

**Assessment of Diet and Health status of
Mandvi town with special reference to
Kakrapar Atomic Power Station**



SOUTH GUJARAT UNIVERSITY

SURAT

MAY

2003

**Assessment of Diet and Health Status of Mandvi town with
special reference to Kakrapar Atomic Power Station**

FINAL REPORT

SUBMITTED BY

**SOUTH GUJARAT UNIVERSITY
SURAT**

SPONSORED BY

**NUCLEAR POWER CORPORATION INDIA LIMITED
MUMBAI**

May

2003

PROJECT PERSONNEL,

SOUTH GUJARAT UNIVERSITY

Principal Investigator - Prof. P. K. Gadhia

Associate Investigator - Dr. Mohini Gadhia

RESOURCE PERSONNEL

Corporate Office (NPCIL)

Dr. Jitendra Singh

Shri. P. M. Wagh

Shri. B. Ramamirtham

Shri. S. K. Singh

Mrs. P. V. Geetha

KAPS

Shri. R. Bhiksham

Shri. T. A. Sabastian

NPC CONSULTANCY SERVICE CONTRACT
SOUTH GUJARAT UNIVERSITY, SURAT.

“ Assessment of diet and health status of Mandvi town with special
reference to Kakrapar Atomic Power Station. ”

ADVISORY COMMITTEE

- | | | |
|-----|---|------------------|
| 1. | Prof. Prem Kumar Sharda, Vice-Chancellor, SGU, Surat. | Chairman |
| 2. | Dr. Arya, B. S. NPCIL, VSB, Mumbai. | |
| 3. | Dr. Bhagwat, S. V. KDN Gohil Hospital, Navsari. | |
| 4. | Shri. Bhiksham, R. SD, KAPS. | |
| 5. | Dr. Dang, H. S. HPD, BARC, Mumbai. | |
| 6. | Dr. Dudhwala, Homi CMO, Maskati Hospital, Surat. | |
| 7. | Shri. Sanvaya, R. T. Deputy Director Fisheries Dept., Surat. | |
| 8. | Shri. Wagh, P. M. Director, HSG & PA, NPCIL, Mumbai. | |
| 9. | Dr. Gadhia Mohini SGU, Surat. | |
| 10. | Prof. Gadhia P. K. SGU, Surat. | Member Secretary |

SGU – South Gujarat University

KAPS – Kakrapar Atomic Power Station

NPCIL – Nuclear Power Corporation of India Limited

HPD – Health Physics Division

PREFACE

Nuclear Power Corporation of India Limited (NPCIL), Government of India awarded a **Consultancy Service Contract (CSC)** to **South Gujarat University, Surat** to carry out Assessment of Diet and Health status of Mandvi town with special reference to **Kakrapar Atomic Power Station (KAPS)**.

The first unit of KAPS attained its criticality on **September 03, 1992** and the earlier baseline survey was carried out before one year of functioning of plant. The baseline survey report was submitted to the Nuclear Power Corporation of India Ltd.


In the present study an assessment of diet and health status was carried out in Mandvi town, which is located in the close proximity of KAPS. The main aim of the present CSC was to overall assess the effects, if any, during the operation of plant. In this report I have tried to give a comparative assessment of earlier baseline survey and Mandvi project.

The report was possible due to the active participation of all the Advisory Committee Members. I, on behalf of my fellow co-investigator like to express our special thanks to all the members for their valuable suggestion. I am thankful to the **Prof. Premkumar Sharda, Hon. Vice-Chancellor** and other officials for their continuous support, advice and co-operation for smooth running of CSC. I am also thankful to NPCIL, Mumbai for the financial assistance. I would like to specially thank Heads, Department of Biosciences and Aquatic Biology, South Gujarat University, Surat for their co-operation.

The lastly, I would like to sincerely thank the residence of Mandvi town without whose support this report could not be completed.

May, 2003

Surat


(P. K. Gadhia)

CONTENTS

ITEM	PAGE
List of Tables	(i)
List of Figures	(iii)
List of Annexures	(iv)
1.0 INTRODUCTION	1
2.0 Kakrapar Atomic Power Station (KAPS)	1
2.1 Profile	1
3.0 History of Consultancy Service Contract	2
4.0 Socio-economic survey	3 - 6
4.1 Population profile	4
4.2 Socio-economic profile	4
5.0 DIET SURVEY	6 - 11
5.1 Food and Nutritional intake	7
5.1.1 Cereals and Millets	7
5.1.2 Pulses	7
5.1.3 Green Leafy Vegetables	8
5.1.4 Other Vegetables	8
5.1.5 Roots and tubers	8
5.1.6 Milk	9
5.1.7 Sugar and Jaggery	9
5.1.8 Fats and Oils	9

5.1.9	Flesh foods	9
5.1.10	Fruits	9
5.2	Nutrient Intake	10
5.2.1	Energy	10
5.2.2	Protein	10
5.2.3	Iron	10
5.2.4	Calcium	10
5.2.5	Vitamin –A	10
5.2.6	Vitamin –C	11
6.0	ANTHROPOMETRY	11
6.1	BMI of Children	11
6.2	BMI of Adults	11
7.0	HELATH SUVERY	12 -13
7.1	Morbidity pattern	12
7.2	Morbidity (Disease pattern)	12
7.3	Other diseases	13
8.0	RADIOACTIVITY MEASUREMENTS	13 - 14
8.1	Cs-137 and Sr-90 in food articles	13
8.2	Tritium in water and milk	14
9.0	PULMONARY FUNCTION TEST	14 - 15
10.0	SUMMARY	15
11.0	COMPARATIVE ASSESSMENT OF EARLIER BASELINE SURVEY AND MANDVI TOWN	16
	REFERENCES	18

(i)

TABLE	TITLE	PAGE
4.1.1	Age and sex-wise population profile of Mandvi town	19
4.2.1	Religion pattern	20
4.2.2	Tribe and caste distribution	20
4.2.3	Family composition	20
4.2.4	Types of accommodation	21
4.2.5	Types of housing	21
4.2.6	Ventilation pattern	21
4.2.7	Electricity facility	21
4.2.8	Habits (Male population)	22
4.2.9	Water source	22
4.2.10	Average consumption of water	22
4.2.11	Bathing facility	23
4.2.12	Types of fuel	23
4.1.1	Respondents and their size of land holdings	24
4.2.14	Annual income of families	24
5.1.1	Diet Survey and food articles	25
5.2.1	Diet Survey of nutrients	25

TABLE	TITLE	PAGE
6.1.1	Body Mass Index Grades of Children	26
6.2.1	Body Mass Index Grades of Adults	27
7.1.1	Morbidity pattern	28
7.2.1	Morbidity pattern (Disease pattern)	29
7.3.1	Agewise distribution of other diseases	30
8.1.1	Radioactivity of Cs-137 and Sr-90 in food Articles	31
8.2.1	Tritium in water and milk	31
9.1.1	Pulmonary function test	32

LIST OF FIGURES

TABLE	TITLE	PAGE
4.1.1	Location site of Mandvi town	33
4.2.1	Tribe and Caste distribution	34
5.1.1	Mean intake of food articles	35
5.2.1	Mean intake of Nutrients in articles	36
6.1.1	Body Mass Index Grades of school children	37
6.2.1	Body Mass Index Grades of adults	38
9.1.1	Pulmonary function – normal	39
9.1.2	Pulmonary function – obstructive type	40
9.1.3	Pulmonary function – obstructive type	41
9.1.4	Pulmonary function – combined type	42
9.1.5	Pulmonary function – obstructive type	43

LIST OF ANNEXURES

NO	DESCRIPTION	PAGE
I	Diet Questionnaire	44
II	Health Questionnaire	52

1.0 INTRODUCTION

Though power generations have multiplied 50 times in 40 years, India still suffers from an acute power shortage. A 12,000 Mwe gap between demand and supply. Bridging this gap is the crucial need of the hour. At present most parts of the country are facing staggering of power supply affecting industry, agriculture and transportation.

If India has to keep pace with the latest technology, to forge ahead progressively, the pace of growth must be further accelerated. Therefore, India needs energy, which can be obtained from all the commercially viable sources like coal, hydel, oil and gas including nuclear energy. It will be only optimal blend of thermal, hydel and nuclear sources, which will help to reduce up to some extent, the power scarcity that looms ahead to the country (DAE Pamphlet, 1999).

Nuclear energy for power production is comparatively clean source and it does not significantly burden the environment as compared to other commercial energy generating sources. At present, many of the environmentally conscious countries in the world depend on nuclear power significantly for their electricity requirements.

2.0. KAKRAPAR ATOMIC POWER STATION (KAPS)

2.1 Profile

Kakrapar Atomic Power Station (KAPS) the fifth nuclear power station in India consists of two identical pressurised heavy water reactors (PHWR) of 220 Mwe. each reactor is natural uranium fuelled with on power refuelling facility. The reactor, boilers and most of the associated auxiliary equipment and systems are located in the Reactor Building. The building is so designed to contain all radioactive

effluents, which could result from the unlikely-event of reactor systems failure. The service building is connected to the Reactor Building through double-door main air locks. The Turbine building houses turbo-generator sets and pertinent systems which includes condenser cooling, diesel generators and other related components.

The heat abstracted from various cooling systems is dissipated to the atmosphere through Natural Draft Cooling Tower (NDCT) for condenser cooling and through Induced Draft Cooling Tower (IDCT) for active process water-cooling beside other cooling equipment. The water required is drawn from the Moticher pond (by Kakrapar Left Bank Canal) by plant water pumps through intake structure and buried pipe lines (KAPS Pamphlet, 1996).

3.0 HISTORY OF CONSULTANCY SERVICE CONTRACT

Nuclear Power Corporation India Limited (NPCIL) had awarded a Consultancy Service Contract (CSC) to the South Gujarat University (SGU) to carry out "Dietary, Health and Biotic Baseline Survey around Kakrapar Atomic Power Station in Surat district". The actual work on the project began on October 2, 1991 just one year before the first unit of Kakrapar Atomic Power Station (KAPS) started functioning on September 3, 1992 and baseline survey work was completed by December, 1992.

Total of twenty-four villages were selected and divided in four clusters covering population of 22,672, which consisted 11431 males and 11241 females. The socio-economic study revealed that majority of the families lived below poverty lines with poor housing facilities.

Dietary survey (10% of total population) was conducted in randomly selected population. Results showed that quantity of food intake by inhabitants was

below the Recommended Dietary Intake (RDI). Nutrient analysis also showed high deficiency of Vitamins A & C. In addition, it was recorded that the inhabitants of the survey area did not meet even the basic calorie requirement. Anthropometrics study of school children and adults was carried out with special reference to Body Mass Index (BMI) and Protein Energy Malnutrition (PEM).

Health survey (100% of population) was carried out to collect information on disease pattern of the population surrounding KAPS. The diseases were classified in two groups namely commonly occurring diseases and other diseases, such as congenital deformity, mental retardation, cataract, goitre, cancer and sterility. Results revealed that prevalence rate of radiation-related disease were falling in the range of natural occurrences.

Biotic survey was conducted to study the angiospermic taxa. A special attention was paid to study the aquatic flora and fauna from seven various spots from upstream to downstream of Tapi river around KAPS. The radioactivity measurements of water, milk and food articles were in the range of global fall out.

4.0 SOCIO-ECONOMIC SURVEY:

Mandvi town cover a wide spectrum of socio-economic conditions having approximately population of 14293 (Census 1991) inhabitants of which 7281 males and 7012 females. It is located in the close proximity of the plant and falls in the Sector -N (1.6 to 5.0 km.) (Map-I). Though Mandvi town was in the close proximity of KAPS, however, it was not surveyed earlier due to the large size of the population and there was need to cover other important villages around KAPS for baseline survey.

4.1 Population profile:

The total population surveyed in 31 wards was 14008, of which 7116 were males and 6692 were female (Table 4.1.1). The demographic analysis showed that highest population was recorded in 00 – 05 years of age group followed by 06 – 10 years of age group. The lowest population was recorded in above 65 years of age group.

4.2 Socio-economic profile

To get a picture of socio-economic status of the population information on demographic structure of the population, which includes sex-ratio, habits, land holdings, economic status was collected. Information on provision of basic amenities like housing and general living conditions was also collected and analysed.

A socio-economic survey of Mandvi town on random sampling of 10% consisting of 252 families (1240 members) was carried out to assess the socio-economic profile.

The people of this area are mainly tribal by origin and they practice Hindu and Christian religion. Data analysis of religion pattern revealed that the majority of the population is Hindu (77.7%), while two other religions namely Christian(12.7%) and Muslim (9.5%) are also observed (Table 4.2.1). Table 4.2.2 and Fig.4.2.1 present the tribe and caste composition. The caste analysis revealed that mixed population of lower castes consist of 56.7% followed by chaudhris (15.5%).

Data analysis of family composition as presented in **Table 4.2.3**

reveals that majority of families (50%) have five to seven members followed by less than five members (43.2%).

An analysis of housing facility specially type of accommodation (**Table 4.2.4**) reveals that the majority of them (61.1%) with reference to economic status live in rented houses and the remaining (38.8%) live in their own houses. It is recorded that majority of families (95.2%) have concrete houses (**Table 4.2.5**) followed by hut with tiles (3.1%). The ventilation pattern (**Table 4.2.6**) reveals that majority (99.2%) has windows and proper ventilation and 0.8% has chimney. Electric facility is found in 95.2% houses and 4.8% houses have no electricity facilities as presented in **Table 4.2.7**.

The habits of male inhabitants show (**Table 4.2.8**) that 20 per cent were using tobacco for chewing and 22 per cent were smoking bidi. Further it was recorded that 43.6% population has no habit of smoking or chewing tobacco. Remaining 12% having other habits of smoking cigarettes and chewing pan masala.

The tap water is major source (85.3%) of water and remaining families use well water (6.7%) followed by bore well (5.1%) as presented in **Table 4.2.9**. Average consumption of water per person per day was recorded. Data reveal that 69% of person use 2.5 to 3.0 liters per day while 30.9% use 4.5 to 5.0 liter per day

(Table 4.2.10) . With regard to bathing facility majority population (98%) use bathrooms and 2% used open space as presented in Table 4.2.11.

Data analysis of types of fuel used by inhabitants showed that majority (52.9%) use kerosene followed by L.P.G. (41.3%) as presented in Table 4.2.12.

The population surveyed reveals that majority of people (59%) are without land followed by 24.6 percent having marginal land holdings that mean less than 1 hector. The percentage of small farmers was 12.7 with land holding up to 2 hector (Table 4.2.13).

The economic status of the families was evaluated on the basis of their annual income (Table 4.2.14). Results reveal that 80.9% families comprising up to four members, have annual income of \geq Rs. 11,500 and only 19.0% families are found with annual earning \leq Rs. 11,500 falling under below poverty line group.

5.0 DIET SURVEY:

Human beings need a wide range of nutrients to perform various functions in the body. The nutrients include proteins, fat, carbohydrates, vitamins and minerals. These nutrients are chemical substances, which are present in daily foods classified as cereals, legumes (pulses), nuts and oil seeds, vegetables, fruits, milk and milk products and flesh foods (fish, meat and poultry).

In each selected ward 10% households were chosen for diet survey. among several methods for diet survey oral questionnaire (Recall) method was observed to be practical and useful. Oral questionnaire (24 hours recall) method

(National Nutrition Monitoring Bureau Report, 1996) of diet survey was used for assessing the intakes of individuals in the household (Annexure-I). Through this method dietary intake data for previous 24 hours was collected from the house of each family using a set of standard measuring cups of different sizes.

5. 1 Food and nutrient intake:

Intra-family distribution of food was assessed. The individual intakes were calculated for different sub-groups based on age, sex, and physiological status so that intakes could be compared with recommended dietary intake (RDI) as suggested by Indian Council of Medical Research (ICMR) Expert Committee. The consumption of food stuffs (g/CU/day) by inhabitants in mandvi town is presented in Table 5.1.1 and Fig. 5.1.1.

5.1.1 Cereals and Millets:

Major cereals in Indian diet are wheat, rice, millets, juwar and bajri and they supply the major part of energy, protein and iron. In the present survey, it is noted that juwar, wheat and rice are the major cereals used by inhabitants as staple diet. Pooled mean intake was 342.3 g. as compared to recommended dietary intake of 460 g., resulting the deficiency of 25.6 percent.

5.1.2 Pulses:

Pulses are dals and whole legumes. They mainly supply protein, calcium and iron. Pulses meet most of the requirements of the proteins of inhabitants. The consumption of 40 g pulses is suggested in the balanced diet. The

consumption of pulses was higher (43.3 g.) as compared to RDI. Therefore, result reveals that consumption of pulses was 8.25 percent more than RDI.

5.1.3 Green leafy vegetables (GLV):

GLV are an essential part of Indian diet and are good source of β -carotene, iron, calcium and Vitamins A & C. The recommended intake of GLV is 40 g. but it was found 4.3 g/CU/day. The average results show the 89.2 percent deficiency, which was highest among all food articles.

5.1.4 Other vegetables:

The consumption of other vegetables like brinjal, ladies fingers, gourds etc. were better than GLV. The intake of other vegetables was 58.6 g. by inhabitants as compared to recommended dietary intake 60 g. The deficiency was 2.3 percent.

5.1.5 Roots and tubers:

Roots and tubers are the source of energy 50–100 calories/100g. In survey, potatoes and onions contributed mostly to this food groups, the consumption was 79.0 g resulting 58.0 percent higher consumption of roots and tubers than RDI.

5.1.6 Milk:

Milk is the only dietary source of Vitamin B12 for pure vegetarians and is also good source of Riboflavin. The recommended quantity of milk per day per person is 150 ml. The mean intake of milk was 118 ml per person per day as compared to RDI having a deficit of 21.3 percent.

5.1.7 Sugar and jaggery:

Sugar and jaggery adds sweetness to the diet. 100g of sugar and jaggery gives energy of 400 calories. The recommended intake of sugar per day is 20 g. The average intake was 5.8 g. higher than RDI resulting in 29.0 percent more intake per person per day than RDI.

5.1.8 Fats and oils:

The recommended intake of fats and oils is 20 g. The average consumption was 14.8 g per person per day resulting in deficit of 26.0 percent as compared to RDI.

5.1.9 Flesh foods:

In general the average consumption of flesh foods was 16.2 g having deficiency of 53.7 percent.

5.1.10 Fruits:

The consumption of fruits was 10.9 g per person per day resulting in deficit of 63.7 percent.

5.2 Nutrient intake

The estimate of average consumption of various nutrients (per CU/g) is presented in **Table 5.2.1** and **Fig. 5.2.1** represents the mean intake of nutrients in the pooled clusters.

5.2.1 Energy:

The mean take of energy was 1680 KCal/CU showing deficit of 31.4 per cent in comparison to RDI of 2450 Kcal recommended by NIN.

5.2.2 Protein:

The mean intake of protein was 54.0 g which is below RDI of 60 g. having average deficiency of 10.0 percent.

5.2.3 Iron:

The mean intake of iron was 26.3 mg as compared to intake of 28 mg per person per day resulting deficit of 6.1 percent.

5.2.4 Calcium:

The mean consumption of calcium was 423 mg as compared to RDI (400 mg) resulting in higher consumption of 5.7 percent of calcium per person per day.

5.2.5 Vitamin- A:

The average intake of Vitamin-A was not satisfactory. The intake was 306 ug as compared to 600 ug/CU/day. The average deficit was 49.0 percent.

5.2.6 Vitamin-C:

The mean intake of Vitamin - C (Ascorbic acid) was 29.4 mg as compared to 40 mg of RDI showing deficiency of 26.5 percent.

6.0 ANTHROPOMETRY:

Body Mass Index (BMI)

The Body Mass Index (BMI) [Weight in Kg/(Height in meters)²] was used as an indicator of nutritional status of adults. The adults were grouped in different nutritional grades.

6.1 BMI grades of School Children:

The body mass index was used as an indicator of nutritional status of children. The Children were grouped according to different age groups such as 0 – 3, 4 – 7, 8 – 10 and 10 –14 years (Table 6.1.1 and Fig. 6.1.1).

Total of 616 children from randomly selected areas of Mandvi town were analysed for BMI grades. Of which 13 (21%) were suffering from severe nutrition. About 556 (90.2%) were mal normal and only 47 (7.6%) were over nourished where BMI was over 15.0. This data were analysed based on National Institute of Nutrition (NIN) guidelines.

6.2 BMI grades of adults:

BMI grades of adults (16 years and above) were analysed as presented in Table 6.2.1 and Fig. 6.2.1. At the aggregate level 1.5% of the adults had BMI of value 25 and above representing overweight and obesity. The normal BMI was seen in tune of 88.2 % and chronic energy deficiency (CED) was recorded in 10.3% of the total population surveyed.

7.0 HEALTH SURVEY:

The 30% health survey covered a population of 4595 consisting of 2334 male and 2261 female of Mandvi town. Door to door survey was carried out with the aid of medical doctors and who diagnosed the disease patterns. Health survey included morbidity pattern in different age groups. A special attention was paid to the diagnosis of common diseases and certain disease patterns such as congenital deformity, mental retardation, cataract, goitre (Grade III & IV) and cancer, which are classified as other diseases.

7.1 Morbidity pattern:

Age and sex-wise distribution of morbidity pattern is shown in Table

7.1.1. Total 524 morbid persons were found in the total population of 4595. The highest morbidity was observed in males of 60-65 years age group and prevalence was 576.2 per 1000 and 666.0 per 1000 in female in the age group of above 65 years. The lowest morbidity was observed for the age group of 16 –20 in males and prevalence was 27.3 per 1000. In female lowest morbidity was observed in 21 –25 years age group and prevalence was 44.7 per 1000.

7.2 Morbidity (Disease pattern) :

Disease pattern among inhabitants of Mandvi town is shown in Table

7.2.1. The varieties of diseases were recorded in total population of 4595. The analysis revealed that in males the prevalence of skin diseases (132.8 per 10000) was

highest followed by general infections and tuberculosis, while in female the prevalence of Gynec problem, (137.1 per 10000) was highest followed by skin diseases and fever.

7.3 Other diseases:

Age-wise distribution of other diseases is presented in **Table 7.3.1**.

Results revealed six cases of congenital deformity (cleft lip, cleft palate and club foot). In addition four cases of mental retardation were recorded. The incidences of cataract were **twenty-nine** and **five** cases of goiter (grade III & IV) were found. The incidences of **four** cases of cancer were recorded in different age groups from total population of **4595**.

8.0 Radioactivity measurements:

The region around Kakrapar site promotes intensive and extensive cultivation of various food articles like cereals (wheat, rice, juwar), pulses (udad, turdal), vegetables (brinjal, tindola), fruits (mango, papaya). Representative (4 - 5 samples each) of the different crops raised in the area were collected during their seasons of cultivation. They were radio chemically analysed for Cs-137 and Sr-90. Milk and grass samples were collected from the cattle grazing near the vicinity of the station where the probability of deposition of release was higher.

8.1 Cesium - 137 (Bhat et al., 1992):

Cesium carrier was added to the aqueous sample and was acidified with nitric acid. The cesium, rubidium and potassium were carried on AMP (Ammonium molydophosphate) and the cesium was purified by absorption on selective elution from cation exchange resin. Finally the cesium fraction was precipitated as Cs_2SnCl_6 and counted in beta counter.

Strontium - 90 (Bhat et al., 1992):

The detection of Sr-90 was done in sample which were concentrated in nitric acid to remove radium, lead and barium activities followed by ferric hydroxide scavenging done to remove other fission products leaving strontium in solute. Finally the Sr activity was counted in beta counter.

Results of concentration of Cs-137 and Sr-90 in various food components are presented in **Table 8.1.1**. The mean activity of Cs-137 in different food articles was ranged from 792 ± 438 mBq/Kg fresh weight in grass to 27 ± 35 mBq/Kg fresh weight in brinjal.

The activity of Sr-90 was found to be 157 ± 127 mBq/Kg fresh weight in wheat followed by 106 ± 29 mBq/Kg fresh weight in brinjal. Other samples were found BDL. In the present study, the concentration of biologically significant long lived radionuclides in diet components that are locally grown and consumed by the residents of Mandvi town are at global fall out levels.

8.2 Measurement of tritium in water and milk:

Radioactivity of tritium was measured in water and milk samples collected from tap water (Municipal supply), well, boring and river and milk purchased from local producers (**Table 8.2.1**). Results revealed that samples of water collected from different sources showed BDL values. Similarly, the milk samples also showed values of BDL in comparison to MDL value of 55 mBq/ml.

9.0 Pulmonary function test:

Pulmonary function test was carried out with Spirovit Sp-1 spirometer in different age groups. The following parameters were studied.

- 1) Forced vital capacity (FVC)
- 2) Slow vital capacity (SVC)
- 3) Forced expiratory value (FEV₁)
- 4) Ratio FEV₁/ FVC or FEV

Total of 100 inhabitants of Mandvi town of different age groups such as 1 –10, 11 – 20, 21 – 30, 31 – 40, 41 – 50, 51 –60 and above 60 years were studied. From each group 15 individuals were studied except last group where 10 individuals were selected for pulmonary function test. Results were computerized and analysed as follows:

- 1) Purely obstructive
- 2) Restrictive
- 3) Combined
- 4) Normal

Results revealed that 4% population has respiratory problems (**Table 9.1.1 and Figs. 9.1.1 to 9.1.5**). Of which **three** individuals have obstructive type and **one** has combined of both obstructive and restrictive in age group of 21 – 30 years.

10.0 SUMMARY:

The report is based on the results of survey conducted on diet and health in Mandvi town during 1998 – 2001. Total 31 wards were surveyed covering population of 14008, which consisted 7716 males and 6892 females. Socio-economic survey revealed that majority of families was above poverty line but with minimum required housing facilities.

Dietary survey (10%) of total population was conducted in randomly selected wards. Results showed that quantity of food intake was not sufficient and it

was below recommended dietary intake (RDI). Nutrient analysis also showed high deficiency in Vitamins A & C followed by calories, proteins, iron. Anthropometrics study with special reference to BMI of children showed that 2.1 per cent were suffering from severe mal nutrition and 7.6 per cent were over nourished. The BMI of adults revealed that 10.3 per cent were suffering from chronic energy deficiency (CED).

Health survey (30%) of population was carried out in Mandvi town. The diseases were classified in two groups namely common diseases and other diseases. Results showed that prevalence rate of other diseases like congenital deformity, mental retardation, cataract, goiter and cancer was in the range of natural occurrences reported for the rural population (CSO, 2000).

The radioactivity measurements for Cs-137 and Sr-90 present in water, milk and food articles were in the range of global fallouts.

The pulmonary functions test was carried out in selected age groups with aid of Spirometer. Results revealed that only 4 per cent inhabitants have respiratory problems of obstructive and combined type.

11.0 COMPARATIVE ASSESSMENT OF EARLIER BASELINE SURVEY AND MANDVI TOWN

Earlier during 1991 – 92 a baseline survey was conducted on Diet, Health and Biotic status of 24 villages around Kakrapar Atomic Power Station (KAPS). The baseline survey completed before first unit of KAPS became functional

on 3rd September, 1992. The Mandvi town survey was carried out during 1998 – 2001.

The comparative assessment of both the surveys with special reference to socio-economic profile, Diet and Health status are as under:

1. The socio-economic study of baseline survey revealed that majority of inhabitants were under poverty line and they were having very poor housing facilities. In comparison, in Mandvi survey majority of population lived above poverty line with minimum required housing facilities.
2. Diet survey of food articles in baseline survey revealed that the inhabitants consumed higher amount of pulses and sugar & jaggery as compared to recommended dietary intake (RDI). Similarly Mandvi survey also revealed that pulses, sugar & jaggery and roots & tubers were consumed higher in quantity than RDI. However, nutrient analysis of baseline survey and Mandvi town showed similar results except content of calcium was more than RDI in Mandvi survey.
3. Anthropometrics study of school children and adults were carried out in both survey. Body Mass Index (BMI) of both the survey did not show much variation, while in baseline survey of adults especially with chronic energy deficiency (CED) was 50% as compared to Mandvi town where adult CED was 10%.
4. Health survey revealed that the prevalence of common and other diseases were in the range of natural occurrences of diseases reported for rural population.

Overall it is concluded from the present study that though Mandvi town survey was carried out during operation period of Kakrapar Atomic Power Station. The effect due to nuclear power Plant operation at KAPS is not observed in the present assessment of Mandvi town.

REFERENCES:

Bhat, I.S., Hegde, A. G., Iyengar, M.A.R. and Day, N. M (1993)

Analytical procedure Manual – Bhabha Atomic Research Centre, Mumbai, pp. 1 – 86.

CSO (2000), Women and men in India, pub., Central Statistical Organisation, Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi, pp. 23 – 36.

DAE (1999), Department of Atomic Energy pamphlet, Nuclear Power and you, Government of India.

KAPS (1996), Kakrapar Atomic Power Station – Pamphlet

NIN (1998), Annual Report – National Institute of Nutrition – Hyderabad,

NNMB (1996), National Status of rural population. Report of National Nutrition Monitoring Bureau, NIN, ICMR, Delhi.

TABLES

TABLE 4.1.1
AGE AND SEX WISE POPULATION PROFILE OF MANDVI TOWN

Age group	Male	Female	Total
00 - 05	987	966	1953
06 - 10	946	939	1885
11 - 15	836	844	1680
16 - 20	771	763	1534
21 - 25	613	599	1212
26 - 30	621	603	1224
31 - 35	514	449	963
36 - 40	373	352	725
41 - 45	341	334	677
46 - 50	299	263	562
51 - 55	269	259	528
56 - 60	261	256	517
60 - 65	180	166	346
> 65	105	97	202
Total	7116	6892	14008

TABLE 4.2.1

RELIGION PATTERN

RELIGION	NO. OF FAMILIES STUDIED	PERCENTAGE (%)
HINDU	196	77.7
CHRISTIAN	32	12.7
MUSLIM	24	9.5
TOTAL	252	100.0

TABLE 4.2.2

TRIBE AND CASTE DISTRIBUTION

TRIBE / CASTE	NO. OF FAMILIES	PERCENTAGE (%)
CHAUDHRI	39	15.5
HALPATI	19	7.5
NAIKA	23	9.1
BRAHMIN	28	11.1
OTHERS	143	56.7
TOTAL	252	100.0

TABLE 4.2.3

FAMILY COMPOSITION

NO. OF MEMBERS IN FAMILY	NO. OF FAMILIES	PERCENTAGE (%)
< 05	109	43.2
05 - 07	126	50.0
08 - 10	11	4.3
> 10	06	2.4
TOTAL	252	100.0

TABLE 4.2.4

TYPES OF ACCOMMODATION

ACCOMMODATION	NO. OF FAMILIES	PERCENTAGE (%)
OWN	98	38.8
RENTED	154	61.1
TOTAL	252	100.0

TABLE 4.2.5

TYPES OF HOUSING

TYPE OF HOUSE	NO. OF FAMILIES	PERCENTAGE (%)
THATCHED HUT	04	1.6
CONCRETE HOUSE	240	95.2
HUT WITH TILES	08	3.1
TOTAL	252	100.0

TABLE 4.2.6

VENTILATION PATTERN

PATTERN	NO. OF HOUSES	PERCENTAGE (%)
WINDOWS	250	99.2
CHIMNEY	02	0.8
TOTAL	252	100.0

TABLE 4.2.7

ELECTRICITY FACILITY

ELECTRICITY FACILITY	NO OF HOUSES	PERCENTAGE (%)
WITH	240	95.2
WITHOUT	12	4.8
TOTAL	252	100.0

TABLE 4.2.8

HABITS (Male population)

TYPES OF HABITS	NO. OF PERSONS	PERCENTAGE %
TOBACCO CHEWING	248	20.0
CIGARRETE SMOKING	80	6.5
BIDI SMOKING	273	22.0
PAN MASALA	98	7.9
NO HABITS	541	43.6
TOTAL	1240	100.0

TABLE 4.2.9

WATER SOURCE

SOURCE	NO. OF HOUSES	PERCENTAGE (%)
TAP WATER	215	85.3
BORE	13	5.1
RIVER	07	2.7
POND	--	----
WELL	17	6.7
OTHERS	---	----
TOTAL	252	100.0

TABLE 4.2.10

AVERAGE CONSUMPTION OF WATER

AVERAGE CONSUMPTION OF WATER PER PERSON PER DAY	NO. OF PERSONS	PERCENTAGE (%)
2.5 TO 3.0 LITER	858	69.0
4.5 TO 5.0 LITER	384	30.9
TOTAL	1240	100.0

TABLE 4.2.11
BATHING FACILITY

BATHING FACILITY	NO. OF HOUSES	PERCENTAGE (%)
OWN	247	98.0
COMMON FOR COMMUNITY	---	---
OPEN	05	2.0
TOTAL	252	100.0

TABLE 4.2.12
TYPES OF FUEL

TYPE OF FUEL	NO. OF FAMILIES	PERCENTAGE (%)
FIRE-WOOD	06	2.4
COWDUNG	09	3.6
AGRICULTURE WASTE	---	---
SAWDUST	---	---
BIO-GAS	---	---
KEROSENE	133	52.7
L. P. G.	104	41.3
TOTAL	252	100.0

TABLE 4.2.13

RESPONDENTS AND THEIR SIZE OF LAND HOLDINGS

LAND HOLDING IN HECTOR	NO. OF FAMILIES	PERCENTAGE (%)
UPTO 1.0 (MARGINAL FARMERS)	62	24.6
1.1 TO 2.0 (SMALL FARMERS)	32	12.7
2.1 TO 4.0 (SEMI MEDIUM FARMERS)	06	2.4
4.1 TO 10.0 (MEDIUM FARMERS)	03	1.2
MORE THAN 10.0 (BIG FARMERS)	---	---
WITHOUT LAND	149	59.1
TOTAL	252	100.0

TABLE 4.2.14

ANNUAL INCOME OF FAMILIES

ANNUAL INCOME (Rs.)	NO. OF FAMILIES (252)	PERCENTAGE (%)
< = 11,500	48	19.0
> 11,500	204	80.9
TOTAL	252	100.0

Rs. 11,500 = Annual income for 4 persons (1991-92)

TABLE 5.1.1

DIET SURVEY OF FOOD ARTICLES

Sr. No.	Food articles (gm)	Mean intake G/CU/day	Recommended intake* g/CU/day	% deficiency
1	Cereals	342.3	460.0	25.6
2	Pulses	43.3	40.0	+8.25
3	Green leafy vegetables	4.3	40.0	89.2
4	Other vegetables	58.6	60.0	2.3
5	Roots & Tubers	79.0	50.0	+58.0
6	Milk	118.0	150.0	21.3
7	Sugar & Jaggery	25.8	20.0	+29.0
8	Fats & Oils	14.8	20.0	26.0
9	Meat/fish/eggs	16.2	35.0	53.7
10	Fruits	10.9	30.0	63.7

* Recommended dietary intake as adopted by NIN, 1996

TABLE 5.2.1

DIET SURVEY OF NUTRIENTS

Sr. no.	Nutrient	Mean Nutrient	Nutrient Recommended*	% deficiency of nutrients
1	Calories(Kcal)	1680.0	2450	31.4
2	Protein (gm)	54.0	60	10.0
3	Iron (mg)	26.3	28	6.1
4	Calcium (mg)	423.0	400	+ 5.7
5	Vitamin -A(ug)	306.0	600	49.0
6	Vitamin-C (mg)	29.4	40	26.5

*RDI - Recommended dietary intake as adopted by NIN, 1996

(Annual report, National Institute of Nutrition, Hyderabad, India)

TABLE 6.1.1

BMI GRADES OF CHILDREN

Age group (year)	Severe mal nutrition(%) (< 12.0)	Mal normal (%) (12.0 - 15.0)	Over nourished (%) (> 15.0)	Pooled (%)
0 - 3	01 (0.2)	181 (29.4)	09 (1.5)	191(31.0)
4 - 7	04 (0.6)	161 (26.1)	14 (2.3)	179(29.0)
8 - 10	05(0.8)	106(17.2)	15 (2.4)	126(20.4)
10 - 14	03 (0.5)	108(17.5)	09 (1.5)	120(19.5)
Total	13	556	47	616

NNMB (1996): Nutritional status of rural population. Report of National Nutrition Monitoring Bureau, NIN, Hyderabad.

TABLE 6.2.1

BMI GRADES OF ADULTS*

Age Groups	No. of Persons	<u>CED(%)</u>			<u>Normal(%)</u>		<u>Obesity(%)</u>
		< 16	16 – 17	17 – 18.5	18.5 – 20	20 – 25	25 – 30
16 – 25	227	5.5	5.1	19.7	40.4	31.1	3.0
26 – 34	196	2.0	3.6	13.4	33.0	49.1	2.5
35 – 44	101	---	2.5	3.6	44.3	46.7	---
45 – 54	79	---	---	1.8	43.7	48.3	3.5
55 – 64	48	---	---	3.0	57.6	37.5	---
> 65	23	---	---	2.0	46.2	51.8	---
Pooled	674	1.2	1.9	7.2	44.2	44.0	1.5

* Standard recommended by NIN (1996)

CED – Chronic energy deficiency

NNMB (1996): Nutritional status of rural population. Report of National Nutrition monitoring Bureau, NIN, Hyderabad.

TABLE 7.1.1

MORBIDITY PATTERN

Age group	Male			Female			Total		
	Popu	Morb.	PR*	Popu	Morb.	PR*	Popu.	Morb.	PR*
00 - 05	332	19	57.2	317	24	75.5	649	43	66.2
06 - 10	309	15	48.5	310	19	61.3	619	34	54.9
11 - 15	274	10	36.5	275	17	61.8	549	27	49.1
16 - 20	256	07	27.3	251	12	47.8	507	19	37.5
21 - 25	213	15	70.4	201	09	44.7	414	24	58.0
26 - 30	210	16	76.1	206	18	87.3	416	34	81.7
31 - 35	163	19	116.5	149	20	134.2	312	39	125.0
36 - 40	128	23	199.6	125	27	216.0	253	50	197.6
41 - 45	124	21	169.3	108	21	194.4	232	42	181.0
46 - 50	91	09	98.9	89	18	202.2	180	27	150.0
51 - 55	76	21	276.3	81	16	197.5	157	37	235.6
56 - 60	63	24	380.7	73	20	273.9	136	44	323.5
60 - 65	59	34	576.2	46	30	652.1	105	64	609.5
> 65	36	20	555.5	30	20	666.6	66	40	606.6
Total	2334	253	---	2261	271	----	4595	524	---

* Prevalence rate per 1000

TABLE 7.2.1

MORBIDITY (DISEASE PATTERN)

Name of Disease Population	Male (PR)* 2334	Female (PR)* 2261	Total (PR)* 4595
<u>Common diseases</u>			
Gynec problem	00(0,0)	31 (137.1)	31 (67,5)
Orthopaedic problem	21 (90.0)	25 (110.6)	46 (100.1)
Cataract	13 (55.7)	16 (70,8)	29 (63.1)
Tuberculosis	26 (111.4)	16 (70.8)	42 (91.4)
Skin disease	31 (132.8)	30 (132.7)	61 (132.7)
Polio	07 (30.0)	03 (13.3)	10 (21.7)
Asthma	26 (111.4)	20 (88.4)	46 (100.1)
Fever	27 (115.7)	28 (123.8)	55 (119.7)
Gen. Infection	28 (120.0)	28 (123.8)	56 (121.8)
<u>Other diseases</u>			
Mental retardation	01 (4,3)	03 (13.3)	04 (8.7)
Paralysis	08 (34.3)	04 (17.7)	12 (26.1)
Leprosy	09 (38.6)	05 (22.1)	14 (30.4)
Leucoderma	05 (21.4)	04 (17.7)	09 (19.6)
Cancer	02 (8.6)	02 (8.8)	04 (8.7)
Goiter	02 (8,6)	03 (13.3)	05 (10.8)
Cong. deformity	02 (8.6)	04 (17.7)	06 (13.0)
Cardiac problem	15 (64.3)	21(92.9)	36 (78.3)
Elephantiasis	-----	02 (8.8)	02 (4.3)
Miscellaneous	30 (128.5)	26 (115.0)	56 (122.8)
Total	253	271	524

*(PR) - Prevalence rate

* Rate per 1,0000

TABLE 7.3.1

AGEWISE DISTRIBUTION OF OTHER DISEASES

Age group	Congenital Deformity	Mental retardation	Cataract	Goitre	Cancer
00 - 05	01				
06 - 10	01	01			
11 - 15	01	01			
16 - 20				01	01
21 - 25	01				
26 - 30				02	
31 - 35	02	01		01	
36 - 40					01
41 - 45			06		
46 - 50		01	06	01	
51 - 55			07		
56 - 60			06		01
60 - 65					01
> 65			04		
Total	06	04	29	05	04

Types of cancer:

No.	Sex	Age	Site
1.	Male	17	CML
2.	Female	36	Breast cancer
3.	Male	63	Prostate cancer
4.	Female	58	Cervix-uteri cancer

TABLE 8.1.1

Concentration of Cs-137 and Sr-90 in various food articles collected from Mandvi town

Sr. No.	Food articles	No. of samples	Activity		Minimum Detection Value
			Cs-137 mBq/Kg fr.wt.	Sr-90 mBq/Kg fr.wt.	
01	Wheat	04	210 ± 140 - 420 ± 290 (363.6 ± 220.8)	95 ± 80 - 225 ± 185 (157.8 ± 127.5)	50
02	Udad	04	BDL	BDL	170
03	Rice	04	45 ± 25 - 115 ± 90 (70.1 ± 48.0)	BDL	50
04	Juwar	04	BDL	BDL	50
05	Brinjal	05	15 ± 10 - 65 ± 50 (37.3 ± 35.5)	85 ± 40 - 186 ± 105 (106 ± 39.2)	30
06	Mug	04	550 ± 150 - 910 ± 400 (779.5 ± 278.4)	BDL	170
07	Tuwar	04	90 ± 60 - 300 ± 195 (187.3 ± 115.0)	BDL	170
08	Mango	06	20 ± 10 - 205 ± 136 (83.8 ± 37.0)	BDL	20
09	Milk	10	295 ± 145 - 720 ± 370 (574.4 ± 267.1)	BDL	35
10	Tindola	06	BDL	BDL	30
11	Papaya	06	BDL	BDL	20
12	Egg	04	BDL	BDL	50
13	Neem leaves	04	BDL	BDL	600
14	Grass	06	505 ± 57 - 940 ± 95.0 (792.0 ± 438.7)	BDL	600
15	Guwar	04	BDL	BDL	30

Data in the parenthesis are mean range

TABLE 8.2.1

CONCENTRATION OF TRITIUM IN WATER AND MILK

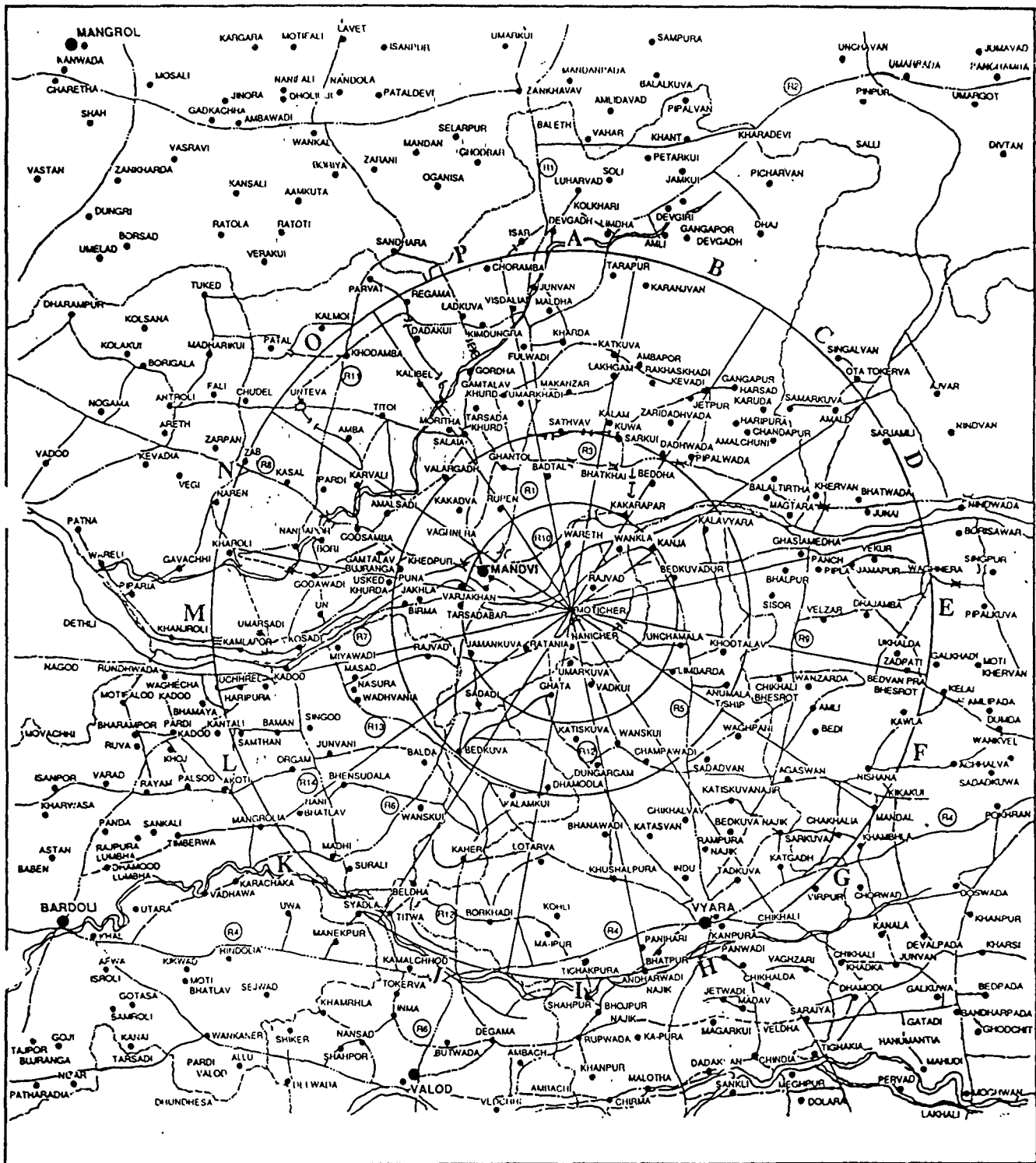
Sr. no.	Sample	Number	Activity	MDL value
1	Water	04	BDL	< 55 mBq/ml.
2	Milk	03	BDL	< 55 mBq/ml

TABLE 9.1.1

PULMONARY FUNCTION TEST

No	Age group	No. of individual examined	Purely obstructive	Restrictive	Combined	Normal
1	1 - 10	15	---	---	---	15
2	11 - 20	15	---	---	---	15
3	21 - 30	15	---	---	01	14
4	31 - 40	15	---	---	---	15
5	41 - 50	15	01	---	---	14
6	51 - 60	15	---	---	---	15
7	> 60	10	02	---	---	08
Total		100	03		01	96

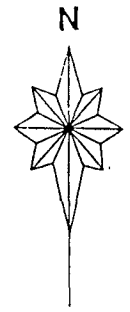
FIGURES



Mandvi town

LEGEND

1. ROADS BLACK TOPPED DOUBLE LANE	—————
2. ROADS BLACK TOPPED SINGLE LANE	—————
3. ROADS W.B.M.	-x-x-
4. ROADS KUTCHA	—————
5. MISSING ROAD LINK	- - - - -
6. EXISTING BRIDGE	≡≡≡
7. MISSING BRIDGE / CAUSE WAY	- - - - -
8. TALUKA BOUNDARY	~~~~~



NUCLEAR POWER CORPORATION
(A GOVT. OF INDIA ENTERPRISE)
KAKRAPAR ATOMIC POWER PROJECT
VILLAGES AND ROUTE AROUND EPZ

FIG. 4.1.1 Map showing location of Mandvi town

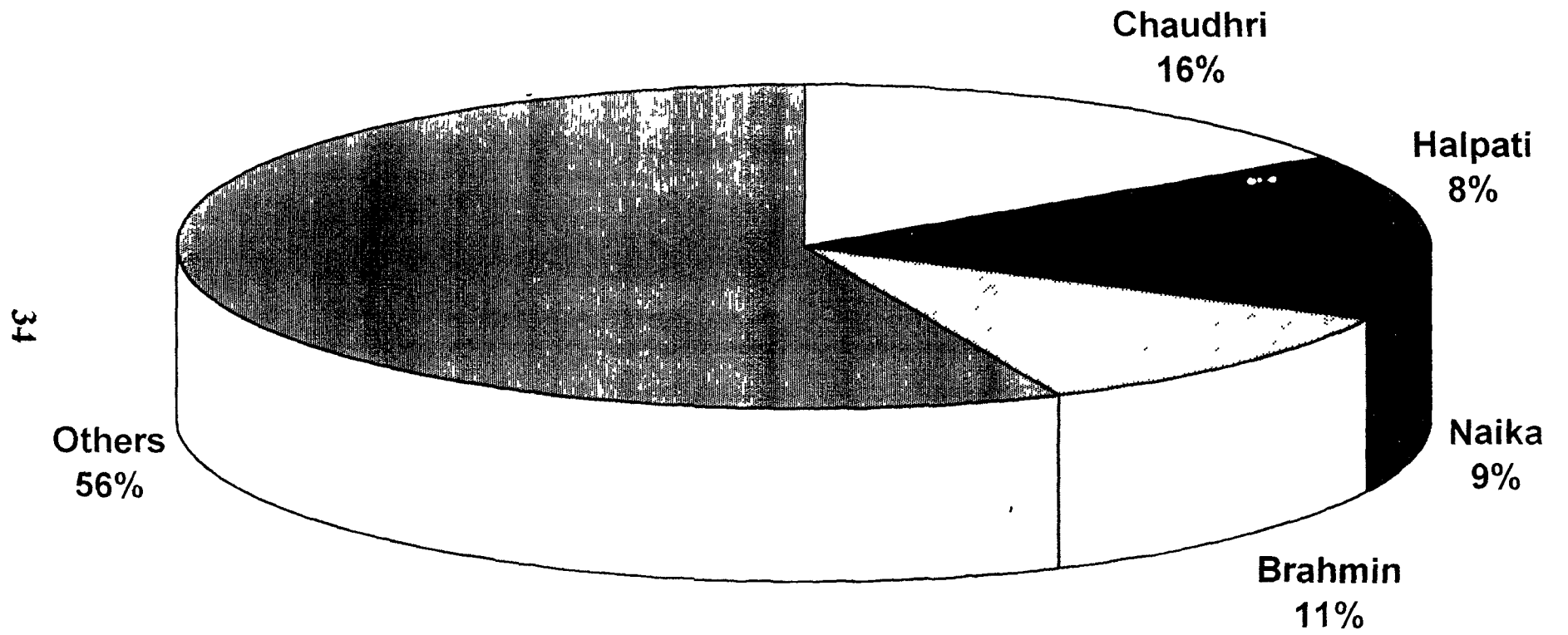


FIG. 4.2.1 TRIBE AND CASTE DISTRIBUTION

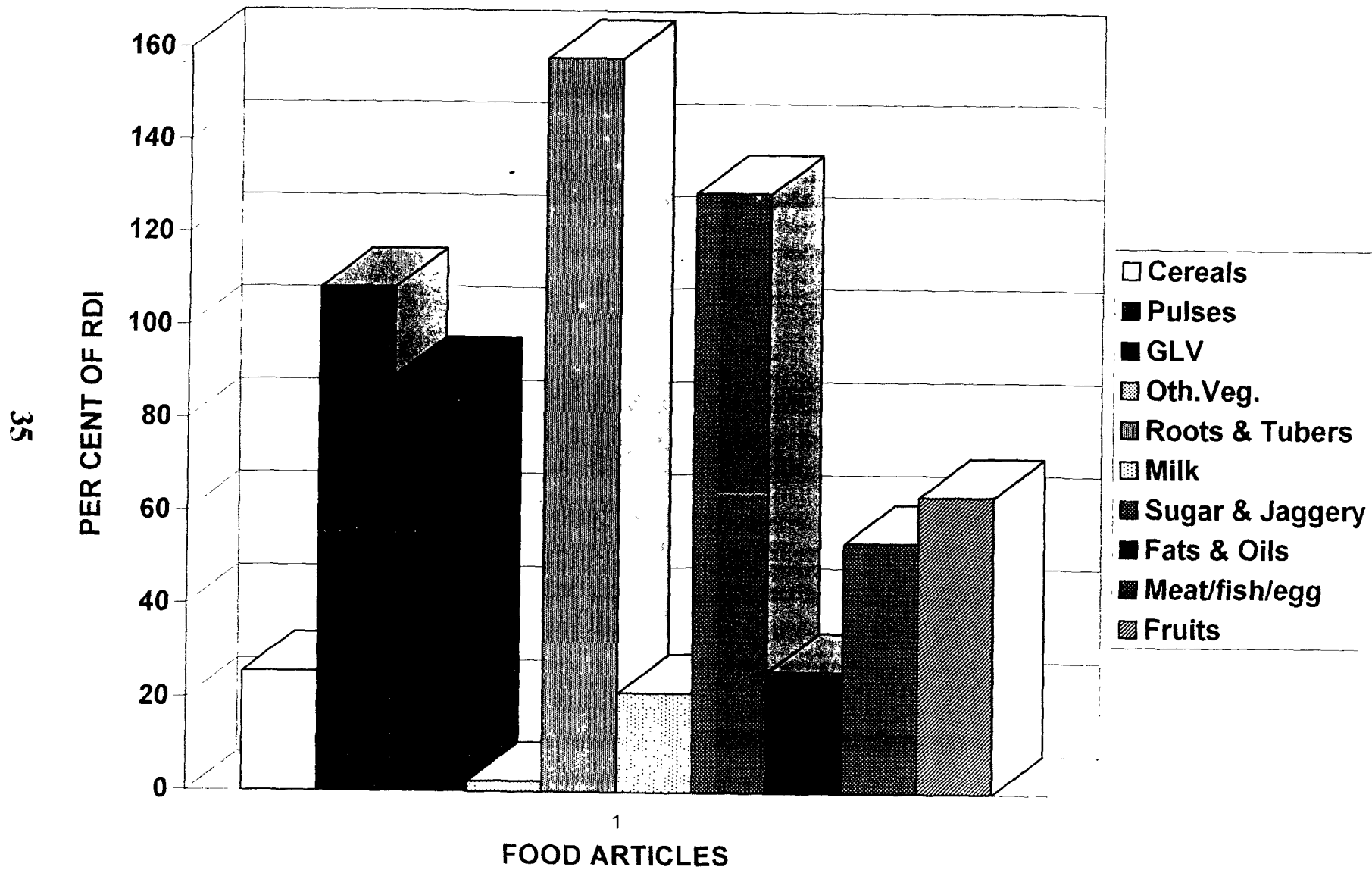


FIG.5.1.1 MEAN INTAKE OF FOOD ARTICLES

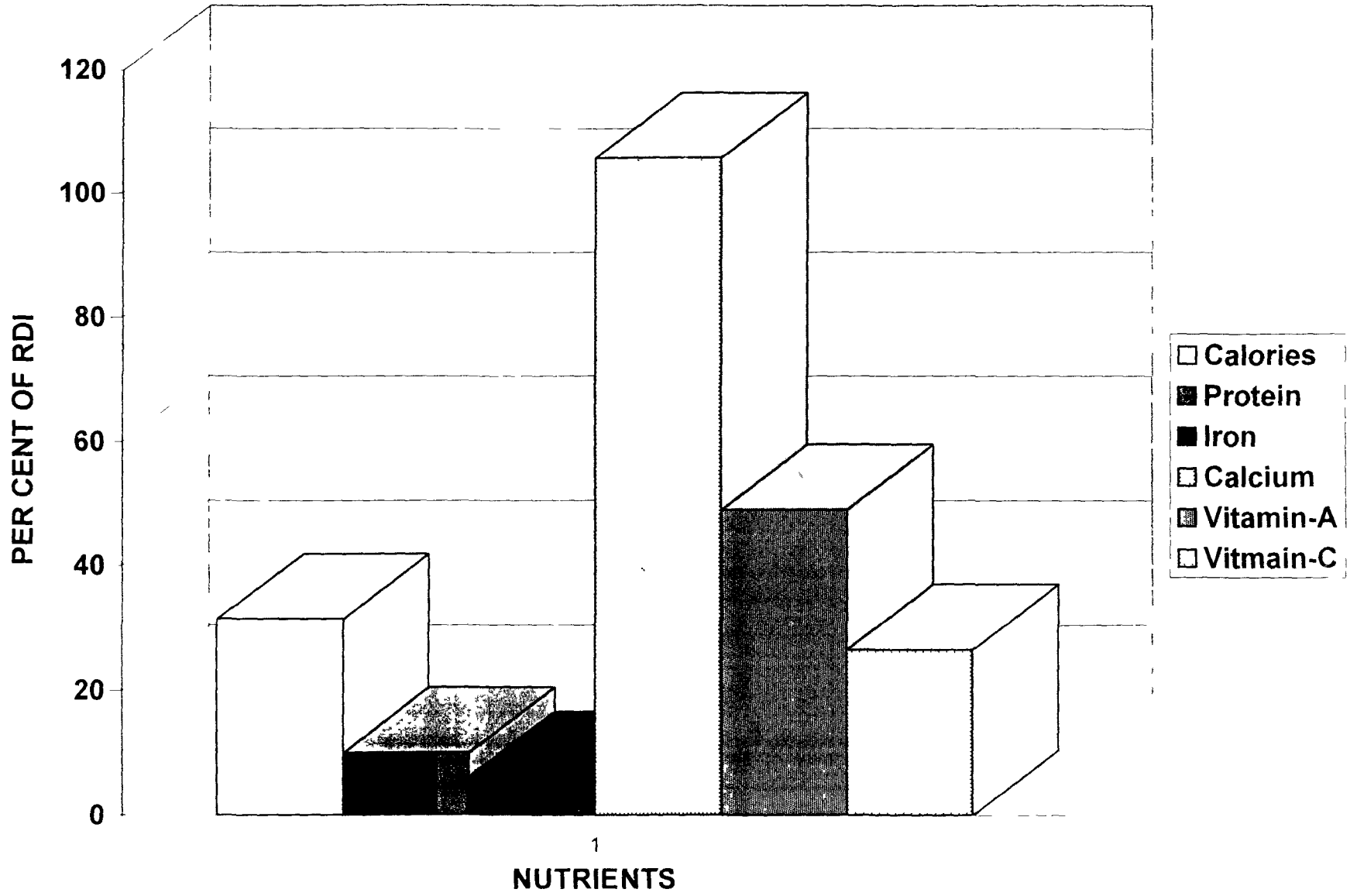


FIG. 5.2.1 MEAN INTAKE OF NUTRIENTS

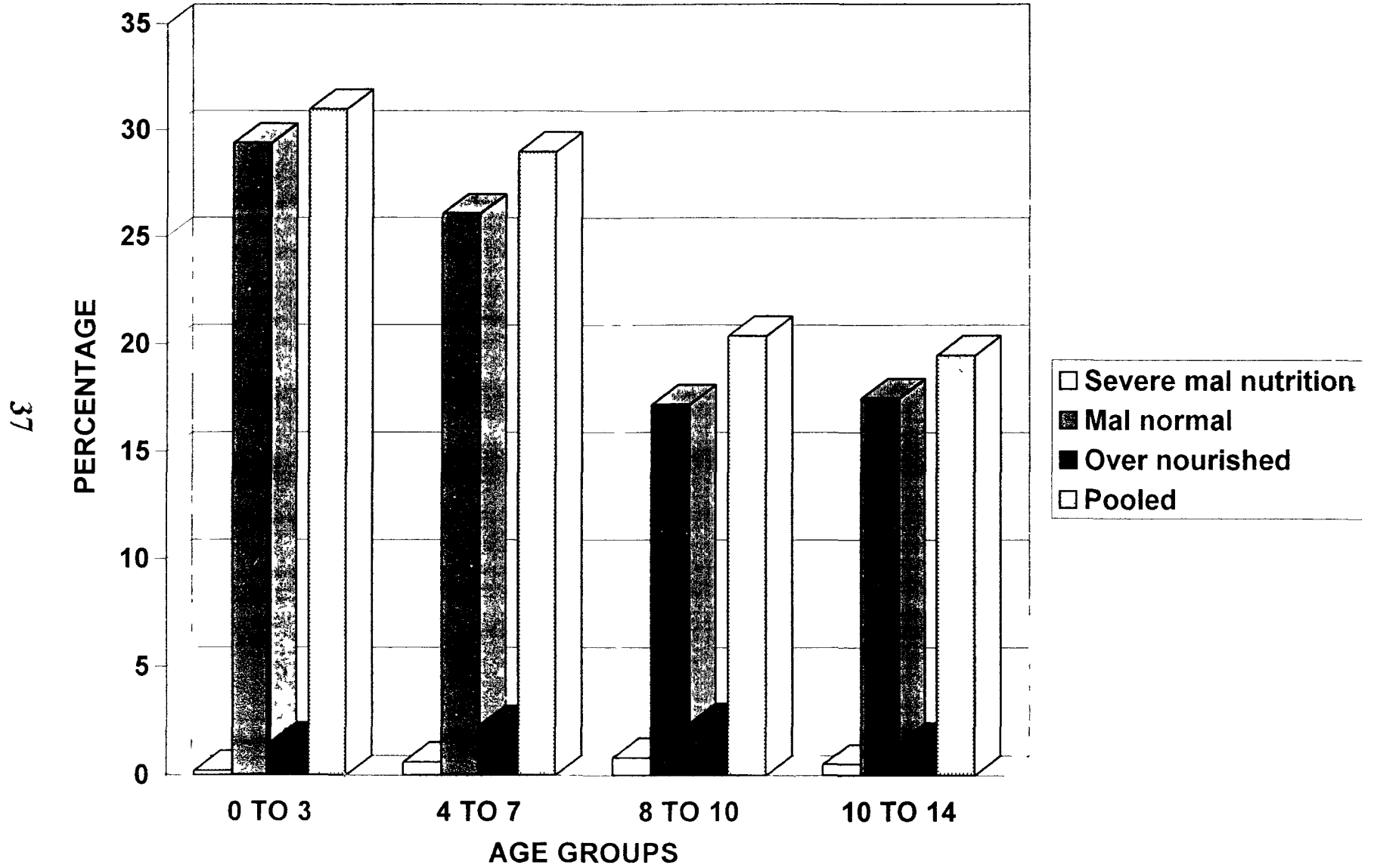


FIG. 6.1.1 BMI GRADES OF SCHOOL CHILDREN

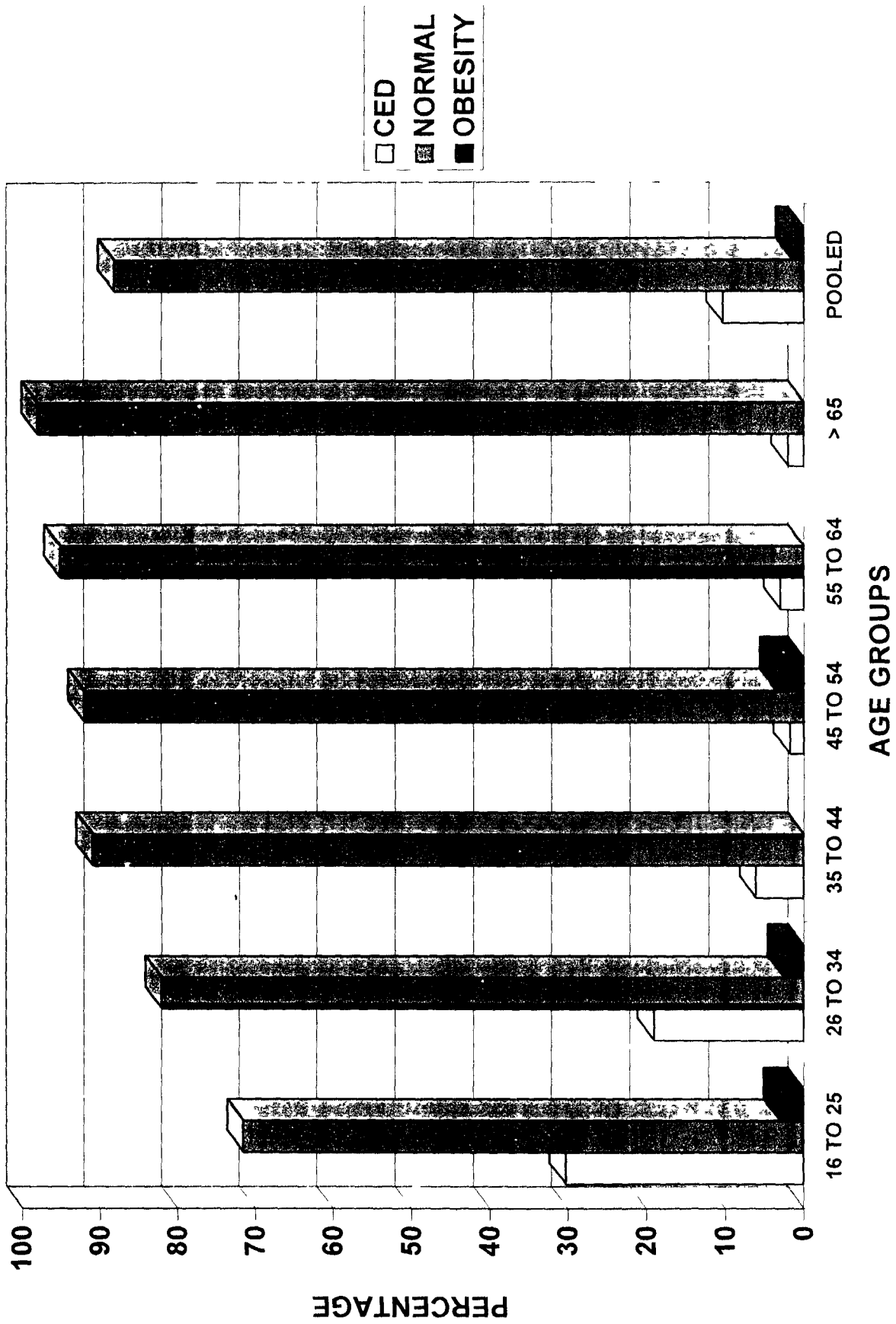


FIG. 6.2.1 BMI GRADES OF ADULTS

Name	K S					MEAS	PRED	%PRED
Number	S							
Age	65	year			SVC	4.86	1.97	247
Gender	F				ERU			
Height	146	cm			IRU			
Weight	45	kg			TU			
Normals	ECCS/Quanjer				FVC	1.46	1.88	78
Cal	01.03.96				FEV1	1.06	1.54	69
					FEV1/SVC	% 21.8	76.6	28
Meas No	3				FEF.2-1.2	l/s 0.93		
Var FVC	304 ml	20.8 %			FEF25-75%	l/s 0.99	2.54	39
Var FEV1	67 ml	6.3 %			FEF75-85%	l/s 0.51		
					PEF	l/min 73	298	25
					FEF25%	l/s 1.18	4.67	25
					FEF50%	l/s 1.04	3.11	33
					FEF75%	l/s 0.66	1.02	65
					FIUC	l 1.72		
					FIU1	l 1.55		
					FIU1/FIUC	% 90.3		
					PIF	l/s 1.31		
					PIF50%	l/s 1.31		
Med. Techn. Assistant								
SGU-CONSULTANCY-PROJ.								
SU 15-JUL-01 07:58 25			1 51 M					
SCHILLER HEALTHCARE INDIA PVT LTD	APR 10 2001				SCHILLER HEALTHCARE INDIA PVT LTD			01 01

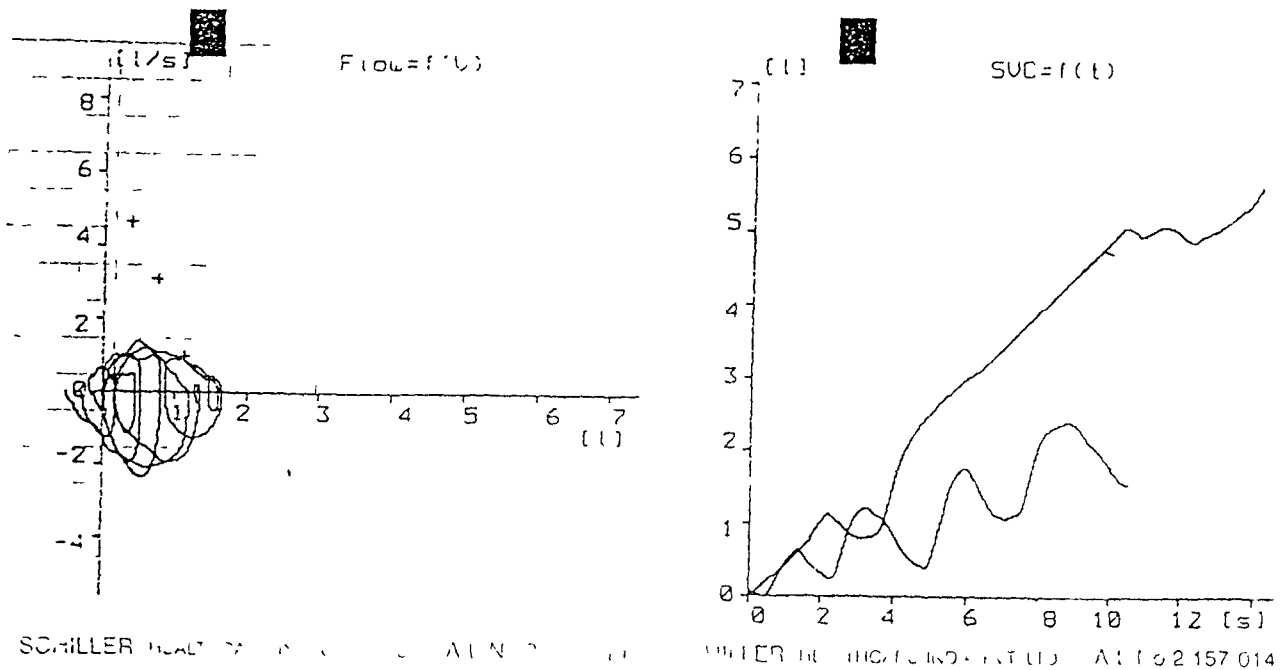


FIG. 9.1.1 Pulmonary function test - normal

5) Name: Kaniaben P. Shah

Age: 65 yrs.

Sex: Female

Height(cm.): 146

Weight(Kg.): 45

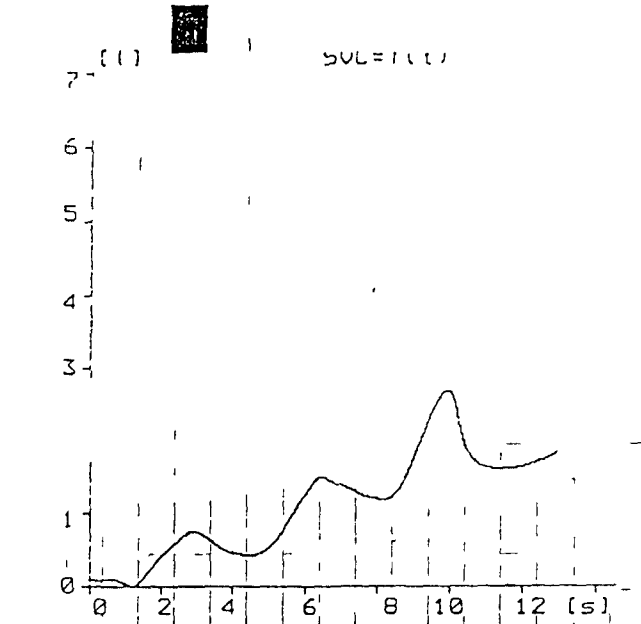
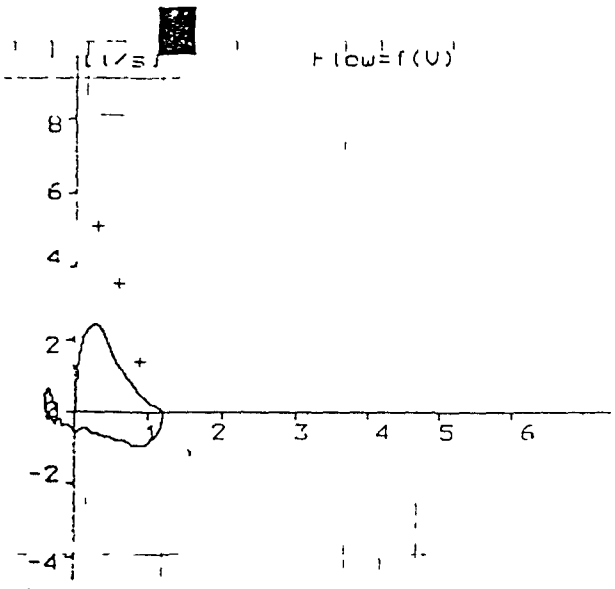
Name: [REDACTED]
 Number: [REDACTED]
 Age: 50 years
 Gender: [REDACTED]
 Height: 148 cm
 Weight: 56 kg
 Normal's: ECCS/Quanjer
 Cal: 01.03.96
 Test No: 2
 Var FVC: 346 ml 28.7 %
 Var FEV1: 373 ml 37.2 %

	MEAS	PREU	ED
SVC	2.69	2.42	111
ERU			
IRU			
TU			
FVC	1.21	2.36	51
FEV1	1.00	2.00	50
FEV1/SVC	% 37.4	79.5	47
FEF.2-1.2	l/s 0.42		
FEF25-75%	l/s 1.07	3.08	35
FEF75-85%	l/s 0.30		
PEF	l/s 2.42	5.53	44
FEF25%	l/s 2.41	5.11	47
FEF50%	l/s 1.26	3.53	36
FEF75%	l/s 0.45	1.41	32
FIUC	l 1.61		
FIU1	l 0.88		
FIU1/FIUC	% 54.7		
PIF	l/s 1.00		
FIF50%	l/s 0.73		

OBSTRUCTIVE

Med. Techn. Assistant
 SGU-CONSULTANCY-PROJ.
 Su. 15-JUL-01 07:22:46 51 M

SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014 SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014



SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014 SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014

FIG. 9.1.2 Pulmonary function test - obstructive type

1) Name: Minaxiben M. Shah

Age: 50 yrs.

Sex: Female

Height(cm.): 148

Weight(Kg.): 56

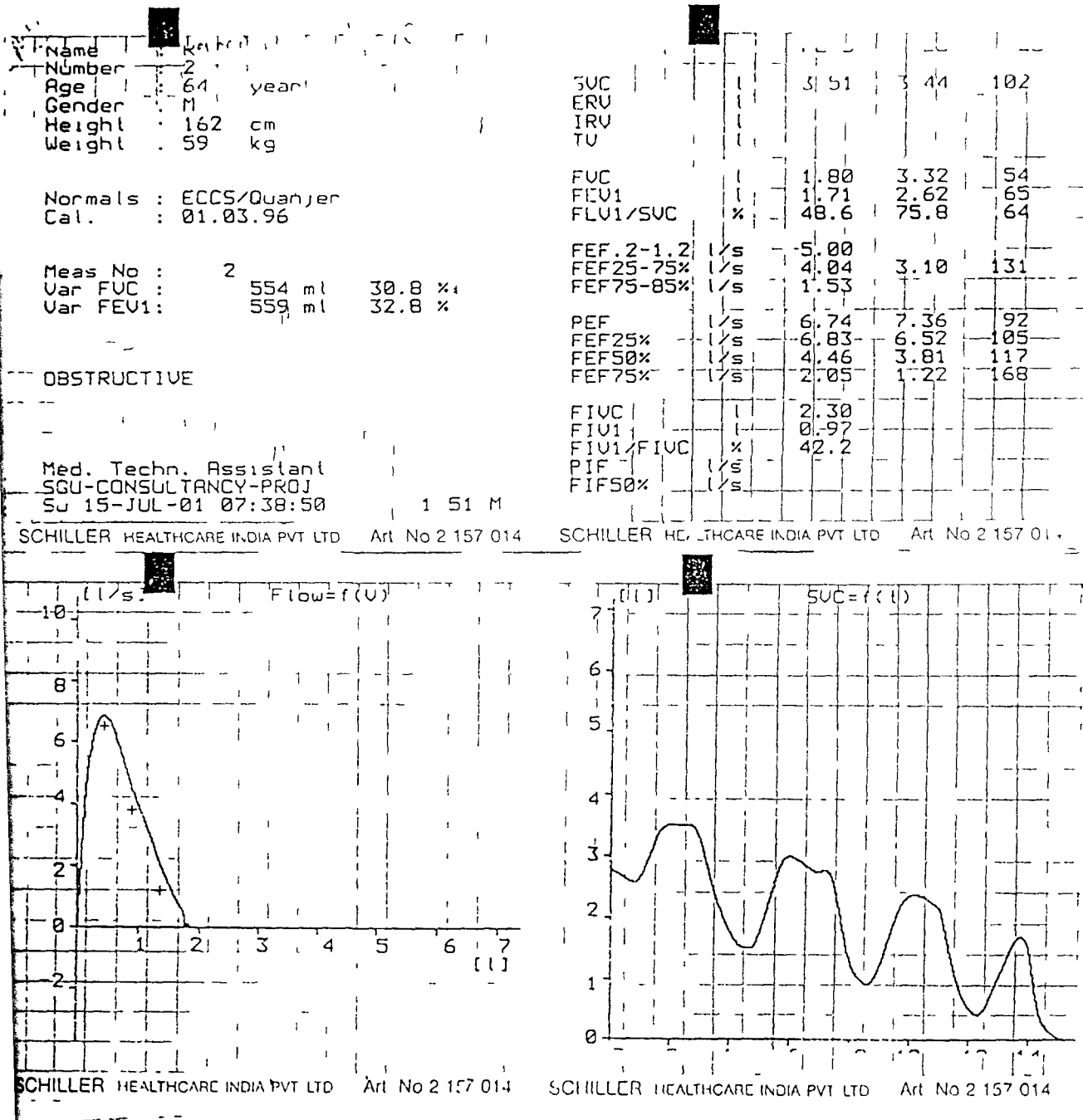


FIG. 9.1.3 Pulmonary function test - obstructive type

2) Name: Rameshchandra C. Shah

Age: 64 yrs.

Sex: Male

Height(cm.): 162

Weight(Kg.): 59

Name	Kokilaben D Maisuria	MEAS	PREO	%PREO		
Number	3	SVC	2.42	3.49	69	
Age	23 year	EPV	0.84			
Gender	F	RV	0.72			
Height	158 cm	TU	0.86			
Weight	52 kg	FVC	1.29	3.46	37	
Normals	ECCS/Quanjer	FEV1	1.29	3.02	43	
Cal.	01.03.96	FEV1/SVC	%	53.2	84.3	63
Meas No	2	FEF2-1.2	l/s	2.42		
Var FVC	51 ml	FEF25-75%	l/s	3.34	4.05	82
Var FEV1	1286 ml	FEF75-85%	l/s	1.58		
		PEF	l/s	4.44	6.83	65
		FEF25%	l/s	4.45	6.06	73
		FEF50%	l/s	3.55	4.40	81
		FEF75%	l/s	2.08	2.14	97
		FIUC	l	0.63		
		FIU1	l	0.63		
		FIU1/FIUC	%	100.0		
		PIF	l/s	0.68		
		FIF50%	l/s	0.57		

COMBINED

Med. Techn. Assistant
 SCU-CONSULTANCY-PROJ.
 SU 15-JUL-01 07:45:23 1 51 M

SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014 SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014

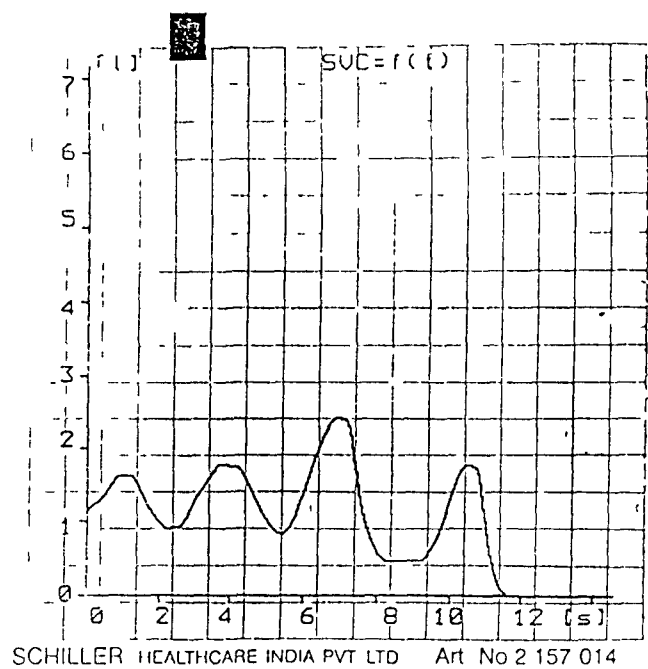
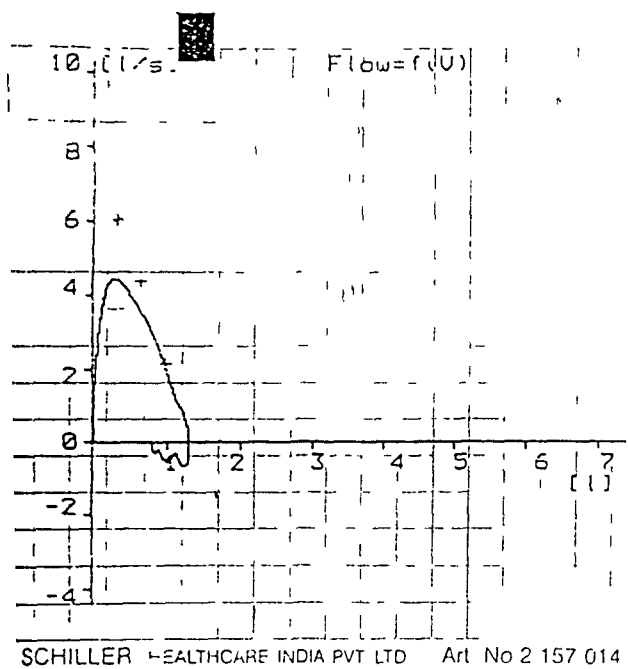


FIG. 9.1.4 Pulmonary function test - combind type

3) Name: Kokilaben D Maisuria
 Age: 23 yrs. Sex: Female
 Height(cm.): 158 Weight(Kg.): 52

Name	Pravinchandra V. Shah
Number	4
Age	68 year
Gender	M
Height	173 cm
Weight	75 kg
Normals	ECCS/Quanjer
Cal	01.03.96
Meas No	2
Var FVC	978 ml 32.9 %
Var FEV1	314 ml -14.6 %

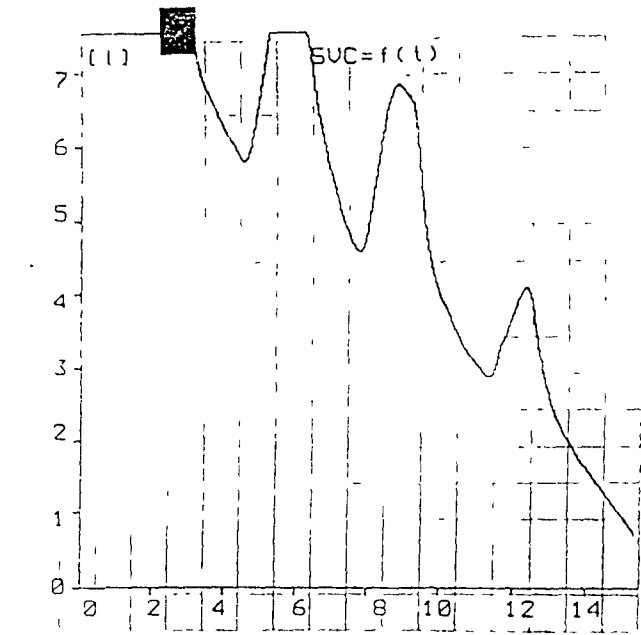
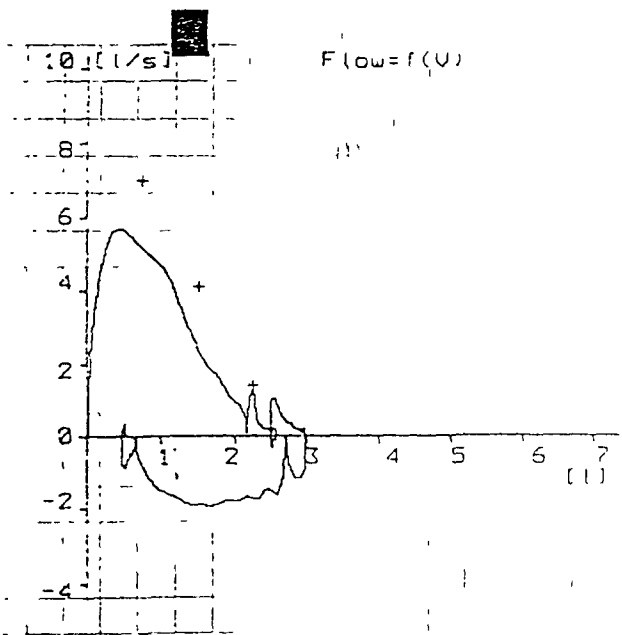
OBSTRUCTIVE

Med. Techn. Assistant
 SCU-CONSULTANCY-PROJ.
 SJ 15-JUL-01 07:51:44 1.51 M

	MEAS	PRED	%PRED
SVC	10.37	4.00	259
ERV			
IRV			
TU			
FVC	2.97	3.85	77
FEV1	2.16	2.98	73
FEV1/SVC	20.8	75.0	28
FEF.2-1.2	5.00		
FEF25-75%	1.55	3.14	49
FEF75-85%	0.21		
PEF	5.67	7.86	72
FEF25%	5.16	7.00	74
FEF50%	2.41	4.10	59
FEF75%	1.26	1.40	90
FIUC	2.53		
FIU1	1.36		
FIU1/FIUC	53.9		
PIF	1.98		
PIF50%	1.96		

SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 011

SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014



SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 011

SCHILLER HEALTHCARE INDIA PVT LTD Art No 2 157 014

FIG. 9.1.5 Pulmonary function test - obstructive type

4) Name: Pravinchandra V. Shah

Age: 68 yrs.

Sex: Male

Height(cm.): 173

Weight(Kg.): 75

ANNEXURES

Annexure - I

BIOSCIENCES DEPARTMENT,
SOUTH GUJARAT UNIVERSITY,
SURAT.

DIETARY SURVEY

- A. Vegetarian
- B. Non-vegetarian
- C. Omnivorous

Time of taking meals

- Morning
- Midday
- Evening
- Night

VEGETARIAN

1. SOURCE
- Cultivated
- Barter
- Purchased

2. Staple food

Type of cereals and Pulses Used	FREQUENCY		
	Daily	Occasionally	Never
Millet			
Rice			
Sorghum			
Wheat			
Nagli			
Maize			
Grams			
Green gram			
Aconite bean			
Blackgram			
Redgram (Tuver)			
Lentils			
Groundnut			
Others			

3. Vegetable

Types of vegetables	Throughout Year	Seasons		
		Winter	Summer	Monsoon
Leafy vegetables				
Roots and tubers				
Others				

4. Fruits

Types	Daily	Weekly	Occasionally	Never
Available from village				
Tamarind				
Myrobalam				
Mullbery				
Plum				
Sapota				
Mango				
Banana				
Guava				
Black plum				
Others				

5. Milk Consumption

Children _____ ml

Adult _____ ml

6.

Milk Products	Daily	Weekly	Occasionally	Never
Curds				
Ghee				
Butter				
Butter milk				
Sweets				
Any others				

7 Food intake per meal per person

Dal gm
 Rice gm
 Bread (rotli) gm
 Curry gm
 Khichdi gm
 Rolla gm
 Total weight gm

NON-VEGETARIAN

8.

Type of food	Source Purchased From home	Amount No/gm	Daily	Weekly/ Twice a Week	Occasi- onally	Never
Egg						
Chicken						
Mutton Sheep/goat						
Beef						
Fish						
from river						
Pond lake						
Other wild animals if any						

9 **Cooking Media**

- | | | |
|----|------------------------|--------------------------|
| 1 | Groundnut oil | <input type="checkbox"/> |
| 2 | Sesame oil | <input type="checkbox"/> |
| 3 | Palm oil | <input type="checkbox"/> |
| 4 | Brassica oil | <input type="checkbox"/> |
| 5 | Madhuca oil | <input type="checkbox"/> |
| 6 | Sunflower oil | <input type="checkbox"/> |
| 7 | Soyabean oil | <input type="checkbox"/> |
| 8 | Coconut oil | <input type="checkbox"/> |
| 9 | Vegetable oil | <input type="checkbox"/> |
| 10 | Butter oil (pure ghee) | <input type="checkbox"/> |

10 **The Cooking Utensils**

- | | |
|-------------|--------------------------|
| Clay | <input type="checkbox"/> |
| Metal/brass | <input type="checkbox"/> |
| Steel | <input type="checkbox"/> |
| Aluminium | <input type="checkbox"/> |
| Any other | <input type="checkbox"/> |

11 **Use of condiments and spices**

Amount

- | | |
|--------|--------------------------|
| More | <input type="checkbox"/> |
| Less | <input type="checkbox"/> |
| Medium | <input type="checkbox"/> |

12 **Use of sugar and jaggery**

Sugar gm
jaggery gm

13 **Method of cooking**

- Raw
- Steamed
- Roasted
- Cooked
- Fried

14 **Time of Cooking**

- Morning
- Midday
- Evening

Time of eating

- Morning
- Midday
- Evening

15 **Special type of food taken/Restricted**

A For particular group		
	Food given	Food Restricted
Children		
Pregnant Women		
Nursing mother		
Any other		
B During Sickness		
Type of Sickness	Food given	Food Restricted
Cold		
Fever		
Diarrhoea		
Dysentery		
Any other		

C During festivals, religious and other Ceremonies

Occasion	Frequency	Food given	Food Restricted
Fast			
Any other			

D According to seasons

Season	Food given	Food restricted
Winter		
Summer		
Rainy Season		

16 Consumption of readymade food (Biscuits etc)

17 Allergy Causing food

18 Total Food taken in a day

Man ----- gms

Women ----- gms

Child ----- gms

19 Amount of water taken

liter

20 Preservation and storage methods

Grains

Pulses

Pickles

21 Food for live stock

Animals	Grazing land	Pond/ Canal	Special food (ready made)	Hay	Preserved Fodder
Cow					
Buffallow					
Goat					
Sheep					
Horse					
Poultry					
Fish					
Any other					

22 Any other information

Date:-

Name of the Investigator

Annexure-II

BIOSCIENCES DEPARTMENT

SOUTH GUJARAT UNIVERSITY

SURAT

HEALTH SURVEY

1. Village
2. Street
3. A Nearest Railway Station _____ k.m.
- B Nearest Bus Station _____ k.m.
4. Mode of Conveyance
 A. Private Frequency
 B. Government
5. Name :
6. Religion :
7. Caste :
8. Birth Place :
9. A. Land
 B. Income
 C. Total number of family members :
10. Information on residence
 A. Owned
 Rented
 Temporary (with relatives)

Facilities in the House

B.	Thatched hut	House with tiles	Brick house with tiles	R.C.C. House
----	--------------	------------------	------------------------	--------------

C.	Living room with kitchen	Living room and kitchen separate	Living room, bed room and kitchen separate	Additional facility, if any
----	--------------------------	----------------------------------	--	-----------------------------

D. No. of doors
No. of windows

E. Smoke outlet Yes / No

	<input type="checkbox"/>	<input type="checkbox"/>
through Window	<input type="checkbox"/>	<input type="checkbox"/>
through Chimney	<input type="checkbox"/>	<input type="checkbox"/>
smokeless Stove	<input type="checkbox"/>	<input type="checkbox"/>

F. Cattie shed in the house or separate?

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

11. A. Lavatory facilities YES NO

Own	<input type="checkbox"/>
Jointly owned	<input type="checkbox"/>
Common for a community	<input type="checkbox"/>
Open	<input type="checkbox"/>

- B. Soak pit YES NO
- C. Drainage facilities YES NO
12. Bathing place
- Own
- Jointly owned
- Common for a community
- Open
13. Water source(s)
- tap water
- Bore
- River
- Pond
- Well
- Any other specify
14. Type(s) of fuel used :
- Fire wood
- Cowdung cake
- Agricultural waste
- Sawdust
- Bio-Gas
- Kerosene
- Gas-cylinder (LPG)
15. Electricity facility YES NO

16. Details of live-stock

	YES	NO	NUMBER(S)
Buffalow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ox	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sheep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Poultry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Any other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. Availability of health service

- A. Primary health centre
- Private Doctor
- Household remedy
- Nurse
- Witch doctor
- B. Distance from village to health centre _____ k.m.

18. Hospital facilities

- Government
- Private

19. Death occurred in the family during last two years

- YES
- NO

Whose ?

Age of the deceased

Reason for death

Treatment

Whose treatment was taken

20. Any other person suffering with prolonged sickness?

21. Is he/she under treatment?

YES

NO

Treated by whom?

22. Diagnosis -

Assumption -

23. Which part of the body has complaint?

Hair

Skin

Hand

Leg

Abdomen

Throat

Eye

Ear

Nose

Mouth

Tumour on body

Size

Painfull

Place

Any other place,
specify

24. Any person is sick in the home? Who?

YES NO

What is the complaint?

What treatment is taken?

Whose treatment is taken?

25. Details of outbreak of any epidemic in your village,

if any

Chickenpox

Cholera

Jaundice

Any other

26. Congenital abnormalities

27. Miscarriage

YES NO

Human

Cattle

28. Vaccination

Date

Name of the investigator

HEALTH SURVEY

Sr.No	Name
	Age
	Male/Female
	Married/Un-married
	Occupation
	Education
	Any complaints regarding health
	Duration
	Treatment
	Congenital abnormality
	No. of delivery
	Outcome of delivery
	Expecting mother
	Nursing mother
	Without any issue

Death occurred in last one year

Name : _____
Relation to the head of the family

Reason of death:-
Age :-

Other details:-

Signature

Assessment of Diet and Health status of Mandvi town with special reference to Kakrapar Atomic Power Station

SUMMARY

This report is based on the results of Diet and Health survey carried out at Mandvi town during operation period of Kakrapar Atomic Power Station.

Mandvi town has total population of 14008, which consisted 7116 male and 6892 female. The socio-economic survey (10%) revealed that majority of families lived above poverty line with minimum required housing facilities.

Dietary survey (10%) was conducted in randomly selected population. Results showed that quantity of food intake by inhabitants of majority of food articles was below the recommended dietary intake (RDI). Nutrient analysis is also showed high deficiency in Vitamins A & C and basic calorie requirement was not met by the inhabitants of Mandvi town. Anthropometric studies of school children and adults were carried out with special reference of BMI.

Health survey (30%) was carried out to collect information on diseases pattern of population of Mandvi town. The diseases were classified in two groups namely common diseases and other diseases such as congenital deformity, mental retardation, cataract, gotire and cancer. Results showed that prevalence rate of common and other diseases were in the range of natural occurrences of diseases reported for rural populations.

In addition, pulmonary functions test was carried out in selected age groups of 100 persons. Results revealed that only 4.0% inhabitants have respiratory problems of obstructive and combined types from population surveyed.

Over all it is concluded from the present study that though Mandvi town survey was carried out during operation period of Kakrapar Atomic Power Station, the effect due to nuclear power plant operation at KAPS is not observed in the present assessment.