Original Research Article

Comparative Assessment of Dietary Pattern in Marwari Community between Traditional Thali and One Meal Concept

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ABSTRACT

Food is a marker of rich heritage traditions and social identity. India is home to a diversity of regional cuisines that are strongly related to social identity, culture and local agricultural practices. One such is the Marwari ethnic group originating from arid state of Rajasthan, India and is well known for its Marwari thali (plate) cuisine. The identification of dietary patterns relevant to population sub-groups and their possible association with the manifestation of non-communicable diseases and epidemiological profiles is crucial. Hence, the study aimed to analyse the dietary pattern of age-old ethnic Marwari community in comparison to whether the traditional thali system is still prevalent or the one meal concept has replaced it. 156 participants belonging to Marwari community were selected under the study by purposive sampling. Data was collected using Google forms and food frequency questionnaire was used to assess dietary patterns of participants. Statistical analysis was done using SPSS software. It was found that traditional thali was still consumed by 55% of study population and 45% consumed one meal plate. A significant difference was found between traditional thali and one meal plate (p= 0.000) implying that traditional food intake is still prevalent in Marwari community. The results also suggested no significant association between dietary pattern and non-communicable diseases in Marwari community (p ≥ 0.05).

INTRODUCTION

'*Thali*' is the lexical term meaning a large round platter on which meals are served in the indigenous traditional meal pattern of India. It has been aptly described as "visual appetite" by Rane (1). It consists of small bowls (called katori), each containing a unique food item put together to form a single meal. Eating from a thali is quite common in the majority of the Indian subcontinent. Even the modern day restaurants have a *thali* meal on their menu. The thali, often serves as a metonym for an entire meal itself. In Medieval temples and within the elite precincts of cities, thalis made of stone and banana leaves have been discovered which signifies that thalis have been the indigenous traditional meal system of ancient India. The traditional motifs of presenting a thali differ from state to state in India, though the thali remains universal, its contents include various local delicacies. In Southern India, banana leaves are very often used as a traditional thali. It is hygienic, environment friendly and visually appealing (2).

India is home to numerous regional cuisines showcasing the rich culinary diversity. However, some customs remain common

and conventional throughout the nation. For instance, the form of main meals where the thali holds rice or bread and several smaller bowls (katori), which hold a separate condiment or curry to be eaten with the rice or bread at the diner's preference. In a country like India wherein every region has an extensive menu, the best way to discover any local delicacies is to try a thali. One can devour a little bit of everything from the best that a cuisine can provide. Marwari cuisine is one such example. The community belonging to the arid desert of Rajasthan is known as the Marwari community (3). Typical Rajasthani delicacies include Sangari, Kair and Kumatiya, Kachra (Capers), now considered gourmet delights, have provided nutrition for generations in the harsh desert climate. The concept of Marwari Bhojnalaya (meaning vegetarian restaurants) has become widespread around the country and serves vegetarian Marwari food. The past has affected the food regimen because the Rajput community preferred majorly a non-vegetarian diet, and on the contrary the Brahmin, Jains, and others favoured a vegetarian meal. So, Rajasthan has multitude styles of delicacies (4).

Previous national surveys have revealed that Rajasthan is the most vegetarian state as it inhabits 74.9% of vegetarians (5). The cuisine of Rajasthan offers a variety of lip smacking curries and delicacies despite the high spice content in contrast to other Indian cuisines. Most of the Marwari dishes are cooked with pure ghee. In Rajasthan, some desserts are eaten before the meal, with the main course and after the meal also unlike other desserts. The scarcity of water and fresh vegetation in the dry state has an undesirable impact on its cooking. As a result, it is favoured to use milk, butter milk and butter in large quantities to reduce the amount of water while cooking food. Dry lentils and beans obtained from native flora like sangria (*Prosopis cineraria*) are used widely in the preparation of Marwari dishes. A primary ingredient that is used in making some delicacies like pakoda and gatte ki

sabji is gram flour that further adds the protein content into diet. Powdered lentils are generously used in preparing "papad". Marwari cuisine involves a lot of chutneys prepared using various spices like mint, coriander, garlic, turmeric. Out of all the Rajasthani dishes, dal bati churma is exceptionally acknowledged (6).

In today's time, as a result of westernisation, there has been a shift in food culture, dietary consumption patterns and nutritional status. The pattern of the Indian diet has been rapidly modified due to nutrition transition i.e. from traditional thali system to one meal concept. This concept consists of consumption of only a single meal at a time. It has been imbibed from the western dietary system which lacks benefits of consuming all food groups. It is generally high in fat, carbohydrates, sugar, salt and low in fibre. These meals are easy to make and hence have short preparation time. The replacement of traditional home-cooked meals with ready-to-eat, processed foods has contributed to an increased risk of chronic non-communicable diseases in urban Indians. A nutrition transition from whole grains to more refined grains has been seen among vegetarian Indians. The higher carbohydrate, glycemic load and trans-fats intakes lead to increased risk of NCDs such as type 2 diabetes and cardiovascular diseases. Such a nutrition transition is increasing the rate of NCDs even in vegetarians (7).

The quantity, variety and combination on which various foods and beverages are often consumed by individuals on a daily, weekly or monthly basis is referred to as the dietary pattern (8).

Previously, diet and health consequences were correlated by focusing on a particular nutrient or a food. But since the early 2000s, there has been a shift from single nutrients or foods to whole dietary patterns as a way to more broadly represent the complete diet and nutrient profiles. Use of dietary pattern analysis in research has been found to be beneficial because individuals consume a combination of foods and multiple nutrients

rather than eating a single nutrient due to which numerous authors have chosen to explore diet–disease interrelation using overall dietary pattern. Additionally, a dietary pattern of an individual has the ability to showcase stronger association with the health outputs than any of the singular items that contribute to it (9). *A priori* and *a posteriori* are two main methods of analysing dietary pattern. A priori methods usually use ratings or indices to assess how properly the eating regimen has the same opinion with some predetermined 'perfect' weight loss program and are often referred to as 'measures of food plan quality'. A posteriori techniques use statistical strategies to discover patterns inside the examine populace (10).

The invisible epidemic of Non-communicable diseases (NCDs) such as cardiovascular diseases, stroke, cancer, diabetes poses devastating health consequences for individuals, families and communities and threatens the health systems. It is responsible for almost 71% of all deaths worldwide owing to unhealthy diet and sedentary lifestyle (11) and its burden is accelerating (12). Data from the Registrar General of India, World Health Organization and Global Burden of Disease (GBD) Study have mentioned that cardiovascular illnesses (CVD) are the most crucial reasons of mortality and disability (13). Total NCD mortality accounted for 41 million of 55 million global deaths in 2019 and according to WHO (14), 80% of cardiovascular diseases and diabetes mellitus can be prevented. The India Global Burden of Diseases (GBD) Collaborators found that leading cardiovascular diseases-ischemic heart disease and stroke made the largest contribution to the total burden of mortality in India in 2016, at 28·1%. The contribution of cardiovascular diseases to mortality increased by 34.3% (26.6–43.7) from 1990 to 2016 (15).

Apart from genetic, environmental, social and other factors, nutritional or dietary assessment is one of the most important determinants of health status, as it happens to be a major modifiable factor which can be quantified. Dietary assessment allows researchers to analyse the patterns, quantity, quality, total calories, and specific amounts of nutrients and diversity of food consumed by individuals or a population and associate them with the manifestation of non-communicable diseases. Compelling associations between regional Indian diets and highly prevalent cardio-metabolic risk factors, such as abdominal adiposity and hypertension, suggest that many of the unique regional components of Indian diets, such as high-fat dairy, sweets and fried snacks, may be characterizing a high-risk diet (16). Asian Indian women are more prone to develop obesity and other CVD risk factors than men due to increased obesity & adiposity (17). Thus, it has been recommended to adopt healthy cooking methods and reduce fat consumption.

Therefore, through this study, the dietary patterns of Marwari community from Rajasthan were studied as there have been comparatively less number of studies about the dietary pattern of people of this state of India. The objectives of the current study were to compare the traditional Marwari Thali with One Meal Concept and further to determine whether the dietary pattern of Marwari community has possible association with non-communicable diseases. The study of dietary patterns can give a better picture as to what kind of a scenario the health condition of Indian Marwari people has been with respect to changing times.

MATERIALS & METHODS

Rajasthan is the largest and one of the most traditional states of India located in the western zone. Despite its arid geography, a variety of colors can be seen in the traditional thali of Rajasthan. The present study focused on assessing the dietary patterns of people residing in Rajasthan i.e. Marwaris with a comparison between traditional thali and one meal concept. 156 Subjects between the ages of 20 to 50 years were selected by purposive convenience

sampling restricted to Rajasthan. Such an age bracket was selected as during adulthood, most of the individuals form their food preferences and have a defined dietary pattern. Individuals above 50 years start having sensory alterations which consequently influence their dietary patterns. Both male and female genders were included. Subjects who were less than 20 years and more than 50 years old were excluded from the study.

Data was collected using an online structured questionnaire and food frequency questionnaire shared via 'Google Forms' to assess dietary consumption pattern which covered: Socio-demographic data, background data such as date of birth, gender, education qualification, occupation, health and lifestyle data, data related to food preference, any medical condition that persists such as diabetes, hypertension, thyroid, obesity etc., any allergies and the medications taken in order to understand the lifestyle of the subjects. Dietary assessment was done to know the eating pattern.

Food and Nutrition Technical Assistance (FANTA) project (18) was used to include food groups such as Cereals, pulses & legumes, leafy vegetables, roots and tubers, other vegetables, fruits, nuts and seeds, Milk and milk products, beverages, fats and oils, desserts and snacks, fried and processed and baked foods in the FFQ. Indian Food Composition Table (IFCT), 2017 (19) was used to look out for Indian foods to be included in the FFQ. The FFQ was categorised further into two sub-parts:

a. Frequency of traditional Marwari thali consumption, comprising the most popular and commonly consumed foods.
b. b. Frequency of one meal foods, comprising all the food groups : cereals, pulses, legumes, fruits, vegetables, milk and milk products, nuts and oil seeds, Beverages, fats and oils, desserts and snacks, fried and processed and baked foods.

Frequency of consumption on a daily, weekly, monthly and never basis was asked using the detailed questionnaire.

Instructions were provided on the portion size being one portion of cereal and pulse to be 30 grams, one portion of milk to be 150 ml. Subjects were also informed which products came under cereals and pulses. In the last section of the FFQ, three point serving response scales were employed to record the quantity of foods consumed by individuals on average (21). For example, food items like cereals, pulses, vegetable dishes were assessed in katoris (e.g., ½ katori = 1 serving, 1 katori = 2 servings, and 2 katoris or more = 3 or more servings; katori is Indian equivalent of a bowl). For beverage items like coffee, responses were measured in cups (e.g. ½ cup = 1 serving, 1 cup = 2 servings, and 2 cups or more = 3 or more servings). These serving sizes specified in the FFQ did not relate to any national dietary guidelines.

Statistical Analysis
Statistical analysis was done using SPSS software. Statistical tests such as t- test and One Way ANOVA were used to compare means of traditional Marwari Thali and one meal concept and to determine whether the dietary pattern in the Marwari Community could be associated with the manifestation of non-communicable chronic diseases, respectively.

RESULTS AND DISCUSSION
The undertaken study included 60% of females and 40% males. A high literacy level noted in the subjects indicates better knowledge towards food choices in the study. 43.6% of the participants were working or involved in the service sector, followed by 28.2% of college students, 19.2% of homemakers and lastly 9% of them were involved in business. Though the Marwari community is well known to be business oriented, the current study did not have the maximum number of businessmen as its participants. Vegetarian population was 91.7%.

Non-communicable diseases are of major concern in today's sedentary lifestyle. Medical history consisting of non-

communicable diseases is one of the important factors in research to know the medical condition of the subjects. 85.9% of the participants did not report having any NCDs, 5.1% participants had thyroid; 1.9% had hypertension and obesity. 1.3 % reported to have diabetes. This result indicates that most of the subjects were in a good health condition i.e. they reportedly did not have any non-communicable disease. 82.1% of Marwari people consumed breakfast daily while 17.9% were noted to skip breakfast. This indicates that a high percentage of subjects knew the importance of consuming breakfast. Furthermore, 95.5% of subjects consumed lunch and 96.2% consumed dinner. Hence, healthy dietary habits could be observed in the study population.

55 % of the study participants reported to follow Traditional Marwari Thali on a daily basis, while 45% reported to have one meal at a time which is near to the average number. One meal plate concept is based on the western diet patterns in which only 2 or 3 food groups are combined to make a single meal. 95% of participants preferred homemade traditional thali over restaurant traditional thali. Among 75% of the study participants, consumption of light meals was observed, followed by 13% who consumed frequent small meals and 12 % consumed heavy meals in a day. In the study, 77.6% respondents reported to perform some exercise on a daily basis as compared to 22.4% who reportedly did not do any exercise. 51% did brisk walking followed by yoga (31%), outdoor sports activities (7%), resistance training and aerobics (4%) and endurance training (3%).

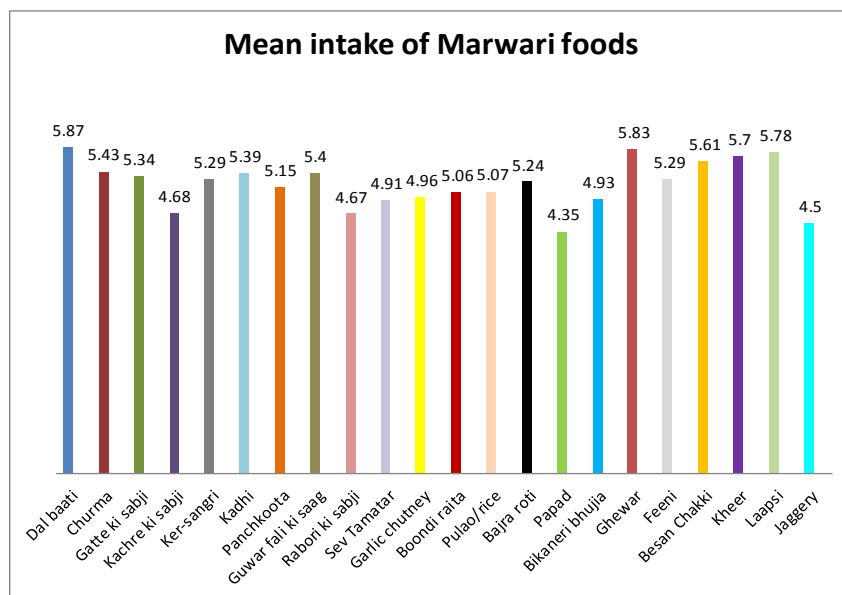## 1. Traditional Marwari Thali –

Figure 1: Various Components of Traditional Marwari Thali

Fig 1 revealed that the mean intake of protein rich traditional Marwari foods was quite high. Reportedly, dal-baati (5.87 ± 2.48) was consumed the maximum. Since the main ingredients of dal baati are wheat flour (cereal) and lentils such as black gram and rajma (pulses), it is a source of complete proteins primarily for the vegetarian population. Also, a lot of ghee goes into making the dough balls, baatis which are enriched in fat and provide insulation in winters. Smaller portions of the dal and baati tend to provide satiety owing to its high protein content. Consumption of other protein rich foods such as guwar fali ki sabji /beans (5.40 ± 2.63), Gatte ki sabji

(5.34±2.51) which is made of pulses/ besan, Kadhi (5.39±2.24) that is made of buttermilk, ker siani/ beans (5.29 ± 2.87) are also high and at par with each other. Most of the traditional Rajasthani dishes are made of pulses as there has always been a paucity of vegetation in the desert region and therefore the diets are traditionally high in protein. '*Boondis*' are fried droplets of besan added into curd or raita. Reportedly, a high consumption of Boondi Raita (5.06 ± 2.51) as observed in table 4.3.1b. It might be due to its cooling mechanism on the palate along with the spicy Marwari cuisine dishes. Curd being a good probiotic also aids in better digestion. Furthermore, garlic is well known to have cholesterol lowering properties thus reducing the risk of heart diseases. Garlic chutney forms an integral part of the Marwari Thali as a side dish and its mean intake in the study population was found to be moderately high (4.96 ± 2.73). The cholesterol and blood pressure lowering benefits of garlic in the form of chutney pairs well with the saturated fat- *ghee* made Marwari foods. The high intake of healthy traditional Marwari foods indicates the awareness and liking of the subjects for

ethnic foods. The least consumed traditional thali food was observed to be '*paapad*' (4.35 ± 2.82). Marwari thali is incomplete without sweets and dessert to satiate the palate after eating a heavy and spicy traditional meal. In the study, high mean consumption of '*Ghewar*' was also noted (5.83 ± 2.51) which is made with refined flour, *desi ghee*, milk, saffron, cardamom powder and sugar, followed by '*Laapsi*' (5.78 ± 2.57) which is prepared with broken wheat sautéed in ghee and sweetened. '*Churma*' is prepared by crushing wheat flour and adding sugar and ghee. It is mainly relished with dal baati. Mean intake of churma (5.43 ± 2.76) was also found to be high since the Marwari study population reportedly consumed more dal baati as compared to remaining dishes. Other Rajasthani sweet delicacies such as besan chakki, kheer, laapsi are made of cereal-pulse combination, milk, ghee, siani, thus adding the extra calories and protein to thali diet. Jaggery (4.50 ± 2.48) was found to be the least consumed sweet food item of Traditional Thali diet even though it has high iron content (4.6 mg/100g, IFCT, 2017) and is advised to be eaten in anemia.
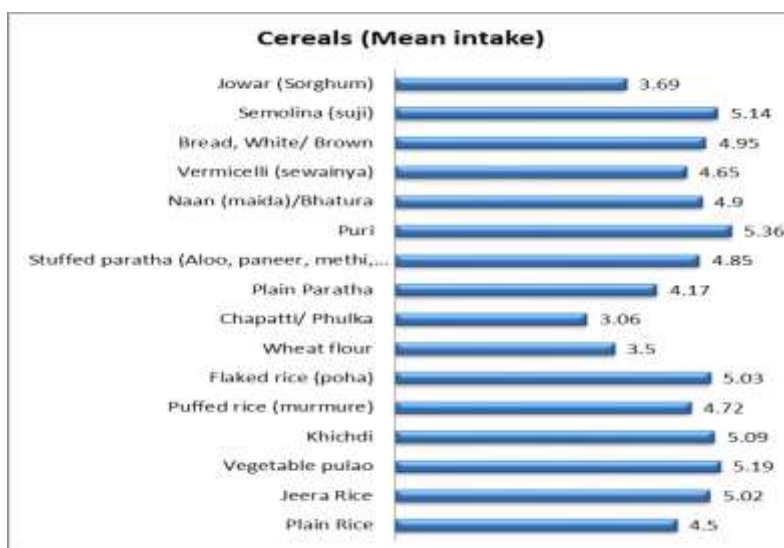
2. One Meal Plate Concept-

Figure 2a: Intake of Cereals by participants

From the fig.2a, data shows that Marwari study group had the highest mean consumption of Puri (5.36 ± 2.38) followed

by vegetable pulao (5.19 ± 2.37) and semolina /suji (5.14 ± 2.48) whereas chapatti/ phulka was reportedly the least

consumed out of all the cereals (3.06 ± 2.42). This result implies that the Marwari community prefers to eat more of the traditional puris and less number of chapattis indicating that they follow traditional thali system. However, whole wheat and white rice intake was reported to be the highest among all the cultural groups

and most commonly consumed cereal, due to nutrition transition that had led to increased risk of developing diabetes, hypertension and obesity which began to dominate the globe (23). Reverse results have been observed in the current study assessing the dietary patterns particularly in Marwari ethnic group.
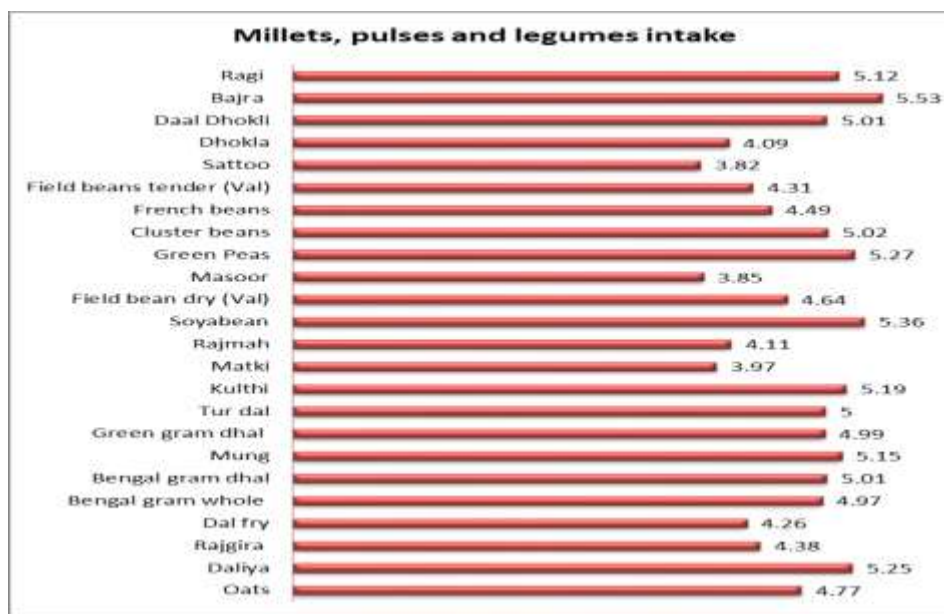
Figure 2b: Intake of Millets, pulses and legumes by participants

From the above figure 2 b it was observed that in the Marwari subjects' consumption of pulse was high as maximum intake of Bajra was seen (5.53 ± 2.58) followed by soybean (5.36 ± 2.52). The least consumed pulse was matki (3.97 ± 3.12).

A meta- analysis study in 2014 suggested that consumption of dietary pulses (median dose 130 g/d, about 1 serving daily) reduced LDL- with 0.17 mmol/L, over a median

follow-up of 6 weeks and Levels of apolipoprotein B and non-HDL were not significantly affected, although only few studies reported these values. Since most of the included trials were of low methodological quality, the effect of dietary pulses led confirmation in longer, better designed trials, which should also measure apolipoprotein B and non-HDL (24)
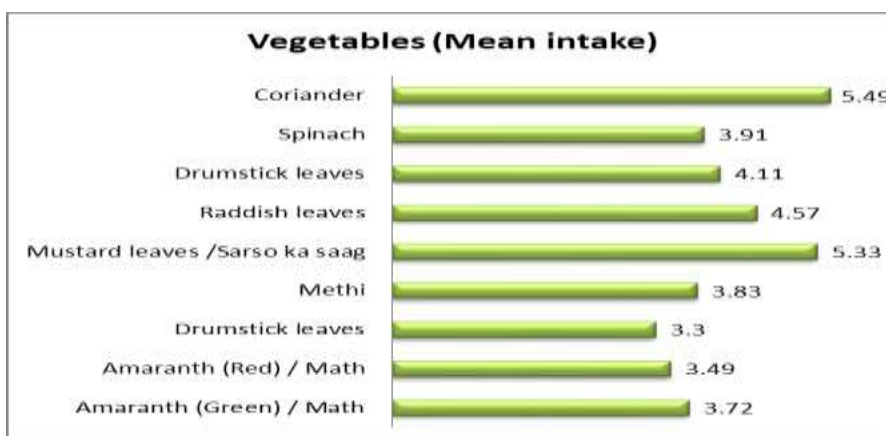

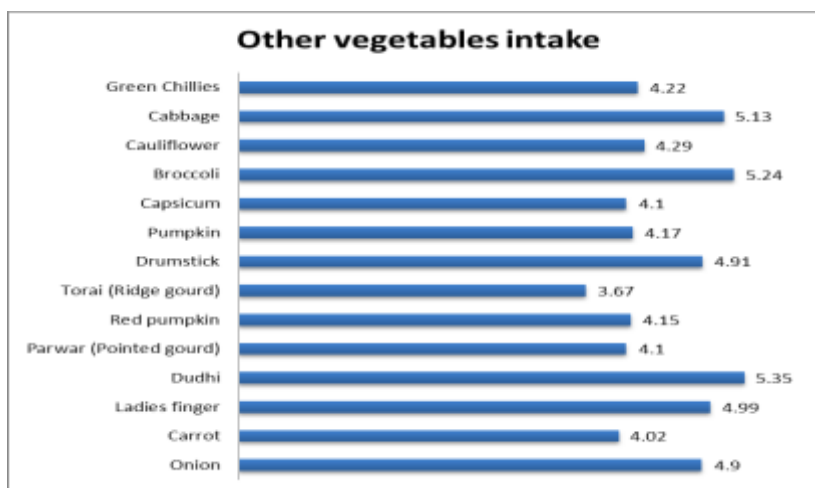**Figure 2 c I: Intake of Green Leafy Vegetables by participants**

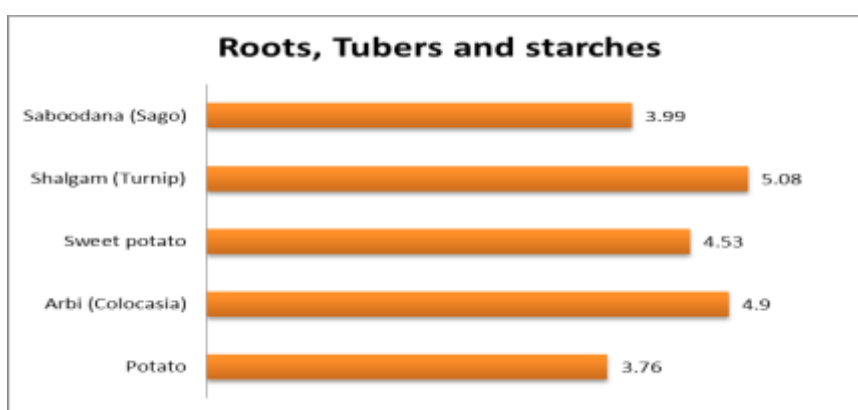**Figure 2 c II: Intake of Other Vegetables by participants**

Figure 2 c III: Intake of Roots, Tubers and starches by participants

From the figures 2 c I and 2 c II, it was observed that the coriander (5.49 ±2.37) and dudhi (5.35 ± 2.18) consumption was found to be the highest and most commonly consumed. The frequency of consumption of other vegetables such as sarso (mustard leaves), turnip, tomato, cabbage and broccoli were seen to be high. Drumstick leaves (3.3 ± 3.20) were found to be the least consumed.

According to a large-scale prospective cohort study, higher intake of fruits and vegetables was associated with a lower risk of hypertension and High intake of fruits and vegetables, as part of overall healthy dietary pattern, might only contribute a modest beneficial effect in hypertension prevention (25).
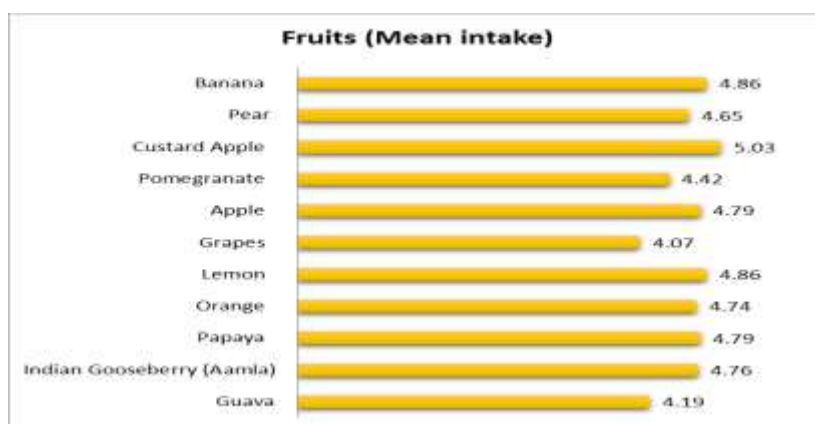

Figure 2d: Intake of Fruits by participants

From the above figure 2d, statistics showed that the consumption of custard Apple (5.03 ± 2.29), Banana (4.86 ± 2.61) and lemon (4.86 ± 2.32) was found to be the highest followed by papaya, amla, orange, and pear. Furthermore, eating more fruits and vegetables reduced the risk for heart disease, stroke and helped to manage body weight when consumed in place of more energy-dense foods and it was recommended that increased attention to food environments in multiple settings, including child care, schools, communities, and worksites, might help improve fruit and vegetable intake, and thus help prevent chronic disease (26).
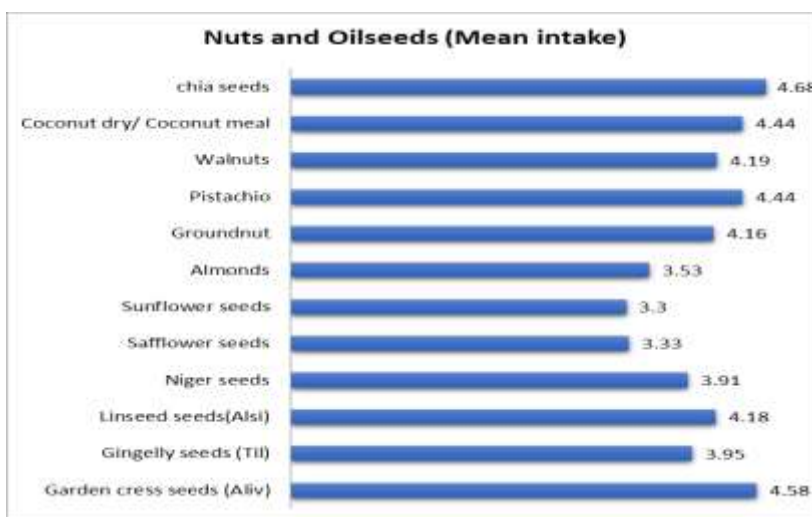

Figure 2e: Intake of Nuts and oilseeds by participants

It was observed from the figure 3.2e that the study group reportedly has the highest consumption of chia seeds (4.68 ± 2.7) followed by Garden cress seeds/Alive seeds (4.58 ± 2.5). A study by Grancieri et al, 2019 (27) stated that the consumption of chia seed (*Salvia hispanica* L.) has increased due its high content of omega-3 fatty acids and dietary fiber. It also has a high concentration of proteins and essential amino acids, becoming a promising source of bioactive peptides. Garden cress seeds have been implicated in the treatment and management of a plethora of diseases such as asthma, pain, inflammation, nociception, blood coagulation, oxidative stress, anuresis, and related disorders due to presence of various phytochemicals namely, alkaloids, flavonoids, cardiotonic glycosides, coumarins, glucosinolates, saponins, sterols, sinapic acid, tannins, triterpene, and uric acid (28).
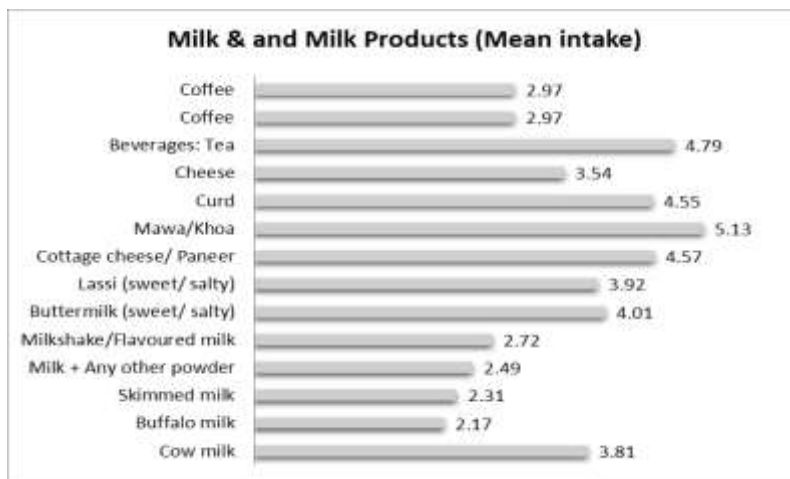

Figure 2 f: Intake of Milk and milk products by participants

From the figure 3.2 f, it was evident that the Marwari subjects reportedly had the highest mean intake of mawa/khoa (5.13 ± 2.60) which is widely used in preparing desserts, followed by tea (4.79 ± 2.74), paneer (4.57 ±2.8) and curd (4.55 ± 3.04). The least consumed dairy in the Marwari group was found to be buffalo milk (2.17 ± 2.16).

A study by Satija et al in 2015 showed an inverse association between daily milk intake and obesity suggesting that dietary patterns characterised by high milk intake might lower the risk of obesity in adult Indians (29). Dairy and milk consumption was included as important components in a healthy balanced diet and it was the first food of mammals that provided energy and nutrients to ensure proper growth and development, epidemiological studies confirmed the nutritional importance of milk in the human diet and reinforced the possible role of its consumption in preventing several chronic conditions like cardiovascular diseases (CVDs), some forms of cancer, obesity, and diabetes (30)
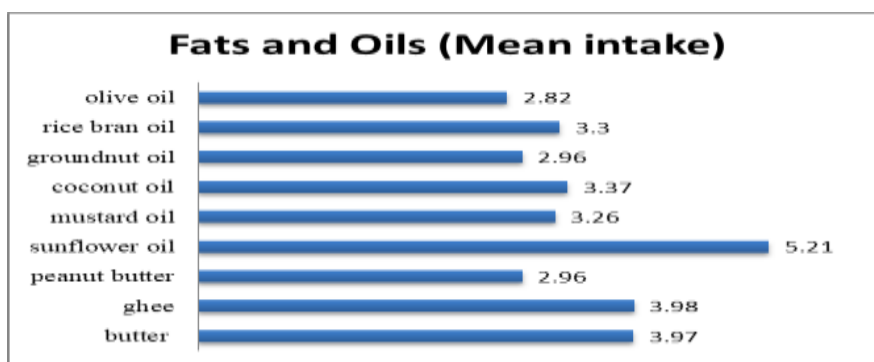

Figure 2 g: Intake of Fats and oils by participants

The above figure 2g clearly depicted that sunflower oil (5.21 ± 2.77) consumption was the highest in the Marwari community followed by ghee (3.98 ±2.88) and butter (3.97 ± 2.95). The least consumed fat and oil were found to be groundnut oil (2.96 ± 3.1) and peanut butter (2.96 ± 2.55).
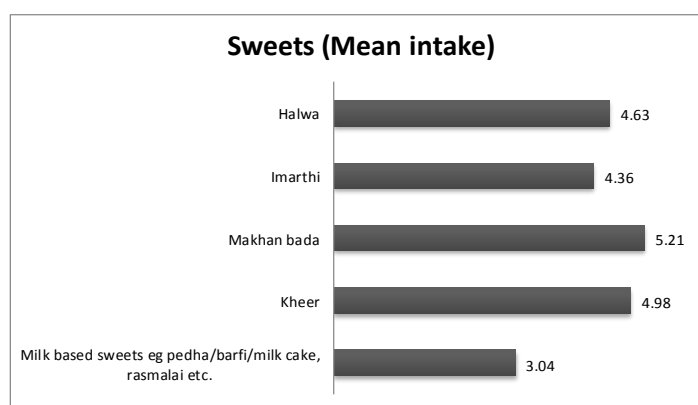

Figure 2 h: Intake of Sweets intake by participants

It was understood from the statistical figure 2h that the Marwari ethnic subjects reportedly consumed considerably high amounts of sweets and desserts, out of which the highest mean intake was of Makhan *bada* (5.21 ± 2.79) followed by kheer (4.98 ±), halwa (4.63 ± 3.07) and *imarthi* (4.36 ± 3.17). It was found that limiting sugar consumption was very important as sugars were found to have no nutritional value except for calories and could have negative health implications (31).
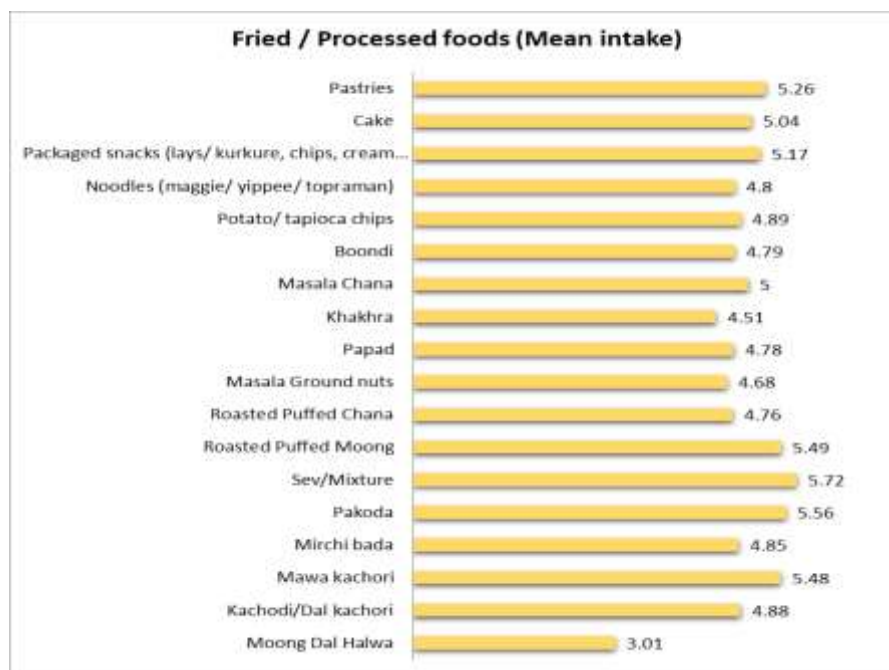
Figure 2 i: Intake of Fried/ Processed foods by Participants

From figure 2 i, fried food consumption of subjects was noted to be on a higher side, sev mixer was reportedly consumed the highest (5.72 ± 2.5), pakoda (5.56 ± 2.62), roasted puffed moong (5.49 ± 2.59), and Mawa Kachori (5.482 ± 2.64). However, multiple cross-sectional studies had also linked the consumption of fried foods to an increased likelihood of cardio metabolic risk factors such as body weight and obesity, hypertension and low serum HDL cholesterol (32) and also it was observed that frequent fried-food consumption was significantly associated with risk of incident Type 2 Diabetes and moderately with incident Coronary Artery Disease, and these associations were largely mediated by body weight and co- morbid hypertension and hypercholesterolemia (33).

3. Comparison between Traditional Marwari Thali with One Meal Concept

Table 3: Comparison between Traditional Marwari Thali with One Meal Concept using T test

		Sample	Mean ± standard deviation	t-value	Sig. (2-tailed)
Pair 1	Traditional Marwari Thali	156	5.20 ± 1.8	7.33	.000**
	One Meal Concept	156	4.42 ± 1.6		

Table 3 depicted that mean frequency of Traditional Marwari Thali consumption was 5.20 ± 1.8 whereas the mean frequency of intake of One Meal Concept was 4.42 ± 1.6. The comparison between traditional Marwari thali and one meal concept was highly significant. (t value= 7.33 and p value = 0.00) which implies that traditional thali diet is still followed by Marwari community.

Traditional thali concept is principally nutrient rich and energy dense. Therefore, high physical activity level should also be considered at such increased daily energy intake to keep metabolic syndromes at bay. One Meal Concept includes easy making single meals which are an outcome of the modern western diet patterns, generally declines in the big traditional joint family culture as there is more of thali diet consumed by all. The gatekeepers of the family, who take food related decisions of the house, are concerned for health of the other family members.

4. Association of Dietary Pattern in the Marwari Community with the manifestation of Non-Communicable Chronic Diseases

Table 4: Effect of dietary pattern on NCDs

NCDs	No. of Subjects	Mean ± standard deviation)	Mean Square	F-value	Sig.
None	134	728.45 ± 264.64			
Diabetes	2	782 ± 49.50			
Hypertension	3	579.33 ± 316.74	32096.81	0.476	0.794
Thyroid	8	669.38± 183.29			
Obesity	3	620.33 ± 194.66			
Others	2	851.5 ± 160.51			
Total	152	722.59 ± 257.53			

As observed in table 4, statistics showed no significant association between dietary pattern and NCDs such as diabetes, hypertension, obesity, and thyroid in Marwari Community under this study (p value >0.05). Such a result implies that since the dietary pattern in Marwari community is predominantly a thali diet, along with some form of daily physical activity, the manifestation of non-communicable diseases is low.

CONCLUSION

Statistical analysis showed no significant association between the observed dietary pattern in the Marwari participants was not associated with non-communicable diseases (p>0.05). Thus, it was concluded that the predominant dietary pattern in the Marwari community is the traditional thali diet, along with some form of daily physical activity; the manifestation of non-communicable diseases was found to be low. The study can be used as a reference for future studies having larger sample size from urban and rural to understand dietary patterns of Marwari population as a whole. Longitudinal studies can confirm NCDs in this community. Since most of the participants followed a light meal dietary pattern, hence lower incidence of NCDs was noted in the study population.

Conflict of Interest: None

Ethical Approval: Approved

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