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Diet and Nutritional Status of Tribal's in North Western Part of Nashik District, Maharashtra (India): Using GIS Techniques

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A B S T R A C T

Background: An individual's health is largely determined by nutrition, and nutrition is determined by diet, which consists of a variety of food items. As a result, eating a well-balanced and healthy diet is the single most significant element in achieving and maintaining good. The health of an individual depends to a large extent on nutrition and nutrition depends on diet, which consists of various articles of food. Hence balanced and nutritious food is the most important single factor in connection with the attainment and maintenance of health. Objective: 1) To study Nutritional deficiency disorders among the tribal population. 2) To study the composite nutritional value as per the given Weightage. 3) To examine the pattern of diet and nutrition and their availability and intake in study regions. Methods: Statistical and cartographic techniques have been used for the research work to precise conclusions. Per head per day availability foodstuff stuffs like, cereals, pulses, milk, vegetables etc. has been finding out and shown through PHC wise isopleths maps. PPHC-whisper head per day consumption has been calculated through the sample village survey. A total of 115 villages are chosen, and 23 villages from the list of ITDP villages have randomly chosen in each tehsil. By using a probability proportional to the size of the various tribes, a total of 10 households (HHs) from each chosen village have been covered. Result: The cumulative nutritional values of cereals are derived from the total of all weight ages measured so far. The composite nutrient values for cereals were 14.72 in Peint tehsil. This method was used to quantify the composite nutrient value for pulses, edible oil, milk, vegetables, and fruits. The cumulative composite value of Peint tehsil was 67.22 when the composite nutrition values were added together. The table shows the cumulative composite nutrition values measured on a tehsil-by-tehsil basis. Conclusion: The indigenous inhabitants of the study region eat jowar, maize, wheat, and bajara as their major foods. Despite the fact that the terrain is conducive to rice farming, they still consume rice on occasion. Pulses are a staple of indigenous people's diets, which they consume on a daily basis. However, they consume very little fat-containing foods such as oil and milk in their regular diet. Similarly, just a small percentage of households include fruits and vegetables in their daily diet. These people are unable to acquire such expensive items due to their poverty. The general nutritional status is measured by computing composite nutrition values. For the entire region, the average composite nutrition value is 74.81.

Introduction

Tribal communities are economically and socially disadvantaged and secluded from the general population. They often stand out from other demographic groupings due to their environment and eating habits. Their eating habits are governed by the whims of nature and range from severe food shortages during the lean season to substantial intakes of a variety of meals during the post-harvest period. There are many factors that contribute to the development of different morbidities and under nutrition, including geographic isolation, primitive agricultural practices socio-cultural taboos, a lack of formal education, inadequate infrastructure facilities, improper health-seeking behaviour, poverty, etc. (Suryawanshi and GavitChhaya, 2012) The Indian government has been implementing a number of programmes under the Tribal Sub-Plan (TSP) approach for the uplift of the tribal inhabitants in order to minimise this. Areas covered by the ITDA have more than 50% of a tribal population, while areas with lower proportions are covered by the modified area development strategy (MADA). The population's nutritional condition is mostly dependent on how much food is consumed in accordance to its demands, which is in turn impacted by food availability and purchasing power. Diverse tribes have different socioeconomic circumstances, such as different agricultural practises and occupational profiles, which are influenced by the ecosystems in which they dwell.

Food and diet are often used interchangeably; although this isn't always the case. Food is a composite mixture of different ingredients, the amount of which can range from a fraction of a gram to hundreds of grams in certain situations. Anything that can be used as food is how the word foodstuff is described. Nutrition, on the other hand, refers to a complex mechanism in which the food, we eat is used to nourish our bodies. (Brock, 1961) A healthy diets is one that includes all of the vital nutrients that the body requires to adequately control all of its functions. Since no single food item contains all of these nutrients in the correct proportions, a varied diet is necessary. In this segment, an effort is made to investigate the overall state of the diet eaten by families in the region's tribal areas. Families from different villages were surveyed for this purpose using questionnaires that included details about which household's food.

Study Region

The study area is located in the north-western part of the Nashik District. It extends from 19^0 44' 57" to 20^0 43' 55" north latitudes and 73^0 14' 05" to 73^0 06' 57" east longitudes. Study area covers an area of 4581.98 sq. km., which is 29.40 % of the geographical area of the district. It is surrounded by Deola and Chandwad tehsil in the east and the north-east, Gujrat state in the north, Palghar districts of Maharashtra State to the south-west, Igatpuri tehsil to the south. It consists of 05 tehsils, namely Peint, Dindori, Surgana, Kalwan and Trimabkeshwar. The population of the region is 976092. It includes 760 villages and 40 PHC.

The primary goal of this study is to evaluate the health status due to food and Nutrition in the tribal of north-western part of the Nashik District. The following objectives are kept in mind in order to achieve the study's goal. To study the Nutritional deficiency disorders among the tribal population. And to study the composite nutritional value as per the given Weightage. Also to examine the pattern of diet and nutrition and their availability and intake in study regions.

Materials and Methods

Samplings

The statistical and cartographic techniques have been used for the research work to precise conclusions. Per head per day availability of food stuffs like, cereals, pulses, milk, vegetables etc. has been find out and shown through PHC wise isopleths maps. PHC wise per head per day consumption has been calculated through the sample village survey.

A total of 115 villages are chosen, and 23 villages from the list of ITDP villages have randomly chosen in each tehsil. By using a probability proportional to the size of the various tribes, a total of 10 households (HHs) from each chosen village have been covered. For this reason, households in each village are divided into groups based on tribe, and the necessary numbers of households from each tribe are included in the survey. The poll is conducted over a 12-month period to capture seasonal change. Due to a lack of data, information on these factors at the tribal level could not be obtained directly from secondary sources, necessitating a detailed fieldwork in 115 villages and 1140 households.

Results and Discussion

Weightages according to calories and percentage of families using different food products is allocated to calculate the tehsil-wise composite nutritional value. The weightages assigned to each object are listed in the table below.

Consumption of Cereals

Cereals make up the majority of people's normal diets. Carbohydrates are mostly obtained from them. In the tribal areas, Rice, Nagali, Jawar, Wheat, Bajara, and other cereals are consumed. During the fieldwork, the heads of the household are asked about their cereal use. The proportions of cereal-consuming families are determined based on their responses, and the results are shown in table no 5

Figure No. 2A is indicating that, rice is a staple food for these individuals. However, the all tehsils, such as Peint, Dindori, Surgana, Kalwan and Trimbakeshwar have a higher proportion of rice-eating households (more than 70 %). More than 800 mm of rain falls in the selected part of the country. Rice is consumed by more than 70% of families in the same belt on a regular basis. Similarly, the tribal areas, which include Trimbakeshwar and Surgana Tehsils (100%), have a large proportion of rice-eating families.

This belt contains vast villages and agricultural area favourable for rice production. The citizens have enough money to buy rice. In the study area in mountainous area, the proportion of families eating jawar, bajara, and wheat is lower; however, the proportion of families eating rice is higher. Rice has a protein content that ranges between 6% and 9%. Rice protein is thought to be of superior consistency. It's high in 'B' group vitamins, especially thiamine. It is vitamin 'A' and 'C' deficient. Rice is a weak source of calcium and iron in terms of minerals.

Wheat is the second most common cereal consumed by tribal people. Wheat has a protein content ranging from 9 % to 16 %. It also contains 71.2 % carbohydrates, 5.0 milligrams of niacin, and minerals (1.5. m. g.). About 69.4 % of the total number of surveyed PHCs said they consume wheat in their diet. Wheat-eating families are significantly more numerous in tribal tehsils such as Dindori, Peint, Surgana, Kalwan and some portion of Trimbakeshwar. In the study region, this is a major wheat-producing belt. These Tehsils have a stronger agricultural growth. The proportion of wheat-consuming families is slightly lower in the tribal regions

Bajara becomes a food source for 36% of the total number of surveyed PHCs. Bajara is the only tehsil of which almost all of the surveyed families use it as a staple meal. With the exception of this tehsil, people in the rest of the research area consume relatively little bajara.

In bajara, the protein content ranges from 10% to 14%. Bajara is high in vitamins B and C, as well as minerals like calcium and iron. The residents of the tribal region eat jawar as their main dish. Around 25% of the PHCs questioned eat Jawar as part of their daily diet. Figure no 2. A show that, in all health facilities, the proportion of tribal families who consume Jawar is less than 5%. In some parts of the research area, particularly in places with primary health facilities such as kulwandi and jogmodi, the proportion of families who consume Jawar ranges from 15 to 25%. Similarly, in ware

PHC, the percentage of families who consume Jawar ranges from 25 to 35. 25 percent of Jawar-consuming families live in the area ranging from Peint to Trimbakeshwar.

Furthermore, indigenous people in all of the tehsils studied consume less jawar. Jawar has a protein content that ranges from 9 to 14 %. Carbohydrates are mostly obtained from jawar. Per 100 grammes of Jawar, about 72.6 grammes of carbs are acquired. Other chemical components found in Jawar include protein (10.4 grammes), calcium (25 m.g.), and iron (5.8 m.g.).

Nagali is the fourth most common cereal consumed by tribal people. One of the most nutrient-dense cereals is finger millet. About 5–8% protein, 1–2% ether extractives, 65–75 % carbs, 15–20 % dietary fibre, and 2.5–3.5 % minerals are found in finger millet. About 26.2 % of the total number of surveyed PHCs said they consume nagali in their diet. Nagali-eating families are significantly more numerous in tribal tehsils such as Trimabkeshwar, Peint, Surgana, Kalwan and some portion of Dindori. In the study region, this is a minor Nagali-producing belt. These tehsils have a stronger agricultural growth. The proportion of Nagali-consuming families is slightly lower in the tribal regions. Ragi, scientifically known as 'Eleusine coracana,' is a nutrient-dense cereal crop. Ragi has a variety of nutritional benefits for your body. Ragi intake has a number of health benefits, including lowering the risk of heart disease, improving digestion, and managing diabetes. One of the most nutrient-dense cereals is finger millet. About 5–8% protein, 1–2% ether extractives, 65–75 % carbs, 15–20 % dietary fibre, and 2.5–3.5 percent minerals are found in finger millet. Finger millet has the greatest calcium (344 mg) and potassium content of all the grains and millets (408 mg). The cereal has a low-fat level (1.3%) and is mostly made up of unsaturated fat. The energy content of 100 grammes of Finger millet is around 336 Kcal on an average. About 19.2 % of the total number of surveyed PHCs said they consume Ragi (Nachani) in their diet. Ragi-eating families are significantly more in tribal tehsils such as Surgana, Trimbakeshwar, Peint and some portion of Kalwan.

Legumes (Pulses)

For the bulk of the tribal population, pulses are an essential source of protein. They are made up of different types of grains (Dals), peas, and beans. Pulses have a protein content ranging from 13% to 25%. In particular, pulses are more effective in helping people overcome protein deficiency. Pulses are a staple of the tribal diet. Pulses are high in iron and contain a number of vitamins such as Riboflavin and Thiamine. (See the table no 6)

Figure no 2B clearly shows that, pulses such as Math, Chawali, Gram, Moog, Udid, Toor are commonly consumed in their daily diet. Toor is one of the key ingredients in the everyday diet of more than 91.6% of the families polled. Moog is consumed by about 89.6 % of the overall studied households. However, in economically established tehsils such as Peint the proportion of families who consume moog is lower. Math and Udid are also in higher demand among tribals. The Math market belt stretches from Peint to Trimbakeshwar Tehsil, as seen in the table. Udid use by surveyed families is higher in the Peint and Dindori tehsils, where it accounts for more than 85% of families. The research region's Dindori and Peint tehsils have the highest concentration of Chawali-consuming families. Gram is consumed by about 41.8 % of the overall studied households. Better soils are needed for the growth of Gram. The tehsils of Dindori, Surgana and Kalwan have a lot of these kinds of soils. Other areas of the soils are infertile, which may explain why a smaller proportion of families consume gram on a daily basis.

Table.1 Weightages Given to Various Food Items According to Per 100% of Families Using them and Calories they Contain**.**

Sr. No.	Food Items (Cereals)	Weightages	Sr. No.	Food Items (Pulses)	Weightages
1	Bajara	10	1	Gram	10
2	Jawar	08	2	Chawali	09
3	Wheat	06	3	Udid	09
4	Rice	06	4	Moog	08
5	Nagali	04	5	Math	08
6	Nachani	04	6	Toor	07
			7	Other	06

Source: Computed by Researcher, 2020-21

Table.2 Weightages Given to Edible Oils and Milk According to their Per Month Per Head Consumption

Sr. No.	Per day family quantity of edible oil	Weightages	Sr. No.	Per day per family quantity of milk	Weightages
1	Family not consuming	00	1	Family not consuming	00
2	0.5.kg	02	2	250 mm	02
3	1 kg	04	3	500 mm	04
4	1.5 kg	06	4	750 mm	06
5	2 kg	08	5	1 litter	08

Source: Computed by Researcher, 2020-21

Table.3 Weightages Given to Vegetation and Fruits According to the Proportion of Family are consuming them

Sr. No.	Per day per family consumption of Vegetables	Weightages	Sr. No.	Per day per family consumption of fruits	Weightages
1	Less than 100 gms	01	1	Less than 100 gms	01
2	250 gms	02	2	250 gms	02
3	500 gms	04	3	500 gms	04
4	750 gms	06	4	750 gms	06
5	1 kg	08	5	1 kg	08

Source: Computed by Researcher, 2020-21

Table.4 Weightages Given to Meat According to Per Day per Family Consumption

Sr. No.	Per day per family consumption of meat	Weightages
1	Nil	00
2	0.5 kg	02
3	1 kg	04
4	1.5 kg	06
5	2 kg	08

Source: Computed by Researcher, 2020-21

Table.5 North-western part of the Nashik District: Tehsil-Wise Proportion ofFamilies Having Consumption of Cereals to Total No. of Surveyed Families, 2020-21

Sr. No.	Tehsils	% of families consuming cereals					
		Rice	Wheat	Bajara	Nagali	Jowar	Nachani
1	Peint	90	80	12	35	15	18
2	Dindori	70	90	65	05	45	-
3	Surgana	100	85	30	28	25	38
4	Kalwan	70	80	58	15	35	12
5	Trimbakeshwar	100	12	18	48	05	28
Region		**86**	**69.4**	**36**	**26.2**	**25**	**19.2**

Source: Data collected during the fieldwork, 2020-21

Table.6 North-western part of the Nashik District: Tehsil-Wise Proportion of Families Having Consumption of Pulses to Total No. of Surveyed Families, 2020-21

Sr. No.	Tehsils	% of Families Consuming Pulses						
		Toor	Moog	Math	Udid	Chawali	Gram	Other
1	Peint	70	75	87	95	78	15	28
2	Dindori	98	92	65	88	95	38	43
3	Surgana	90	89	100	75	68	42	53
4	Kalwan	100	92	87	62	62	52	35
5	Trimbakeshwar	100	100	89	75	70	62	45
Region		**91.6**	**89.61**	**85.6**	**78.4**	**74.6**	**41.8**	**40.8**

Source: Data collected during the fieldwork 2020-21

Table.7 North-western part of the Nashik District: Tehsil-Wise Proportion of Families Having per Head per Month Consumption of Edible Oil, to Total No. of Surveyed Families, 2020-21

Sr. No.	Tehsils	Per head per month consumption of edible oil					
		Nil	0.5 kg	1 kg	1.5 kg	2 kg	%
1	Peint	13	40	30	17	-	100
2	Dindori	09	36	27	13	15	100
3	Surgana	06	50	25	10	09	100
4	Kalwan	10	47	27	13	03	100
5	Trimbakeshwar	20	53	27	-	-	100
Region		**11.6**	**45.2**	**27.2**	**10.6**	**5.4**	**100**

Source: Data collected during the fieldwork, 2020-21

Table.8 North-western part of the Nashik District: Tehsil-Wise Proportion of Families Having Per Day Consumption of Milk to Total No. of Families Surveyed, 2020-21

Sr. No.	Tehsils	Per day Consumption of Milk (in m litters)				
		Nil	250	500	750	1 litter
1	Peint	44	18	11	5	22
2	Dindori	18	36	18	18	09
3	Surgana	22	40	11	10	07
4	Kalwan	13	47	14	13	13
5	Trimbakeshwar	41	12	6	18	23
Region		**27.6**	**30.6**	**12**	**12.8**	**14.8**

Source: Data collected during the fieldwork, 2020-21

Table.9 North-western part of the Nashik District: Tehsil-Wise Proportion of Families Having Per Head Per Month Consumption of Vegetables and Fruits to Total Number of Surveyed Families.

Sr. No.	Tehsils	Vegetables					Fruits				
		Less than 100 gms	250 gms	500 gms	750 gms	1 kg	Less than 100 gms	250 gms	500 gms	750 gms	1 kg
1	Peint	20	47	20	13	-	27	47	10	10	06
2	Dindori	-	10	37	23	30	24	28	31	10	07
3	Surgana	46	19	11	16	08	30	10	30	20	-
4	Kalwan	12	27	12	27	22	40	20	20	20	-
5	Trimbakeshwar	17	33	33	09	08	30	29	25	11	05
Region		**19**	**27.2**	**22.6**	**17.6**	**13.6**	**30.2**	**26.8**	**23.2**	**14.2**	**3.6**

Source: Data collected during the fieldwork, 2020-21

Table.10 North-western part of the Nashik District: Tehsil-Wise Proportion of Families Having Per Month Consumption of Meat to Total No. of Surveyed Families 2020-21.

Sr. No.	Tehsil	Per Month Consumption of Meat				
		Nil	0.5 kg	1 kg	1.5 kg	2 kg
1	Peint	-	20	53	14	13
2	Dindori	18	36	27	11	08
3	Surgana	09	25	27	22	17
4	Kalwan	23	20	23	14	10
5	Trimbakeshwar	-	12	24	29	35
Region		**10**	**22.6**	**30.8**	**18**	**16.6**

Source: Data collected during the fieldwork, 2020-21

Table.11 North-western part of the Nashik District t: Tehsil-Wise Composite Nutrition Values for Various Food Items 2020-21.

Sr. No.	Tehsils	Cereals	Pulses	Oil	Milk	Meat	Vegetation	Fruit	Total
1	Peint	14.72	36.61	3.32	2.86	4.4	2.72	2.69	67.22
2	Dindori	19.9	42.27	3.78	3.24	3.1	5.46	3.2	80.95
3	Surgana	18.74	41.67	3.32	2.4	4.26	2.88	3.7	76.97
4	Kalwan	18.68	39.96	3.04	3.32	2.96	4.52	2.8	75.28
5	Trimbakeshwar	11.96	44.07	2.14	3.4	5.74	3.33	2.94	73.58
Region		**16.8**	**40.92**	**3.12**	**3.04**	**4.09**	**3.78**	**3.06**	**74.81**

Source: Computed by Researcher, 2020-21

Fig.1 Location Map

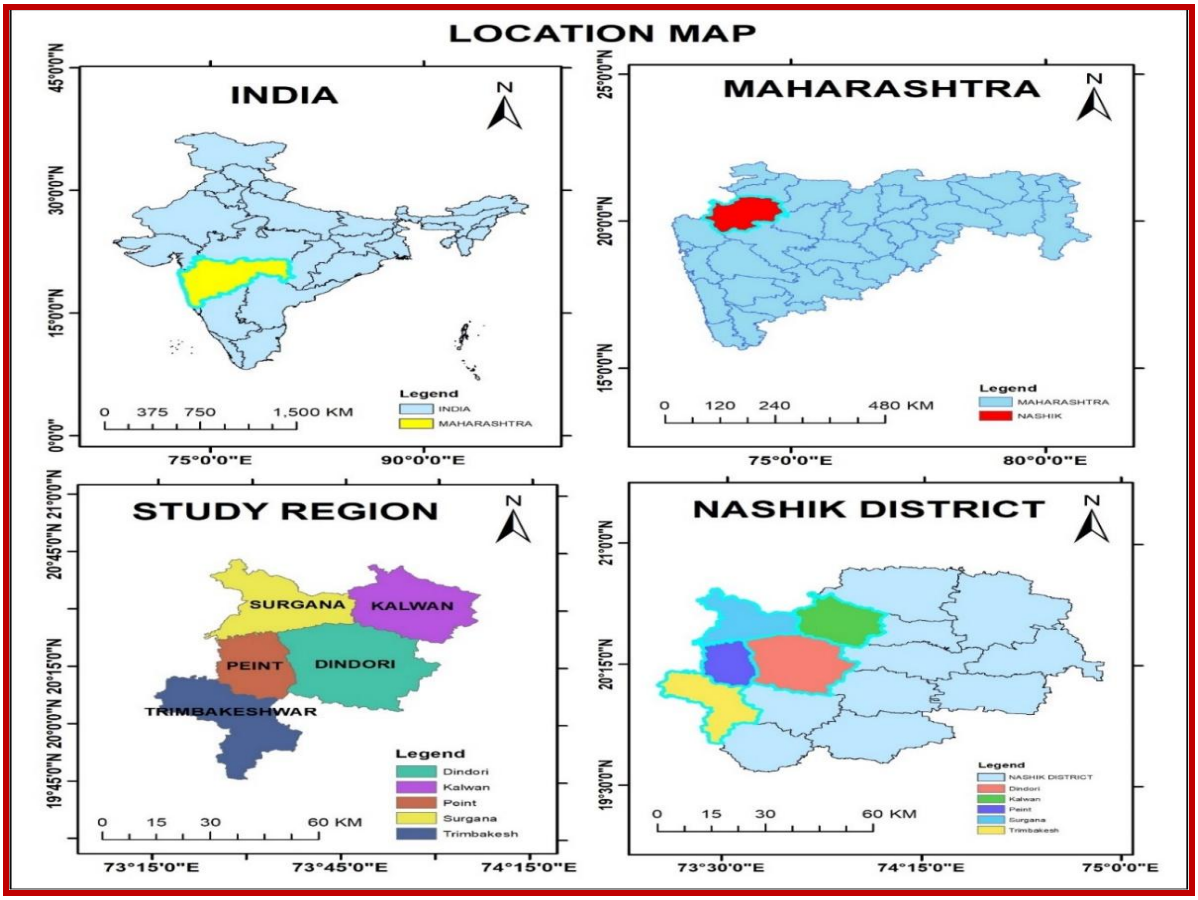


Fig.2A Cereals Food Items

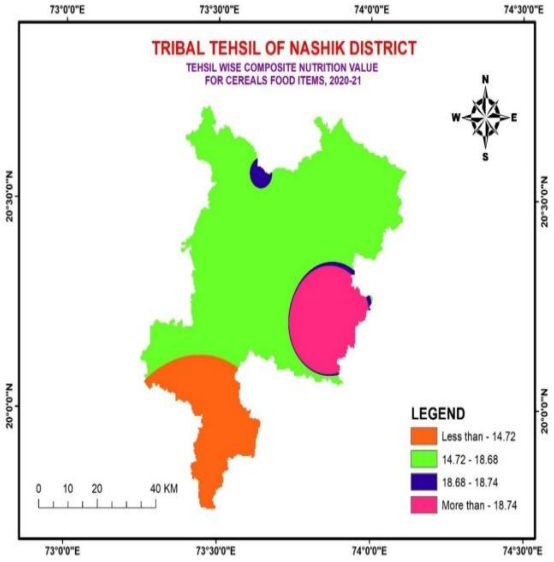


Fig.2B Pulses Food Items

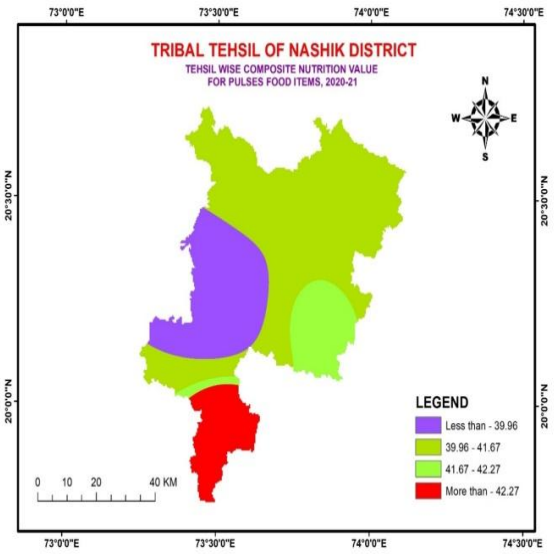


Fig.3A Edible Oil Food Items

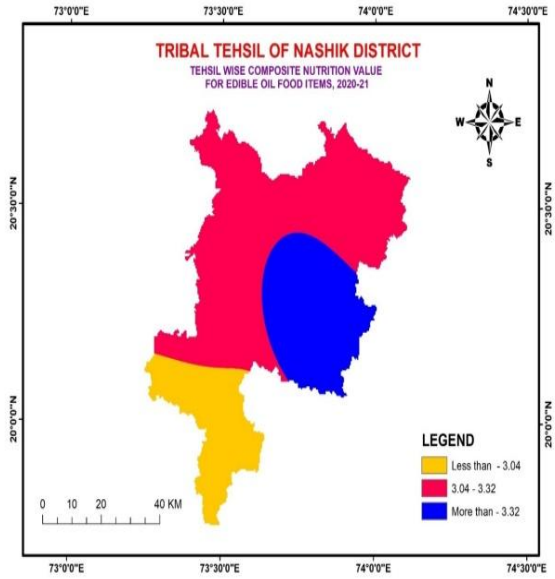


Fig.3B Milk Food Items

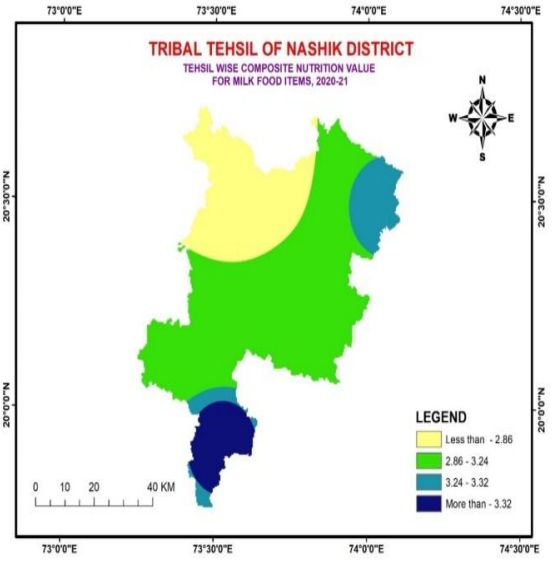


Fig.4 Consumption of Edible Oil

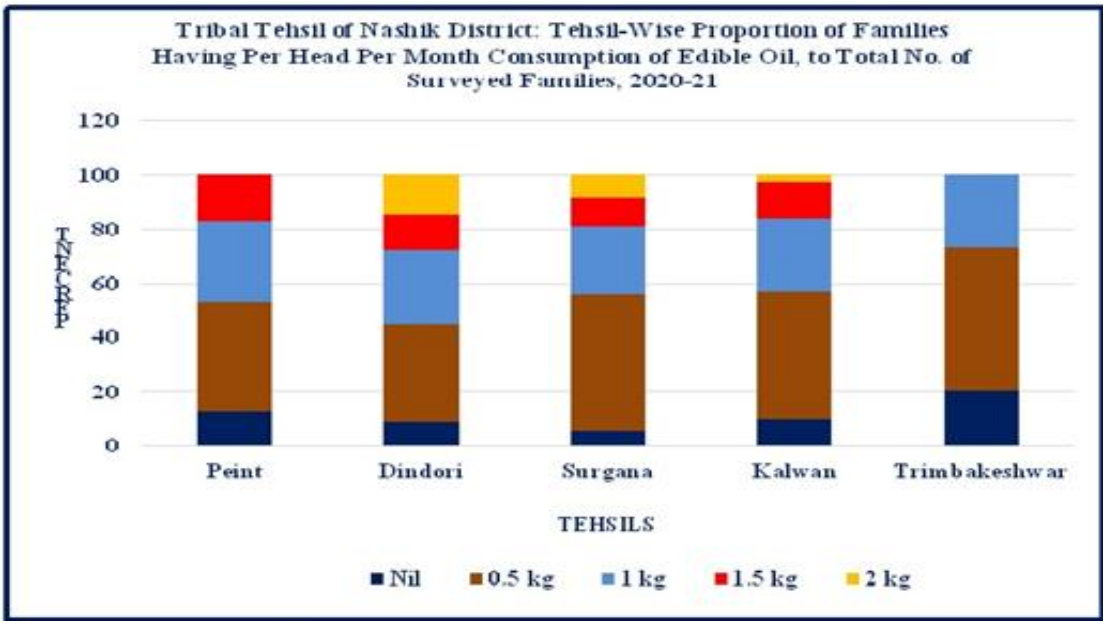


Fig.5 Consumption of Milk

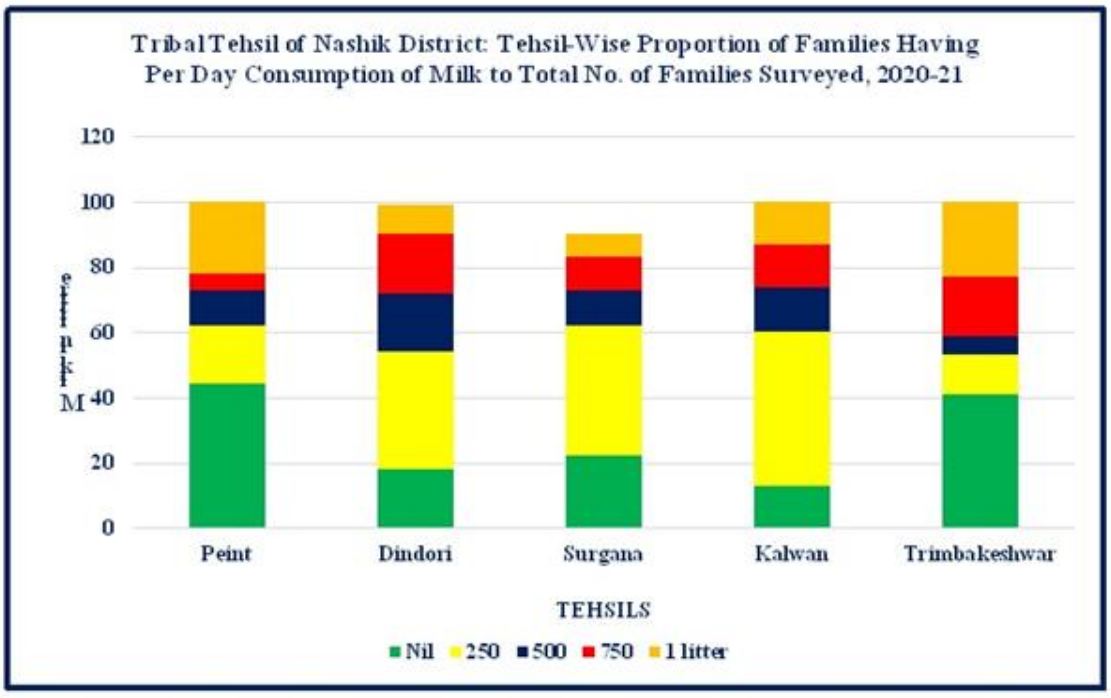


Fig.6A Vegetation Food Items

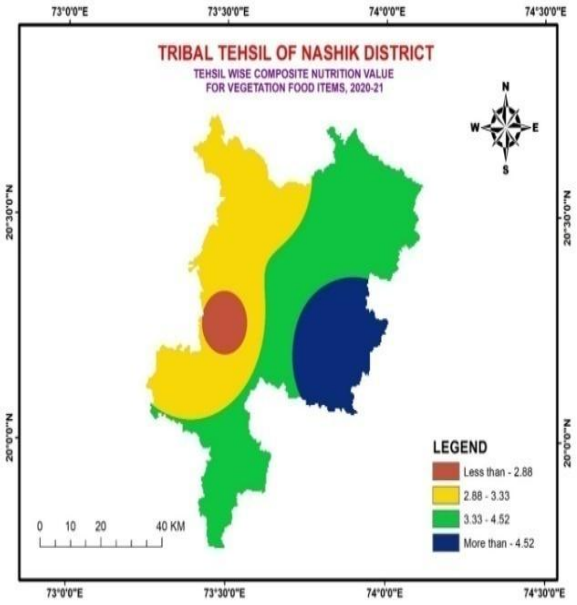


Fig.6B Fruit Food Items

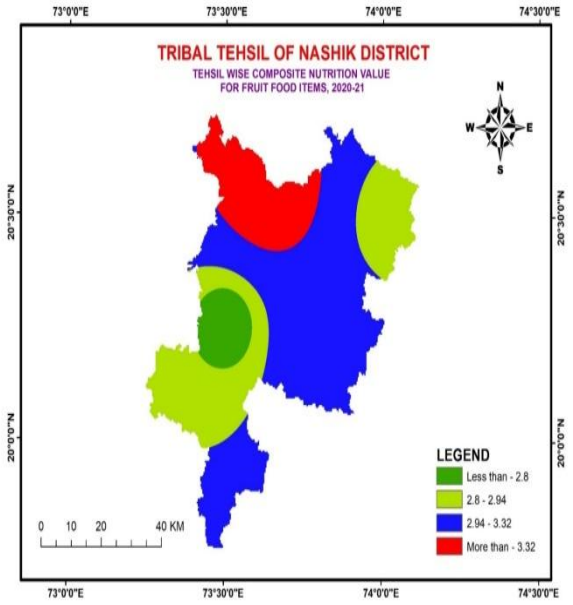


Fig.7 Consumption of Fruits

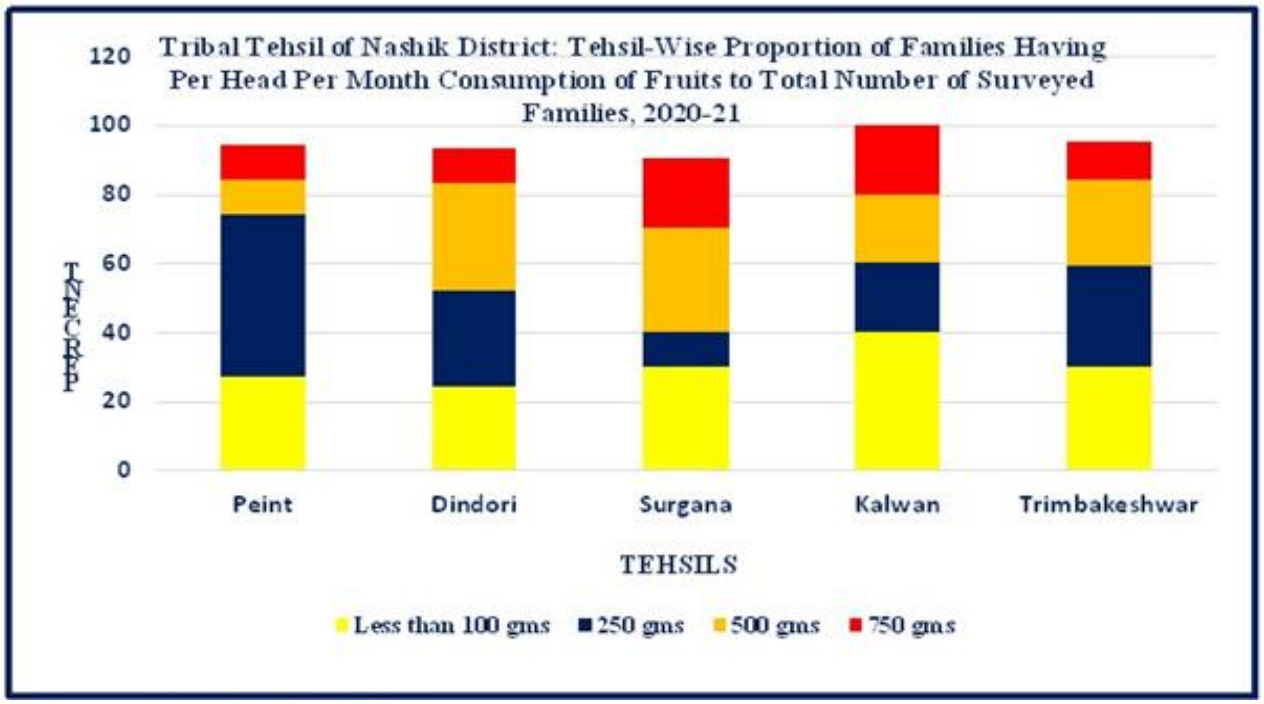


Fig.8 Meat food Items

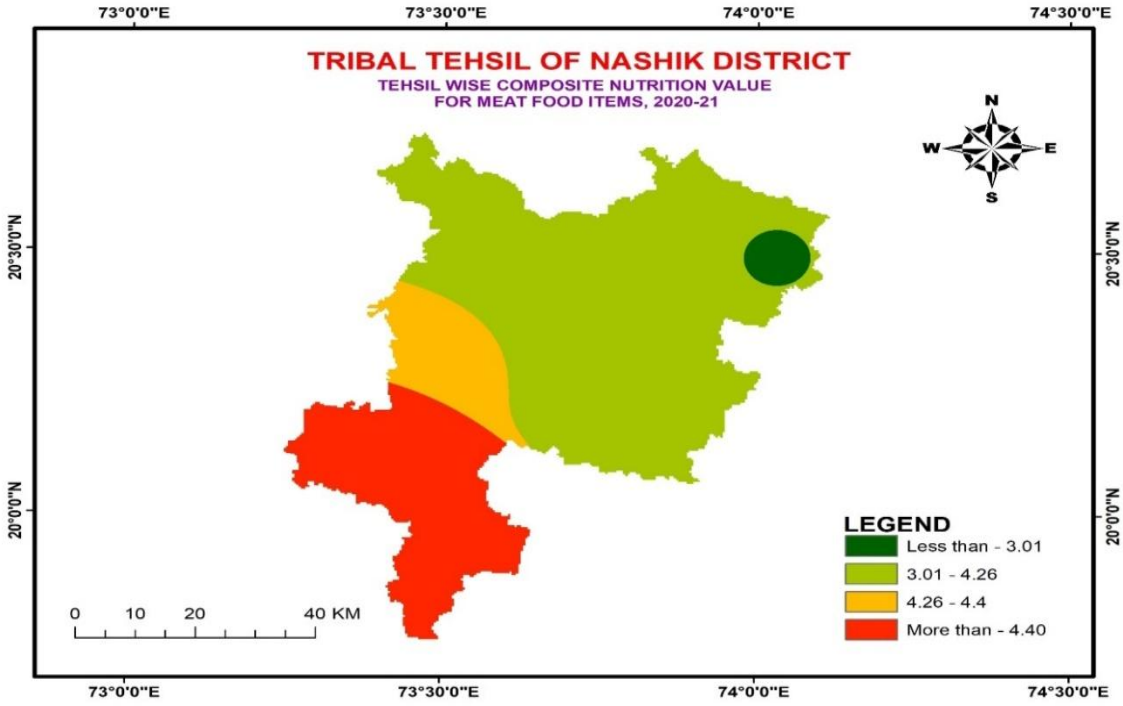


Fig.9 Consumption of Meat

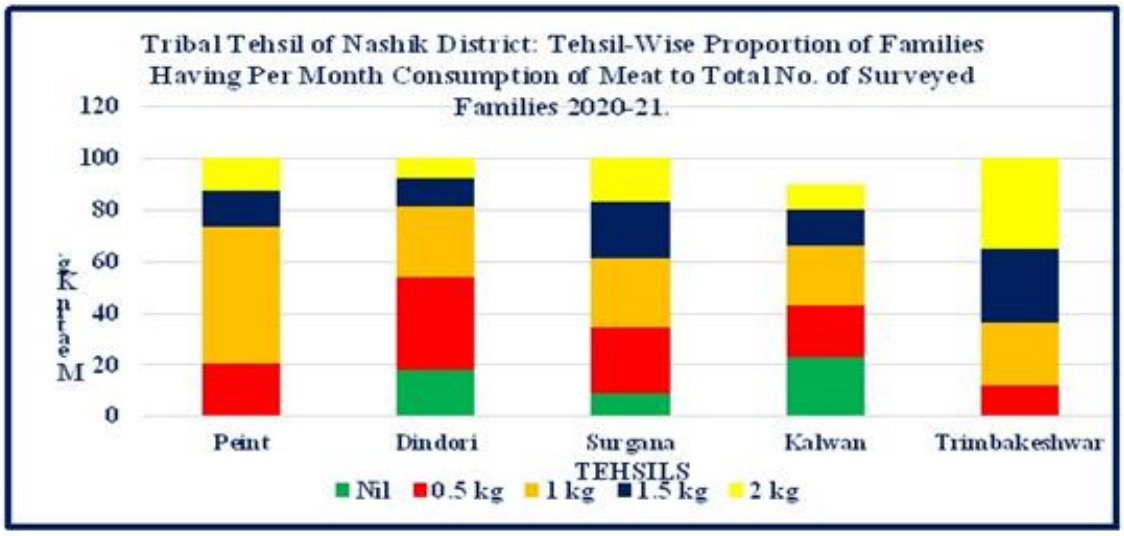
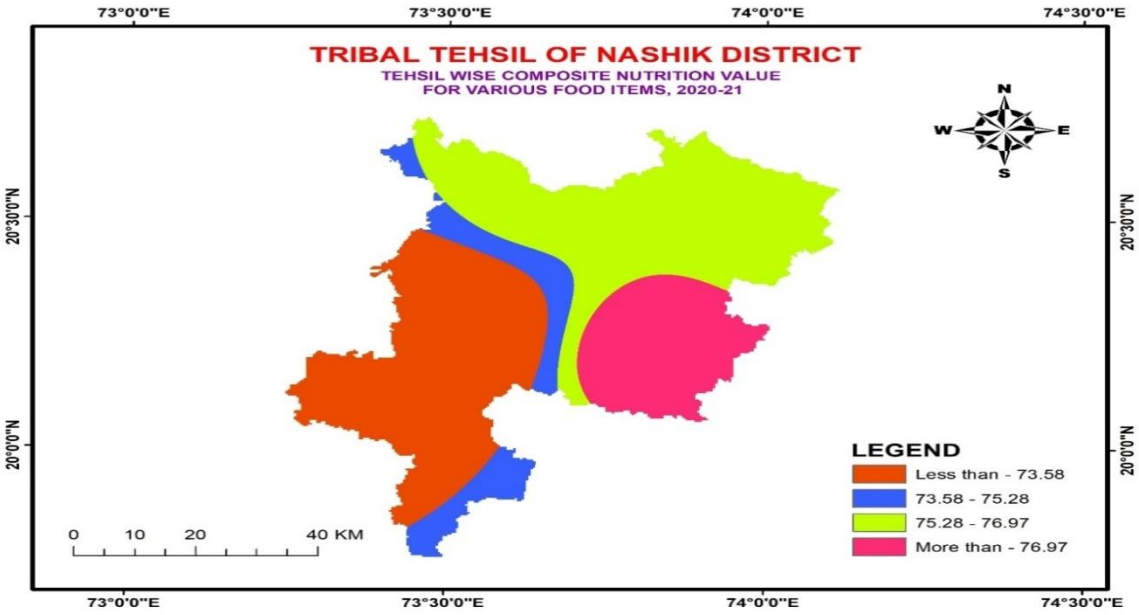


Fig.10 Various food Items



Edible Oil

Groundnut and other seeds are used to extract edible oils. Edible oils have a lot of fat and protein in them. The amount of groundnut produced in the study area is adequate. The Kalwan, Surgana and Dindori region has a higher proportion of groundnut-covered land. During fieldwork, however, it was discovered that tribal populations in the research area consume very little crude. Approximately 80% of the surveyed families consume edible oils in quantities of less than 250 grams per month.

Milk

Milk is the most vital element out of all foods because it contains all of the nutrients needed for development. According to Table No7 and figure no. four, 4.5 % of families in the research area consume more than 250 ml of milk every day.

Vegetables and Fruits

Human bodies become healthier as we eat more vegetables and fruits. During the fieldwork, it was discovered that only a small percentage of high-income families consume fruits and vegetables. More than 75.4 % of the surveyed families consume more than 500 grams of fruits and vegetables over the course of a month. These people are bad in terms of money. As a result, they are unable to buy fruits and vegetables at the store. These people eat whatever fruits and vegetables are available in their region.

Meat

Meat, fish, and eggs are good sources of nutrients, with protein levels ranging from 15% to 20% and differing fat levels. Non-vegetarians make up more than 85% of the tribal population in the district under investigation (only prefer mutton of goat). Both of these people, on the other hand, eat goat meat. It is apparent from table No. 10 that approximately 80% of the families surveyed consume less than 1kg of meat each month.

Composite Nutritional Value

Weightages according to calories and percentage of families using different food products is allocated to calculate the tehsil-wise composite nutritional value.

The Weightage assigned to each object are listed in the table below.

During the fieldwork, data was gathered on how the families consumed different food products in their daily meals. The data was processed, and the percentages of families that consumed each food item were calculated. The total amount of share in terms of Weightage of a given food item in the meal was calculated using the allocated Weightage. For example, in Surgana tehsil, 100 percent of total families surveyed eat Rice in their diet. Therefore, the corresponding Weightage for this percentage of families would be 06. The cumulative nutritional values of cereals are derived from the total of all weight ages measured so far. The composite nutrient values for cereals were 14.72 in Peint tehsil. This method was used to quantify the composite nutrient value for pulses, edible oil, milk, vegetables, and fruits. The cumulative composite value of Peint tehsil was 67.22 when the composite nutrition values were added together. The table shows the cumulative composite nutrition values measured on a tehsil-by-tehsil basis.

The average composite nutrition values for the study area is 74.81, as seen in the above table. The Dindori tehsil of the region's aggregate values is higher than the normal. Since this area of the region is more under agriculture, people have a higher buying power and can afford to buy healthier foods, while the rest of the region's composite nutrition values are poor. Tribal's living in this part of the area. They have a poor economic situation. Since tribal people are poor, they cannot afford to buy a variety of nutritious foods. Tribal populations are malnourished, and as a result of food deficiencies, they are at risk of developing dietary deficiency diseases.

The indigenous inhabitants of the study region eat jowar, maize, wheat, and bajara as their major foods. Despite the fact that the terrain is conducive to rice farming, they still consume rice on occasion. Pulses are a staple of indigenous people's diets, which they consume on a daily basis. However, they consume very little fat-containing foods such as oil and milk in their regular diet. Similarly, just a small percentage of households include fruits and vegetables in their daily diet. These people are unable to acquire such expensive items due to their poverty. The general nutritional status is measured by computing composite nutrition values. For the entire region, the average composite nutrition value is 74.81.

Declarations

Ethical Approval

There are no human subjects in this article and informed consent is not applicable.

Competing Interest

Authors have no competing interests to declare

Authors Contributions

All authors conceived and designed the study. All authors contributed to manuscript revisions. All authors approved the final version of the manuscript and agree to be held accountable for the content therein.

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