

REGIONAL DISPARITIES IN PROTEIN AVAILABILITY IN MADHYA PRADESH

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ABSTRACT: In this paper districtwise protein availability has been calculated, using the food balance sheet method. The study indicates that the State as a whole is deficient in the protein availability in comparison to the recommended requirement. The proportion of protein malnutrition continues to increase in the State, where most of the population is engaged in agriculture. Majority of the state's population depends on inadequate diet. More than two-third population of the State has failed to meet their minimum requirement. The diet of entire population is based on cereals and pulses, which do not provide complete source of protein. Spatially, the eastern and south-eastern parts of the State are deficient, while the western and north-western parts are surplus in comparison to the recommended requirement. Alternate sources of protein food and methods for improving protein availability from agricultural products have been identified and suggested.

INTRODUCTION

Protein, carbohydrates, fats, minerals, vitamins and water are essential nutrients required for the growth of human body as well as for its maintenance (Deodhar, 1983). The sufficiency of these nutrients especially of protein in a diet is an important measure of the adequacy and quality of diet. Their importance is enhanced many times because they are required for the growth and development of human body (Mehta, 1987). Protein is needed for building, maintaining, and repairing body tissues. It is essential throughout life, but it is especially necessary during the growing period. Protein also serves as a chemical regulator of the body, and supplies substances that prevent disease and act against infections (World Book of Encyclopaedia, 1959). Therefore, protein quantity and, especially protein quality, play an important role. The practical significance of protein quality in food may be considered from two points of view. One is

the direct impact which it can have in terms of nutrition and health, and the second is related to the efficiency of utilisation of other nutrients. It is an established fact that good quality protein stimulates food intake which results in more weight and higher efficiency of protein utilisation. The deficiency of protein results in various clinical conditions such as reduced growth, retarded mental development, emaciation, wasting of muscles and lack of subcutaneous fat, incidence of diarrhoea, and lower working efficiency (Park, 1983). Moreover, those who exist on a low protein diet usually have lower resistance to diseases. They show signs of old age earlier than those who live on more adequate protein diets (Singhai, 1988). In developing regions, the problem of protein malnutrition is widespread, which results from inadequate protein in daily diets of a large proportion of population (FAO, 1964). This problem concerns the health and efficiency of present population especially it effects young children

and nursing mothers. Protein malnutrition may be of three types : (i) the person may be getting insufficient food in terms of calories and protein, (ii) the person may be getting sufficient food in terms of calories, but not enough protein, and (iii) the person may be getting adequate protein, but may not be getting enough food in terms of calories (Ramchandran, 1977).

In the present study an attempt has been made to analyse the systematic and interpretative analysis of protein requirement and availability in different part of Madhya Pradesh. The State is now one of the deficient parts of the country in terms of protein availability. Nearly 58 per cent districts or more than two-thirds (68 per cent) population of the State recorded 25 to 50 per cent deficiency of protein, when comparison was made with the recommended requirement. Moreover, majority of the population exists on vegetable proteins which are usually incomplete proteins.

Methodology

FAO (1957), Sukhatme (1962) suggested two methods of estimating the level and pattern of nutritional consumption in an area :

1. The Household food consumption survey method and
2. The Food Balance sheet method.

The household Food Consumption Survey method is based on a representative sample of households in a country or smaller area and ideally covers their total expenditure in a given period on food and other items, the quantities of food purchased and consumed. Sukhatme (1962) suggests two ways of household survey under Indian conditions:

- (i) interviewing households on the quantities of food obtained or consumed with the help of recall list. This is by far the more rational method. But it is liable to many errors since households, especially in the illiterate rural areas where farmers largely consume the food grown by them, may not recall the precise quantities of the foodstuffs consumed by them.
- (ii) Weighting all foodstuffs before preparation of meals. This method is more promising from the point of view of accuracy.

The food balance sheet shows the estimated per capita consumption of a foodstuff per day in an area. It is measured by the total production, adjusted for in and out movements in trade, for change in stocks, and for any quantities used for seed, losses, industrial use or other purposes apart from food. When such commodity balances are available for all main foodstuffs the nutritive value can be calculated for the diet.

The food balance sheet method has been adopted in the present study. Districtwise food balance sheets have been prepared for calculating the proteins availability in Madhya Pradesh. The data derived from these sheets were compiled and mapped into choropleth system of mapping to depict regional disparities therein. The study involves the consideration of all the possible sources of food in Madhya Pradesh in the range of cereals, pulses, vegetables, oils, fruits, milk, and all kinds of flesh foods. The food production data have been obtained from Director of Agriculture, Bhopal. While the milk and flesh food production data are based on field survey which has been conducted in the various parts of the State.

Sources of Protein

Protein may be derived from two sources, i.e. animal sources and vegetable sources (i) Animal proteins are derived from dairy products and flesh foods (egg, meat, fish). In general, proteins which come from animal sources are complete proteins (Gopalan, 1980). But they contribute a very small part of a total dietary protein in Madhya Pradesh, because of religious habits and the fact that the animal proteins generally cost four to five times higher than the vegetable proteins. (ii) The vegetable proteins are derived from pulses, nuts, and oil-seeds, certain cereals (rice, maize and wheat), and certain leafy vegetables (amarnath, spinach). Moreover, vegetable proteins differ in their nutritional quality depending on their amino acid profile and digestibility. Pulses are rich in lysine and are limiting in sulfur containing amino acids mainly methionine (Mehta, 1987). While cereal grain proteins have lower nutritional quality because they are limiting in lysine, threonine and/or tryptophan. When cereals are taken in combination with pulses, the deficiency of one is made good by the excess in another.

In Madhya Pradesh about 86.55 per cent protein consumption is estimated to come from vegetable sources (cereals, pulses, vegetables) and about 13.45 per cent from animal sources (Table 1). Grains, which are the staple food, are the major source of protein, furnishing almost 83.17 per cent of the total protein availability. Vegetables and fruits provide 3.38 per cent, animal products (flesh food) provide a little more than one per cent, and dairy products about 12.40 per cent of the total protein availability of the State.

Protein Requirement

The body cannot exist without replacing the protein that is lost each day. The requirement is affected by the size and weight of the body, occupation and activity, and by the type of protein eaten. Less protein is needed when it is of high quality than when it is of low quality. The recommended allowances of protein (FAO and WHO, 1975 and ICMR, 1981) are one gram protein per kilogram body weight per day for adults (man and woman), 1.8 gram protein per kilogram body weight per day for infants, and 1.2 to 1.8 gram protein per kilogram of body weight per day for pre-school children (Table 2). This would mean that a man weighting 70 kilograms should eat at least 70 grams of a complete protein each day. The greatest amount per unit of weight is needed during period of rapid growth which occurs during early childhood and in adolescence.

Dietary Patterns

Dietary patterns, closely correspond to the conditions of climate and availability of foodstuffs in an area. As in the other parts of the country, the diet habits of the majority of the population of Madhya Pradesh are limited essentially to the food that are produced locally (Misra, 1983). The diet of population of the State primarily based upon cereals and pulses which consist more than three-fourths of the diet (Table 1). In fact, the food consumed by the people of the State is highly grain-oriented (Misra and Dube, 1985), and therefore, cereals constitute the major source of nutrients. The consumption of green leafy and other vegetables, fruits, fats and oils, and animal protein is negligible, especially in rural areas and in the summer, while in the season of rains the proportion of

Table 1 : Sources of Proteins in Madhya Pradesh

Foodstuffs	Protein availability per capita per day (grams)	Per cent
Cereals	38.88	60.00
Pulses	15.02	23.17
Vegetables and fruits	2.19	3.38
Milk	8.04	12.40
Flesh food	0.68	1.05
Total	64.81	100.00

Table 2 : Recommended Requirement of Protein for Infants, Pre-School Children and Adults

Age group	Body weight (Kg)	Protein requirement (gm/kg body weight/day)
Infants	6-9 months	—
Pre-school children	4-6 years	18.87
Boys	10-12 years	34.30
Girls	10-12 yeras	36.47
Man	-	55.00
Woman	-	45.00

Source: Indian Council of Medical Research, 1984.

vegetables generally increases because of the higher production and availability of these vegetables. In the urban centres, however, the quantity and quality of diet is determined by purchasing power. Consequently, the diet of the poor population is inferior, when compared with that of the high income groups both in rural and urban areas.

Besides, according to Government statistics non-vegetarians constitute about 55 per cent of the total population of Madhya Pradesh (Gopalan, 1971). But the per capita daily consumption of meat, fish, and eggs is only 3.47 grams per day. Therefore, about 90 per cent of the total population of the State is vegetarian in actual practice.

Protein Availability Level

Madhya Pradesh was one of the deficient states of the country in the year 1951 in terms of protein availability because of lower food production. The agricultural development since then, especially due to the Grow More Food campaign during the plan periods subsequently improved the food supply situation and the State acquired a surplus position during the year 1961 (Misra, 1988). The protein availability decreased again after 1971 and it was about 64.18 grams per capita per day in the year 1981. The declining protein availability does not, however, suggest any decline in the agricultural production. In fact, agricultural production has steadily increased but population has increased still faster to divide the available food among the growing number of food consumers.

Regional Variations in Protein availability

The regional variations in the availability of protein have been mapped by making use of the data at the district level. The classes for mapping the regional patterns have been determined by fixing the class boundaries in the form of percentage variation from recommended requirement of protein which is 70 grams per capita per day. The areas where availability is higher than the requirement are classed under the surplus categories, while those areas where it is lower than the requirement are arranged under the categories of deficient availability.

During the year 1981, Madhya Pradesh has recorded protein availability of 64.81 grams per capita per day which is slightly lower (7.41 per cent) than the recommended requirement of 70 grams (ICMR,

1986). Protein availability varies from 33.87 grams in Bhopal district to 122.16 grams in Raisen district (Table 3). Spatially, the south-eastern parts of the State are deficient in protein availability, while the north-western parts are surplus in this respect. The deficient areas are the Bastar plateau, the Chhattisgarh region, the Baghelkhand region, the Rewa plateau, and the Satpura-Maikal region. On the other hand, the surplus areas are the Malwa region, the Madhya Bharat plateau, the Bundelkhand region, and parts of the central Madhya Pradesh (Map 1). Moreover, less than half of the districts (42 per cent) of the State are surplus and the remaining more than half of the districts (58 per cent) are deficient in the availability of proteins.

A. The Surplus Regions

About 42 per cent districts or one-third population (31.61 per cent) of the State is classed under the categories of surplus availability where availability of protein is more than 70 grams. This ranges from 72.38 grams in Ratlam district to 122.16 grams in Raisen district. Among these areas about 20 per cent district recorded excessive sufficiency and 22 per cent district recorded moderate sufficiency (Table 4).

1. The Excessively Surplus Areas : Nearly 20 per cent districts or 14.36 per cent population recorded between 25 to 50 per cent surplus availability when comparison was made with the requirement. The availability ranges from 88.37 grams in Morena district to 122.16 grams in Raisen district. These areas include the Morena plateau and the Lashkar plain in the extreme northern part, the Mandsaur plateau in the north-west, and the Raisen-Vidisha plateau in the central part of the State.

Table 3 : Protein Availability in Madhya Pradesh, 1981

(Per capita per day grams)

District	Protein	District	Protein
Balaghat	49.99	Narsinghpur	96.17
Bastar	48.97	Panna	64.73
Betul	56.25	Raigarh	41.49
Bhind	103.97	Raipur	49.57
Bhopal	33.87	Raisen	122.16
Bilaspur	48.02	Rajgarh	75.40
Chhatarpur	86.23	Rajnandgaon	50.82
Chhindwara	46.40	Ratlam	72.38
Damoh	64.71	Rewa	52.06
Datia	91.56	Sagar	69.03
Dewas	79.44	Satna	56.63
Dhar	78.44	Sehore	103.74
Durg	43.53	Seoni	54.08
East Nimar	47.85	Shahdol	41.42
Guna	82.16	Shajapur	102.65
Gwalior	60.17	Shivpuri	78.22
Hoshangabad	77.27	Sidhi	53.85
Indore	44.69	Surguja	43.61
Jabalpur	34.67	Tikamgarh	79.32
Jhabua	52.84	Ujjain	83.18
Mandsaur	105.94	Vidisha	117.76
Mandla	50.97	West Nimar	47.26
Morena	88.87	M. P. State	64.81

Source : Food Balance Sheets, Madhya Pradesh, 1981.

2. The Moderate Surplus Areas: About 22 per cent districts or 17.25 per cent population recorded 25 per cent surplus availability. This ranges from 72.38 grams in Rutlam district to 86.23 grams

in Chhatarpur district. These areas extend over the central Malwa region, the Hoshangabad plain, the Orchha upland, the Chhatarpur upland, and parts of the Madhya Bharat plateau.

Table 4 : Protein Availability in the Districts of Madhya Pradesh, 1981

(per capita/day/grams) Surplus/Deficit	No. of Districts	Name of Districts
Excessively surplus (87.5 to 122.5 g)	90	Bhind, Datia, Mansaur, Morena, Narsinghpur, Raisen, Sehore, Shajapur, Vidisha,
Moderately surplus (70 to 87.5 g)	10	Chhatarpur, Dewas, Dhar, Guna, Hoshangabad, Rajgarh, Ratlam, Shivpuri, Tikamgarh, Uttain.
Moderately deficit	09	Betul, Damoh, Gwalior, Jhabua, Panna, Sagar, Satna, Seoni, Sidhi.
Excessively deficit (34 to 52.5 g)	17	Balaghat, Bastar, Bhopal, Bilaspur, Chhindwara, Durg, East Nimar, Indore, Jabalpur, Mandla, Raigarh, Raipur, Rajnandgaon, Rewa, Shahdol, Surguja, West Nimar.

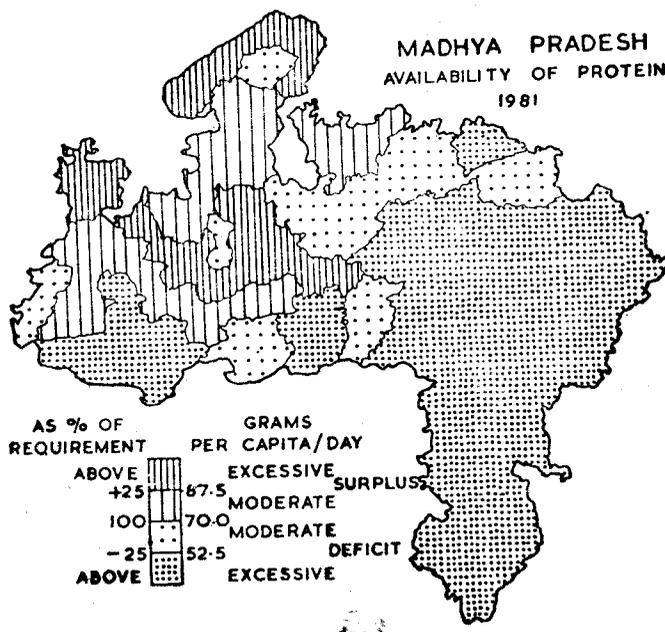
The high and very high availability of protein in these areas is attributable primarily to the recent agricultural development and partly to the smaller size of population. The higher nutritional availability is also responsible for this sufficiency in protein. It is evident from the fact that this is the region which is surplus in calorie availability, while the remaining State is deficient (Dube and Misra, 1984). In addition, the higher production and availability of pulses, oilseeds, and milk are the other factors which have been responsible for this sufficiency in these areas.

B. The Deficit Regions

More than half of the districts or two-third population of the State (68.39 per cent) recorded deficient availability of protein, ranging from 33.87 grams in Bhopal district to 69.03 grams in Sagar district. Among them about 20 per cent district recorded moderate deficiency and 38 per cent excessive deficiency.

1. **The Moderate Deficient Areas :** Twenty per cent districts or 16.04 per cent population of the State recorded 25 per cent deficiency of protein. The availability ranges from 52.84 grams in Jhabua district to 69.03 grams in Sagar district. These areas include Jhabua of the Malwa region in the west, the Betul and Seoni plateau of the Satpura region in the south; the Singrauli basin in the north-east, the Sagar-Damoh plateau in the central part, and Gwalior plain of the Madhya Bharat plateau in the north.

2. **The Excessively Deficient Areas :** More than one-third districts (38 per cent) or half of the total population (52.35 per cent) of the State recorded deficiency of protein between 25 and 50 per cent. This ranges from 33.87 grams in Bhopal district in the west to 52.06 grams in Rewa district in the east. These areas comprise a great part of the eastern and southern parts of the State, including the Bastar plateau and the Chhattisgarh



basin in the south-east, the Sohagpur-Surguja basin, and the Rewa plateau in the north-east, the Maikal-Maihar plateau, and the Jabalpur Haveli in the east; the Chhindwara pleateau in the south-central part, and the Nimar uplands in the south-western part of the State.

It is interesting to note that more than two-third population of the State has failed to meet their minimum protein requirement, when most of the population is engaged in agriculture. This may be attributable to the large families, crowded farmland, small size of land holdings and primitive method of farming, inadequate education of food and nutrition, widespread poverty and lower purchasing power, the predominance of nutritionally poor food crops and lower production of pulses, oilseeds, milk and fleshfoods.

Conclusions

Protein, the costly element in the diet, is an essential nutrient required for

the growth and development of body throughout life, but it is especially necessary during growing period. Madhya Pradesh has registered 64.81 grams protein availability per person per day during the year 1981, which is 7.41 per cent lower than the recommended requirement of 70 grams. Besides, more than two-third population (68.39 per cent) of the State has been deficient in protein intake. Spatially, the entire eastern and southern parts of the State recorded moderate to excessive deficiency both in quantity and quality. Therefore, it is necessary to increase the availability of protein. There are three major components of the strategy to increase the quantity and to improve the quality of Protein in the diet of the population of the State : (i) by increased consumption of those protein foods which are commonly used, (ii) by increased consumption of foodstuffs that are readily available but not commonly used, and (iii) by the introduction of new protein foods.

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