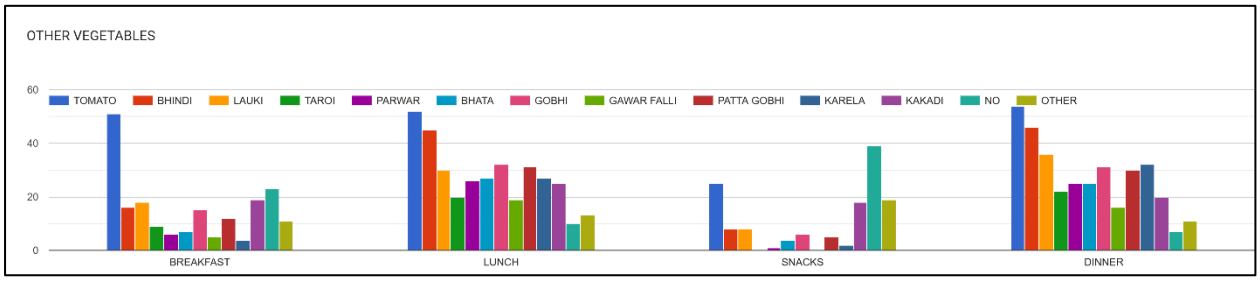

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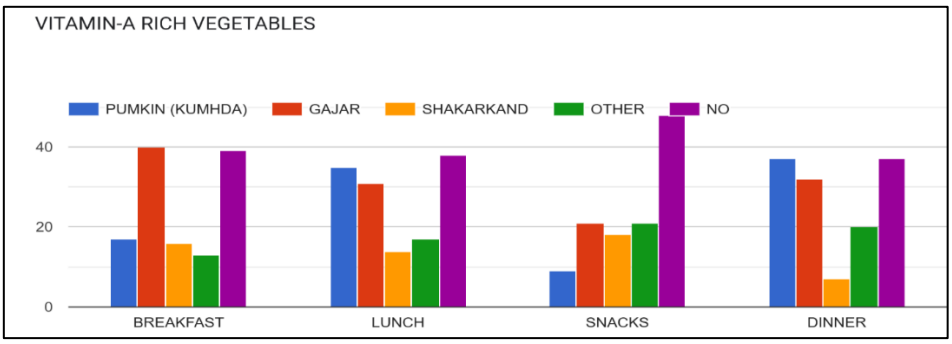

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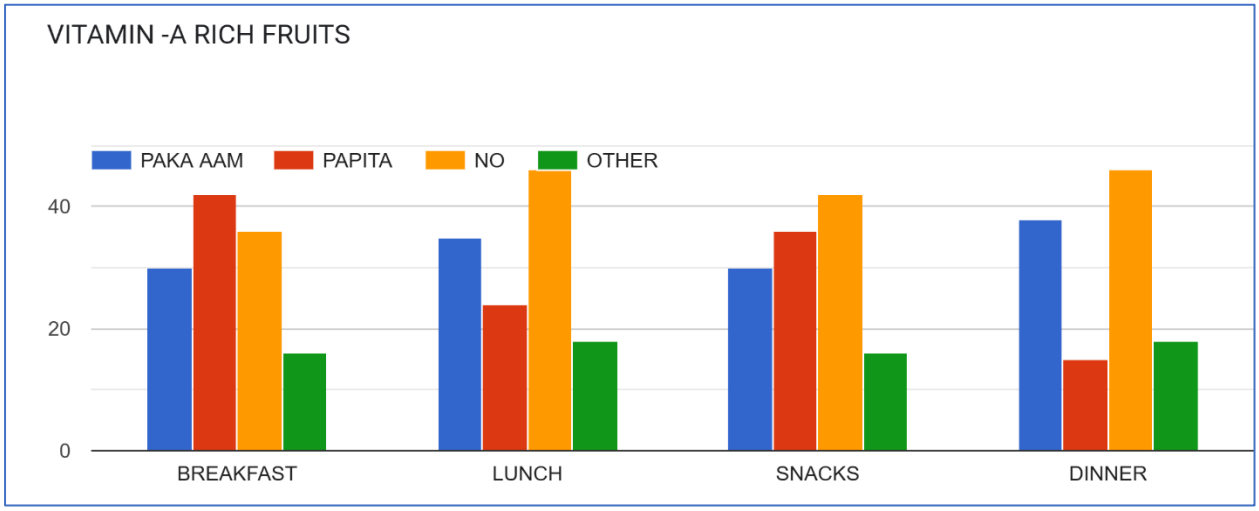

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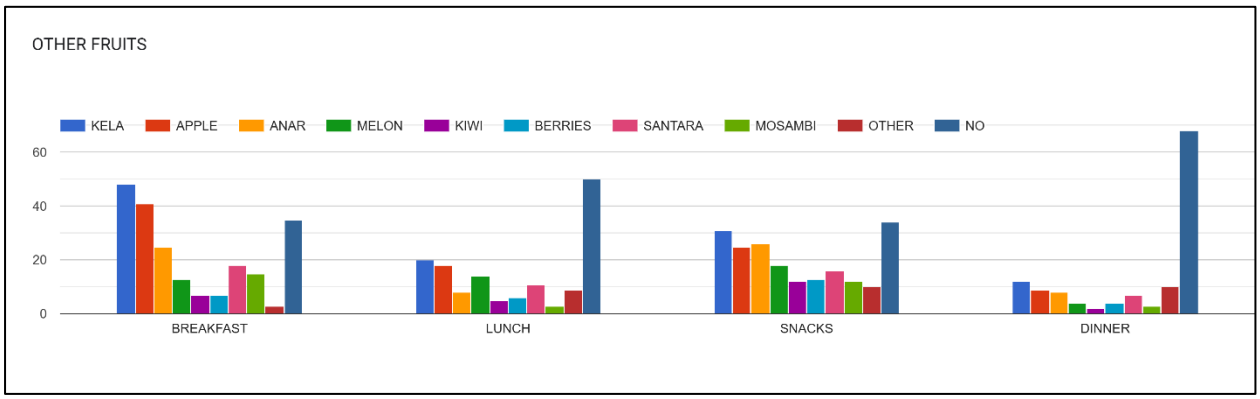
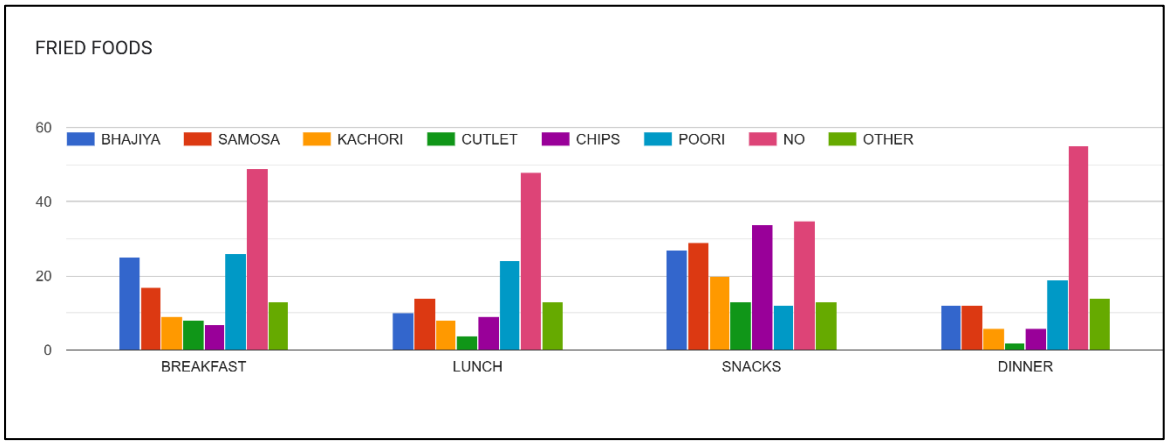


Consumption of unhealthy foods: Fried Foods - Consumption of fried foods was seen least during dinner (49.51% of the population consumed) and maximum as snacks (70.87% of the population consumed). Among the fried foods, the consumption of Poori was observed to be the highest consumed fried foods (19.66%), being included in 81 meals out of 412, followed by bhajiya (18%). (Figure 14). Sweet Foods - Consumption of sweets was seen maximum during snacks. Chocolates were the most consumed sweet. (Figure 15). Instant Foods - Consumption of instant foods was most at the snack time followed by breakfast. Pasta (18%) was the most often eaten instant food, followed by noodles (17.5%). (Figure 16) Sweet Infusions - Tea was the most consumed sweet infused beverage, followed by coffee. (Figure 17). In an average 5.5% of the total food consumed is the deemed unhealthy food.

Figure 14



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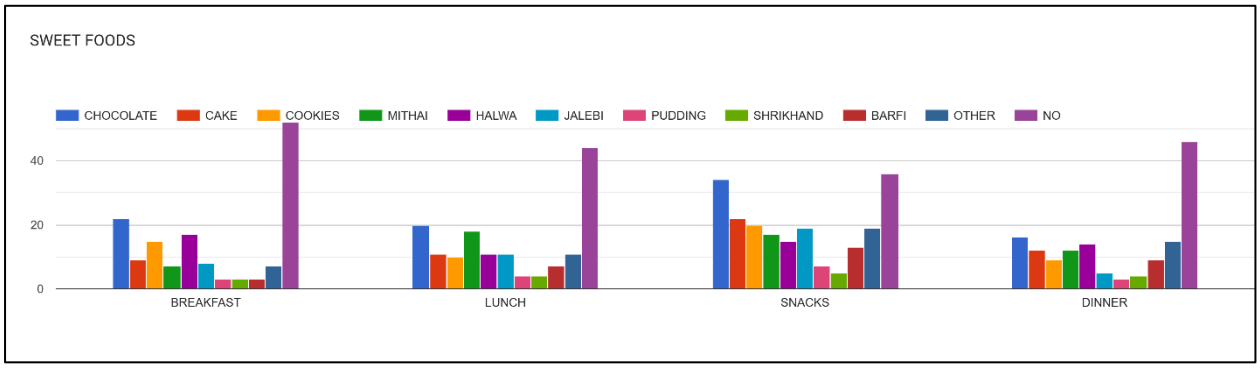

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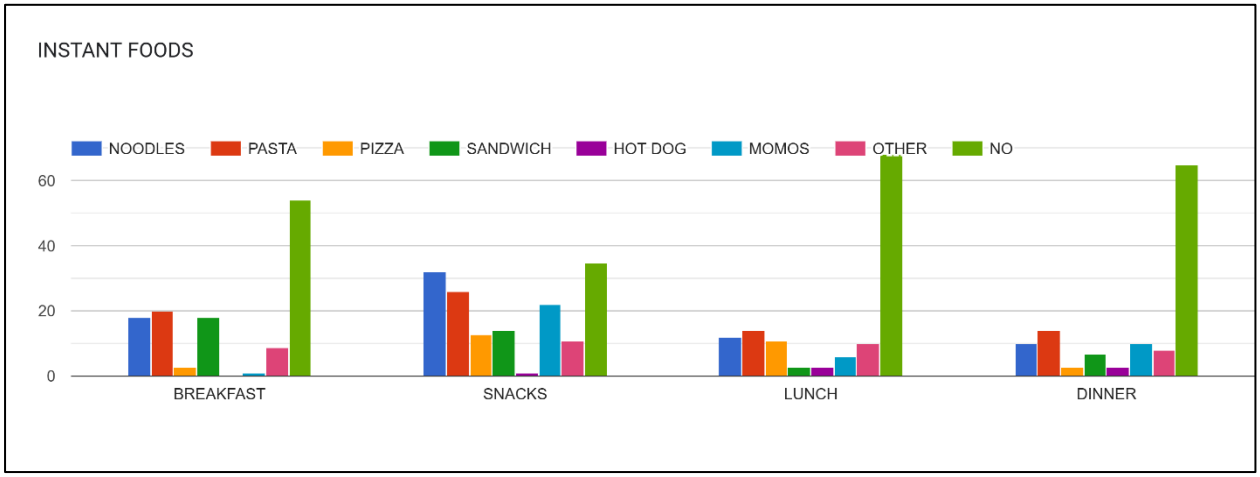

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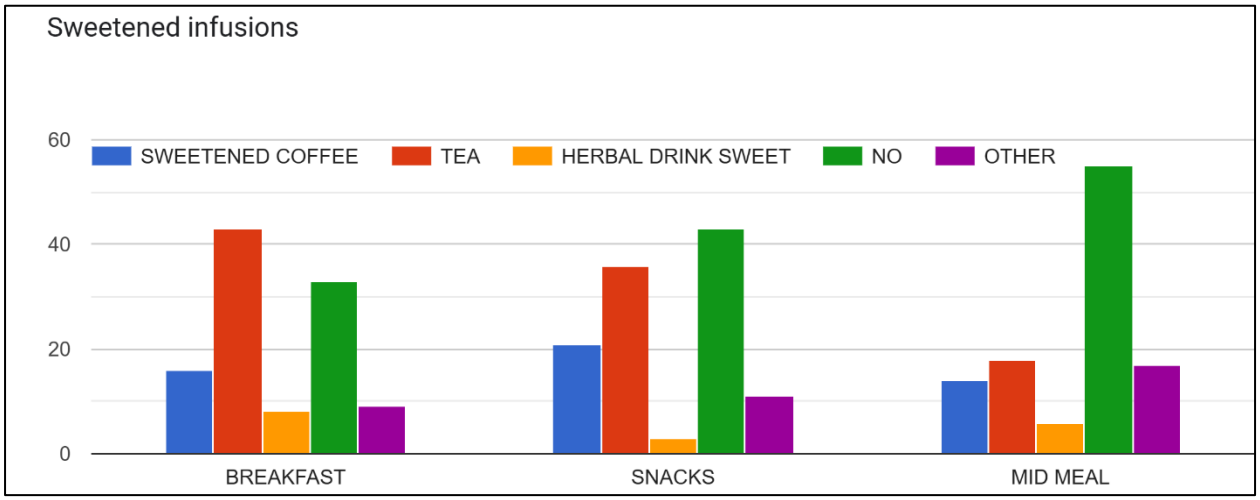

Dietary Diversity Score and Consumption of unhealthy foods: The highest dietary diversity score was observed in the age group 31 to 45. The highest score in consumption of deemed 'Unhealthy foods' was seen in the younger age group between 15 to 30 years of age. (Table 2)

What was expected was the higher the score for dietary diversity, the lower will be consumption of unhealthy foods, which was not true for any of the age groups or the population as a whole (Figure 18 a, 18 b, 18 c, 18 d). The age group 15-30, and 31-45, however, when compared within themselves, showed a high consumption of unhealthy foods with low dietary diversity score in the age group 15-30 years of age, and a low consumption of unhealthy foods and a higher dietary diversity score in the 31-45 years of age group. The age-group 46-60 years, did not comply with this trend, with their lowest dietary diversity, their consumption of unhealthy foods was also the lowest when compared to other age groups. (Table 2)

Figure 18 a

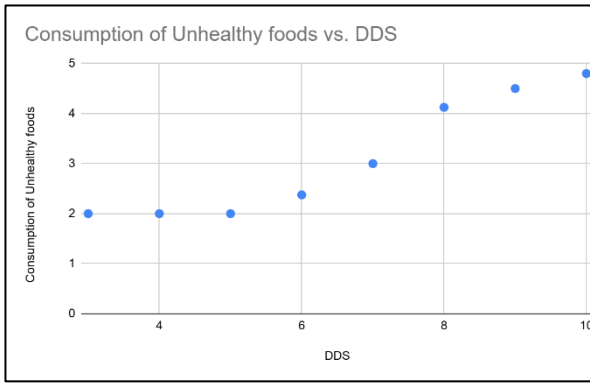

Figure 18 b

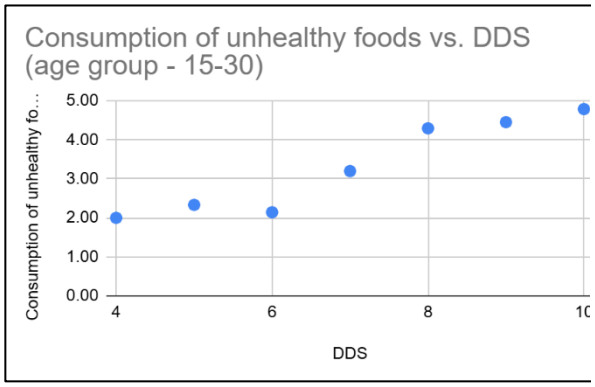

Figure 18 c

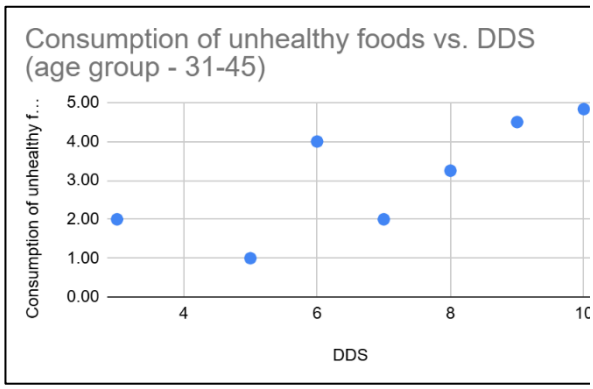

Figure 18 d

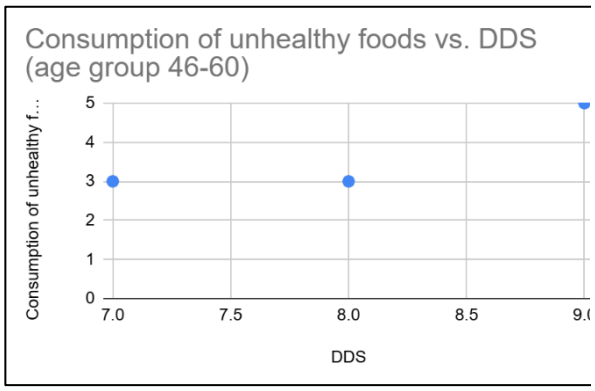

Table 2

Age	Frequency	Average DD Score	Consumption of Unhealthy foods
15-30	82	7.95	3.90
31-45	17	8.12	3.65
46-60	4	7.75	3.50

Overall in the population sample, with increasing dietary diversity the consumption of unhealthy foods also increased. (Figure 18 a)

Contribution of various food groups to total food intake: From the observed data, the composition of the diet of the sample population consists maximum of starchy foods (i.e. grains, roots and tubers) (13.6%), followed by pulses and legumes (12%). Meat and poultry contributed least to the total food intake in the population, i.e. 3.8%. The portion of 'vegetables and fruits' food group took up almost half of the total food intake, in line to what is recommended in the latest Dietary Guidelines for Indians. (Figure 19). Figure 20 and Table 3 represent the dietary intake of various food groups, their contribution in the total food intake and the comparison between what is recommended by the Dietary Guidelines for Indians.

Figure 19

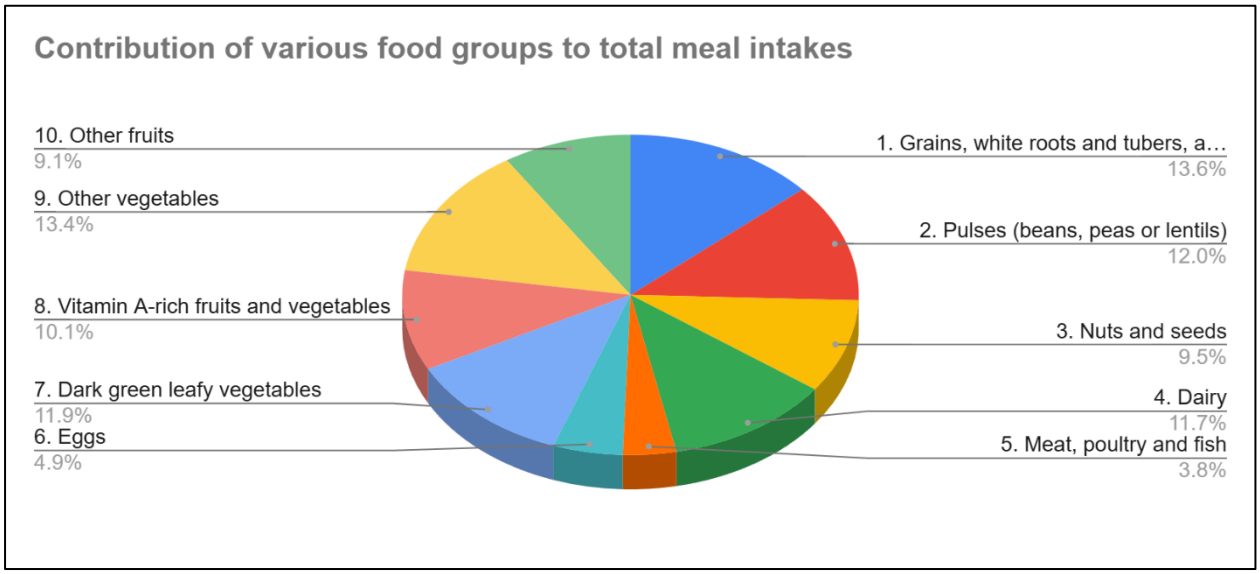

Figure 20

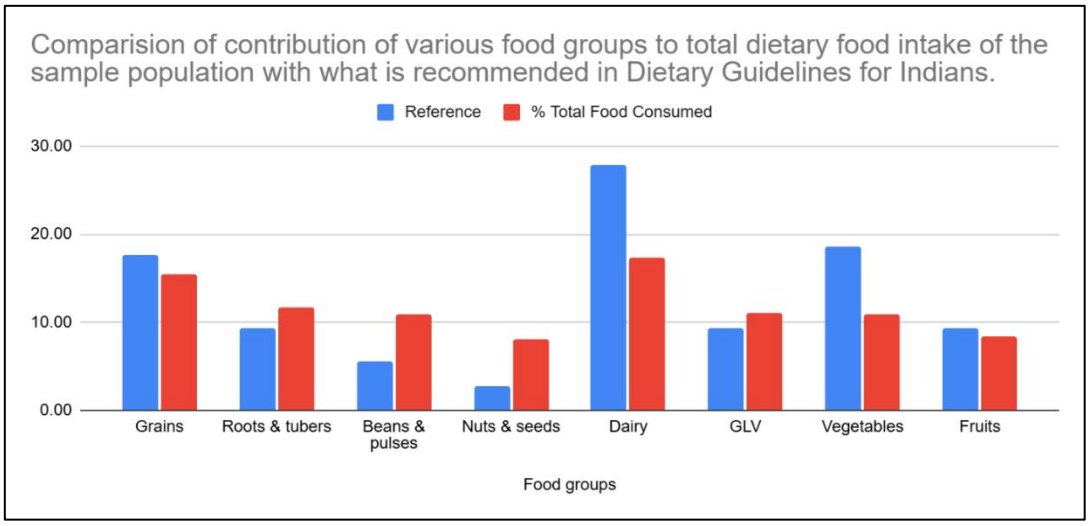

Table 3

Food groups	Reference	% Total Food Consumed
Dairy	27.78	17.34
Vegetables	18.52	10.97
Grains	17.59	15.38
Roots & tubers	9.26	11.65
GLV	9.26	11.00
Fruits	9.26	8.35
Beans & pulses	5.56	10.93
Nuts & seeds	2.78	8.14

Consumption of Roots and tubers, Beans and pulses, nuts and seeds, and Green leafy vegetables was seen higher than recommended by Dietary Guidelines for Indians. Which seems acceptable for green leafy vegetables and roots and tubers, verified from studies done previously. However, for beans and pulses, and nuts and seeds this might not be true, which may be due to the main reason that the data collected is not quantitative about the serving size, and the serving size of nuts and beans and pulses may be lesser than what is recommended. The verification of which is however out of scope of this study. The consumption of Grains, dairy, vegetables and fruits is lower than what is recommended by the Dietary Guidelines for Indians. (Figure 20).

5. Conclusions

Green leafy vegetable consumption by women of Chhattisgarh was decreased from the data collected by NFHS - 5, i.e. NFHS - 5 – 97.3% to MDD-W – 92.2% (*India - National Family Survey 2019-2021*, n.d.). Table 1 shows the comparison of percentage of women's consumption of various food groups between NFHS-5 and the MDD-W survey conducted by us. Out of the sample collected 73.9% people consumed unhealthy foods on daily basis. People with a low dietary diversity score are more susceptible to nutrient deficiency, according to which, our data indicates that about 6% of women of Chhattisgarh are in danger of, if not already suffering from, one or more nutrient deficiencies, specially that of iron (Fe), zinc (Zn) and calcium (Ca). This assumption is supported by data from NFHS-5, that states that 60% of women of Chhattisgarh are suffering from anemia.

Table 1

Food group	NFHS-5 (2021)	MDD-W (2024)
Milk / Curd*	45	95.1
Pulses / Beans	92.4	92.2
Dark green leafy vegetables	97.3	92.2
Fruits*	42.9	86.4
Eggs	39.7	41.7
Fish / Chicken / Meat	34.2	28.2
Fried Foods*	30.5	78.6

* NFHS-5 data represents consumption per week, however MDD-W figures represent consumption for the last 24-hrs. This may be the reason why differences are too large for some food groups.

The work can be done more extensively to include the population who do not have access to smartphones , or are not tech-friendly. Also since diet is also impacted by other factors like income, region, food safety, personal and environmental hygiene, health conditions, etc., these factors could also be studied in further researches, to study their relationship with dietary diversity and their effects.

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