



REPORT

ON

THE STUDIES ON VESICAL CALCULUS (Stone in the Urinary Bladder)

IN

MEHSANA DISTRICT (1953-55)

By

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CONTENTS.

	PAGE
I. Introduction	1
II. Survey of the Existing Conditions—	2
1. The District of Mehsana	2
2. The Soil and Water Supply	2
3. Food Production	2
4. Main Occupations	2
5. Health Conditions	2
6. Medical Facilities	3
III. Nature and Extent of the Present Investigations—	3
1. Preliminary Collection of Data	3
2. Preliminary Visit	4
3. Assessment of the Incidence of the Disease	4
4. Laboratory Work	4
5. Field Investigations	4
IV. Salient Features of Investigations—	5
1. The People and their Dietary Habits	6
2. Studies on the Average Dietary Intake	7
3. General Observations in the Families Surveyed.	11
4. Dietetic Studies of Residential Institutions	13
5. Laboratory Investigations—	14
(a) Water Samples	14
(b) Encrustations in Water Pipes	14
(c) Vesical Stones	15
6. Clinical Appraisal of Stone Cases	15
7. Nutrition Survey of School Children	16
Discussion on the Aetiology of the Condition	19

	PAGE
VI. Summary and Conclusions	20
VII. Recommendations	21
VIII. Appendices—	
A—Map of Mehsana District	22
B—Questionnaire for Assessing the Diseased Condition	23
C—Schedule for the Study of Dietary Habits of Families in Rural Areas	24
D—Food Intake of <i>individual</i> Families (Lower Middle Class)	26
E—Nutrient Analyses of the above Group of Families	28
F—Food Intake of <i>Individual</i> Families (Agricultural/Labour Class)	30
G—Nutrient Analyses of the above Group of Families	32
H—Schedule for the Study of Institutional Diets	34
J—Existing and Recommended Diets for Backward Class Hostels	36
K—Existing and Recommended Diets for Private Boardings (Schools)	37
L—Analyses of Water Samples	39
M—Composition of encrusted Material collected from the Water Pipes	40
N—Classification of Stones	40
P—Distribution of patients according to age and sex	41
Q—Tabular statement showing Composition of Stones	42
R—Schedule for “Rapid Clinical Nutrition Survey”	46
S—Statistical Analyses of Clinical Nutrition Survey Findings (Tables I and II).	47
T—Average Heights and Weights of School Children	49
U—Graphical Representation of Average Heights and Weights compared with Standard Curves.	50

STUDIES ON VESICAL CALCULUS (STONE IN URINARY BLADDER) IN MEHSANA DISTRICT.

(1953 to 1955.)

I. Introduction :

During 1953, it was reported to Government, that many persons in Mehsana (North Gujarat) were suffering from stone in the (Urinary) bladder. It was also observed that water pipes in the town of Mehsana were encrusted with chalky white material, resulting in considerable choking of the pipes. In view of the slight increase in the incidence of this disease in recent years and its probable relationship with diet, the matter was referred to the Department of Nutrition for investigation.

Although extensive work has been carried out, both in this country as well as in other countries, on the subject of stone in the urinary tract, the exact causation of the condition has still not been clearly determined. Various factors, such as hardness of potable water, dietary deficiencies, low grade chronic infections and metabolic disorders have been mainly incriminated as the causative factors. It has, however, been recognised that no single factor or mechanism would suffice to explain the pathogenesis of urinary calculus, including stone in the bladder. Hardness of water is commonly believed to be a predisposing factor in view of the high content of lime, with relative deficiency of phosphates. So far as 'food faults' are concerned, the following are considered to be important factors :—

- (i) Deficiency of Vitamin A of animal origin.
- (ii) Deficiency of Phosphates relative to the amount of lime (calcium) in the diet.
- (iii) Presence of some unknown (?) factor (agent) in whole cereal grains.

The belief in them, as causative factors, is mainly based on experimental production of stones in rats. However, no specific data is available regarding the interrelationship between dietary deficiencies and the high incidence of stone, in a given geographical area. There are countries (like Holland) where the stone incidence is high, although water is soft and the nutritional disorders are not particularly known. On the other hand in South India the incidence of stone is very small, although gross malnutrition is very common.

In view of such discrepancies, it was decided to study the possible nutritional influence in the causation of this disease in Mehsana District.

The dietary studies were carried out by Kumari S. S. Corley and the Clinical Nutrition Work, by Dr. V. N. Jai.

The Laboratory investigations were carried out by Shri S. Seshadri and Dr. S. M. Patel and the Statistical work, by Smt. K. Lotlikar.

II. Survey of the Existing Conditions :

1. *The District of Mehsana.*—A greater portion of the present Mehsana District was formerly a part of Baroda State. The present District (population 14,71,662, according to 1951 census report) consists, in addition, of certain former small States, like Radharpur, Sidhpur, etc. It is a part of the geographical area called North Gujarat. It is separated from Rajasthan by Banaskantha District, in the North and Sabarkantha District in the East. It is flanked on the West by the two deserts of Kutch. (Please refer to Map—Appendix A).

The main (metre gauge) railway passes through Mehsana—the Headquarters of District administration.

2. *The Soil and Water Supply.*—The desert area in the West and North West of the District is mainly the result of percolation of brackish water (from the Gulf of Cutch) into this low-lying area. Obviously, the subsoil in these areas of the District adjacent to the deserts, resembles the salt-desert, geologically. Thus, the well water obtained in the western talukas (like Radhanpur and Sami) of the District, is markedly hard.

3. *Food Production.*—The main crops of the District are *bajri*, *jowar* and wheat. Many varieties of pulses like *tur*, *mung*, *udid*, *muth*, bengal gram, etc. are also produced. The availability of vegetables and fruits is restricted, to a few varieties only. On the other hand, the production of milk is fairly high. Groundnuts, *til* and rapeseed are grown in the District and hence the oils derived from these oilseeds are commonly consumed.

4. *Occupation.*—Although agriculture is the main activity, town-dwellers also work in small-scale industries such as 'bidi' making, weaving, tanning, oil-pressing, etc. Cotton being an important crop, many families are employed in the work of separating cotton wool and cotton seed from the cotton pods.

5. *Health Conditions.*—(i) The general health conditions of the families visited appeared to be satisfactory. The head of a family (No. 54 vide Appendix F), had suffered from T.B., about a year ago.

(ii) *Common ailments.*—From a study of the quarterly Returns (for different ailments) maintained at the Government Dispensaries and Hospitals, as also from discussion with the Medical Officers, it was gathered that the following are some of the common ailments for which patients seek treatment :—

Malaria, influenza, pneumonia and other infective fevers; dysenteries and diarrhoeas (of non-specific origin); hook-worm and guinea-worm infections; Tuberculosis—pulmonary as well as non-pulmonary; skin diseases, such as scabies, and ring-worm; eye diseases such as trachoma and cataract, are fairly common.

(iii) *Stone in the bladder.*—From the latest Annual Report on Civil Hospitals and Dispensaries (for the triennium ending 1953), it is observed that the incidence of stone in the bladder is very high in Mehsana as also in Banaskantha Districts, amongst the Districts North of Bombay. Between them, the number of such cases treated as out-patients in the Civil Hospitals, is about 20 per cent. of the total figures for Bombay State during the same period.

(iv) *Malnutrition*.—As regards specific deficiency states, the incidence of malnutrition is not reported to be high. Apart from rickets and secondary anaemia, the incidence of gross undernourishment or specific nutritional disorders, is rather uncommon.

6. *Medical Facilities*—(i) *Hospitals*.—In addition to the District Hospital, at Mehsana proper, there are four other hospitals in the District viz. at Patan, Visnagar, Radhanpur and Kadi.

(ii) *Dispensaries*.—Further, there are nearly 50 dispensaries (including one Ayurvedic Dispensary) spread all over the District.

Compared to the population of the District (about 15 lakhs), the number of treating centres is fairly adequate.

(iii) *Stone cases*.—Patients who are clinically suspected as cases of urinary stone are referred by the Medical Officers-in-charge Dispensaries, to the nearest Hospital. However, all the hospitals are not equipped with X-ray apparatus to facilitate early diagnosis and to judge the size of the stone. Under the circumstances, many of the patients have either to spend outside for the X-ray diagnosis or to be operated upon without radiological diagnosis.

(iv) From the visits to some of the hospitals and the Dispensaries, it appears that they are adequately stocked with vitamin tablets and other nutritional supplements, usually required for treating cases of malnutrition.

III. Nature and Extent of the Present Investigations :

Our investigations include the following work covering a period of nearly two years. Collection of data and samples of water, urinary stones, etc. from the Hospitals and Dispensaries of the District, took up a major portion of this period :—

1. *Preliminary Collection of Data*.—Before commencing the actual work in the District, all the Medical Officers-in-charge Government Hospitals and Dispensaries were asked to give information regarding the incidence of the disease in their respective Talukas, for the preceding three years viz. 1950 to 1952. From the information received, it was gathered that about 300 cases were being treated at Government Hospitals/Dispensaries, during this triennium. The average incidence for the whole District, worked out to be one case for about 1,200 out-patients. Moreover, it was observed that the incidence had strikingly increased during the year 1952. However, there were 6 to 7 places where the incidence was much higher viz., up to 3 per 1,000. The details are given below :—

Name of the Taluka Place.	No. of Stone cases	
	Per 1000 Out-patients	Per 1000 of Population
Sami (Mujpur)	3	0.683
Radhanpur	2	0.678
Visnagar	2	1.033
Patan	1	0.392
Vijapur	1	0.083
Kalol (Nardipur)	1	0.071

2. *A preliminary Visit to the District.*—I visited the District in the early part of the investigations, to assess the extent of the problem, the nature of investigations to be planned and to secure adequate first-hand knowledge of the dietary habits as well as the nutritional status of the population. Apart from the clinical examination of some school children in Mehsana town, I studied the source and nature of water supply at Mehsana and Visnagar. Moreover, the Civil Hospitals at these two places were specially visited to study the clinical course of patients admitted for the disease. Nine samples of stones (6 from Visnagar and 3 from Mehsana) were collected for chemical analysis. The observations made during this visit to Mehsana and Visnagar were useful in planning the future line of investigations.

3. *Assessment of the Incidence of the Disease.*—Soon after my return to Bombay, a questionnaire was prepared to get clinical details of the patients as well as the type of stone, in the operated cases.

The questionnaire was issued to those Medical Officers who had previously reported on the incidence of the disease. It will be seen from the questionnaire (Appendix B) that some information was sought to provide fairly accurate background regarding the distribution of disease according to age and sex the physical properties of the stones in each case, as also the dietary habits of the patients in general and the source of water supply. Unfortunately, only a few Medical Officers gave complete information. Out of 290 cases, treated during the triennium, data regarding only 68 operated cases was received. Even in these cases, information regarding the dietary habits or the source of water supply is not available. Moreover, only one Medical Officer has sent the samples of stones along with the questionnaires.

4. *Laboratory Work.*—In order to correlate, if possible, the nature of water, composition of encrusted material (from the water pipes) as well as samples of stones, with the average dietary intake of representative population, detailed chemical analysis of the following material was carried out in the Laboratory of the Department:—

(i) Eight samples of water (3 from Mehsana, 2 from Visnagar and 3 from Radhanpur).

(ii) Encrusted material from the water pipes of Mehsana town.

(iii) Thirty-five vesical stones (29 from Radhanpur, 6 from Visnagar and 3 from Mehsana).

5. *Field Investigations.*—As mentioned earlier, the exact role of "food faults" or dietetic deficiencies in this disease is not clearly defined. Moreover, no information was available regarding the dietary conditions or the nutritional status of Mehsana population. It was, therefore, proposed to undertake field work on the following lines:—

(A) Clinical Nutrition Survey of growing children in areas where the incidence of the disease was reported to be high.

(B) Study of the dietary habits of representative families in these areas.

For the purpose, the following six places were selected in view of the slightly higher incidence of the disease in them :—

- | | | | |
|------------------|-----|-----|---------------------|
| 1. Nardipur ... | ... | ... | (Taluka Kalol). |
| 2. Ladol ... | ... | ... | (Taluka Vijapur). |
| 3. Visnagar ... | ... | ... | (Taluka Visnagar). |
| 4. Patan ... | ... | ... | (Taluka Patan). |
| 5. Radhanpur ... | ... | ... | (Taluka Radhanpur). |
| 6. Mujpur ... | ... | ... | (Taluka Sami). |

After the approval of the proposal by Government, two field workers (viz. the Medical Officer and a Senior Nutritionist) of the Department carried out the diet and nutritional studies, as follows :—

(A) An itinerary of visits to the different places was finalised after reaching Mehsana and in consultation with the Civil Surgeon of the District (Dr. L. G. Java).

(B) At each place, the Medical Officer clinically examined representative school children of the town, by the "rapid" method of clinical nutrition survey.

In all, about 1,610 school children were examined. The nutrition survey included the recording of heights and weights.

(C) At each place, the Government Hospital/Dispensary was visited to study the case-histories of patients treated for this diseased condition.

(D) Simultaneously with the nutrition survey work, the Senior Nutritionist visited representative localities in the same areas to study the dietary habits of the population. Detailed enquires were made regarding food intake, expenditure on food, and socio-economic conditions. In all, 55 families representing the lower middle class and the agricultural/labour class, were visited for the purpose. The information recorded during these visits, provides some fairly accurate idea about the pattern of dietary habits, and the availability of foodstuffs. The details are given in Appendices D and F.

(E) With a view to study the dietary conditions in the institutions of the District, 10 residential institutions—mainly school boardings, were visited. Details about the average diets of the seven institutions from which dietary data is obtained, are given in Appendices J and K.

IV. Salient Features of Investigations :

1. *The People and their Dietary Habits.*—(i) From the preliminary discussions held with the officials of the District, it was learnt that the dietary habits of the population representing the different areas in the District, closely resembled each other.

Bajri is the staple foodgrain, but during the summer months, it is replaced by other grains viz., *jowar*, wheat and millets such as *banti*, *chino*, on account of the popular belief that *bajri* is "heat producing". Majority of the people are vegetarians.

There is a general dearth of fresh vegetables during the summer months, when the people largely depend upon root vegetables like potatoes and onions, for about 3 to 4 months of the year (March to June). Leafy vegetables are seldom used, even when available in season.

The District has a good produce of milk which is mostly converted into *ghee*. The buttermilk or whey, thus derived is distributed free or sold at a nominal price. During summer months, the buttermilk is utilised along with millets for making preparations called *ghens* or *bhaidku*. These two preparations are peculiar to this District. For *ghens*, millet such as *chino* or *banti* is used. When coarsely ground *jowar* is also used, the preparation is called *bhaidku*. Both preparations are made in a similar manner. The cereal is cooked in water until half done. Sufficient buttermilk is then added to complete the cooking. Salt is added to taste. The preparation is taken in a semi-liquid or a thick porridge form. They are taken with a cup of buttermilk or *chutney*, in place of *khichadi*. Those who can afford, take some vegetables with the preparation. All other practices in cooking are similar to those observed in the lower middle class Gujarati families.

(ii) *Method of Study*.—Accompanied by a local social worker, who is well acquainted with the people of the area, each family was visited once—preferably in the morning. In addition to noting the general family history, such as age, sex, occupation and health, the head of the family or the housewife was interrogated for the collection of the dietary data (Appendix C).

As water was suspected to be closely related to the incidence of stone in the bladder, information on the source of water supply of the individual family, was also obtained.

(iii) *Family Survey*.—Families representing the lower middle class and the agricultural/labour class, were selected at random for the dietetic studies. In all 55 families, from 5 of the 6 taluka areas, selected earlier for the study, were visited. The diet survey of families in the 6th area viz. Mujpur, in Sami Taluka, could not be undertaken, because during the visit to Mujpur, the families had all left their homes for a religious fair in the neighbourhood (at Loteshwar). However, from the general information obtained from the local officials, it was learnt that the dietary conditions are very similar to those in other five areas.

Of the 55 families, 23 belong to the lower middle class (Group I) such as traders, shop-keepers, teachers, peons, etc., and 32 belong to the agricultural and labouring class (Group II).

The food intake of the agricultural/labour class is generally greater than that of the lower middle class, who have sedantary habits of living. The two categories are, therefore, classified and studied separately.

(a) *The Lower Middle Class—Group I*.—This comprised of 23 families with an average of 5.3 members per family. The total represented 121 members with 27 (22 %) adult males, 35 (29 %) adult females; and 59 (49 %) children.

(b) *The Agricultural/Labour Class—Group II.*—This comprise of 32 families with an average of 5.9 members per family. The total represented 190 members, with 51 (27 %) adult males, 51 (27 %) adult females and 88 (46 %) children.

The details of the food intake per consumption unit (C. U.) per day and the nutrient analyses for each of the 55 families in the two groups, viz. Group I—lower middle class ; and Group II—agricultural/labour class, are given in Appendices D.to G.

2. *Studies on the Average Dietary Intakes.*—The average intake of foodstuffs per C. U. per day, as also the nutrient analyses, for the two groups, are given below :—

Composition and Analysis of Diets per C. U. per day (in ozs.).

Foodstuff.	Group I.	Group II.
Rice	2.3	0.8
Wheat	3.5	2.3
Bajri	6.6	11.5
Jowar	0.9	1.5
Banti, Chino	2.3	3.1
Pulses and dals	2.3	2.6
Leafy vegetables.. ..	0.3	0.03
Root vegetables	2.7	2.0
Other vegetables.. ..	0.6	0.4
Fruits	0.6	0.01
Sugar and Jaggery.. ..	1.7	2.2
Vegetable oils/fats.. ..	0.8	0.6
Butter and ghee	0.5	0.5
Milk, curds	5.0	3.6
Buttermilk	4.9	6.6
Meat and Fish	0.5	0.3
Eggs	0.02	..
Groundnuts	0.05	..

Nutrient analysis.—

Total Proteins (in g.)	75.0	85.9
Animal Proteins (,,)	9.7	7.5
Fats (,,)	61.6	60.7
Carbohydrates (,,)	420.0	495.9
Calcium (,,)	0.73	0.71
Phosphorus (,,)	1.89	2.26
Iron (in mg.)	39.3	53.8
Vitamin A (in I. U.)	2214	1981
Vitamin B1 (,,)	632	735
Vitamin C (in mg.)	35	14
CALORIES	2534	2874

<i>Distribution of Calories—</i>				Group I.	Group II.
				per cent.	per cent.
Proteins	...	...	..	12	12
Fats	...	...	..	22	19
Carbohydrates	...	...	..	66	69

(i) *Composition of Diet.*—The dietary habits of the two groups of people appear to be similar. The day's food intake comprised of two principal meals and a cup of tea early morning. A small number of families which did not consume tea, took milk or buttermilk instead.

The noon meal consisted of wheat *chapati* or bajri/jowar *bhakar* with *dal* and/or vegetables. The evening meal consisted of *khichadi* (rice/millet and pulse) with buttermilk and/or vegetables. The *ghens* or *bhaidku* preparation taken in place of *khichadi* was more commonly observed in the diets of Group II.

Cereals.—While *bajri* was the main cereal consumed by both groups, it was supplemented by varying quantities of rice, wheat, jowar and millets like *chino* and *banti*. Rice and wheat grains were consumed to a greater extent by Group I than Group II.

The total intake of cereals ranged from 24.2 ozs. to 7.9 ozs. with an average of 15.6 ozs. in Group I; and that in Group II, from 29.0 ozs. to 12.6 ozs. with an average of 19.2 ozs. per C. U., per day. The percentage yield of calories derived from cereals alone in the two groups, on an average, is 61.6 per cent. and 66.8 per cent. respectively.

Pulses.—Pulses were present in all the 55 diets, except in one, in Group I. Among the common ones used were *mung* (green gram), *udid* (black gram) and *tur* (red gram). *Chana* and other varieties of pulses were also used occasionally, but in very small quantities. While *mung dal* or pulse was prepared into *khichadi*, the *udid* and *tur* were used for the liquid preparations. The average intake for Groups I and II, viz. 2.3 ozs. and 2.6 ozs. per C. U., per day; shows a negligible difference in the intake of pulses in the two groups.

Vegetables.—During the period under survey, potatoes and onions appeared to be the principal vegetables consumed by families in the two groups. These were found to be supplemented by a small quantity of leafy vegetables like cabbage and *tandulja* (*Amaranthus polygamus*) and other vegetables like brinjals, ladies fingers, gourds and tomatoes. The total intake in both the groups was low, the averages being 3.6 ozs. and 2.4 ozs. per C. U., per day, for Groups I and II, respectively.

Leafy vegetables were present in only 4 of the 23 diets in Group I and 2 of the 32 diets in Group II.

Fruits.—A fair variety of fruits is available according to the seasons, but the papaya is the common one available throughout the year. But fruits, in general, were seldom consumed. They were present in the diets of 3 families in Group I and only one family in Group II.

The mango fruit, however, is highly relished by these people and from inquiries, it was learnt that in season, it is widely used. On account of the scarcity and/or the high cost of fresh vegetables, in the summer months, the mango fruit often takes the place of vegetables in the diet.

Sugar/Jaggery.—Sugar was consumed mostly in tea; whereas, jaggery was used in cooking, as well as taken with the principal meals. Jaggery was consumed to a larger extent than sugar, and for the same reason, it has been tabulated separately in the family diets. It will be seen that it is invariably consumed by all the families in Group II. The average intake of sugar and jaggery for Group I is 1.7 ozs. and that for Group II 2.2 ozs. per C. U., per day.

Vegetable Oils and Fats.—Groundnut, *til* and rape seed oils were the varieties used for cooking, in the different diets. A small quantity of hydrogenated oil (Dalda brand) was also occasionally used by some families. The total intake ranged from 2.4 ozs. to 0.1 oz., with an average of 0.8 oz., in Group I and from 2.2 oz. to nil, with an average of 0.6 oz., in Group II.

Butter/Ghee.—Ghee is one of the main produce of the District, as a result of which it was found present in the diets of 38 (69 per cent.) of the 55 families. It is also observed that of the families consuming ghee, the number in group II is higher (i.e. 75 per cent.) than group I (61 per cent.). The average intake per C. U., per day, is, however, the same for both the groups, viz. 0.5 oz.

Milk and Milk Products.—Buffalo milk is mostly available in this District. A small quantity of cow's milk is sometimes mixed with the buffalo milk before sale. A few families which keep goats, used goat's milk; but one family in Nardipur (No. 51) was found to be using camel's milk.

Milk is present in all the diets in varying quantities in Group II, but is absent in 4 of the 23 diets in Group I.

As reported earlier, the milk is converted into ghee and therefore, butter-milk is fairly widely used in the diets. This butter-milk is poor in caloric and nutritive value and is, therefore, tabulated separately from the milk intake. It may, however, be observed from the average intake per C. U., per day, that families in Group I consumed more of milk and less of butter-milk and the reverse was true in the case of Group II.

Meat/Fish.—As a rule, the people of Mehsana District take a vegetarian diet. Very few, particularly the harijans and the muslims, take some meat occasionally.

Eggs.—Egg was present in only 1 diet in Group I and totally absent in Group II. During enquiries, it was learnt that eggs are mostly consumed during the winter months.

Groundnuts.—A small quantity of groundnuts, was present in a few diets.

(ii) *Nutrient Analyses of Diets—Proteins.*—In general, the protein intake of our diets is usually deficient from the qualitative aspect. In this diet survey, the intake varied in Group I from 106.5 g. to 42.5 g. with an average of 75.0 g.; and in Group II, from 137.9 g. to 53.9 g. with an average of 85.9 per C. U., per day. The protein values of the diets, on an average, appear to be satisfactory. Only one (No. 13) of the 55 families appears to be living on as low as 42.5 g. of protein per C. U., per day.

The proteins in the majority of cases is mostly derived from cereals and pulses. However, only 1 family (No. 18) shows a total absence of animal proteins. The highest animal protein content in Group I is 25.4 g. and that in Group II 15.9 g.

Fats.—The highest amount of fats consumed in Group I is 137.9 g. and the lowest, 20.1; the corresponding figures in Group II are 167.8 g. and 19.0 g. respectively. The averages in the two groups are 61.6 g. and 60.7 g., respectively.

Carbohydrates.—The total carbohydrates consumed varied from 611.8 g. to 279.6 g., with an average of 420.0 g., in Group I; and 755.5 g., to 316.9 g., with an average of 495.9 g. in Group II. It is higher in the case of the manual workers viz. Group II (Agricultural/Labour Class).

Adequacy (Caloric Yield) of the Diets.—The average intake viz. 2534 of Group I is nearer to the recommended allowance of 2600 calories per C. U., per day; whereas that (2874 calories) of Group II falls short by about 126 calories; their requirement being 3000 calories per C. U., per day. It ranges from a maximum of 3563 to a minimum of 1685, in Group I and from 4515 to 1948, in Group II.

The percentage of calories derived from proteins (12 per cent.) is satisfactory in both the groups. Although, the difference in the average intake of fats of the two groups is not significant, the percentage yield of calories derived from fats shows a lowered trend in the case of Group II. It will also be seen that most of the calories are derived from carbohydrates, yielding 66 per cent. and 69 per cent. of the total calories in Groups I and II, respectively.

It will thus be seen that the average diet in group I is better balanced than in Group II. This is in agreement with the findings in similar surveys.

Calcium.—The calcium contents of the diets ranged from 1.17 g. to 0.36 g. in Group I and 1.24 g. to 0.40 g. in Group II. The averages for the two groups viz., 0.73 g. and 0.71 g. respectively, is deficient, compared to recommended daily allowance of 1.0 g. per head, per day. This deficiency may be explained by the low intake of milk and milk products and green leafy vegetables, in particular.

Iron.—The intake of iron ranges from 62·0 mg. to 18·3 mg. with an average of 39·3 mg., in Group I ; and 85·6 mg., to 31·9 mg., with an average of 53·8 mg. in Group II. With the exception of 4 diets in Group I, which has an intake ranging from 26·7 mg., to 18·3 mg., all the rest of the 55 families have a satisfactory iron intake. This is because of the consumption of *bajri* and jaggery, which are rich in iron content. As observed earlier, *bajri* is the staple food grain and jaggery is widely used, as a dietary habit.

Vitamin A.—Like calcium, vitamin A is low in most of the diets, in both groups, due to the non-consumption of green leafy vegetables and low intake of milk and milk products. The maximum and minimum intakes in Group I are 8709/I. U., and 930/I. U., respectively, with an average of 2214/I. U., and 4060/I. U. and 889/I. U. with an average of 1981/I. U., in Group II.

Vitamin B₁.—The average intakes of vitamin B-1 viz., 632/I. U. and 735/I. U. for Groups I and II, respectively, satisfy the recommended allowance for the day. This is due to the high intake of cereals in both the Groups.

Vitamin C.—The average intakes for Vitamin C, in the two groups fall below the recommended allowance of 50 mg., per day. This is explained by the non-consumption of fresh vegetables and fruits.

It will thus be seen that between the diets of the two groups, the one consumed by the lower middle class (Group I) is slightly better than the one consumed by the Agricultural/labour class (Group II). Both the groups show varying degrees of similar defects, such as a high intake of carbohydrate foods, and a low consumption of the *protective foods*. As a result of the latter, the diets show a deficiency in the animal proteins, calcium and vitamin, (particularly vitamins A and C). The findings also endorse the earlier observation that apart from the economic status, the dietary habits of the two groups of people are similar.

Moreover, the findings of this survey are in conformity with the findings of similar surveys.

3. *General Observations in the Families Surveyed*—(i) *Water Supply.*—Inquires regarding the water supply for the people of these areas, revealed the following :—

(a) *Visnagar and Patan.*—The water supply in both these towns is controlled by the local municipalities.

(b) *Buthia Vasana.*—A hamlet, about 5 miles away from Patan City, where one family diet survey (No. 35) was undertaken, derives its water supply from a pond.

(c) *Ladol.*—A big overhead water tank has been constructed for the supply of water to the people. Public water taps are erected at suitable distances for the benefit of the people.

(d) *Radhanpur*.—A local municipal tank is the source of water supply for drinking purposes. Bore wells are provided for washing purposes.

(e) *Nardipur*.—The people of Nardipur derive their water from a number of bore wells. This water is used for washing, as well as drinking.

As a general rule, drinking water is rarely boiled. It is strained through a muslin cloth, by a few families.

(ii) *Living Conditions*.—The housing and living conditions of the families surveyed, were quite satisfactory. Very few families lived in rented quarters. The homes, though small, were kept neat and clean. Those families which kept milch buffaloes, usually housed them under the same roof.

(iii) *Dietary History of Cases of Vesical Calculus among the Families Surveyed*—

(a) During the course of the diet survey, only one family (Family No. 44) in Radhanpur Town, gave history of stone in the bladder in a child.

A male child (present age 7 years) was operated upon in a Mission Hospital at Anand (Kaira District). The child was then only 4 years old, and two stones ("supari" size) were removed. The child appeared quite healthy. The mother reported that under instructions of the Physician, she gives this child special food, such as $\frac{1}{2}$ seer milk *khichadi* prepared from *mung* and rice, ghee and fruit (mosambi) the latter as often as possible. The head of the family is a vegetable vendor, as a result of which a fair amount of vegetables (7·3 oz. per C. U. per day), is consumed. The diet of the family in general is satisfactory in the caloric and protein yield, but is deficient in vitamin A and calcium. Apart from this child, there is no history of stone among other members of the family.

(b) Visnagar was the first of the selected areas to be surveyed. The 10 families selected at random, surveyed in Visnagar Town, gave no history of stone. The Medical Officer in-charge General Hospital, Visnagar, however, showed a case (boy aged 3 years) whose parents had come to the O. P. D., for consultation. On screening, the boy was found to have a stone in the bladder.

The patient's mother stated that the boy complained of pain during micturition, for about 3 months, but that the pain had increased since 15 days. The patient was later admitted into the hospital.

The family and dietary history of the case, revealed the following :—

The patient has both parents and he is the youngest of their 4 children. None of the other members of the family suffered from similar symptoms. Both the parents are vegetable vendors by occupation. The family lives at Dhanoj, a village 17 miles away from Visnagar town.

Their normal diet (No. 10), composed largely of the millet *banti* (16 oz.) pulses such as *tur*, *mung*, *math* (4·5 ozs.), small quantities of rice, vegetables jaggery and milk, a negligible intake of oil and 9 ozs. of butter-milk. The nutrient analysis revealed deficiency of calories, fats and essential nutrients like animal proteins, calcium and vitamins A and C. The family derived its water supply from a well.

4. *Dietetic Studies of Residential Institutions.*—Ten residential institutions for school and college students were visited in the towns of Visnagar, Patan and Radhanpur with a view to study the dietary habits of the growing population. Dietary data of 7 institutions only was obtained. While three of these are Backward Class Hostels, aided by Government, four of them are private residential boardings organised by different communities, such as Jains, Patels, Lohanas, etc. These hostels do not receive any Government grant, but are aided from funds donated by the different community trusts.

(i) *Backward Class Hostels.*—There are 3 hostels, one at Visnagar, the second at Patan and the third at Radhanapur. The total number of inmates are 45, 53 and 15 respectively. The expenditure on food is about Rs. 15 per head per month.

The menu pattern at the 3 hostels is about the same. The noon meal consists of rice, *dal*, *chapati* and vegetables; and *khichadi* with vegetables and/or *kudi* for the evening meal. Of the 3 hostels, the Visnagar hostel provides 8 ozs. of milk and the Radhanpur hostel provides about 4 ozs. of milk, per head, per day. At Patan, the students who can afford, take milk at their own cost. Once a month, feast is served, at all the 3 hostels.

The composition and nutrient analysis of the 3 diets, per head, per day, is given in Appendix J. The diets are compared with the standard vegetarian diet recommended by this Department for the Government Backward Class Hostels in Bombay State. It will be seen from the enclosed table that all the diets show a deficiency of vitamin A, which is due to the total absence of green leafy vegetables. The calcium content of the diet at Visnagar and Radhanpur Hostels is satisfactory, but in the one at Patan it is low. The animal proteins appear to be fairly satisfactory only at the Visnagar hostel. In general, the diets are deficient in the "protective foods".

(ii) *Private Boardings.*—These are 4 hostels, 2 at Radhanpur and 1 each at Visnagar and Patan. The total population at the 4 hostels is 175, with the number ranging from 75 to 23. All the inmates are boys and adolescents between the ages of 12 and 22 years. The expenditure on food is usually borne by the inmates, whereas the cost of the building, establishment charges etc. are borne by the Managing Trusts of the hostels.

At each hostel, a cup of milk is served early morning; except at the Jain Boarding, Radhanpur, where half the number of inmates take tea in place of the milk.

The morning meal generally consists of rice, *dal*, vegetables and *chapatis*, and the evening meal consists of *bhakar/khichadi* with vegetables and/or milk. The cost of the diets varies from Rs. 15 to Rs. 20 per head, per month.

The details of the 4 diets together with the nutrient analysis are compared with the standard vegetarian diet recommended for inmates of Government Secondary Schools Hostels. These are given in the Appendix K.

The 1 oz. of ghee present in the diet of the Patel Boarding, Patan, is not supplied by the Boarding, but brought by the inmates from their homes.

It will be seen from Appendix K that the cereal intake of diets served by the Visnagar and Patan Boardings, is higher than that served by the two Radhanpur boardings. Consequently, the diets are greater in the caloric value.

The intake of "protective foods" viz. milk and milk products, green leafy and fresh vegetables is generally low in all the diets, except in the diet of the Patan Hostel, which contains adequate amounts of both vegetables and milk.

Green leafy vegetables are totally absent except in the Lohana Boarding, Radhanpur, which was found to serve about 1 oz. of cabbage per head per day.

Both the diets of the Radhanpur hostels are deficient in calcium and animal proteins.

All the diets are deficient in vitamin A; and only 1 diet (Patel Boarding, Patan), satisfies the recommended daily allowance for vitamin C.

Health.—The general health of the inmates in all the seven hostels was reported to be good. No incidence of stone in the bladder among the inmates was reported.

5. *Laboratory Investigations—(A) Drinking Water.*—Eight samples of water have been chemically analysed. They belonged to three places viz. Mehsana town (three), Visnagar town (two) and a village near Radhanpur (three). Out of these, one sample from Mehsana and both the samples from Visnagar represent water samples, after being treated with "CALGAON S" (Sodium metaphosphate). The details are given in Appendix L. It will be seen from this Appendix that the chemical treatment of water has not reduced its hardness, nor the amount of total solids. On the other hand, all the samples show hardness of varying degrees. The samples of water from the towns of Mehsana and Visnagar are exceedingly hard; whereas the water samples collected from a rural area of Radhanpur are not so hard. The latter show a fair amount of sediment.

Representative samples of water from various places in the District and particularly from Kalol, Vijapur, Visnagar, Radhanpur and Mehsana, were also analysed by the Public Health Laboratory, Pcona. The results of analysis have not thrown any light regarding the correlation between the formation of urinary stones and the inorganic salts commonly found in hard water.

(B) *Encrustations in Water-pipes.*—In view of the chalky-white material as encrustations in the interior of the water pipes of Mehsana town, a typical sample of encrusted material was chemically analysed. From its composition, it can be surmised that the hardness of water is mostly due to calcium carbonate and to some extent, it is also due to magnesium salts (Chlorides and carbonates): Details are given in Appendix M.

Thus, the population gets comparatively, a large dose of calcium, as also small quantities of Magnesium and other inorganic salts.

(C) *Vesical Stones*.—In all, 35 vesical stones, mostly from Radhanpur Hospital, were examined for their physical properties, as well as chemical composition. Wherever possible, the outer layers were separated out from the nucleus in each stone. Both were powdered and analysed, separately. Based on the results of the chemical analysis, individual stones have been classified into either *pure* stones (Urates or Phosphates or Oxalates) or *mixed* stones (mixture of above salts). There was one sample which consisted mainly of blood clots. The detailed classification is given in Appendix N. It will be seen from the Appendix, that the majority of stones (75 per cent), are mixed stones. This is in conformity with the general observations that pure stones are not very common. The analysis has further shown that they are mainly composed of Phosphates, Oxalates as salts of calcium and magnesium, and/or Urates. In 12 stones (33 per cent.) all the three salts mentioned above were present.

6. *Clinical Appraisal of Stone Cases*—(i) *Incidence of the disease*.—Although the preliminary information received from the various Dispensaries regarding the incidence of the disease is not complete as mentioned earlier, it is observed that cases of vesical stone have been reported from practically all the dispensaries and hospitals. The information obtained from those Dispensaries/Hospitals, where the incidence appeared to be slightly high, is summarised below :—

Place (Hospital/Dispensary)	No. of stone cases reported (1950-51-52)	No. of cases for which adequate information is available.	No. of stone samples obtained
Visnagar ...	99	.....	6
Patan ...	59	.....	.....
Mujpur ...	33	5	.....
Radhanpur ...	31	26	26
Nardipur ...	11	.....	.....
Ladol ...	6	.....	3
Mehsana ...	4	4	3
	243	35	35

It will be seen from the above that only the Medical Officer in-charge Radhanpur Hospital, has sent full information as well as the samples of stone. One Medical Officer (Ladol) has stated that since there is no facility for treating them as indoor patients, no detailed information is recorded. Two Medical Officers have not replied to our questionnaire (Patan and Nardipur). The Medical Officer in-charge Visnagar, where the largest number of stones cases were treated (99 in 3 years), has stated that henceforward he will maintain complete records about the clinical course, and the type of stones removed by operation.

Thus, from the information available, it is not possible to map out areas in the District showing different degrees of distribution of the disease. From the independent study of the case-histories of patients in the hospital at the time of visit, it was observed that the patients belonged to villages far away from the place of treatment. Besides, there was no evidence to suggest that dietary habits or the water supply of the patient or his family would be in any way different from others. Moreover, the effective treatment for the condition being surgical interference (lithotomy or lithotomy), the number of cases recorded in any hospital (e.g. 99 cases in Visnagar Hospital) is likely to depend more upon the popularity and the skill of the treating surgeon, rather than on the local incidence of the disease. More patients will also come to a Hospital which has X-ray equipment.

(ii) *Distribution according to sex and age.*—From the information received about those patients who were clinically diagnosed as cases of vesical stones, (about 70 from 10 Dispensaries/Hospitals), it is observed that amongst adults vesical calculus is far more common in men than in women. Moreover, 50 per cent. of cases are in the age group 0-10. Thus, the incidence of vesicular stone is fairly high amongst males both boys and adults. Details are given in Appendix P.

(iii) *Diagnostic facilities.*—Even at most of the Hospitals, the diagnosis of Vesical calculus is based on the origin and progress of the disease and the clinical examination, including passing of sound through the urethra. In the absence of X-ray equipment, it is not possible to know the nature and the number of stones, their size, etc. before taking the decision to operate. Even routine analysis of urine samples is possible only in one or two big hospitals.

It will be clear from the above that the information available is too inadequate to clearly assess the incidence of the disease in the different areas of the District.

(iv) *Opinion of Medical Officers of the District.*—At most of the places, the Medical Officer in-charge Hospital/Dispensary was rather surprised that his place (town/village) was selected by us for this particular investigation. Most of them were of the opinion that the disease is prevalent throughout the District, particularly amongst the poorer classes. Moreover, it is not higher than in the neighbouring Districts (e.g. Banaskantha) or in the neighbouring States (Saurashtra or Kutch). It was their experience that a majority of them came from distant talukas (in view of better facilities or perhaps the popularity of the surgeon) rather than from the taluka to which a particular hospital belonged.

It is their impression that the incidence is much higher in Western Talukas (near the Kutch deserts) compared to the Eastern Talukas. This has not been substantiated by either the dietary studies or the nutritional survey findings.

7. *Nutrition Survey of School Children.*—(i) After a preliminary discussion with the local Education Officers, representative schools were visited in each of the previously selected places, to clinically examine the school children—

particularly in the lower primary standards. Altogether, 1,615 children—798 boys and 817 girls, were so examined. They belong to the *three towns* of Visnagar, Patan and Radhanpur and the *three villages* of Ladol, Nardipur and Sujnipur (near Patan). Most of them fall between the ages of 6 and 16.

(ii) The distribution of these children in the three grades* of nutritional status is given, in the following table :—

No.	Examined.	Grade I		Grade II		Grade III		II & III
		No.	per cent.	No.	per cent.	No.	per cent.	per cent.
Boys ...	798	108	13	669	84	21	3	87
Girls ...	817	273	34	527	64	17	2	66
Total	1,615	381	24	1,196	74	38	2	76

From the above table, it is evident that only *one* out of every *four* children depicts good health and physique (24 per cent. in Grade I). The majority of the remaining show generalised undernourishment (74 per cent. in Grade II) and a few others show clinical evidence of one or more deficiency states (2 per cent. in Grade III). It is also observed that the nutritional status of the girls is better than that of the boys.

(iii) The following table gives a comparison between the nutritional status of children belonging to the Western and Eastern Talukas :—

No.	Examined.	No. of Boys.	I		II		III		No. of girls Examined.	I		II		III	
			No.	per cent.	No.	per cent.	No.	per cent.		No.	per cent.	No.	per cent.	No.	per cent.
Eastern Taluka.	852	414	42	10	357	88	15	4	438	123	28	301	69	14	3
Western Taluka.	763	384	66	17	312	81	6	...	379	150	39	226	60	3	1
	1615	798	108	13	669	84	21	3	817	273	34	527	64	17	2

The extent of malnutrition in the Western Talukas (Radhanpur and Patan) is not higher as compared to the figures for Eastern Talukas (Visnagar, Vijapur and Kalol). Actually, the percentage of children in Grades II and III is slightly higher (90 per cent.) in the Eastern Talukas than in the Western Talukas (83 per cent.)

*Grade I (Physique and General Health, good).

Grade II (Undernourished).

Grade III (Evidence of malnutrition—single or multiple deficiency states, present).

(iv) The details of clinical findings, particularly the signs and symptoms of specific nutritional deficiencies, commonly observed amongst the children who are grouped either in Grade II or III, are given below :—

Evidence of nutritional deficiencies.	Boys		Girls		Clinical significance (Names of the particular nutrient deficiency).
	No.	per cent.	No.	per cent.	
1. Poor musculature ...	95	12	26	3	Caloric undernutrition with or without Protein malnutrition.
2. Deficient subcutaneous fat ...	538	70	419	51	
3. Dry and rough skin ...	15	1	23	3	
4. Dryness of conjunctivae ...	7	1	3	<1	Vitamin A deficiency (Hypovitaminosis—A).
5. Bitot's spots ...	12	2	8	1	
6. Night blindness ...	1	<1	1	<1	
7. Anaemia ...	1	<1	4	<1	Iron deficiency.
8. Angular stomatitis ...	4	<1	3	<1	Riboflavin deficiency (Hypovitaminosis—B2).

The above table reveals a very high prevalence of generalised undernourishment i.e. inadequacy of diet (caloric undernutrition), together with—in many cases, a deficiency of proteins also. Apart from this, the extent of other deficiencies including hypovitaminosis-A, is not very significant.

The other details of the nutrition survey, such as the number of students examined in the different places and age, are given in the Appendix S.

(v) The incidence of clinical signs whose nutritional origin is not yet definitely established, is given below :—

	No.	per cent.
Dental caries ...	205	13
Pigmentation of conjunctivae ...	75	5
Muddy conjunctivae ...	18	1

It may be mentioned here that in about 3 per cent. of these children, the general health and physique were satisfactory and hence were actually placed under Grade I of nutritional status.

The clinical significance of muddy conjunctivae and pigmentation of conjunctivae, is not quite clear in the assessment of nutritional status. However, the former is usually associated with low economic group of population and either the exposure to glare, or insanitary conditions may perhaps be predisposing factors.

(vi) *Heights and Weights*.—As a part of the clinical examination, heights and weights of all the children (except of the Sujnipur village) were recorded. The average figures for boys and girls, according to age, are given in Appendix T. From these details, there is no appreciable difference between the figures for boys and girls of the same age. The averages are, however, compared with a similar group and represented in two Graphs (Appendix U).

(vii) From the detailed clinical study in the District of Mehsana, there appears to be no evidence to conclude that the nature and degree of nutritional disorders observed, are in any way, significantly different from those observed in rural population in other Districts, such as Poona (Sirur Health Unit area), Kolaba (Karjat Community Project area) and Dangs, or in an urban population, viz. D-ward of Bombay City.

V, Discussion On The Aetology :

Nearly 50 per cent of the patients with vesical calculus, whose case histories are available, fall in the age group 0-10 years. Most of the cases reported are of stone in the bladder; only a few cases of stone in the kidney have been observed. The incidence of stone is much higher in men than in women.

The main varieties of stones are phosphates, oxalates, urates and their mixtures as salts of calcium and magnesium. In few cases, ammonium is also found. Analyses of nuclei also show wide variation in chemical make up and do not exhibit any definite relation in the formation of outer layers of stone. Similarly, age seems without any influence on the chemical composition of stone.

The composition of urinary stone and the hardness of potable water do not show positive correlation. However, it is still probable that the excessive hardness of water can be a predisposing factor in the incidence of stone in the urinary tract. Such condition may cause imbalance of minerals particularly as the consumption of "protective foods" such as milk and milk products, green vegetables and fresh fruits is rather low in this District. Further, it is revealed by the dietary study of the people that the diets are low in vitamin A which is also believed to be one of the predisposing factors in the causation of vesical calculus. Moreover, the undernutrition particularly in the primary school children i.e. in the age group in which the incidence of urinary stone is more common, is fairly prevalent.

In recent years some evidence is also accumulating, suggesting that stone formation in the bladder is due to the disturbance of a complicated biochemical mechanism and that a poisonous factor in the diet might be the responsible agent. The possibility of the presence of such a poisonous factor here does not seem probable, as the diets consumed by the people do not consist of any unfamiliar foodstuff.

It is difficult to assess the exact role played by low grade chronic infections in the material collected from the various hospitals in the Mehsana District. It is quite possible that in the presence of low grade chronic infection associated with low intake of vitamin A, pathological material which could form a nucleus for the formation of stone, may be present in the urinary tract.

VI. Summary and Conclusions :

The report gives details of laboratory and field investigations to study the possible nutritional factors in the causation of the high incidence of Vesical Calculus in Mehsana District (Bombay State).

(A) *Dietary Studies of the Families.*—The diet survey covers 55 families belonging to the lower middle class and agricultural/labour class. Majority of the people are vegetarians.

Bajri is the staple foodgrain, but is supplemented with other cereals like jowar, wheat, rice and millets (*barfi, chhino*).

The intake of fresh vegetables and fruits is low. During summer months, there is a dearth of fresh vegetables, hence root vegetables like potatoes and onions are mostly used.

Milk is one of the main products of the District, but it is mostly utilised for making *ghee*. However the buttermilk, thus derived, is widely consumed.

The nutrient analyses reveal that the diets are fairly adequate in calories, but these are mostly derived from the cereals and starchy foods. Moreover, on account of the low consumption of "protective foods" like milk and milk products, green leafy and other fresh vegetables and fruits, etc, the diets are deficient in animal proteins, calcium and vitamins A and C.

The dietary pattern of the two groups, viz. lower middle class and agricultural/labour class, is similar, but in the former the diet is better balanced.

(B). *Dietary Studies of the Residential Institutions.*—The diets of 7 residential institutions were studied. The dietary habits are similar to those of the lower middle class families. However, rice and wheat are the principal foodgrains.

All the diets yield adequate calories, but are deficient in animal proteins calcium and vitamin A.

(C) *Clinical Appraisal of Stone Cases.*—The incidence of Vesical stone is higher amongst males—both boys and adults. The condition is common in the age group 0-10 years.

Field investigations viz. the study of dietary intake and the clinical nutrition appraisal has not revealed the presence of any specific nutritional factors to explain the condition.

(D) *Nutritional Status of School Children.*—The clinical nutrition examination of about 1,600 representative school children has revealed a high incidence of generalised undernourishment and stunted growth. This can be largely explained by a low intake of "protective foods" by the population in general.

Although the extent of clinical hypovitaminosis-A in Mehsana District is not significantly higher than in similar population groups in other Districts, it may be a predisposing factor, particularly where the drinking water is excessively hard.

(E) *Water Supply.*—The drinking water is excessively hard, the degree of hardness varying from place to place. It is hard even in samples which are chemically treated with sodium metaphosphate, as at Mehsana and Visnagar.

Analysis of encrusted material collected from the water pipes of Mehsana town show, that it is largely composed of carbonates and chloride of calcium and magnesium.

(F) *Vesical Stones.*—Chemical analysis of stones received, reveal that a majority of them are mixed stones—composed mainly of oxalates, phosphate as salts of calcium and magnesium and/or Urates.

Laboratory investigations have not revealed any direct correlation between the nature of water supply and the composition of vesical stones. However, the excessive hardness of water may cause an imbalance of minerals in the body.

VII. Recommendations :

The recommendations, given below, are mainly based on our observations and investigations. They are meant, in general, to improve the water supply in the District and raise the nutritional status of growing Children.

(A) *Improvement of Water Supply.*—The Public Health Engineer to the Government of Bombay may be requested to consider the question of reducing the hardness of water, as far as possible, in the Mehsana District. As an experimental measure, a water softening plant may be installed at two places viz., Mehsana and Radhanpur. The results of this measure may be assessed after a period of five years.

(B) *Ameliorative Measures.*—1. Reconstituted milk (8 ozs.) from skim milk powder (1.4 oz.) may be distributed daily to primary school children of areas where the incidence of stone is high, such as Radhanpur, Patan, Visnagar Taluka, etc., under the supervision of school teachers.

2. Similarly, one tablet of vitamin A-D (prepared by the Haffkine Institute, Bombay) may be distributed daily to them, during school hours.

(C) *Improvement of diet in Residential Institutions.*—The Standard Diet scales, recommended by this Department for Backward Class Hostels and Secondary School Hostels (*vide* Appendices J and K) may be introduced with advantage in the Backward Class Hostels and the private School Boardings, respectively.

APPENDIX C.

DEPARTMENT OF NUTRITION, GOVERNMENT OF BOMBAY.

Schedule for the study of Dietary Habits.

Serial No. of the Family : Place :
 Name of the Head of the Family :
 Address :
 Members of the Family :
Adult : Males— ; C. U. =
Adult : Females— ; C. U. =
Children : , (Aged) ; C. U. =
 Total C. Us. of the Family = C. Us. =
 Total Income of the Family : Rs.
 Religion and Community : Mother tongue :
 Occupation : Landowner/Tenant
 No. of acres of land (Cattlewealth etc.) :
 Approx. expenditure on Food : Home Rs. ; Outside Rs.
 Dietary practices : Vegetarian/Non-vegetarian :
 (Methods in food preparation)
 Water Supply :
 Living conditions :
 Health and Personal Hygiene :
 Remarks :
 Date : 195 Name of Investigator.

Quantities of raw foodstuffs consumed by the Family.

Foodstuffs.	Total quantity for the Family.	Quantity per C.U. per day (in ozs.)	Remarks.
Rice	
Wheat	
Bread	
Jowar	
Bajri/Maize/milo	
Ragi	
Other cereals	
Whole pulses	
Split pulse (dal)	
Leafy vegetables	
Root vegetables	
Other vegetables	
Fruits	
Dry fruits	
Sugar	
Jaggery	
Vegetable oils/fats	
Ghee	
Butter	
Milk (Buffalo/Cow/Goat)	
Curds/Buttermilk	
Powdered Milk (Full cream/S. M. P.)	
Meat/fish	
Eggs (No.)	
Other foods (nuts, etc.)	
Tea/Coffee	
Salt	
Condiments, spices	
<i>Fuel—</i>			
Firewood	
Soft coke/charcoal	

APPENDIX

*Statement showing diet (in ozs.) per consumption
(Group I) surveyed in*

Serial No	Family No.	Rice.	Wheat.	Jowar.	Bajri.	Other Cereals.	Total Cereals.	Pulses.	Leafy veg.	Root veg.
1	1	5.2	..*	..*	8.7	1.8	15.7	2.7	5.2†	..*
2	2	3.1	6.3	6.3	..*	..*	15.7	3.1	..*	4.7
3	6	1.9	3.8	..	2.5	..	8.2	1.3	..	3.8
4	7	2.9	7.1	..	..	..	10.0	2.9	..	3.7
5	10	..*	1.7	..	..	16.0	17.7	4.5	..	1.7
6	12	0.6	5.9	..	5.9	..	12.4	1.5	0.5	0.5
7	13	3.6	3.9	0.3	4.5	0.6	12.9	3.6	..	1.7
8	15	1.8	6.7	0.5	1.8	..	10.8	2.7	..	2.1
9	16	4.0	3.9	..	..	..	7.9*	0.7	..	3.3
10	22	..	..	..	..	21.0†	21.0	..*	..	3.1
11	23	..	..	..	16.0	2.7	18.7	1.1	..	2.3
12	24	..	..	..	10.5	4.2	14.7	5.6†	..	4.5
13	25	2.1	..	..	8.0	..	10.1	1.1	..	2.3
14	29	..	..	14.1†	1.1	..	15.2	1.4	..	2.0
15	36	..	..	..	20.1	..	20.1	1.5	..	3.0
16	41	7.1†	..	..	17.1	..	24.2†	2.8	0.7	3.0
17	44	1.0	..	..	21.0†	..	22.0	1.8	0.3	5.0†
18	45	..	..	..	20.8	..	20.8	0.8	..	3.0
19	46	2.7	9.1	..	..	2.7	14.5	3.6	..	1.8
20	47	5.0	10.0	..	..	..	15.0	3.3	..	3.3
21	48	3.8	12.3†	..	..	..	16.1	1.5	..	3.1
22	50	..	..	..	13.3	4.4	17.7	3.2	..	0.6
23	54	7.0	10.2	..	..	..	17.2	2.6	..	2.6

* Minimum.

† Maximum.

Families numbers 10 and 44 reported cases of stone in the bladder.

D.

unit per day, of 23 lower middle class families
Me'sana District.

Other veg.	Fruit.	Sugar.	Jaggery	Veg. oils fats.	Butter ghee.	Milk curds.	Butter milk.	Meat fish.	Egg.	Ground-nuts.
..*	..*	0.5	0.6	0.4	0.7	2.5	..*	1.7	..	1.2
..	0.6	0.8	1.5	1.4	0.8	11.8	..	..	..	0.1
..	2.5	1.3	0.6	1.0	1.6	12.7†	..	3.8†	..	..
2.0	..	2.9†	0.3	2.1	2.1†	11.4	..	..	..	..
..*	0.8	0.1*	..*	0.8	9.1	..	..	..
0.5	..	1.5	0.6	1.2	0.9	9.0	11.8	..	..	..
1.0	..	0.9	1.8	0.4	0.4	4.1	19.0†	..	..	..
2.0	..	1.8	0.9	0.9	0.9	8.0	..	..	..	..
2.0	10.0†	1.3	..*	0.3	1.0	12.0	8.0	1.3	0.6	..
..	0.1	..	..*	12.6	..	..	..
..	0.1	..	..	1.5	0.7*	..	..
..	1.0	0.5	..	4.2	8.4	..	..	..
..	1.8	0.7	0.3	2.7 (Goat)	..	..	..	..
..	1.6	2.4†	..	2.4	6.0	1.2	..	..
..	..	1.5	2.0†	0.5	1.0	9.1 (Goat)	..	1.7	..	..
2.0	..	0.7	1.4	1.4	..	5.7	..	0.8	..	..
2.0	0.9	..	1.8	..	0.7	..	..
3.0†	0.3	..	..	..	..	..	..
..	..	0.6	1.2	0.6	0.3	1.8	11.0	..	..	..
..	..	2.2	1.1	1.1	0.7	6.6	0.5	..	..	..
..	..	1.0	1.5	0.8	0.4	3.1	0.7	..	..	..
..	1.1	0.3	..	..	6.3	..	..	..
..	..	0.2	1.7	0.3	0.3	5.1	17.0	..	..	..

APPENDIX

*Statement showing the nutrient analyses of
(Group I) surveyed in*

Serial No.	Family number.	Total Proteins. (g.)	Animal Proteins. (g.)	Fats. (g.)	Carbo- hydrates. (g.)	Calcium. (g.)	Phos- phorus. (g.)	Iron. (mg.)
1	1	89.2	12.1	69.3	410.1	0.89	1.84	50.2
2	2	84.3	14.2	89.6	482.2	1.11	2.09	35.2
3	6	71.1	35.2	111.9	281.3	1.17*	1.55	22.4
4	7	65.8	13.7	137.9*	379.8	1.01	1.60	21.8
5	10	82.5	3.1	20.1†	463.4	0.51	1.99	39.1
6	12	64.8	13.5	87.8	345.2	0.94	1.79	33.3
7	13	73.0	9.3	45.6	413.0	0.78	1.78	39.1
8	15	63.2	9.6	69.7	362.3	0.80	1.56	28.7
9	16.	57.5	25.4*	67.4	288.8	1.13	1.41	18.3†
10	22	62.0	2.9	21.1	439.8	0.37	1.82	34.6
11	23	69.2	1.0	29.9	387.9	0.36†	1.96	46.8
12	24	91.0	7.0	44.1	431.7	0.83	2.22	48.7
13	25	42.5†	2.8	44.1	279.6†	0.38	1.14†	30.2
14	29	65.8	10.6	87.6	396.3	0.52	1.61	38.1
15	36	95.8	18.5	90.3	529.1	0.95	2.58	62.0*
16	41	106.5*	12.0	76.6	611.8*	0.88	2.67*	61.6
17	44	92.4	5.8	62.1	480.6	0.66	2.51	60.0
18	45	76.4	...	38.6	427.3	0.43	2.22	55.7
19	46	73.2	4.7	38.9	418.9	0.56	1.72	33.0
20	47	76.4	8.0	67.2	482.4	0.77	1.79	29.7
21	48	65.4	3.9	45.1	444.2	0.53	1.64	30.1
22	50	77.3	1.5	33.6	428.0	0.44	2.04	50.3
23	54	79.1	10.0	37.1	476.8	0.81	1.92	35.8

* Maximum.

† Minimum.

E.

*the diets of 23 lower middle class families
Mehsana District.*

Vitamin.			Calories.	Distribution of calories.		
A (I. U.).	B1 (I. U.).	C(mg.).		Proteins.	Fats.	Carbo- hydrates.
8,700*	611	83	2,621	14*	24	62
2,286	742	39	3,072	11	26	63
3,820	454	19	2,416	12	42*	46†
2,711	552	37	3,023	9†	41	50
975	658	9	2,365	14	8	78
2,359	553	16	2,431	11	32	57
1,375	559	18	2,354	12	17	71
1,726	562	29	2,329	11	27	62
3,737	390	285*	1,992	12	20	58
930†	583	16	2,197	11	9†	80*
1,385	629	12	2,098	13	13	74
1,752	657	23	2,488	15*	16	69
1,311	345†	12	1,685†	10	24	66
1,126	585	10	2,637	10	30	60
3,019	733	15	3,312	12	24	64
2,892	768	44	3,563*	12	19	69
2,514	807*	48	2,850	13	20	67
1,767	720	42	2,362	13	15	72
1,094	710	9	2,319	13	15	72
1,638	734	17	2,840	11	21	68
1,314	774	16	2,444	11	16	73
1,245	629	3*	2,324	13	13	74
1,248	748	13	2,555	12	13	75

APPENDIX

Statement showing diet (in ozs.) per Consumption Unit per day of 32
Mehsana

Serial No.	Family No.	Rice.	Wheat.	Jowar.	Bajri.	Other Cereals.	Total Cereals.	Pulses.	Leafy vegetables.	Root-vegetables.
1	3	..*	..*	*..	22.2	..*	22.2	4.6	..*	3.2
2	4	..	..	..	20.0	3.3	23.3	6.6	..*	...*
3	5	4.1	..	..	10.3	..	14.4	4.1	..	..
4	8	4.2	12.6	..	..*	..	16.8	2.8	..	1.8
5	9	1.0	4.2	..	10.5	..	15.7	0.8	..	3.0
6	11	3.2	..	..	11.9	..	15.1	2.2	..	1.4
7	14	0.4	5.2	..	10.4	5.8	21.8	1.3	..	1.3
8	17	0.2	..	..	13.0	7.0	21.1	2.3	..	0.5
9	18	..	0.3	..	17.0	0.3	17.6	0.8	..	1.0
10	19	0.4	3.3	..	22.6	1.6	27.9	1.6	..	1.4
11	20	1.2	2.2	..	7.2	2.2	12.8	2.5	..	2.0
12	21	0.2	3.1	..	15.6	8.0	26.9	6.2	0.7†	3.0
13	26	..	..	..	25.8†	..	25.8	1.1	..	3.3
14	27	..	..	19.0	10.9	3.3	24.2	4.5	..	1.6
15	28	..	..	..	24.2	4.8	29.0†	4.8	0.3	4.0
16	30	..	..	13.9†	3.5	..	17.4	0.4*	..	3.7
17	31	..	..	..	17.6	3.0	20.6	2.7	..	1.9
18	32	..	..	..	11.3	4.5	15.8	1.7	..	1.4
19	33	..	..	..	12.6	..	12.6*	2.1	..	3.8
20	34	..	..	..	..	15.1†	15.1	1.6	..	1.1
21	35	..	..	..	12.9	10.3	23.2	3.7	..	1.1
22	37	..	..	10.0	10.0	..	20.0	0.5	..	1.0
23	38	..	..	..	13.3	..	13.3	0.5	..	2.5
24	39	..	..	10.0	10.0	..	20.0	0.5	..	1.1
25	40	..	..	..	16.3	..	16.3	1.4	..	4.1†
26	42	..	..	..	16.8	6.3	23.1	6.9†	..	3.0
27	43	..	..	..	..	13.9	13.9	2.6	..	3.5
28	49	5.6†	..	..	11.2	..	16.8	3.7	..	3.0
29	51	..	..	4.9	9.8	..	14.7	0.4	..	..
30	52	..	17.0†	..	..	6.0	23.0	1.4	..	1.0
31	53	2.0	13.5	..	..	2.0	17.5	2.7	..	1.3
32	55	4.1	12.8	..	..	..	16.9	4.1	..	4.1

*Minimum.

F.

Families of Agricultural Labour Class (Group II) surveyed in District.

Other vege- table.	Fruit.	Sugar.	Jaggery.	Vegetable oils rate.	Butter Ghee.	Milk curds.	Butter- milk.	Meat fish.	Egg.	Ground- nuts.
*	*	0.7	3.4	2.2†	2.2	8.9	*	...	...	...
...	...	0.9	4.4†	0.9	2.2	3.3	...	...	...	...
...	...	*	0.7	*	*	1.0*	...	...	...	...
...	...	1.1	3.9	1.1	1.4	4.4	...	1.3	...	...
2.3	1.4	0.4	0.3	2.9	...	0.8	...	...
...	2.0	0.7	...	2.2	4.3	0.3*	...	...
...	...	0.5	2.0	0.5	0.5	0.6	17.7	...	...	...
...	1.9	0.6	0.6	3.5	5.6	...	...	...
0.7	0.5*	0.3	0.1	2.1	9.3	...	...	...
1.0	0.8	0.2	0.2	2.4	4.0	1.6†	...	...
0.9	...	0.3	2.8	0.2	0.4	1.3	14.3	...	...	...
2.0	...	0.3	2.8	0.5	0.5	2.0	11.4	...	...	...
...	...	0.2	1.3	0.4	0.3	3.2	2.6	...	...	...
...	...	0.7	2.2	0.7	0.4	4.1	...	...	...	...
2.0†	3.2	1.0	0.3	4.8	19.4	...	...	...
...	1.2	0.8	...	1.7	2.4	0.5	...	...
...	1.1	0.6	...	2.3	1.5	0.2	...	...
...	1.1	0.2	0.1	3.4	4.0	0.3	...	...
1.0	1.4	1.0	...	4.2	...	1.1	...	...
...	2.3	0.8	...	3.0	2.6	0.6	...	...
...	...	1.0	3.9	0.6	1.3	10.3*	15.5	...	...	...
...	1.1	0.4	...	3.3	...	0.0	...	...
...	...	0.7	0.8	0.6	0.4	2.2	...	0.6	...	...
...	1.0	0.5	...	6.0	1.1	...	...	...
...	1.4	0.3	0.2	2.7	6.8	0.4	...	...
...	4.2	1.1	0.6	3.0	12.6	...	...	...
...	...	1.7†	1.3	1.3	0.4	7.0	3.5	0.5	...	...
0.7	0.6	0.2	0.2	1.9	2.5	1.2	...	...
...	0.6	...	2.3†	3.7	36.9†	...	...	...
...	2.4	0.2	0.2	1.2	9.7	...	...	...
...	0.3†	0.2	2.0	0.4	0.2	1.3	8.1	...	...	...
...	...	0.7	1.4	0.5	0.7	3.1	20.5	0.5	...	...

†Maximum.

APPENDIX

Statement showing the nutrient analyses of the diet of 32 Agricultural

Serial No.	Family Number.	Total Proteins. (g).	Animal Proteins. (g).	Fats. (g).	Carbohy- drates. (g).	Calcium. (g).	Phospho- rus. (g).	Iron. (mg).
1	3	115.1	10.7	167.8*	636.1	1.16	3.07	75.7
2	4	121.0	4.0	121.8	702.0	0.87	2.91	85.6*
3	5	71.0	1.2†	19.0†	373.2	0.40†	1.57	41.5
4	8	83.6	12.0	87.0	543.5	0.73	1.91	41.4
5	9	66.2	7.4	43.8	378.4	0.56	1.78	42.1
6	11	67.1	5.1	44.4	397.4	0.52	1.72	44.2
7	14	89.1	11.3	64.2	558.6	0.93	2.55	59.0
8	17	86.2	5.5	65.5	506.9	0.66	2.37	56.8
9	18	68.4	4.7	42.4	371.9	0.53	2.01	49.2
10	19	114.5	12.2	58.0	597.3	0.75	3.08	72.4
11	20	64.5	6.7	39.5	393.9	0.67	1.70	43.3
12	21	133.5	6.1	67.4	735.4	1.04	3.39	81.5
13	26	97.5	4.0	62.2	569.5	0.68	2.85	72.2
14	27	101.6	5.3	62.7	650.3	0.78	2.78	65.2
15	28	137.0*	10.2	90.1	755.5*	1.24*	3.74*	94.2
16	30	62.0	5.2	40.8	416.9	0.44	1.66	39.8
17	31	88.6	4.2	50.2	481.7	0.60	2.39	57.6
18	32	67.8	6.6	37.0	375.0	0.57	1.85	43.0
19	33	68.1	10.8	58.4	336.8	0.63	1.75	42.2
20	34	59.9	7.4	41.1	402.4	0.50	1.55	33.9
21	35	111.4	15.9*	99.7	668.1	1.23	3.05	70.8
22	37	74.9	8.7	40.1	446.9	0.53	2.02	38.0
23	38	53.9†	5.8	52.4	316.9†	0.43	1.53†	37.8
24	39	72.7	6.6	43.8	448.5	0.59	2.07	47.7
25	40	70.0	5.5	43.9	393.6	0.58	1.96	49.3
26	42	125.3	6.5	86.7	693.7	0.99	3.13	80.6
27	43	67.4	10.8	71.2	432.1	0.71	1.70	31.9†
28	49	84.8	8.9	37.9	432.2	0.56	1.93	43.5
29	51	61.9	12.6	90.8	323.5	0.69	1.85	44.2
30	52	86.8	3.7	27.8	559.7	0.58	2.33	47.1
31	53	77.1	3.4	29.9	471.4	0.54	1.91	39.0
32	55	92.1	11.1	54.0	500.3	0.85	2.16	40.5

*Maximum.

G.

Labour Class Families (Group II) surveyed in Mehsana District.

Vitamins.			Calories.	Distribution of Calories.		
A (I. U.)	B-1 (I. U.)	C. (mg.)		Proteins.	Fats.	Carbohydrates.
4000*	864	16	4515*	10†	34	56
3746	1000	.....†	4383	11	25	64
983	565	.....	1948†	14*	3†	77
2180	843	9	3291	10	24	66
1663	643	36	2173	12	18	70
1233	511	7	2257	12	18	70
1943	800	7	3169	11	18	71
1898	691	3	2962	12	20	68
1421	590	11	2143	13	18	69
2105	1015	16	3369	13	16	71
1542	516	18	2189	12	16	72
3620	1091*	44	4082	13	15	72
2517	873	17	3228	12	17	71
2138	908	8	3604	12	16	72
3441	1085	52*	4385	13	18	69
1363	633	19	2283	11	16	73
1676	731	10	2733	13	17	70
1337	540	7	2104	13	16	71
1602	524	28	2145	13	24	63
889†	464†	6	2219	11	17	72
2921	792	6	4015	11	22	67
1347	682	5	2448	12	15	73
1560	467	13	1955	11	24	65
1553	668	6	2479	12	16	72
1895	603	21	2250	12	18	70
2724	928	15	4056	12	19	69
1657	490	18	2639	10	24	66
1538	613	21	2409	14	14	72
2677	552	.....	2361	10	35*	56†
1228	1077	5	2836	12	9	79*
1139	873	15	2463	12	11	77
1774	904	21	2856	13	17	70

†Minimum.

(G.O.P.) No-B O 3378-3

APPENDIX H.

DEPARTMENT OF NUTRITION, GOVERNMENT OF BOMBAY.

Statement showing the total daily issue of foodstuffs for all the inmates on ten consecutive working days.

(Date : From to)

Name and address of the Institution :

Name of foodstuff.	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	8th day	9th day	10th day	Remarks.
Rice ... Lbs.											
Wheat ... Lbs.											
Other cereals* Lbs											
Pulses* ... Lbs.											
Leafy vegetables* Lbs.											
Root vegetables* Lbs.											
Other vegetables* Lbs.											
Fruits* ... Lbs.											
Sugar and Jaggery Lbs											
Vegetable oils/fats Lbs.											
Butter and Ghee lb											
Milk, Curds, etc. Lbs.											
Meat and Fish Lbs.											
Eggs ... No.											
Other Foods* ...											
Number of inmates ...											

Total Number of Inmates (Men.....; boys—1-5 years.....; 6-11 years; 12-14 years.....)

(Women.....; Girls—1-5 years.....; 6-11 years; 12-14 years.....)

approximate Cost of Food Purchases per month ;

*Please give names in detail.

THE MENU FOR TEN CONSECUTIVE WORKING DAYS.

G.P. NO. 8378-4

Serving Time	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	8th day	9th day	10th day
Breakfast (Morning tea, conjee, snacks, etc.)										
Mid-day meal ...										
Afternoon tea, snacks, etc.										
Evening meal ...										

35

To be filled in and returned to—

The Assistant Director,
 In-charge Department of Nutrition,
 C/o Haffkine Institute, Parel, Bombay-12.

The Senior Nutritionist's name :

Date of study :

APPENDIX J.

Existing and Recommended Diets for Backward Class Hostels.

Foodstuffs.	Existing Diets.			Recommended diet (Vegetarian).
	Shri Sayaji V. Ashram, Visnagar.	Shri Sayaji V. Bhavan, Patan.	Sanskriti Mandir, Radhanpur.	
Rice	4.9	5.5	2.5	4.0
Wheat	6.3	5.8	3.6	12.0
Bajri	..	3.3	7.5	8.0
Other cereals	....	....	....	....
Pulses	5.7	6.9	4.4	3.0
Leafy Vegetables	....	....	..	3.0
Root Vegetables	2.0	2.0	3.0	3.0
Other Vegetables	0.9	1.0	3.0	4.0
Fruits	....	....	....	....
Sugar/Jaggery	0.6	....	1.5	0.75
Vegetable Oil/fats	1.1	0.7	0.8	1.5
Butter/ghee	....	0.4	....	....
Milk/curd	8.0	....	4.3	1.3 (Skim milk powder)
Buttermilk	....	1.6	....	....
Groundnuts	....	....	....	0.5
<i>Nutrient Analyses—</i>				
Total Proteins (g)	80.6	89.7	75.6	75.8
(Animal Proteins) (g)	9.6	0.4	5.2	13.8
Fats (g)	50.7	41.9	46.8	56.9
Carbohydrates (g)	367.7	426.8	409.0	365.7
Calcium (g)	0.85	0.46	0.75	1.27
Phosphorus (g)	1.71	1.83	1.82	1.84
Iron (mg.)	25.8	34.8	41.7	38.5

APPENDIX J—*contd.*

Nutrient Analysis.	Existing Diets			Recommended diet (Vegetarian).
	Shri Sayaji V. Ashram, Visnagar.	Shri Sayaji V. Bhavan, Patan.	Sanskriti Mandir, Radhanpur.	
Vitamin A (I. U.)..	990	1240	1520	4663
Vitamin B-1 (I. U.)	604	728	638	563
Vitamin C (mg.) ..	18	19	42	103
CALORIES ..	2,249	2,443	2,360	2,278
<i>Distribution of Calories—</i>				
Proteins ..	14%	15%	13%	13%
Fats ..	20%	15%	18%	23%
Carbohydrates ..	60%	70%	69%	64%

APPENDIX K.

Existing and Recommended Diets for Private Boardings (Schools).

Foodstuffs.	Existing Diets.				Recommended Diet for Secondary School Hostels (Vegetarian).
	Adarsh Boarding, Visnagar.	Patel Boarding, Patan.	Lohana Boarding, Radhanpur.	Jain Boarding, Radhapur.	
Rice	2.0	1.5	2.6	2.0	4.0
Wheat	14.0	12.1	9.0	9.7	
Bajri ... ..	.....	2.5	0.6	.....
Other cereals ... ..	.....	.....	.....	.....	.....
Pulses	5.0	4.1	2.3	2.7	2.5
Leafy vegetables ... ..	.....	.....	1.1	.....	2.0
Root vegetables	2.0	4.8	1.2	.....	4.0
Other vegetables	2.0	4.0	0.1	5.1	3.0
Fruits ... ..	.....	.....	.....	.....	If desired.

APPENDIX K—*contd.*

Foodstuffs.	Existing Diets					Recommended Diet for Secondary School Hostels (Vegetarian).
	Adarsh Boarding, visnagar.	Patel Boarding, patan.	Lohana Boarding, Badhanpur.	Jain Boarding, Badhanpur.		
Sugar/Jaggery	... 1.0	1.1	1.7	2.1	2.0	
Vegetable oil/fats	... 0.7	1.1	0.8	1.8	1.25	
Butter/ghee ...	... 0.4	1.0*	0.8	0.8	0.5
Milk/courds	... 8.0	12.0	6.8	2.8	12.0	
Buttermilk ...	... .....	.....	3.7	.....	.....
<i>Nutrient Analyses—</i>						
Total Proteins (g) ...	95.5	97.4	63.8	60.9	66.6	
(Animal Proteins) (g) ...	9.6	14.4	8.9	3.4	14.4	
Fats (g) ...	52.5	88.5	62.3	84.0	75.5	
Carbohydrates (g) ...	459.9	467.2	354.4	353.3	369.7	
Calcium (g) ...	0.95	1.25	0.78	0.52	1.43	
Phosphorus (g) ...	2.22	2.42	1.56	1.43	1.76	
Iron (mg.) ...	35.1	38.3	25.1	28.4	33.6	
Vitamin A. (I. U.) ...	1526	2511	2909	1342	5394	
Vitamin B ₁ (I. U.) ...	932	922	617	636	469	
Vitamin C. (mg.) ...	28	60	26	46	107	
CALORIES	2693	3055	2234	2413	2424	
<i>Distribution of Calories—</i>						
Proteins ...	14 Percent.	13 Percent.	11 Percent.	10 Percent.	11 Percent.,	
Fats ...	18,,	26,,	25,,	31,,	28,,	
Carbohydrates	68,,	61,,	64,,	95,,	61,,	

* The quantity of ghee is brought from home.

APPENDIX L.

*Analysis of water samples.**

Analysis.	Mehsana,			Visnagar.		Radhanpur Taluka.		
	1	2	3	4	5	6	7	8
Turbidity	Clear	Clear	Clear	Clear	Clear, Yellowish tinge.	Turbid, and sediment.	Turbid, no sediment.	Turbid and sediment.
Total solids	206	204	99.6	157	156	62	146	88
Total Hardness	40	39	39	22	22	19	25	30
Chlorides (Cl.)	78	78	25	30	30	3	46	13
Nitrates (Nitric-Nitrogen)	1.4	1.6	1.2	2.8	2.8	.....	.....	.....

* Results are expressed in parts per 100,000.

1. Sample of the bore water taken directly from the bore pipe before it is treated with Calgon 'S' (Sodium metaphosphate) in the water works.
2. Sample of tap water, after treatment with Calgon 'S'.
3. Sample of water taken from the Sabardi well which supplies water to the other side of the town.
4. Sample of tap water after treatment with Calgon 'S'.
5. Sample of water taken from cement-plastered reservoir (8' deep) where the water is purified with Calgon 'S'.
6. 'Verda' water from Sardarpura Village (2 miles from Radhanpur town).
7. Same sample after being filtered at home.
8. 'Verda' water from Purana Village (4 miles from Radhanpur town).

APPENDIX M.

Composition of a Typical sample of encrusted material collected from the water pipe of Mehsana town.

Composition.	Per cent.	Composition.	Per cent.
Moisture ...	0.054	Sulphate (SO ₄) ...	0.26
Ash ...	88.82	Chloride (Cl) ...	0.06
Organic matter ...	Nil.	Phosphorus ...	Nil.
Calcium (Ca) ...	15.17	Nitrate ...	Nil.
Magnesium (Mg.) ...	14.57	Carbonate (Co 3) ...	40.8
Iron (Fe) ...	0.078		

APPENDIX N.

Classification of Stones according to major components.

Place.	Pure stones.			Mixed stone.				B	Total.
	U	P	O	UP	UO	PO	UPO		
Mehsana ...	...	...	...	1	...	1	1	...	3
Radhanpur.	3	2	2	5	...	2	11	1	26
Vienagar ...	...	...	1	1	2	2	...	...	6
Total ...	3	2	3	7	2	5	12	1	35
Per cent. ...	8.6	5.7	8.6	20.0	5.7	14.3	34.3	2.8	.

U=Urate; P=Phosphate; O=Oxalate; B=Blood Clot

APPENDIX P.

Distribution of Patients according to Age and Sex.

No.	Age group (years)	No. of patients.			Per cent.
		Male.	Female.	Total.	
1	0 to 5 ...	20	1	21	31
2	6 to 10 ...	12	1	13	19
3	11 to 15 ...	2	.....	2	3
4	16 to 20 ...	1	.....	1	1
5	21 to 30 ...	10	.....	10	15
6	31 to 40 ...	8	.....	8	12
7	41 to 50 ...	5	.....	5	7
8	51 to 60 ...	6	.....	6	9
9	Over 60 ...	1	1	2	3
Total ...		65	3	68	100

APPENDIX

Tabular statement showing Physical Properties and

Serial No.	Weight.	Shape.	Surface.	Colour.	Moisture. percent.	Ash. percent.
1	2	3	4	5	6	7
						-MEH
1	11.02	Round	.. Nodular	.. Light brown	4.7	46.1
1N	....	....	....	Light brown	..	..
2	7.23	Oval	.. Smooth	.. Chalky white	12.8	64.1
3	8.89	Round	.. Nodular	.. Dark brown	4.1	59.8
						RADHAN
4	12.65	Oval	.. Slightly Nodular	Brown	0.2	12.1
5	9.23	Oval	.. Smooth	.. Light brown	1.6	5.1
6	5.13	Oval	.. Rough	.. Light brown	11.7	20.5
7	3.14	Oval	.. Rough	.. Light brown	1.3	2.8
8	14.77	Oval	.. Nodular	.. Dark brown	2.4	35.7
9	21.19	Round	.. Nodular	.. Brown	2.3	35.3
10	2.29	Round	.. Smooth	.. Light brown	3.1	38.0
11	35.79	Oval	.. Smooth	.. Brown	1.5	4.4
11N	....	....	....	Light brown	..	..
12	11.91	Cashew nut	.. Smooth	.. White	32.1	46.2
12N	....	....	....	Brown	..	..
13	129.18	Round	.. Rough	.. White	49.7	46.7
14	12.06	Oval	.. Smooth	.. Black	..	..
15	61.27	Oval	.. Smooth	.. Light brown	7.2	43.3
16	4.62	Oval	.. Rough	.. Brown	9.0	47.7
17	16.71	Oval	.. Rough	.. Light brown	1.5	5.8
17N	....	....	....	Light brown	..	..
18	6.91	Cashew nut	.. Smooth	.. Chalky white	21.9	64.7
19	49.74	Round	.. Nodular	.. Dark brown	3.1	48.7
19N	....	....	....	Dark brown	..	..
20	53.03	Oval	.. Nodular	.. Dark brown	2.7	48.4

Q.

Chemical Composition of Urinary Stones.

Total. per cent.	P2 O5 per cent.	CaO per cent.	Mg O per cent.	C2 O3 per cent.	Uric Acid, per cent.	Ammonium NH4 per cent.
8	9	10	11	12	13	14
SANA.						
2.1	9.5	38.5	0.5	27.2	3.7	1.1
15.4	Nil.	Nil.	Nil.	Nil.	9.9	2.2
5.4	19.6	25.3	1.1	Nil.	6.7	2.1
1.1	2.1	21.5	0.2	24.5	0.3	Trace.
PUB						
16.7	1.9	11.5	Nil.	5.6	16.0	0.1
22.4	4.4	3.1	Trace.	1.1	12.8	1.1
19.4	5.8	88.4	0.3	Nil.	6.4	1.3
23.4	0.4	1.9	Nil.	Nil.	8.0	0.3
2.0	1.9	33.9	0.2	22.5	2.0	0.1
4.4	2.0	32.9	0.4	21.4	3.7	0.1
4.0	36.6	27.1	Nil.	18.0	4.7	0.3
25.6	0.5	2.9	Trace.	Nil.	18.1	Nil.
25.8	.....	.....	.....	Nil.	10.8	1.9
5.4	4.0	6.3	0.1	Nil.	1.9	2.1
8.3	.....	.....	.....	Nil.	93.9	Nil.
5.2	2.3	4.4	Nil.	Nil.	0.6	1.6
.....
9.3	2.6	23.3	Nil.	10.1	8.4	0.6
5.4	4.0	25.4	0.3	21.4	6.4	0.6
28.3	0.7	4.0	Trace.	Nil.	3.2	0.2
14.2	.....	.....	.....	Nil.	14.4	Nil.
2.6	4.4	23.5	0.3	Nil.	6.4	1.8
0.2	0.8	33.3	0.4	28.1	4.0	Nil.
0.7	.....	.....	.....	31.9	Trace.	Nil.
0.8	0.8	34.1	0.4	16.0	1.0	Nil.

APPENDIX

Serial No.	Weight.	Shape.	Surface.	Colour.	Moisture per cent.	Ash. per cent.
1.	2	3	4	5	6	7
RADHANPUR						
21	26.77	Round	.. Smooth	.... Light brown	9.3	41.8
21N	....	....	....	Dark brown	2.2	37.1
22	6.41	Irregular	.. Nodular	.. Dark brown	2.8	69.7
23	8.99	Oval	.. Smooth	.. Dark brown	2.3	23.2
24	7.45	Oval	.. Smooth	.. White	1.2	4.2
24N	....	....	....	Dark brown	..	..
25	36.13	Oval	.. Slightly Nodular	Dark brown	2.1	36.7
26	96.9	Round	.. Nodular	.. Brown	1.9	36.8
26N	....	....	....	Light brown	..	..
27	6.91	Irregular	.. Rough	.. Nut brown	3.3	36.9
27N	....	....	....	Light brown	..	..
28	13.81	Cashew nut	.. Rough	.. Chalky white	19.9	64.6
29	45.19	Oval	.. Rough	.. Light brown	1.7	11.1
29N	....	....	....	Light brown	..	..
VIA						
30	42.35	Round	.. Nodular	.. Dark brown	2.7	36.9
31	11.48	Oval	.. Smooth	.. Chalky white	30.5	45.8
32	4.63	Oval	.. Rough	.. Nut brown	1.9	3.1
33	7.4	Irregular	.. Rough	.. Uneven colour	0.1	66.3
34	39.76	Round	.. Nodular	.. Light brown	4.0	7.3
34N	....	....	....	Brown	1.7	2.2
35	22.21	Oval	.. Rough	.. Light brown	5.4	63.8
Average composition.	22.95	....	....	....	7.29	35.02

Number bearing 'N' indicates the nucleus

Q—contd.

Total. per cent.	P ₂ O ₅ per cent.	Ca O per cent.	Mg O per cent.	Si O ₂ per cent.	Uric Acid, per cent.	Ammonium NH ₄ per cent.
8	9	10	11	12	13	14

—contd.

6.3	3.6	22.0	0.9	9.0	2.7	1.1
0.3	1.9	32.4	Nil.	28.1	Nil.	Nil.
0.7	4.1	37.4	Nil.	27.0	Nil.	Nil.
12.8	1.5	22.6	0.1	16.9	0.9	1.0
12.2	7.7	9.7	Trace.	1.1	1.2	1.5
0.6	.....	.....	.....	30.4	4.0	Nil.
1.2	1.5	34.4	0.2	25.9	1.9	0.2
0.8	1.1	34.6	0.5	19.1	Nil.	Nil.
34.7	.....	.....	.....	Nil.	43.1	3.2
8.6	3.8	41.2	0.2	24.8	2.7	1.0
10.3	.....	.....	.....	.....	.....	.....
2.8	5.8	23.5	Nil.	Nil.	0.7	1.7
23.4	1.1	9.3	Trace.	Nil.	3.1	0.6
16.3	.....	.....	.....	.....	.....	.....

NAGAR

0.7	0.1	21.1	Trace.	22.0	0.2	Nil.
8.2	4.1	13.1	1.5	Nil.	2.1	0.7
28.8	Nil.	Nil.	Nil.	2.5	1.9	1.4
0.2	4.3	28.2	0.8	8.3	0.6	1.3
30.0	Nil.	Nil.	Nil.	2.0	2.8	0.3
39.9	Nil.	Nil.	Nil.	2.0	2.5	Nil.
0.7	1.5	31.9	0.3	8.3	0.2	0.3

10.29	4.16	21.44	0.25	11.87	5.70	0.7
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of stone of the respective digit.

APPENDIX R.

DEPARTMENT OF NUTRITION, GOVERNMENT OF BOMBAY.

Schedule for Rapid Clinical Nutrition Survey.

Serial No. Date

Name :

Age : Years Months. Sex : Place :

Weight : lbs. Height : inches.

Haemoglobin : g/100 ml. Std. Div.

GRADE I

GRADE II

- (a) Poor musculature.
- (b) Deficient subcutaneous fat.
- (c) Mild anaemia.
- (d) Lack of interest in surroundings.
- (e) Mild signs of not more than one of the specific nutritional disorders or deficiencies mentioned under Grade III.

GRADE III

- (a) Gross muscular wasting.
- (b) (i) Xerosis or pigmentation of conjunctivae.
- (ii) Bitot's spots.
- (iii) Xerosis of cornea.
- (iv) Angular conjunctivitis.
- (c) Marked anaemia.
- (d) (i) Red and/or raw tongue ; Glazed tongue ; Stomatitis.
- (ii) Bleeding gums.
- (e) Dental caries.
- (f) Dry and/or rough skin. Hyperkeratosis. Crazy pavement epithelium.
- (g) Oedema—localised or generalised.
- (h) Tenderness of the Calf muscles.

Special remarks (if any) :—

APPENDIX S. (Table I).

Statement showing the distribution of boys and girls, including adolescents, in the three nutritional grades, at different places in the Mehsana District.

Place,	Number of students examined.	Number of boys examined.	I		II		III		Number of girls examined.	I		II		III		
			No.	Per-centage.	No.	Per-centage.	No.	Per-centage.		No.	Per-centage	No.	Per-centage	No.	Per-centage	
<i>West of Mehsana.</i>																
Patan	369	179	36	20	140	78	3	2	190	92	48	97	51	1	1	
Radhanpur	334	166	28	18	132	82	..	..	174	56	32	118	68	..	..
<i>East of Mehsana.</i>																
Visnagar	402	183	23	13	148	80	12	7	219	59	27	149	68	11	5	
Nardipur	244	128	7	5	119	98	2	2	116	37	32	79	68	..	..
Ladol	208	103	12	12	90	87	1	1	103	27	26	73	71	3	3	
Sujuipur	60	45	2	4	40	89	3	7	15	2	13	11	74	2	13	
Total ..	1,615	798	108	13	669	84	21	3	817	273	34	527	64	17	2	

APPENDIX S (Table II):

Statement showing the distribution of boys and girls, including adolescents, in the three nutritional grades according to age.

Age in years.	Number of students examined.	Number of boys examined.	I		II		III		Number of girls examined.	I		II		III		Remarks.
			No.	Per-centage	No.	Per-centage	No.	Per-centage		No.	Per-centage	No.	Per-centage	No.	Per-centage	
6	25	22	3	14	19	86	...	...	3	1	33	2	67	...	...
7	120	89	12	18	72	81	5	6	31	8	26	23	74	...	...
8	130	68	5	7	61	90	2	3	62	8	13	54	87	...	...
9	241	100	14	14	84	84	2	2	141	47	33	93	66	1	1	
10	263	109	8	7	98	90	3	3	154	47	31	104	67	3	2	
11	244	121	14	11	106	88	1	1	123	42	34	75	61	6	5	
12	208	93	17	18	72	77	4	4	115	40	35	73	63	2	2	
13	133	67	13	10	64	81	...	...	66	24	36	40	61	2	3	
14	106	55	11	20	43	78	1	2	51	22	43	28	55	1	2	
15	51	18	5	28	13	72	...	...	33	18	55	15	45	...	...
16	22	8	1	12	7	88	...	...	14	9	64	5	34	...	...
Above 16 years.	8	3	3	100	...	...	...	...	5	4	80	1	20	...	...
Age not recorded.	4	...	...	...	...	...	...	...	4	1	25	3	75	...	...
Sujnipur village (6-12 years)	60	45	2	4	40	89	3	7	15	2	13	11	74	2	13	
Total	1,615	798	108	13	669	84	21	3	817	273	34	527	64	17	2	

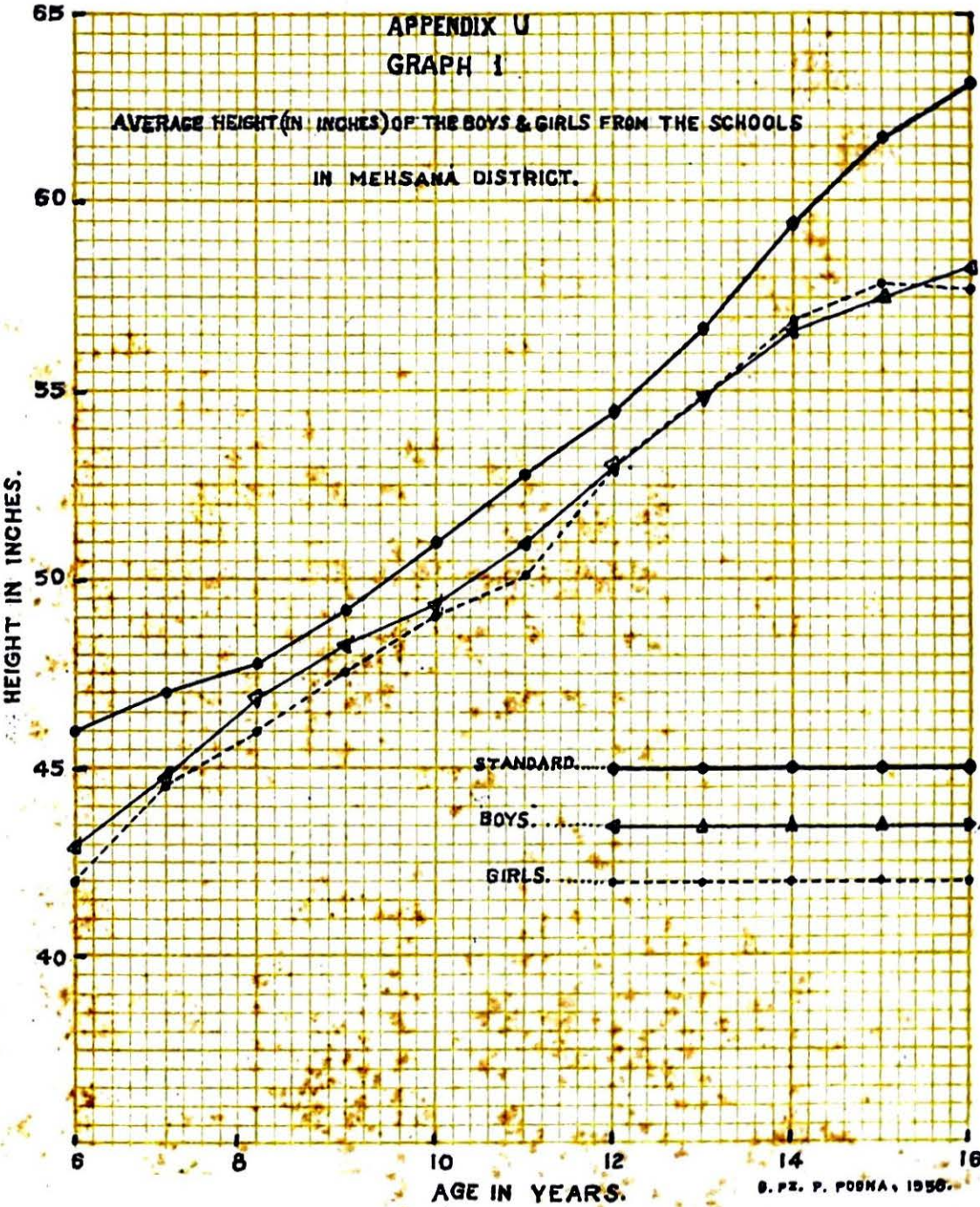
APPENDIX T.

Statement showing the average heights and weights of boys and girls, including adolescents upto 18 years.

Age.	Number of boys.	Average height in inches.	Average weight in lbs.	Number of girls.	Average height in inches.	Average weight in lbs.	Remarks.
6	22	43.0	35.8	3	42.0	35.3	
7	89*	44.8	39.1	31	44.8	39.8	*Height of one boy was not taken.
8	68	46.8	42.7	62	46.2	40.5	
9	100	48.1	46.5	141	47.6	43.0	
10	109	49.4	47.9	154	49.1	46.7	
11	121	51.0	51.4	123	51.1	51.4	
12	93	53.0	56.7	115	53.0	56.1	
13	67	54.7	62.1	66	54.7	62.8†	†Weight of one girl was not taken.
14	55	56.6	68.1	51	56.9	69.6	
15	18	57.5	68.9	33	57.9	75.9	
16	9	58.4	76.6	14	58.6	74.6	
17	2	62.5	91.5	1	64.0	61.0	
18	1	62.0	94.0	1	69.0	86.0	

APPENDIX U
GRAPH 1

AVERAGE HEIGHT (IN INCHES) OF THE BOYS & GIRLS FROM THE SCHOOLS
IN MEHSANA DISTRICT.



GRAPH II

AVERAGE WEIGHT (IN POUNDS) OF THE BOYS & GIRLS -
FROM THE SCHOOLS IN MEHSANA DISTRICT.

