Original Articles

DIETARY HABITS OF SCHOOL BOYS IN UTTAR PRADESH

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MARRACK (1948-49) in reviewing surveys of nutritional status carried out in United Kingdom from the beginning of the second World War up to 1945 said that 'we need base lines from which to make comparisons' and 'we need to study groups of individuals, not only by making laboratory investigations, but also by finding out what they eat, how well they are, and what happens to them in the future'. In U.P., systematic diet surveys have been undertaken since the establishment of the Nutrition section in 1948 in the Public Health Department and the present study is an attempt to record what school boys living in boarding houses of various institutions in the state, eat and to correlate their nutritional state and present diets.

Statistics of agricultural production, food imports and exports, etc. give a rough idea of average food consumption but average figures even if accurate, may conceal wide variations in food intake in different areas and in different economic and social groups within the same province. Diet surveys in representative groups give more useful and accurate information.

Food intakes do not constitute a measure of food requirements. Freely chosen intakes are usually restricted by convention, taste, or economic necessity. The importance of combining dietary with clinical survey and to correlate them, needs no emphasis. Large scale experiments on human beings are difficult and expensive. Piece-meal dietary and clinical surveys therefore provide the primary data for the study of standards for body requirements. To grade degrees of well being is also difficult. To describe ill health in terms of frank morbidity is comparatively easy but to describe 'how much ill health is due to poor and ill balanced diet' is not at all easy.

Method of enquiry

An investigation into the food intake of 412 boys living in fourteen hostels in different districts of the State was carried out during the period August 1949 to December 1951. Each kitchen was visited twice daily at the time of preparation of meals for a continuous period of seven days, for weighing on a portable balance, all the ingredients of food to be consumed in their raw state. The amount consumed *per capita* was calculated by dividing the total quantity eaten, by the number of consumers. The amount of cooked food remaining unconsumed was accounted for. The food consumption figures in Table I thus refer to food 'as purchased'. Each boy was also interrogated daily for recording foods consumed by him other than those prepared in the kitchen. Seven days enquiry may be considered inadequate to give a correct picture of the diet throughout the year and repeated surveys in all the seasons may be advocated, but the diets in the kitchens of the hostels do not vary much with seasons and the results of even a short survey of seven days at one season are a fair index of food intake throughout the year.

Economic status

In one district (Moradabad) the boarding house was run by the Mission for the poor Christian boys. Most of them were too poor to pay for their meals and were sustained by the Mission. Those who could pay, paid for their meals along with the fees. In other districts, the boys living in hostels came from neighbouring villages and were mostly sons of the cultivators. They brought their rations from home at the time of their periodical visits, like wheat flour, rice, pulses and ghee, etc. Things like vegetables were purchased locally.

Consideration of the diets eaten

Intake of various classes of food per consumption unit in different districts is shown in Table I.

The students had two principal meals. The morning meal was taken between 9 and 10 a.m. and evening one at about 7 p.m. Fruits or prepared articles of food were taken in the afternoon. In the morning a few students had nashta (light meal). Bengal gram, though a pulse, has been shown in the column of cereals. It was consumed either in the form of besan along with wheat flour for their evening meal once in a week as a result of campaign for saving cereals.

Cereals.—Wheat and rice were both consumed. In table No. I, first seven districts come under the category of western districts while the last six districts are in the eastern zone of the State. Wheat and rice were both eaten in the eastern districts. Rice consumed was mostly of the home pounded parboiled type. Arwa rice machine milled was also taken. It was washed two or three times before cooking and gruel was not thrown away. The other

cereals which came in the diets at Badaun and Jhansi were Bajra (*Pennisetum typhoideum*) and Juar (*Sorghum vulgare*).

Pulses.—In the eastern districts red gram was usually consumed while in other places, black gram, green gram, lentil and red gram were the pulses taken. The average consumption of pulses is higher in areas where rice is also taken along with wheat.

Leafy vegetables.—These were taken in three kitchens in small quantities in the form of spinach, cabbage and coriander leaves.

Non-leafy vegetables including roots and tubers.—The consumption of these vegetables ranged from nil at certain places to 9.4 ounces at others and included potatoes, colocasia, carrots, brinjal, cauliflower, tomatoes, ridge gourd, ladies fingers and other seasonal varieties.

Fat and oils.—Most of the students brought ghee (butter fat) from their homes and used it with pulses. Vegetables were usually cooked in vanaspati or mustard oil. At one place (Jhansi) gingelly oil was used for cooking.

Fruits.—These included banana, guava, mangoes, cucumber and other cheap seasonal fruits.

Sugar and jaggery.—Sugar was mainly used to sweeten milk or its products but at one place (Basti) it was also used to prepare cold sweet drinks. Jaggery was taken by very poor students.

Milk and milk products.—Boys consumed it as liquid milk as well as in the form of curd. Its intake and that of prepared articles of food depended upon the amount of pocket money, each student received from his guardian.

Flesh foods.—Meat, fish and eggs were conspicuous by their absence in all the kitchens except one.

Prepared articles of food.—Sweet preparations were mostly preferred and included *barfi, jalebi, pera,* and *besan laddu,* etc. Puffed rice with *gur, pakori* and *nanpara* were also taken. A high intake of cereals relative to that of other foods was characteristic of practically all the districts.

Nutrient values of the diets

The consumption of all the foodstuffs entering into the diets was calculated for the various nutrients according to Field Service Hygiene Notes, India (1945). In the analysis of the diets, average values have been taken wherever possible and allowance has not been made for destruction of nutrients by cooking. Losses vary greatly according to the method of preparation, cooking and serving. There is little loss in cooking of food constituents other than vitamins destroyed by heat, or extracted into washing or cooking water which is not consumed. The calculated daily nutrient intakes are shown in Table II and III.

The main interest in the assessment of the dietary intakes lies in knowing the amount of ailments and nutrients available to the body from the consumed food and comparing them with their requirements for maintaining normal health. There are many difficulties in assessing their availability and requirements. Niacin may be synthesized by bacteria in the gut and then absorbed (Benesch, 1945). Thiamine is not only synthesized in the intestines but also gets destroyed there. How much of a certain nutrient actually becomes available to the body is therefore difficult to judge. Human system too is very adaptable. Physiological adaptation can occur and alter the requirement of nutrients (Mitchell, 1944). Finally the inter-action of one nutrient with another is known to be different in certain combinations. Inspite of limitations, dietary surveys are valuable and help in suggesting the cause and treatment of deficiency signs.

The nutritive values of the diets surveyed when compared to the daily allowances recommended by the Nutrition Advisory Committee, Indian Research Fund Association (1944) appear unsatisfactory. School boys may be classified as 'moderately active' and as such should get a diet of net caloric value of 3,000 calories or 3,300 gross calories per consumption unit. The daily requirement of proteins has been suggested to be 82 gm. out of which 29 gm. should be of animal origin. In eight districts no animal protein was consumed while in the rest it varied from 0.5 gm. to 11.5 gm. per consumption unit per day. The intake of calcium and vitamin A was far below the standards recommended for these by the Nutrition Advisory Committee. The intake of iron, aneurin, and nicotinic acid was satisfactory. Riboflavin consumption was rather on the low side. As regards ascorbic acid, no allowance has been made for its losses in cooking in table No. II.

If 50 per cent is deducted from uncooked value, for destruction of ascorbic acid in cooking, none of the diets would provide 30 mg. considered necessary (Medical Research Council 1948) to cover all requirements for active life and inherent individual variability.

Clinical studies

A clinical examination of all the boys whose diets were measured and of others was carried out in each area. The state of nutrition of 6,371 boys was assessed clinically according to the standard described previously by the author (Govil, 1952) as good, fair, poor and very poor. They were also examined for signs of diseases which are supposed to be associated with deficiency of one or more nutrients. The results of the examination have been given in the previous

communication (Govil, 1952) and are partly reproduced below in Table IV. 59.3 per cent of the boys examined were found affected with one or more so called deficiency conditions.

Discussion

The data presented in Table I shows either no intake or very low consumption of protective foods. The diets are deficient in proteins of animal origin, calcium, vitamin A, and ascorbic acid according to the standard laid down by the Nutrition Advisory Committee. This is also confirmed by the result of clinical examination as shown in Table IV. The incidence of xerophthalmia spongy gums, pigmentation of conjunctiva, caries teeth and xerosis of the skin was fairly high. The intake of aneurin and nicotinic acid was found satisfactory and hence no signs of their deficiencies such as œdema, tenderness of calves paræsthesia, and symmetrical dermatitis, were detected in the school boys.

Gingivitis is a classical feature of scurvy and has been regarded almost without question as a specific lesion of deficiency of ascorbic acid. Kruse (1942) believes that examination of the gums forms a satisfactory basis for appraisal of vitamin C status and that the changes in the gum tissue are specific and constant in occurrence. Crandon, when he had clinical scurvy had no macroscopical changes in his gums. swelling and bleeding of gums therefore may not be present in the deficiency of vitamin C.

Trauma and oral hygiene are also responsible to a great extent to changes in the gums, and deficiency of ascorbic acid may be predisposing only.

Circumcorneal injection of blood vessels and vascularization of cornea have recently achieved prominence as signs of ariboflavinosis. Circumcorneal injection can easily be produced by rubbing the eyes. Conjunctivitis is common in U.P. and with dusty air, it is not easy to label it as due to riboflavin deficiency only. But superficial symmetrical vascularisation of cornea in both eyes is possibly due to deficient intake of riboflavin.

Carbohydrates contributed 60.1 to 81.0, fat 7.4—28.7 and protein 9.3—16.3 per cent of the total gross average calories due mainly to the preponderance of cereals in the diets.

Calcium intake was 0.3 to 0.9 gm. daily. This is below the required amount. These days wheat flour of high extraction is used to make more wheat available for human consumption. Such a flour depresses the absorption of calcium due to phytic acid content and makes the deficient intake of calcium still worse. Fortification of flour with calcium carbonate to inactivate phytic acid and to make up the deficiency of calcium in the diet, should improve matters.

Poverty and scarcity of protective foods are not the only causes of qualitative and quantitative defects in the diets. Green leafy vegetables are cheaper than the other varieties and supply carotene, vitamin C and minerals. Their adequate intake alone would remove several defects of the dietaries. Their low intake therefore leads one to believe that ignorance of healthy food habits is also responsible to a certain extent for the consumption of unbalanced diets. Supply of proteins of animal origin is a difficult problem. The Nutrition Advisory Committee in 1944 assumed that 30 per cent of the population in India was vegetarian. This estimate may be correct for U.P., also if it means that 70 per cent of the population has no objection to taking meat including fish and eggs in one form or the other. But meat even by the non-vegetarians is not taken regularly. Milk production greatly falls short of requirements and people do not change their traditional dietary habits easily. Under the circumstances intake of foods of vegetable origin with high biological value appears to be the only solution for the time being.

Summary

1. Diet survey of 412 boys living in 14 districts was carried out during the period August 1949 to December 1951.

2. Wheat formed the staple cereal in the western districts while wheat and rice were both preferred in the eastern zone of the State.

3. The average consumption of pulses was higher in areas where rice was also taken along with wheat.

4. The consumption of protective foods was far below the standard laid down by the Nutrition Advisory Committee.

5. A high intake of cereals relative to that of other foods was characteristic of practically all the places.

6. The diets were found deficient in proteins of animal origin, calcium, vitamin A and ascorbic acid.

7. The intake of iron, aneurin, and nicotinic acid was satisfactory.

8. Riboflavin consumption was rather on the low side.

9. Carbohydrates contributed 60.1 to 81.0, fat 7.4 to 28.7, and protein 9.3 to 16.3 per cent of the total gross average calories.

(*Continued on page 363*)

He builded better than he knew;
The conscious store to beauty grew.

—*Emerson, The Problem.*

TABLE I

Average intake of various foods in ounces per consumption unit per day.

Serial No.	Name of the district	CEREALS				VEGETABLES								
		Wheat flour	Rice	Bengal gram	Millets	Pulses	Leafy	Non-leafy including tubers	Fat and oils	Fruits	Sugar and Jaggery	Milk and milk products*	Flesh foods	Miscellaneous and prepared articles of foods
1	Meerut ..	16.0	..	..	..	2.0	..	6.0	2.2	Neg.	..	..	..	..
2	Bulandshahr ..	18.4	..	..	..	2.0	1.4	4.8	1.4	2.1	0.6	5.6	..	1.0
3	Muzaffarnagar	11.0	1.0	..	..	3.2	0.2	8.9	2.2	Neg.	0.9	2.4	..	..
4	Budaun ..	14.6	0.2	..	3.6 (BAJRA)	3.0	..	1.2	1.0	Neg.	Neg.	Neg.	..	..
5	Moradabad ..	13.2	..	7.2	..	2.6	..	0.9	0.34	1.0	..	..	0.9	Neg.
6	Hardoi ..	19.0	..	..	..	3.8	..	..	1.4	Neg.	..	..	..	Neg.
7	Farrukhabad ..	22.9	..	..	..	3.8	..	..	2.0	..	..	..	..	..
8	Jhansi ..	11.0	2.4	..	1.2 (JUAR)	3.8	..	6.4	0.7	Neg.	1.5	11.0	..	1.8 0.7 (Groundnuts).
9	Gonda ..	9.6	10.6	..	..	4.4	..	4.6	0.5	1.6	0.5	2.6	..	2.6
10	Basti ..	12.0	10.0	4.2	..	4.0	..	3.8	0.5	2.2	4.0	..	..	..
11	Ghazipur ..	4.2	15.5	..	..	4.1	..	6.0	2.4	..	..	..	..	..
12	Gorakhpur ..	8.8	7.4	1.6	..	3.6	0.1	2.4	0.5	Neg.	0.4	0.5	..	..
13	Ballia ..	14.2	5.0	..	..	4.0	..	9.4	1.4	..	..	..	..	..
14	Allahabad ..	12.4	9.2	..	..	5.4	..	..	1.0	Neg.	..	..	..	Neg.

*Excludes ghee (Butter fat).
Neg. = Negligible = less than 0.1 ounces.

TABLE II

Calculated daily nutrient intakes per consumption unit.

Serial No.	Name of the district	Average gross calories	Protein (g.) Animal	Protein (g.) Vegetable	Protein (g.) Total	Fat (g.)	Carbohydrates (g.)	Calcium (mg.)	Iron (mg.)	Vitamin A (i.u.)	Aneurin (mg.)	Nicotinic acid (mg.)	Riboflavin (mg.)	Ascorbic acid (mg.)
1	Meerut ..	2416	..	68.7	68.7	71.2	374.5	300.0	39.7	1267	2.4	24.3	0.77	23.0
2	Bulandshahr ..	2792	5.8	81.2	87.0	60.5	474.2	694.1	47.4	2332	2.8	27.7	1.13	44.4
3	Muzaffarnagar	2323	2.5	62.1	64.6	73.9	348.5	444.4	33.8	1580	2.0	18.8	0.85	37.8
4	Budaun ..	2398	..	80.5	80.5	42.5	423.2	362.2	47.8	881	2.7	25.3	0.86	7.8
5	Moradabad ..	2457	3.7	96.1	99.8	31.5	442.7	668.2	25.2	781	2.9	26.5	1.36	29.8
6	Hardoi ..	2622	..	87.8	87.8	51.4	452.2	387.6	49.7	930	2.8	28.5	0.93	3.8
7	Farrukhabad ..	3164	..	101.0	101.0	70.2	532.1	430.5	57.8	1206	3.3	33.9	1.06	3.8
8	Jhansi ..	2776	11.5	81.1	92.6	56.2	471.8	923.6	39.2	1372	2.3	21.9	1.05	27.4
9	Gonda ..	3011	2.7	88.8	91.5	29.7	591.8	561.8	40.4	955	2.5	27.9	1.03	25.0
10	Basti ..	3644	..	105.2	105.2	30.1	736.1	603.0	54.0	1012	3.2	33.4	1.39	34.4
11	Ghazipur ..	2999	..	69.2	69.2	73.9	511.9	321.4	29.7	1280	2.0	25.6	0.88	26.1
12	Gorakhpur ..	2328	0.5	73.8	74.3	24.9	450.3	417.3	37.2	665	2.2	23.6	0.93	18.5
13	Ballia ..	2748	..	84.9	84.9	49.7	488.5	410.4	44.7	1180	2.7	28.7	1.02	37.6
14	Allahabad ..	2918	..	91.5	91.5	39.0	549.3	417.8	45.5	741	2.8	30.1	1.04	5.4

TABLE III

Serial No.	Name of the districts	Contribution of proteins, fats and carbohydrates to total calories (%)			Composition of diets (% by weight)		
		Protein	Fat	Carbo-hydrate	Protein	Fat	Carbo-hydrate
1	Meerut	11.4	26.6	62.0	13.4	13.8	72.8
2	Bulandshahr	12.5	19.5	68.0	14.0	9.7	76.3
3	Muzaffarnagar	11.2	28.7	60.1	13.3	15.2	71.5
4	Budaun	13.4	15.9	70.7	14.7	7.8	77.5
5	Moradabad	16.3	11.6	72.1	17.4	5.5	77.1
6	Hardoi	13.4	17.6	69.0	14.8	8.7	76.5
7	Farrukhabad	12.8	20.0	67.2	14.4	10.0	75.6
8	Jhansi	13.4	18.3	68.3	14.9	9.1	76.0
9	Gonda	12.2	8.9	78.9	12.8	4.2	83.0
10	Basti	11.6	7.4	81.0	12.1	3.4	84.5
11	Ghazipur	9.3	22.2	68.5	10.6	11.3	78.1
12	Gorakhpur	12.8	9.6	77.6	13.5	4.5	82.0
13	Ballia	12.4	16.3	71.3	13.6	8.0	78.4
14	Allahabad	12.6	12.0	75.4	13.5	5.7	80.0

TABLE IV

Serial No.	Clinical condition	Criteria upon which features assessed	Boys found affected Actual No.		Percentage
1	Good	.. ..	232		3.7
2	Fair	.. ..	3,554		55.7
3	Poor	.. ..	2,372		37.3
4	Very poor ..	.. ..	213		3.3
5	Xerosis Conjunctiva ..	(*i*) Slightly dry on exposure for ½ minute, lack of lustre	296		
		(*ii*) Conjunctiva dry and wrinkled	185	712	11.2
		(*iii*) Conjunctiva very dry and Bitot's spots present ..	231		
6	Pigmentation Conjunctiva.	(*i*) Slight discolouration	312		
		(*ii*) Moderate browning in patches	721	1,194	18.7
		(*iii*) Severe earthy discolouration	161		
7	Vascularisation (Eyes)	(*i*) Circum-corneal injection of blood vessels ..	122		
		(*ii*) Vascularization of cornea	61	183	2.8
8	Gums condition ..	(*i*) Bleeding or gingivitis	338		
		(*ii*) Pyorrhœa	51	389	6..1
9	Caries Teeth ..	(*i*) Slight	740		
		(*ii*) Marked	428	1,168	18.3
10	Skin Xerosis ..	(*i*) Dry, rough and loss of lustre	671		
		(*ii*) Phrynoderma	29	700	11.0
11	Hair condition ..	Dry, lustreless or staring	368		5.7

10. The diets are poor in quality and quantity.

11. The dietary defects reflected on the health of the boys and were confirmed by the result of the clinical examination.

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STUDIES ON METABOLISM OF CALCIUM, INORGANIC PHOSPHORUS AND CHOLESTEROL IN PRE-ECLAMPTIC TOXÆMIAS OF PREGNANCY.

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PRE-ECLAMPTIC toxæmia is by far the most common manifestation of pregnancy toxæmia in the late months of pregnancy. It is this late appearance in pregnancy which really distinguishes it clinically from other varities of toxæmia in pregnancy e.g. essential hypertension and chronic glomerular nephritis in association with pregnancy, for in these latter conditions the symptoms and signs are nearly always present before pregnancy begins and during the early part of pregnancy. The pre-eclamptic toxæmia is characterised chiefly by a rise in blood pressure, œdema and albumin in the urine. The clinical course and the severity of the toxæmia vary widely and in the more severer cases, the onset of convulsions and/or coma supervene (eclampsia).

The incidence of late toxæmias in pregnancy is very high in our country, which probably comes next to that of anæmia. Mitra (1940), on an analysis of labour cases admitted in Chittaranjan Seva Sadan during the years 1929 to 37 found the incidence of eclampsia was 1 in 33 and the maternal mortality on account of eclampsia and other toxæmias amounted to 20.53 per cent of the total maternal deaths. The exact frequency of pre-eclamptic toxæmia is not known but it presumed true incidence will be much higher as the toxæmias of milder varieties seldom come to hospital.

In the present series, 32 pregnant women, all during the last trimester of pregnancy have been studied for bio-chemical investigations (Table I). All the patients reported, for the first time, with some sort of subjective symptoms suggestive of toxæmia, e.g. headache, giddiness, oliguria, epigastric pain, disturbances of vision, etc. and the duration of these symptoms varied between 2 to 6 weeks. Previous history of toxæmia was elicited in 5 cases, mostly from their clinical history of previous pregnancies, i.e. œdema, scanty urine, headache, etc. and none had any severe toxæmia or eclampsia in previous pregnancies. None of them gave any history of nephritis or previous hypertension. Out of the series, 21 were primigravidæ and the rest had 1 to 6 previous pregnancies. On clinical examination, œdema was present in varying degrees in all patients except in one and the blood pressure was uniformly high in the majority of cases. Albumin in the urine was absent in 2 cases, occurred as a trace in one and in the rest, was present in varying amounts. In addition, the urine contained granular casts in 6 cases and hyaline casts in 5 cases.

It will be seen that all of them were fairly established cases of pre-eclamptic toxæmia of moderate severity. The writer had no opportunity to examine the cases earlier in pregnancy, nor was a follow-up possible in these cases by prolonged observation. No kidney function tests were carried out in these cases. The history of previous toxæmia, though was obtained in 6 cases could not be relied upon much. Under the circumstances, it was difficult to distinguish the type of toxæmia the patient was suffering from and the whole group has been considered under pre-eclamptic toxæmia, though a few cases of nephritic toxæ-