NATIONAL NUTRITION MONITORING BUREAU

REPORT OF URBAN SURVEY - SLUMS

(1993 - 94)

NATIONAL INSTITUTE OF NUTRITION
Indian Council of Medical Research
Hyderabad - 500 007

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Contents

INTRODUCTION

The National Nutrition Monitoring Bureau (NNMB), since its inception in the year 1972, has been carrying cut surveys in rural areas of the country. Between the year 1975 and 1980 each unit in addition covered a sample of 250 households in urban areas in one calendar year. In the year 1983, NNMB surveys were linked up with National Sample Survey Organization (NSSO) which established that it was technically feasible to carry out a survey of food consumption and nutritional status of rural communities using the sampling design of NSSO. Based on this experience, in the year 1991, the Bureau adopted the sampling design of NSSO, and covered 16 strata (districts) in each State. Thus, the earlier limitation in the spatial distribution of the sample in each State was also overcome.

A repeat survey was carried out in the year 1988-90 in the same villages which were surveyed earlier during 1975-79 in each State, to assess whether there were changes, if any, in the diet and nutritional status.

An urban survey of different income groups was carried out in the cities of Ahmedabad, Bangalore, Bhopal, Bhubaneshwar/ Cuttack, Calcutta, Hyderabad, Lucknow, Madras, Nagpur and Trivandrum, where the headquarters of the State Units of NNMB are located, during the period 1975-80. The urban sample (50 households from each group) included

households of low, middle, high income groups, industrial labourers and slum dwellers.

Since no information has been collected on urban segments of the papulation during the last 13 years, a survey was initiated to obtain information on food consumption and nutritional status of urban communities, and to compare the same with the data collected during 1975-80 to find out time trends, if any.

The specific groups proposed to be surveyed for the purpose were from the three distinct economic categories namely the high, middle and low income groups, and slum dwellers. To start with, the survey of urban slum dwellers has been initiated in July 1993,

MTHODOLOGY

Sampling :

A sample of 200 households from each of the four socio-economic groups was considered adequate to provide a representative picture of diet and nutritional status of each group. For the purpose, the slums in each city were stratified according to size of the population. From these strata, 20 slums were selected according to **Probability proportion to size (PPS).** From each of the selected slums, 10 households were randomly chosen by using systematic, sampling procedure.

Investigations :

(a) Socio-economic particulars like occupation of the head of the family, total family income, land possession, type, of family, type of dwelling were recorded by interviewing the head of the household.

(b) In each slum, one day weighment method of diet survey was carried out in 5 households, while in the rest of the 5 households, oral questionnaire (24 hour recall) method of diet survey was carried out on all the members of the family.

(c) Anthropometric measurements like standing height, weight, mid upper arm circumference and fat fold at triceps were taken on all the available members in each of the selected households.

(d) Clinical examination for the presence of signs of nutritional deficiency was carried out on all the above individuals.

Analysis:

(a) Diet Survey:

i) Weighment method :

The intakes were expressed per consumption unit* (CUI) and compared with the Recommended Dietary Intakes (RDI) suggested by ICMR (1991). The nutrient content of the foods

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* The calorie consumption of an average adult man, weighing 60 kg, doing secentary type of work is taken as one consumption unit, and the other coefficients are worked out on the basis of calorie requirement proportionately.

consumed was calculated using the Food Composition Tables[2]. The average food and nutrient intakes were computed and presented according to the socio-economic status in each city/town.

Calorie adequacy status of the households were determined adopting the following procedure :

The requirements of 2,350 Kcal and 46 g were taken to represent the average for energy and proteins per CU respectively. The distribution of requirements was assumed to follow a Gaussian distribution with a coefficient of variation of 15%. To determine whether a particular household was consuming adequate amount of protein or energy or not, Mean – 2 SE of the requirements was used as the cut-off. If, in a given household the intake per CU of protein or energy was above this cut-off, the household was considered as consuming adequate amount of either calories or protein. All the households were, thus, classified into four categories of protein-calorie adequacy and inadequacy.

ii) Oral Questionnaire :

The food and nutrient intakes of individuals surveyed in different socio-economic groups and cities were calculated according to age, sex, physiological status and physical activity. The mean values were compared with the recommenced levels suggested by the ICMR Expert Committee[1].

b) Anthropometry :

Means and SDs for height, weight, mid upper arm circumference and fat fold at triceps were computed for each age and sax. The data from Bhopal was observed to have certain discrepancies during scrutiny, and, hence, the anthropometric survey of preschool children was being repeated.

The body weights of preschool children were expressed as percentage of weight–for–age of well–to–do Hyderabad children and NCHS[3] standards[4], and all the children were categorized into different nutrition qrades as per Gomez[5] classification given below :

Weight for age (% of standard)	Nutritional Grade	
>90	Normal	('Normal' Nutrition)
75 - 90	Grade I	('Mild' malnutrition)
60 - 75	Grade II	('Moderate' malnutrition)
<60	Grade III	('Severe' malnutrition)

Body Mass Index (BMI) :

The Body Mass Index [Weight in kgs/ (Height in meters)^2] was used as an indicator of nutritional status of the adults. The distribution of adults according to different degrees of chronic energy deficiency (CED) and obesity was calculated as given below[6] :

Body Mass Index -	Nutritional Grade
<16.0	III degree CED
16.0 - 17.0	II degree CED
17.0 - 18.5	I degree CED
18.5 - 20.0	Low Normal
20.0 - 25.0	Normal
25.0 - 30.0	Overweight (I degree obese)
>30.0	Obese

RESULTS

The details of sample covered are provided in Table-1 and the cities surveyed are indicated in the Map (Fig.l).

The survey could not be carried out in Lucknow due to logistic reasons. In the city of Calcutta, as the survey was initiated late, the data was not received at the time of analysis and hence was not analysed. Due to certain inconsistencies observed in the clinical/ anthropometric data received from the cities of Madras and Bhopal, it was not included in the present report.

Food Consumption:

The average daily consumption of food stuffs (g) per consumption unit is presented in Table – 2.

Cereals and Millets :

In all the cities, cereals and millets (g/CU/day) formed the bulk of the diet of the slum dwellers. The consumption of cereals was 22-120 g lower than that suggested for balanced diets among the eight cities. The intakes were 74 - 95% of the RDI.

Pulses :

The average intake of pulses ranged from 10g in Trivandrum to 34 g in Nagpur and was below the RDA. In the cities of Hyderabad, Madras and Trivandrum, there was more than 30% deficit in the consumption of pulses as compared to the RDI.

Vegetables :

In general, consumption of vegetables was below the suggested allowances. The intake of green leafy vegetables, the least expensive rich source of iron and B-carotene, was less than 70% of RDI, except in the city of Bhopal.

The intakes of other vegetables were particularly low in the cities of Hyderabad (32 g), Madras (39 g) and Trivandrum (26 g), as against the RDI of 60 g.

Roots and Tubers :

The maximum consumption of roots and tubers was noticed in Bhubaneshwar (102 g) followed by Trivandrum (69 g). While in Trivandrum it was tapioca and in Bhubaneshwar it was because of onions and potatoes. Among the rest of the cities Hyderabad had the lowest. intake (50% RDI).

Nuts and Oi1 Seeds :

In Trivandrum, the consumption of nuts and oil seeds, particularly coconuts, was high (90 g), while in all the remaining cities the intake was less than 10 g.

Fruits :

The consumption of fruits (seasonal) was highest in Hyderabad (68 g) and was about 30-36 g in the cities of Bangalore, Madras and Nagpur, while it was much lower in other States.

COVERAGE OF CITITES/TOWNS UNDER URBAN SURVEY - SLUMS

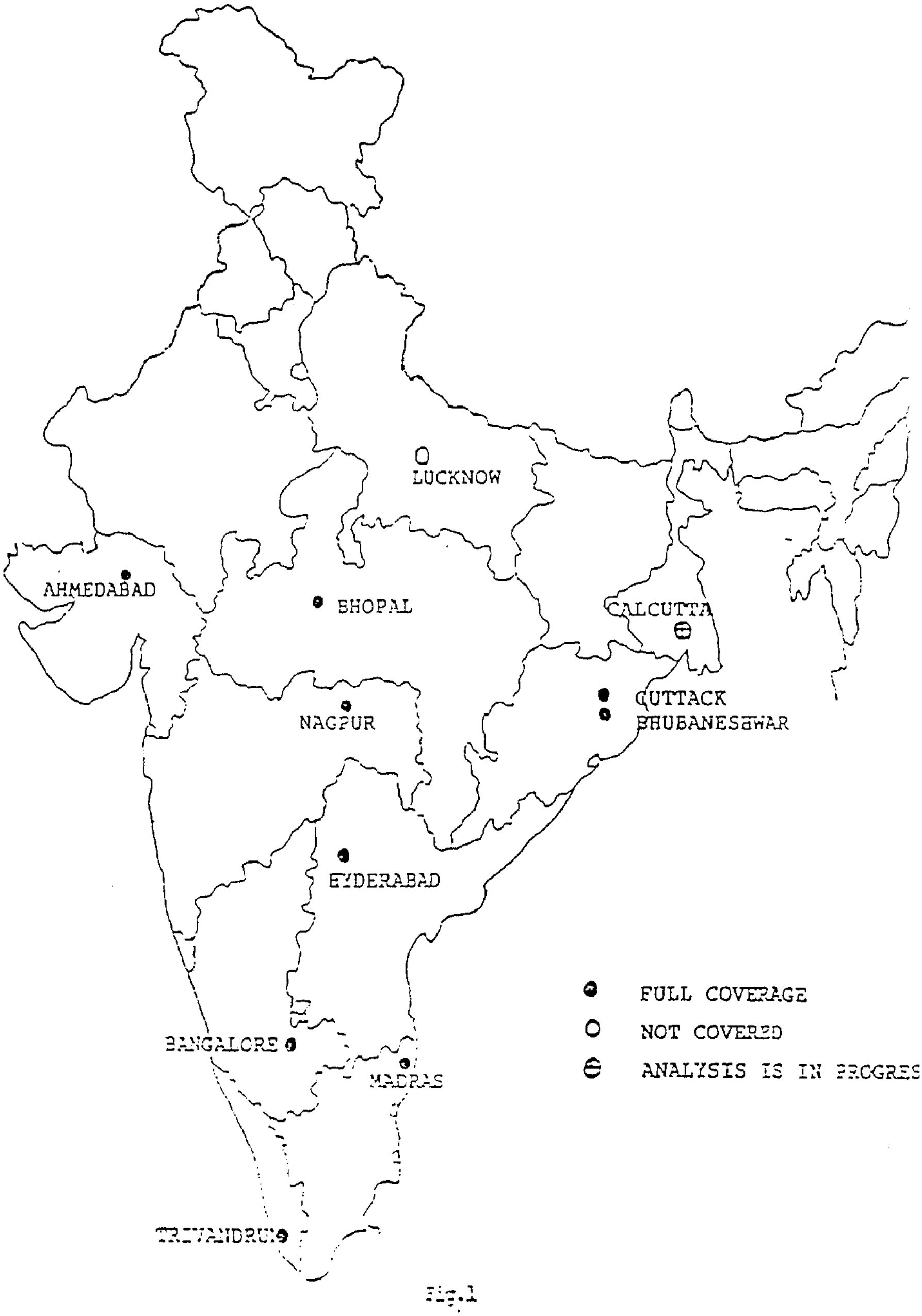


Fig.1

Fish and Flesh foods :

The intake of fish and flesh foods was low (<10 g) in five of the eight cities surveyed, while it was between 27–29 g in Bhubaneshwar and Madras. The consumption of fish and flesh foods, however, was high in Trivandrum (113 g) (mostly consisting fish).

Milk and Milk Products :

In all the cities surveyed, except Ahmedabad, the consumption of milk and its products was deficient by 30% or more as compared to the RDI.

Fats and Oils :

As in the case of milk, in all the cities except Ahmedabad, the fat intake was deficient by >30% of RDI. Infact, in the urban slums of Bangalore, Bhubaneshwar, Hyderabad and Trivandrum, the fat consumption was <30%. of RDI.

Invisible fat in the foodstuffs contributed significantly to total fat intake (visible + invisible fat), while it was nearly twice that of visible fat in most of the cities, in Trivandrum it was six times that of visible fat.

Sugar and jaggery:

The average consumption of sugar and jaggery in the cities of Ahmedabad, Nagpur and Trivandrum was comparable to RDA while in Bangalore, Bhopal, Bhubaneshwar, Hyderabad and Madras the intakes were <70%. of RDI.

Thus, the diets, in general, were predominantly cereal based. The consumption of Green Leafy Vegetables (GLV), milk and milk products, fat and sugar was deficit by >30%. of RDI in almost all the cities. The slum dwellers in Hyderabad and Madras were generally deficient (>30%) in all the food intakes except cereals as compared to RDI. On the other hand, in the city of Ahmedabad, the diets were generally adequate except for cereal and GLV.

NUTRIENT INTAKE:

The average intakes of various nutrients (per CU/day) consumed in the diets by the slum dwellers in the six cities are given in Table – 3.

Protein :

In all the cities, protein intakes of slum dwellers were below, the RDI of 60 g/CU/day except in the city of Trivandrum. The lowest intakes were observed in the city of Hyderabad where it corresponded to about 67% of RDI, while the highest consumption (1057. of RDI) was noted in the city of Trivandrum, where the consumption of fish was very high.

Energy :

The average intake of energy in slum dwellers varied from a low 1685 kcal (72% of RDI) in Hyderabad to a maximum of 2249 kcal (96%. of RDI) in Trivandrum. The deficit in energy intake in the rest ranged from about 15% in Bhubaneshwar to about 22%. in Madras.

Calcium :

The intake of calcium in Trivandrum was almost twice that of RDI, perhaps, due to very high consumption of fish. In the cities of Ahmedabad, Bangalore and Bhopal, the intakes were above the RDI, while in the city of Hyderabad, there was about 407. deficit in calcium consumption.

Iron:

In general, in all the cities the iron consumption was just about comparable to RDI, except in Hyderabad and Madras, where the intakes were deficient by over 25% as compared to RDI.

Vitamin A:

In none of the cities, the intake of vitamin A was satisfactory. The average intake ranged from 200 ug in Ahmedabad to 391 ug in Bhopal - much below the RDI (600 ug/CU/day).

Vitamin B-Complex:

In general, tne intakes of thiamine (vitamin Bl) and niasin were below tne suggested levels in all cities except in tne cities of Ahmedabad, Bhopal and Nagpur where they were either more or comparable with, the recommended levels.

In the case of riboflavin (Vitamin B2), the intakes were deficient in all the cities. The percentage of deficiency in average intakes varied from 21% to 64% of the RDI in Bhopal and Hyderabad respectively. Even in Bangalore, Bhubaneshwar, Madras, Nagpur and Trivandrum the intakes were about half of the RDI.

Vitamin C :

The average intake of vitamin C (ascorbic acid) varied from 32 mg in Ahmedabad to 59 mg in Nagpur while in Bangalore, Bhubaneshwar, Madras, Hyderabad, Trivandrum and Bhopal it ranged from 35 mg to 54 mg. Vitamin C is an important promoter of iron absorption.

Protein-calorie Adequacy status of households:

The distribution of households according to protein-calorie adequacy status is presented in Table - 4. The proportion of households consuming diets which were inadequate in calories ranged from 44% in Trivandrum to 34% in Hyderabad. On the other hand, the percentage of households with intakes which are inadequate (both in

protein and calories was highest in Hyderabad (44) and lowest in Bhopal (5). The proportion of protein inadequacy was much higher both in Madras (37%) and Hyderabad (45%) which was less than 25% in the other cities.

In general, the diets, thus, were more deficient in energy than that of protein.

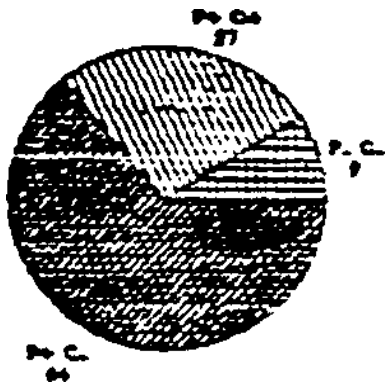
The diets were inferior to those of the rural households particularly with respect to energy intakes.

Socio-economic factors and food and nutrient intakes:

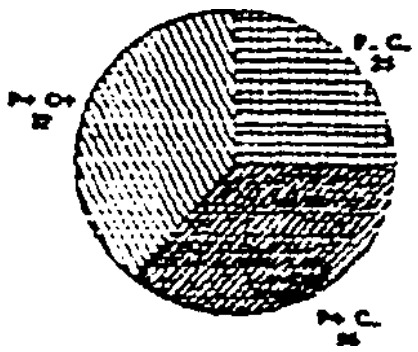
Socio-economic conditions such as per capita income and occupational status of head of household are known to be associated with food and nutrient consumption. The results of analysis according to occupation and per capita income are presented in Figs. 3-4. There appeared to be a linear relationship between occupation - landless labourers (lowest category) to services (better off) - and the intake of energy, protein and vitamin A.

The nutrient intakes increased with increasing per capita income per month. The intakes of energy and protein were less than RDI in households with income less than Rs.150 per capita per month. In the case of vitamin A, however, only these with the per capita income of > Rs-300/- per month had mean intakes comparable to RDI.

PROTEIN-CALORIE ADEQUACY & INADEQUACY STATUS - URBAN SLUMS

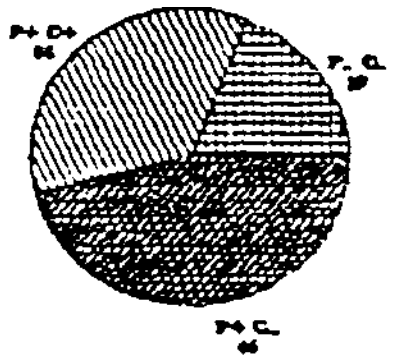


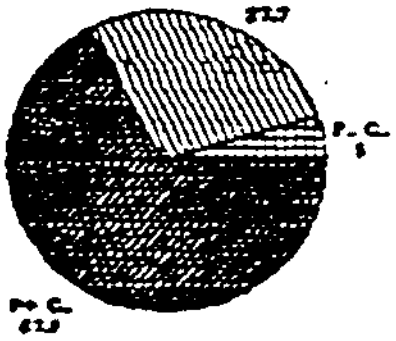
AHMEDABAD



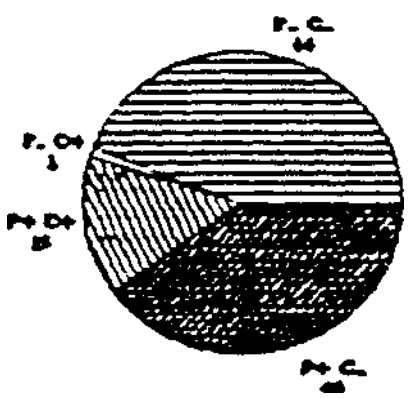
BANGALORE

BHUBANESHWAR

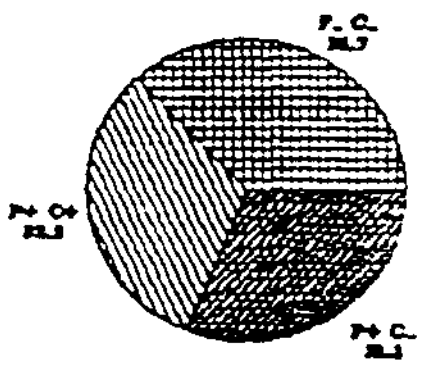




BHOPAL

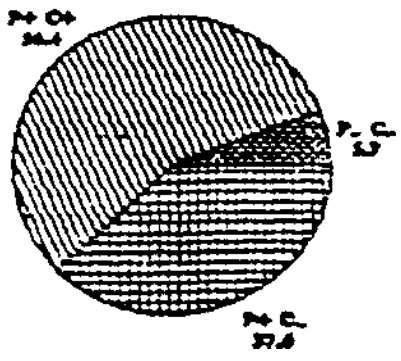


HYDERABAD



MADRAS

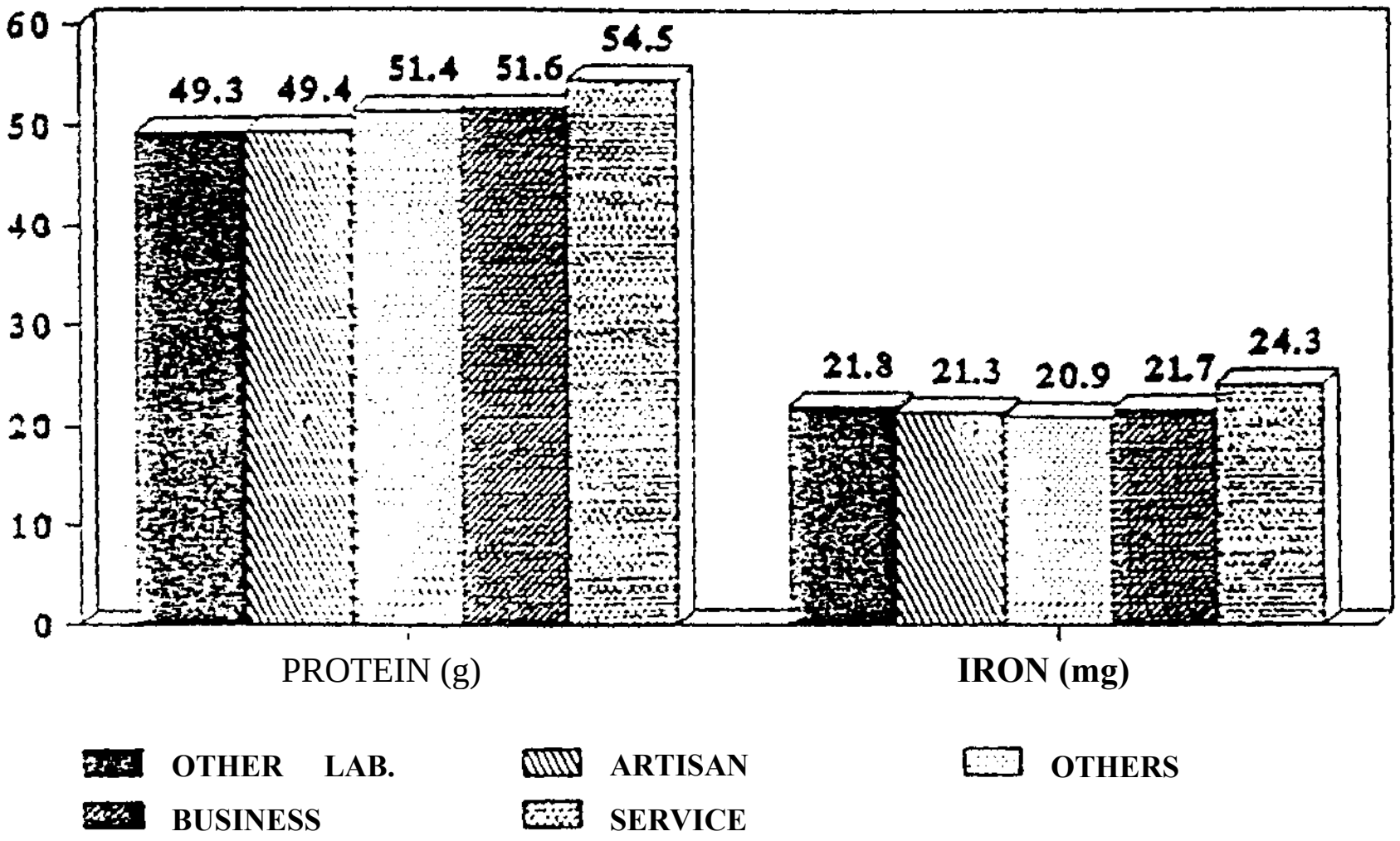
NAGPUR



TRIVANDRUM

Fig. 2

INTAKE OF NUTRIENTS BY OCCUPATION



INTAKE OF NUTRIENTS BY OCCUPATION

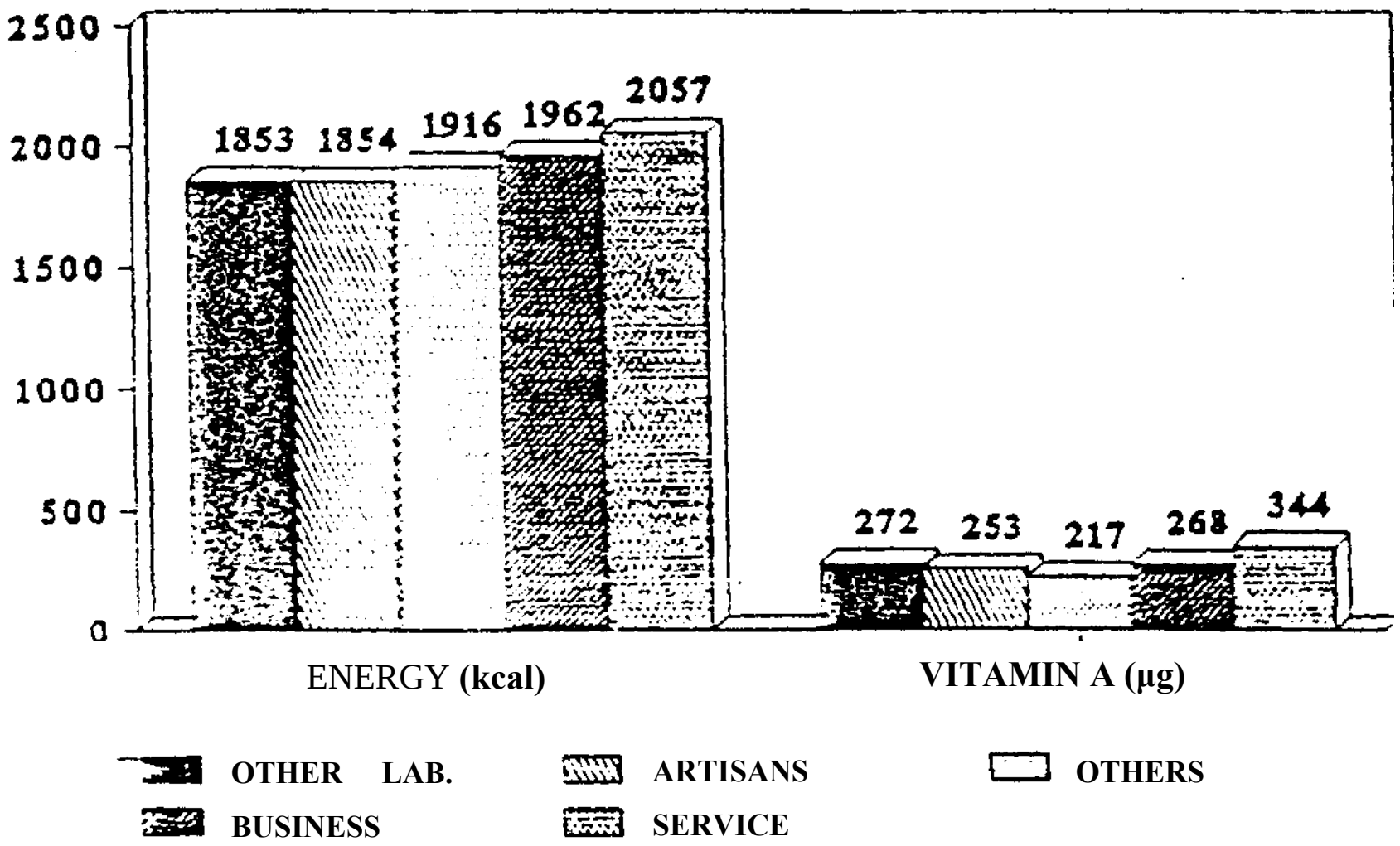
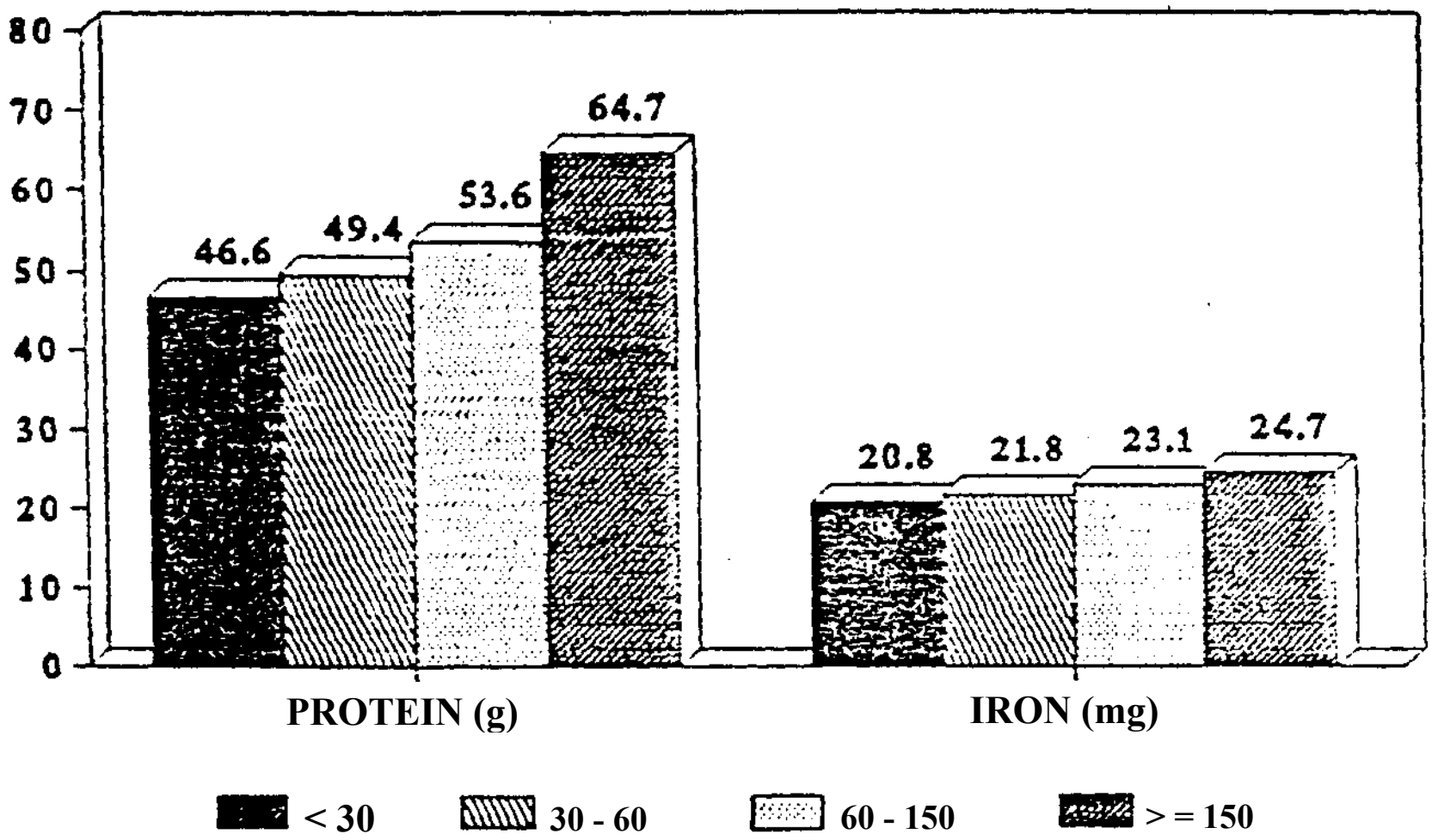


Fig. 3

INTAKE OF NUTRIENTS BY PER CAPITA INCOME

(Rs./per month)

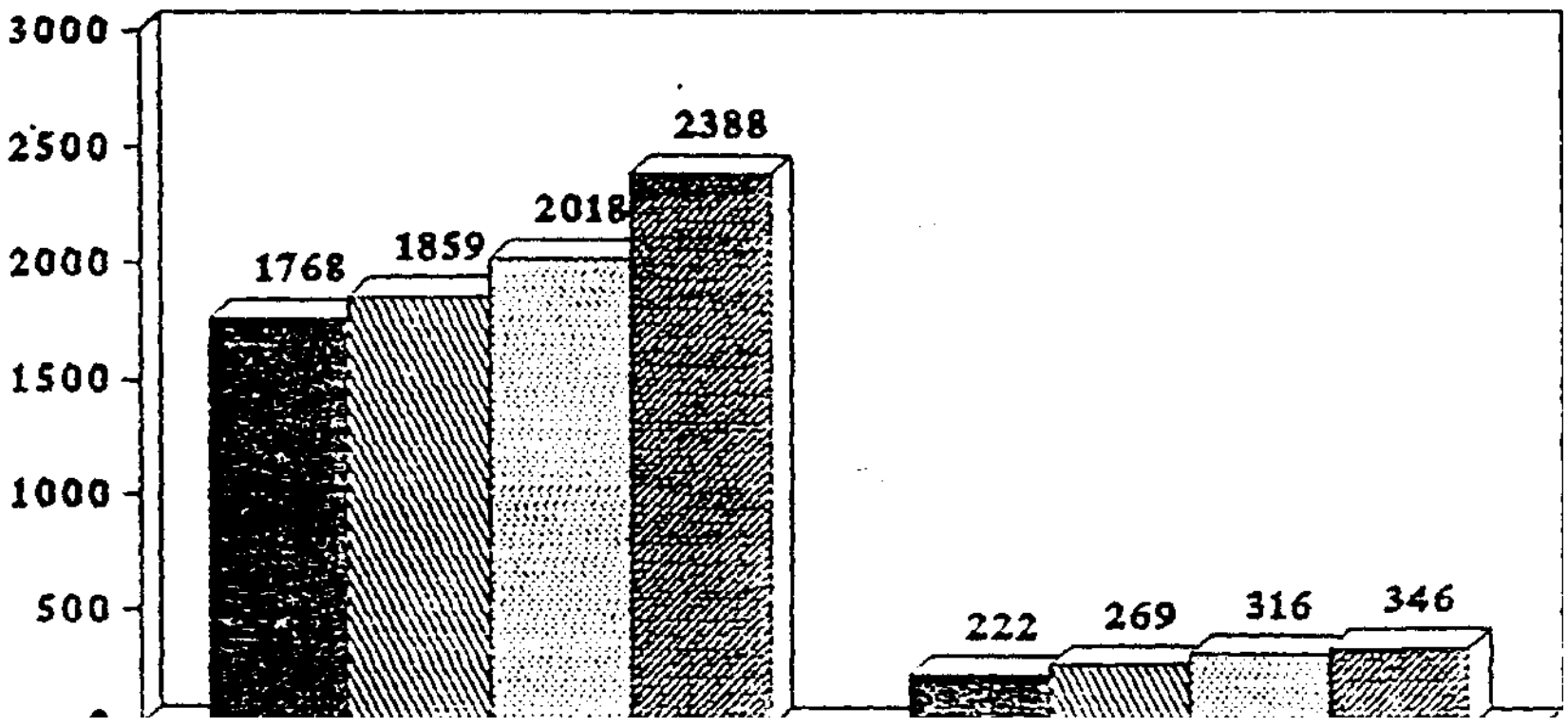


PROTEIN (g) **IRON (mg)**

< 30 **30 - 60** **60 - 150** **> = 150**

INTAKE OF NUTRIENTS BY PER CAPITA INCOME

(Rs./per month)

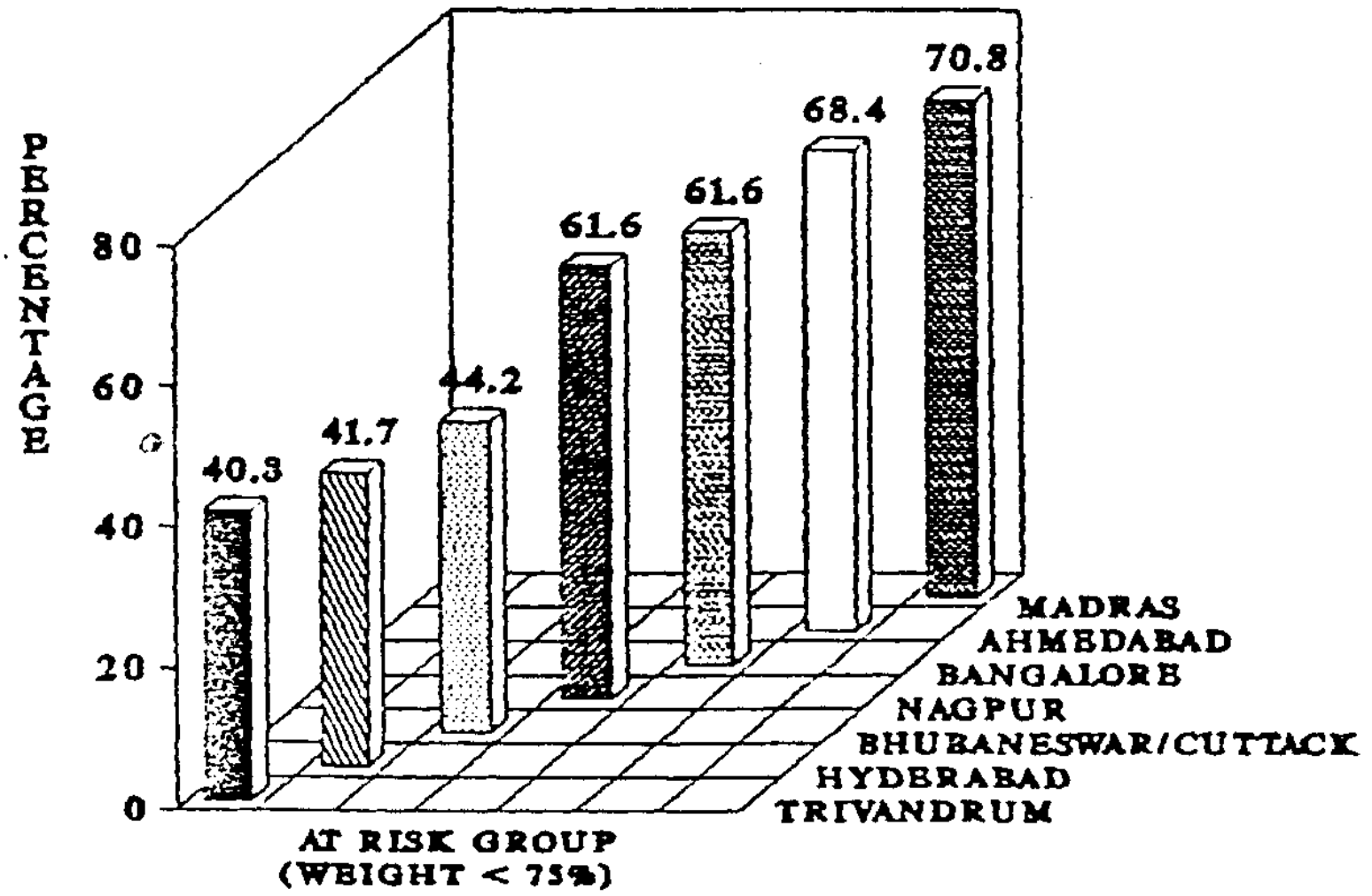


ENERGY (kcal) **VITAMIN A (pg)**

< 30 **30 - 60** **60- 150** **>=150**

Fig. 4

GOMEZ CLASSIFICATION OF PRE-SCHOOL BOYS



GOMEZ CLASSIFICATION OF PRE-SCHOOL GIRLS

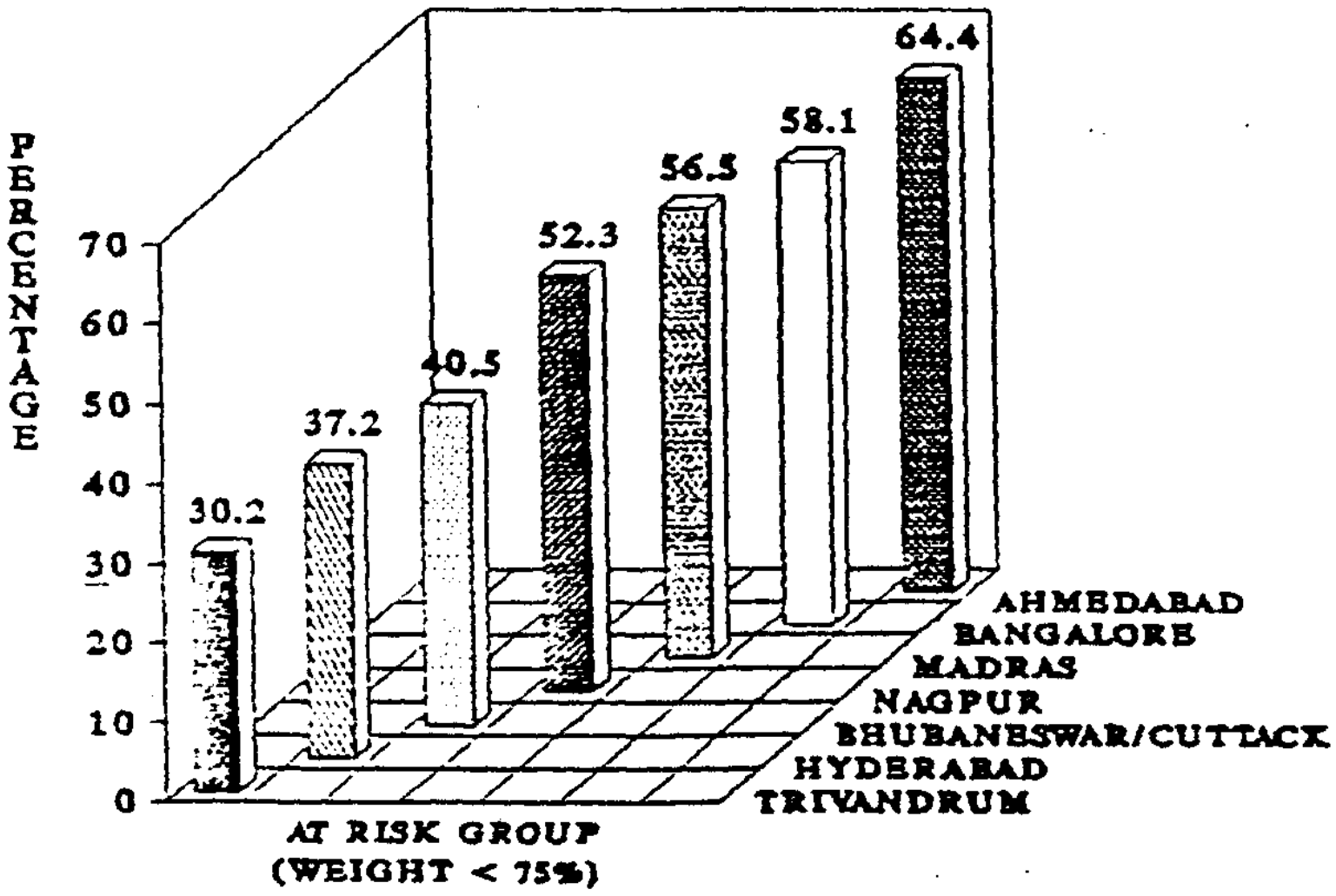
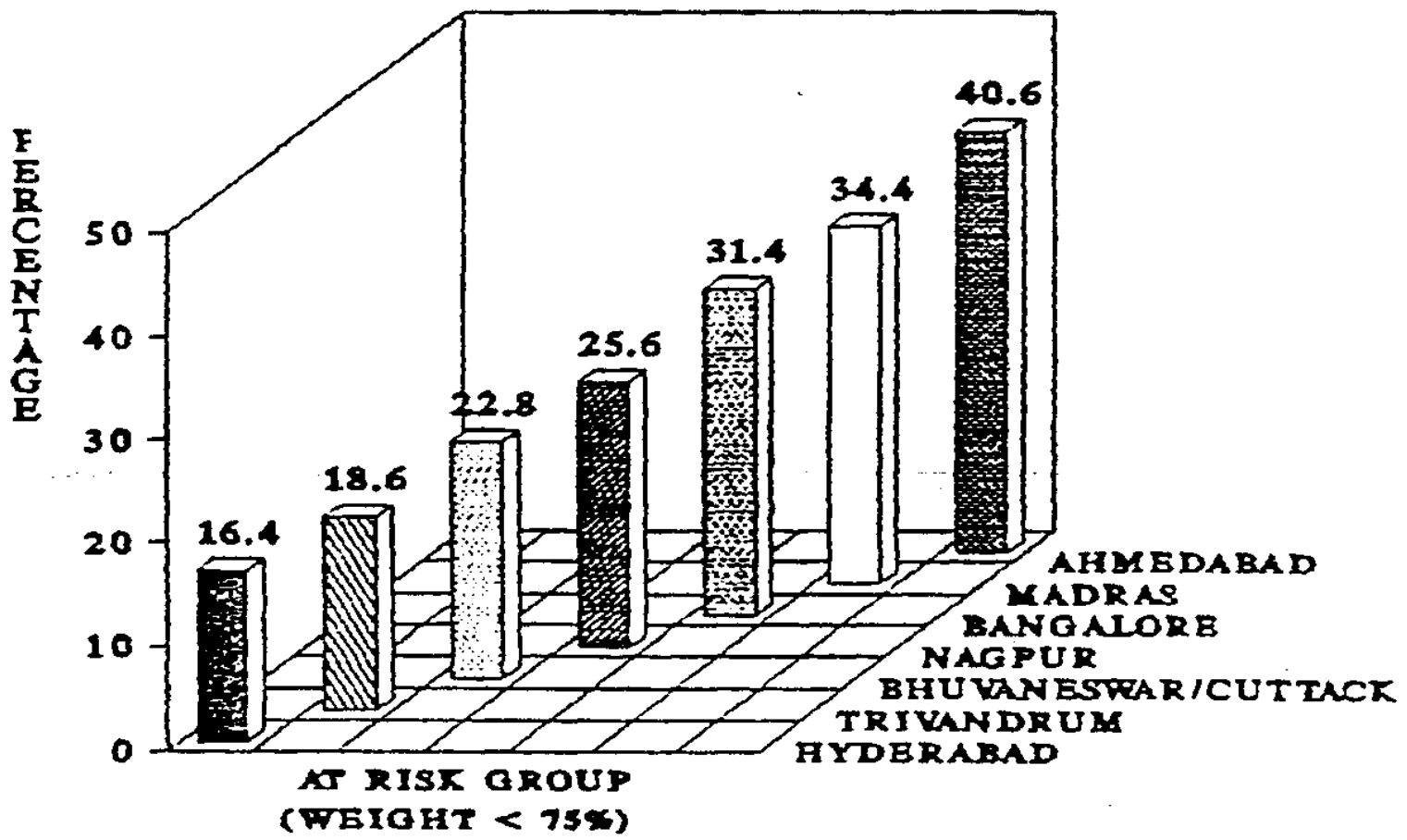


Fig.5

GOMEZ CLASSIFICATION OF PRE-SCHOOL CHILDREN



GOMEZ CLASSIFICATION OF PRE-SCHOOL CHILDREN

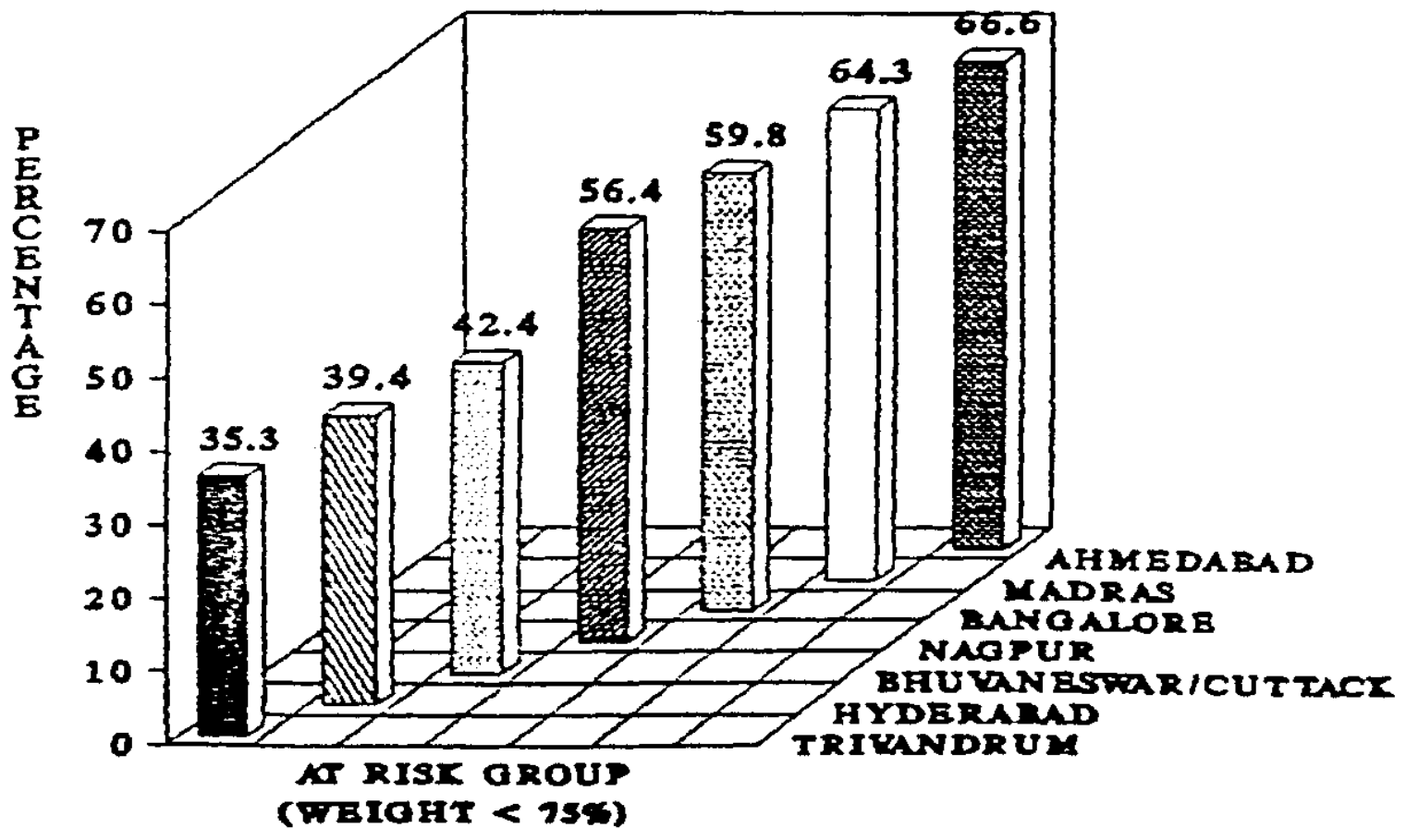
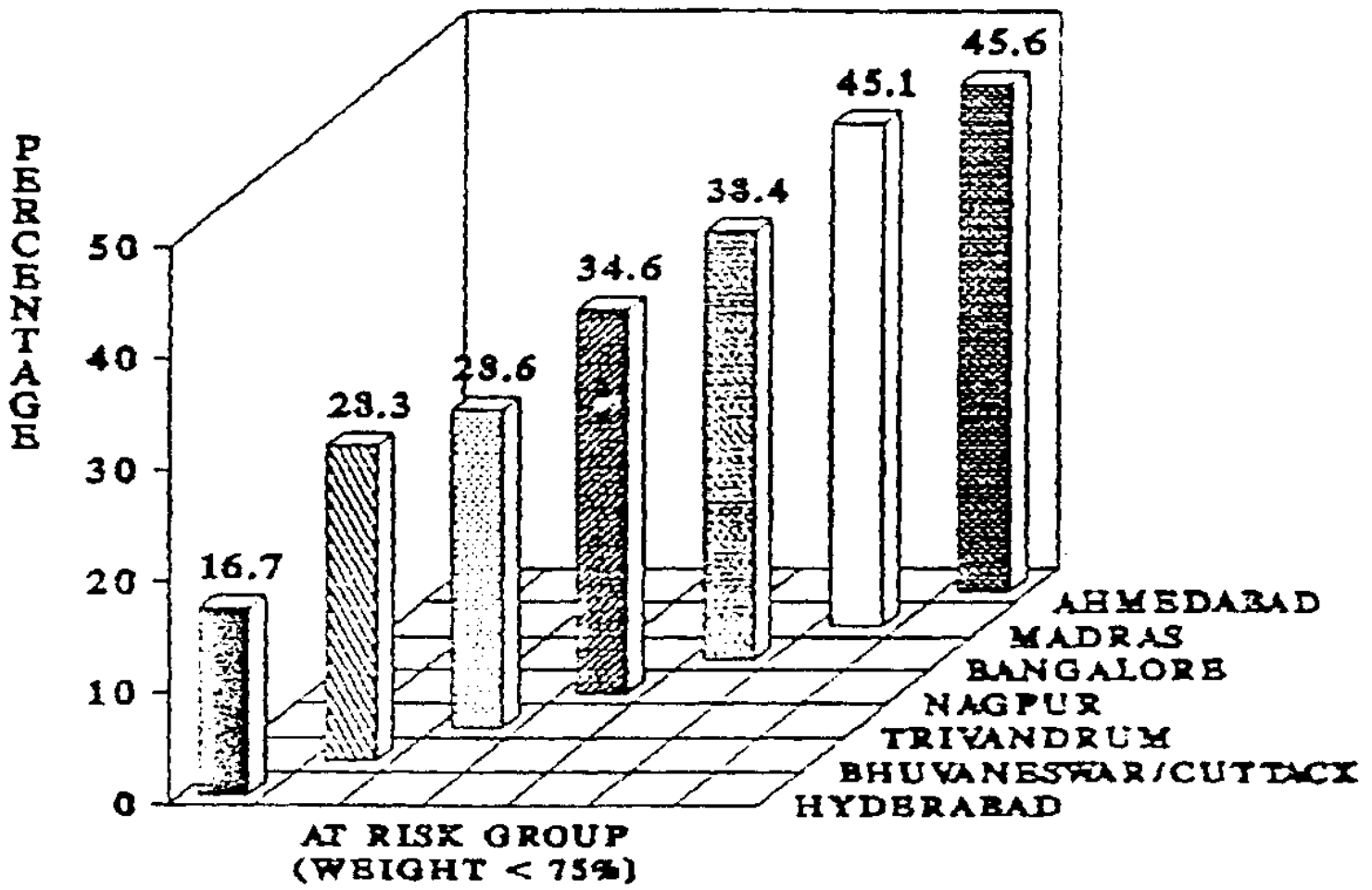


Fig.6

GOMEZ CLASSIFICATION OF PRE-SCHOOL BOYS



GOMEZ CLASSIFICATION OF PRE-SCHOOL GIRLS

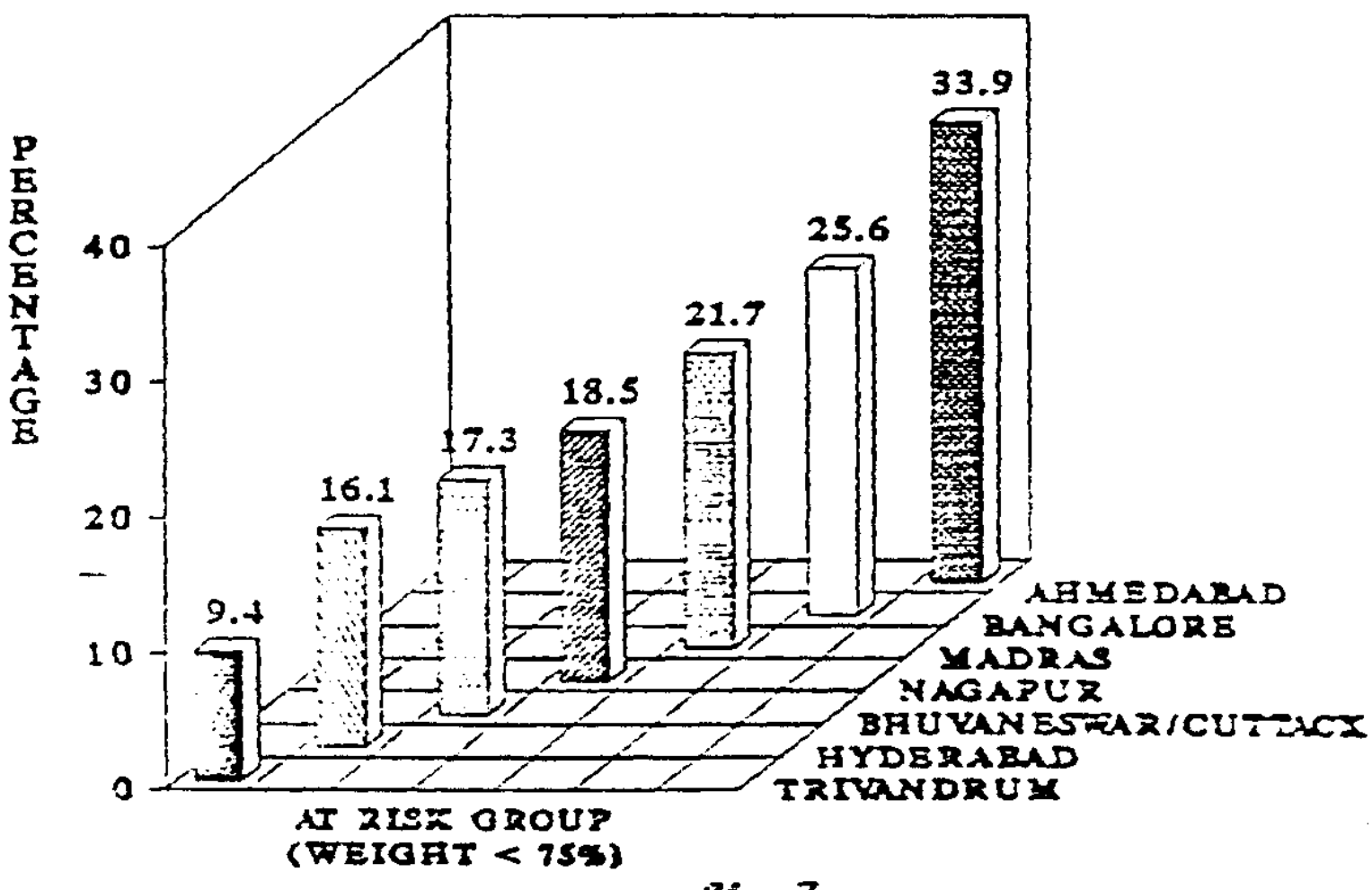


Fig.7

BMI VALUES OF ADULT MALES

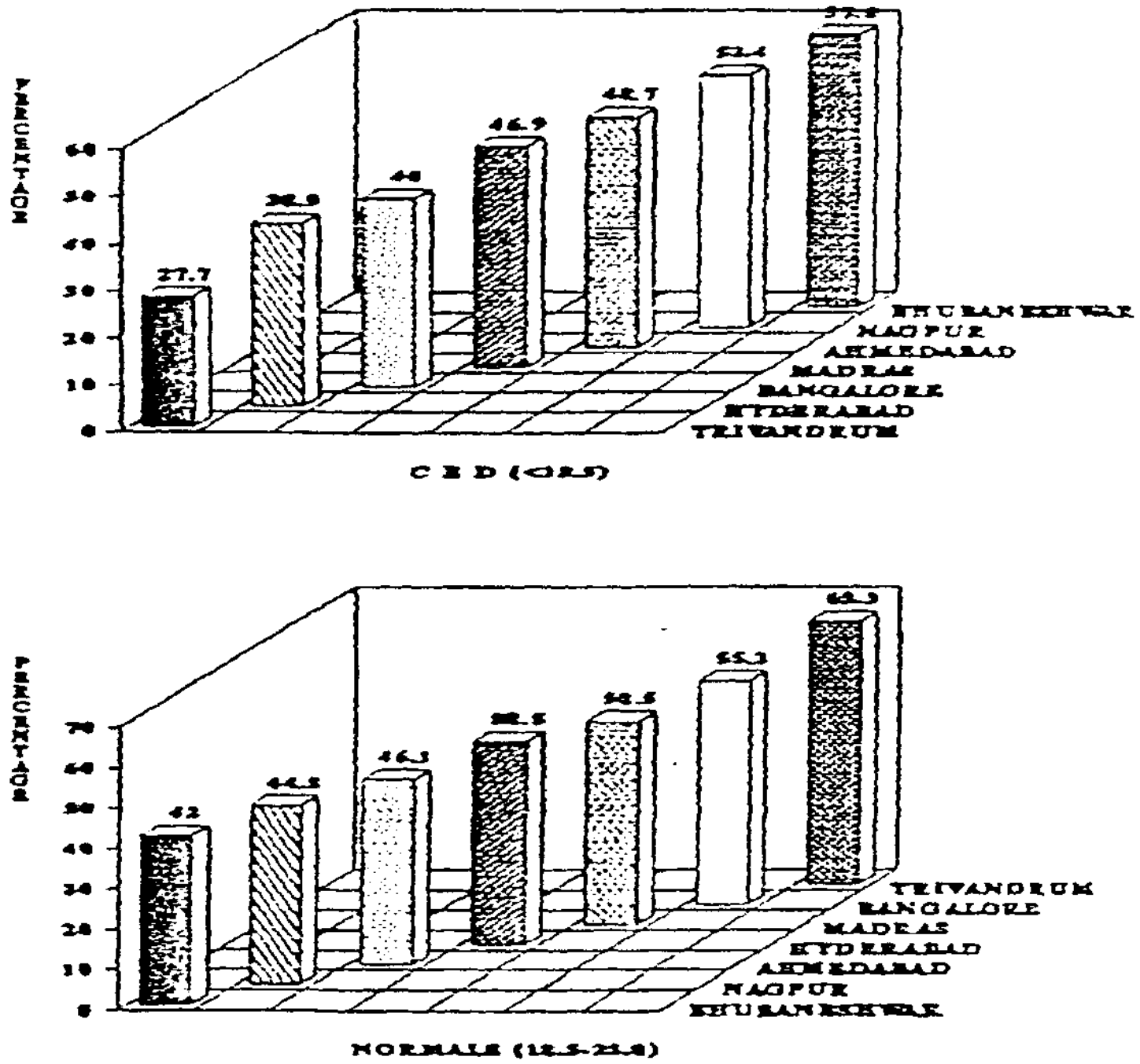
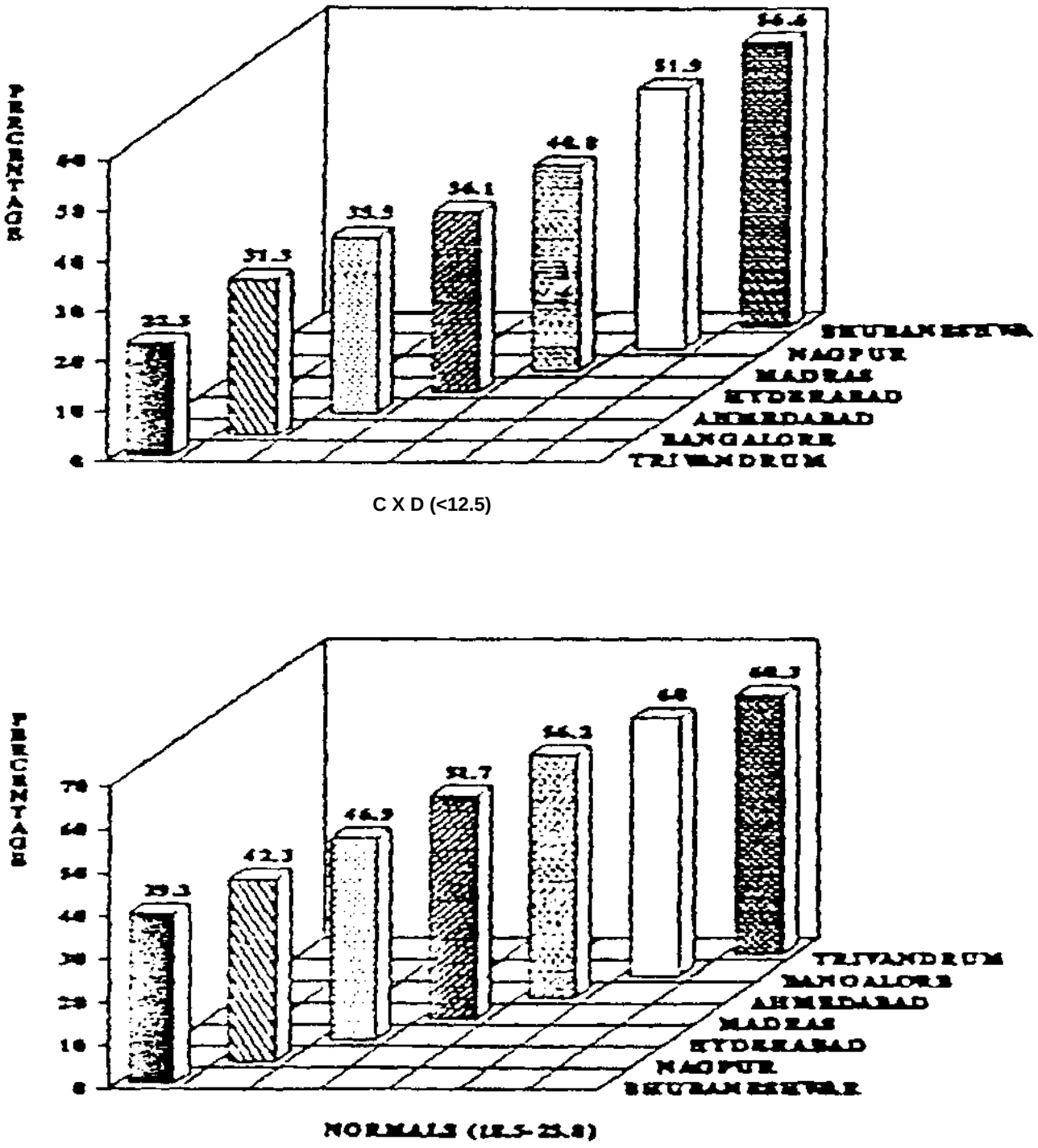


Fig.8

BMI VALUES OF ADULT FEMALES



C X D (<12.5)

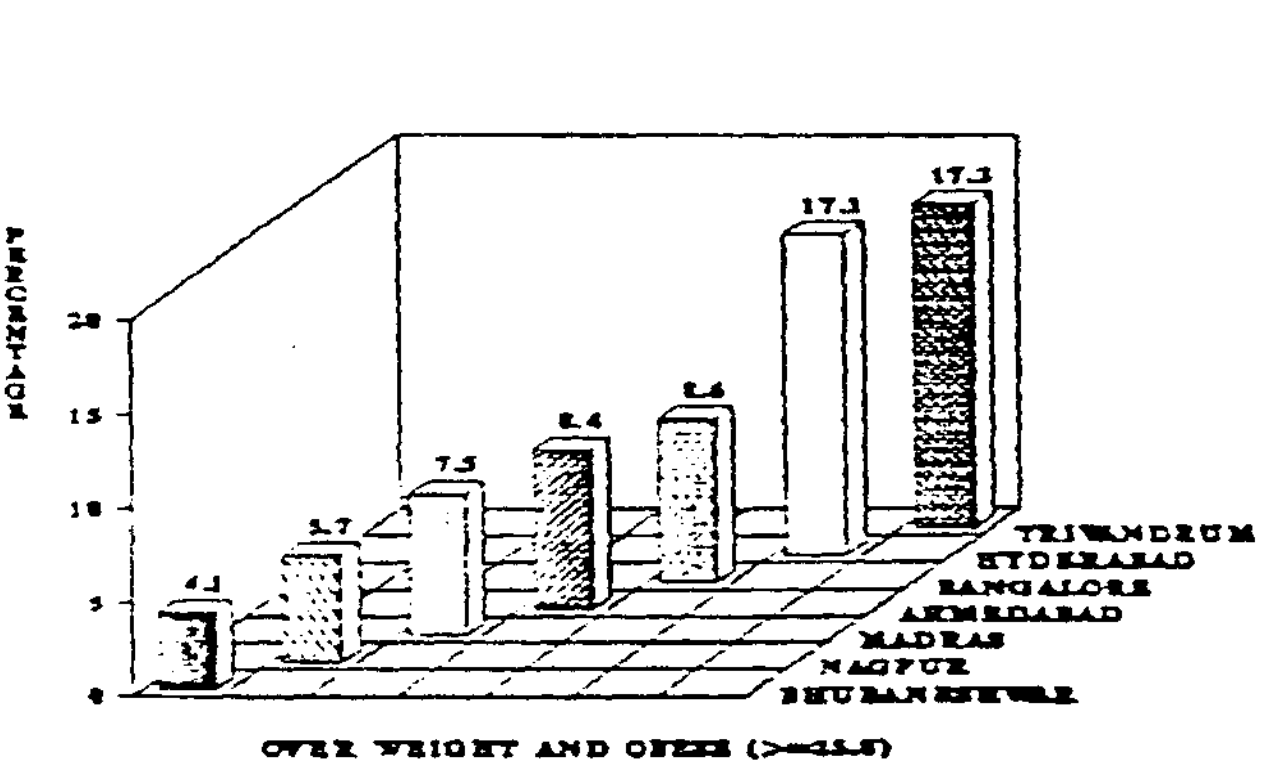


Fig.9

Anthropometry:

The means of four anthropometric measurements, viz., height, weight, mid upper arm circumference and fat fold at tricebs (FFT) are presented according to age and sex for all the five cities/towns separately in Annexure - II (i to x)

In view of small size of sample in each age and sex group, there were variations in the mean anthropometric measurements in different ages. Care has to be taken before any conclusions are drawn.

Weight for age status :

The body weights for age of all children (1-5 years) were expressed as percent of NCHS and Hyderabad well to do standards and the nutritional grades according to Gomez classification - 'Normals', 'mild'(Grade I), 'moderate' (Grade II) and 'severe' (Grade III) malnutrition. The Results of such a distribution are given in Table - 6. The results showed that the prevalence of 'severe' malnutrition in children (sexes pooled) was the highest in the city of Ahmedabad (18.1%), about double that of the city of Madras with next highest prevalence of 7.3%. These results are surprising when the dietary intakes of the HH in Ahmedabad are considered which are superior to those of other cities. Comparison between sexes in each city may not be appropriate in view of small sample size in each age.

When the Standards based on well-to-do Hyderabad children were considered (Table - 5), the pattern was essentially similar, though the extent of malnutrition was lower (Fig. 5-7).

Body Mass Index (BMI) :

BMI values were computed for adult men and women (those who are 18 years and above) and their percentage distribution according to Nutritional Grades are provided in Table - 7.

The proportion of adults with normal BMI values (18.5-25.0), at the aggregate level was around 52%. The prevalence of chronic energy deficiency in males (BMI <18.5) was the highest in Bhubaneshwar/Cuttack (58%) and lowest in Trivandrum (28%). Chronic energy deficiency was slightly less in females than in males in almost all the cities surveyed. Similarly, higher proportion of overweight/obese papulation (BMI >25.0) was observed in females than in males in each city. It ranged from 4% in Bhubaneshwar to 17% each in Trivandrum and Hyderabad (Fig. 8-9).

Clinical Siqns of Nutritional Deficiency :

The clinical nutritional deficiency signs indicative of protein energy malnutrition (PEM), vitamin A and B-complex deficiencies etc., are presented according to the age groups in Tables - 8 to 12. The results of clinical survey of

Madras city are being reviewed in view of certain discrepancies and hence the results are not presented.

In general, but for a stray case of marasmus in Nagpur, the infants living in slums in all the cities surveyed were apparently healthy.

In the preschool age group, only one case marasmus (0.7%) seen in the city of Ahmedabad. Bitot spots, indicative of vitamin A deficiency were noticed in the cities of Ahmedabad (1.4%) and Bhubaneshwar/Cuttack (2-5%) and Nagpur (0. 9%) .

Among the school age children (5-12 years) the common signs were those of deficiencies of vitamin A and B-complex. The prevalence of Bitot spots was observed to be over 5% in the cities of Bhubaneshwar/Cuttack, Bangalore and Ahmedabad. In Hyderabad, it was observed in about 1%. The prevalence of Angular stomatitis was between 4-9% in all the cities except Trivandrum where not a single case was observed.

COMMENTS

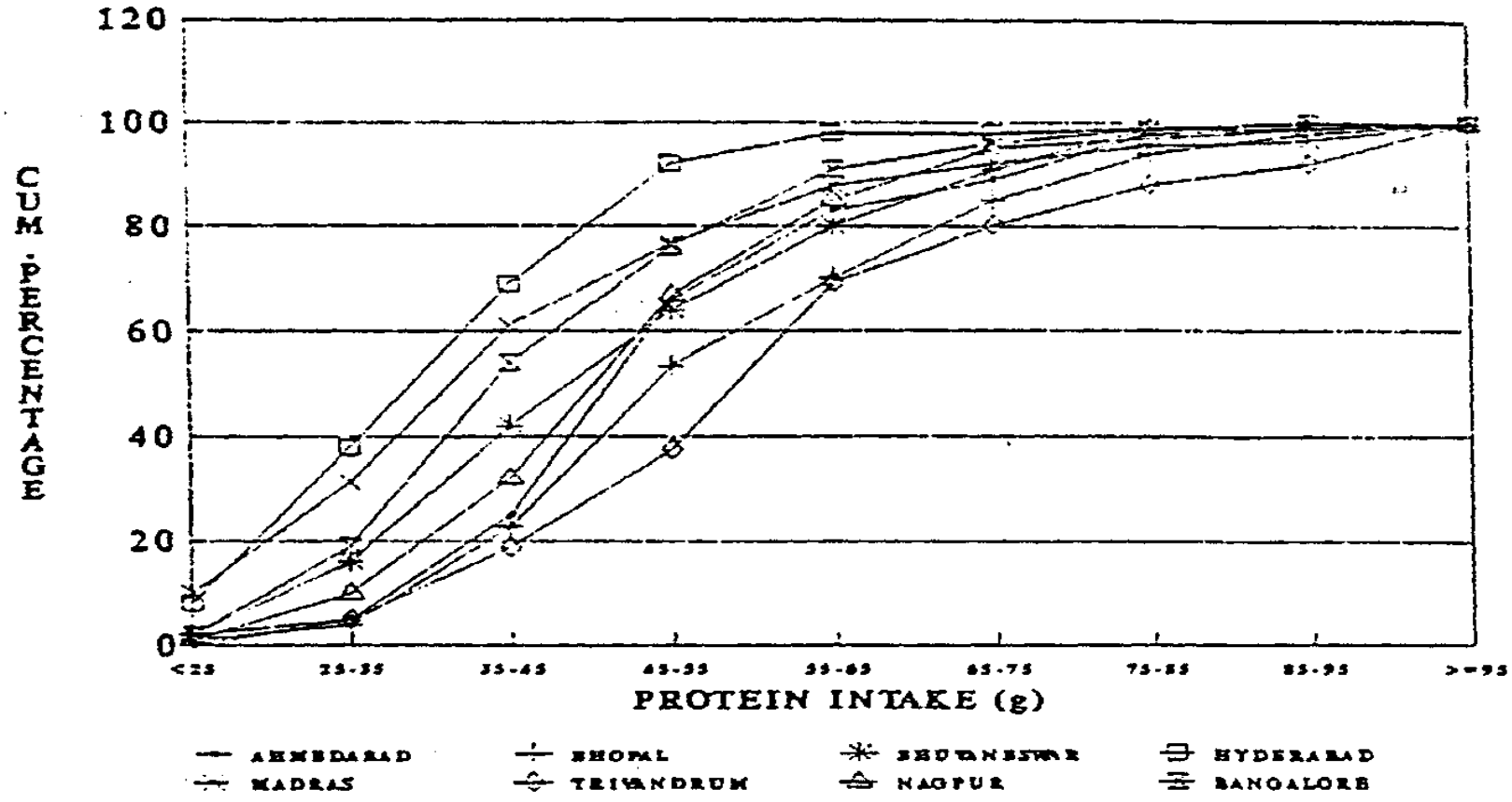
The diets or the slum dwellers in the cities surveyed were basically deficient in energy. However, the diets appeared to be more deficient in vitamin A and B-complex. In all the cities, vitamin A intakes were below 70% of RDI. In the city of Hyderabad, the nutrient intakes were below 70% of RDI with respect to all nutrients except protein and iron.

A comparison between the current data and that of seventies (1975-79) with respect to energy did not indicate significant difference. In other words, at the aggregate level there has been little change in the average energy intakes of slum dwellers during the last fifteen years. About 647. of the households had a per capita income of Rs.<2/- per day at 1975 prices. Surely, this is not adequate to meet the RDI,

The quantity of the diet appeared to improve with increasing income and also with regular source of income (service) of the families with particular respect to the consumption of protective foods like pulses, milk, fish, vegetables etc.

In general, the intakes were the least in the Hyderabad city and better in Trivandrum (Fig. 10-13).

The mean anthropometric measurements of population surveyed in the year 1993-94 were slightly better than those of the seventies (1975-79) (Figs.14-15). When the nutritional status of preschool children, which is believed tO reflect community's nutritional status, was considered, the preschoolers of the slum dwellers of Trivandrum had better' dietary intakes and also the lowest proportion (97.) of undernourished children (Severe and Moderate degree). On the other hand, there appeared to be a reversal of the


CUM. PERCENT DISTRIBUTION OF HOUSEHOLDS
CUM. PERCENTAGE
120
100
80
60
40
20
0
<25
25-35
35-45
45-55
55-65
65-75
75-85
85-95
>=95
PROTEIN INTAKE (g)
AHMEDABAD
BHOPAL
BHUBANESWAR
HYDERABAD
MADRAS
TRIVANDRUM
NAGPUR
BANGALORE

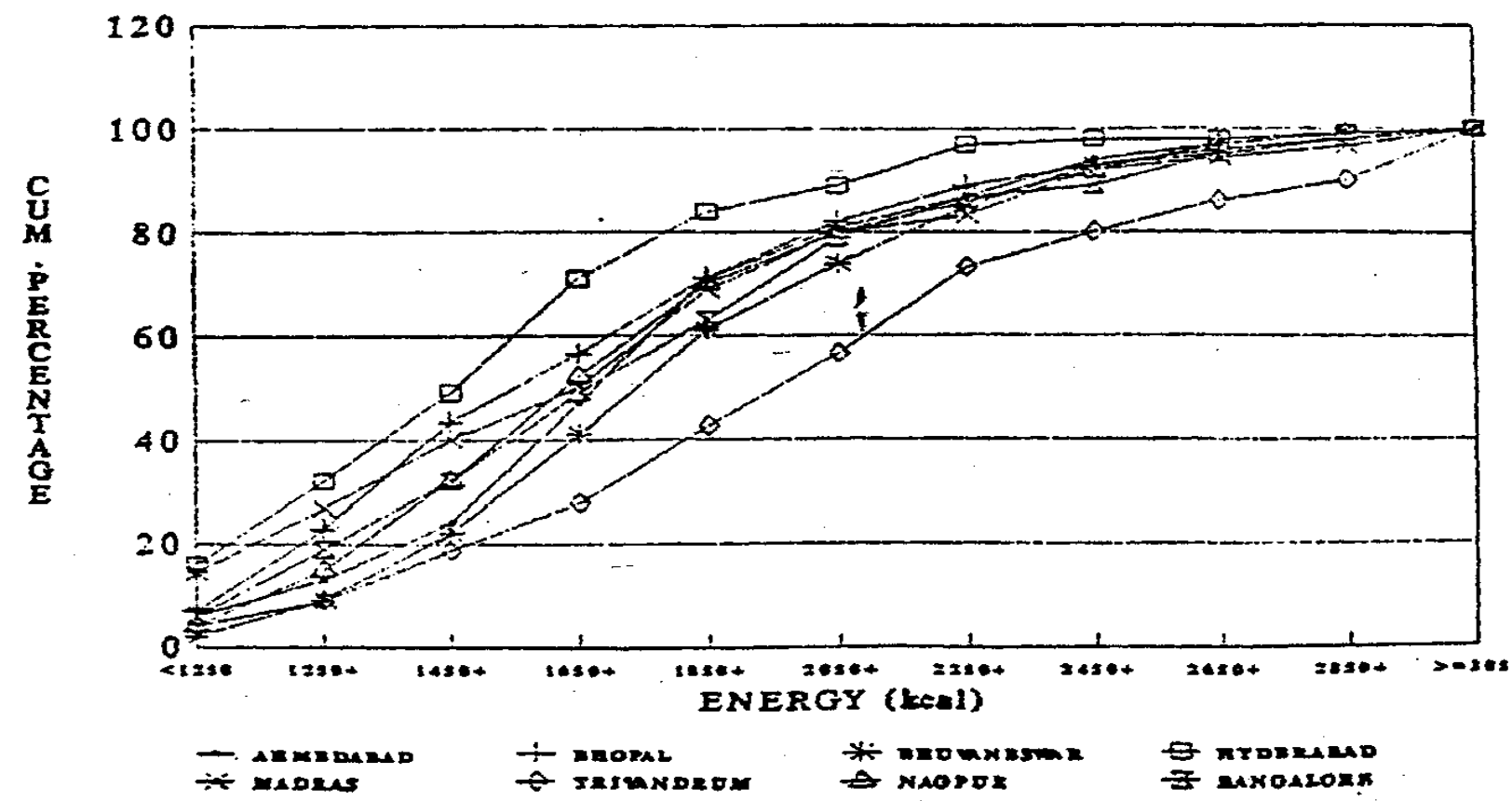
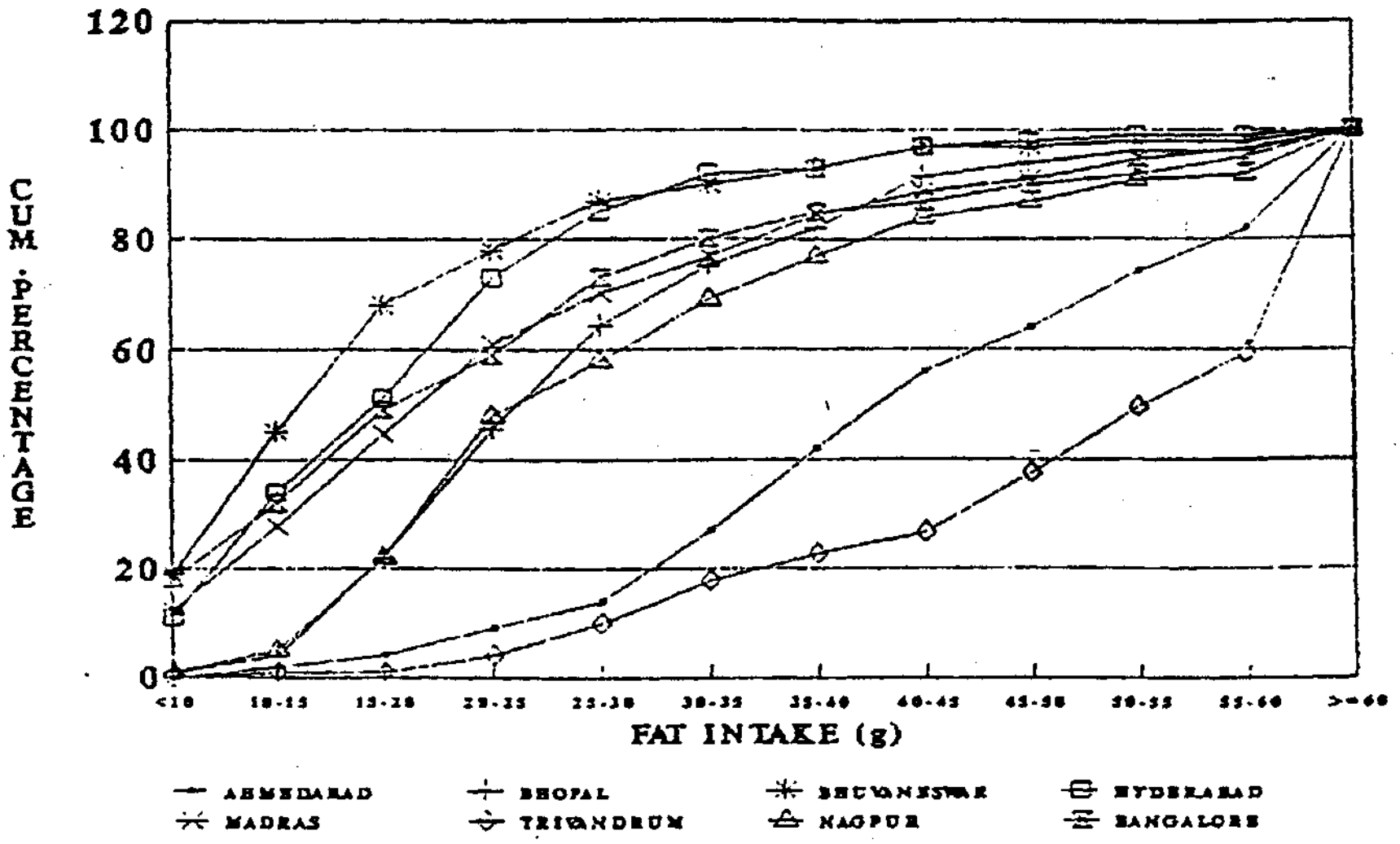

CUM. PERCENT DISTRIBUTION OF HOUSEHOLDS
CUM. PERCENTAGE
120
100
80
60
40
20
0
ENERGY (kcal)
AHMEDABAD
BHOPAL
BHUBANESWAR
HYDERABAD
MADRAS
TRIVANDRUM
NAGPUR
BANGALORE

Fig.10


CUM. PERCENT DISTRIBUTION OF HOUSEHOLDS
CUM. PERCENTAGE
120
100
80
60
40
20
0
<10
10-15
15-20
20-25
25-30
30-35
35-40
40-45
45-50
50-55
55-60
>=60
FAT INTAKE (g)
AHMEDABAD
BHOPAL
BHUVANESWAR
HYDERABAD
MADRAS
TRIVANDRUM
NAGPUR
BANGALORE

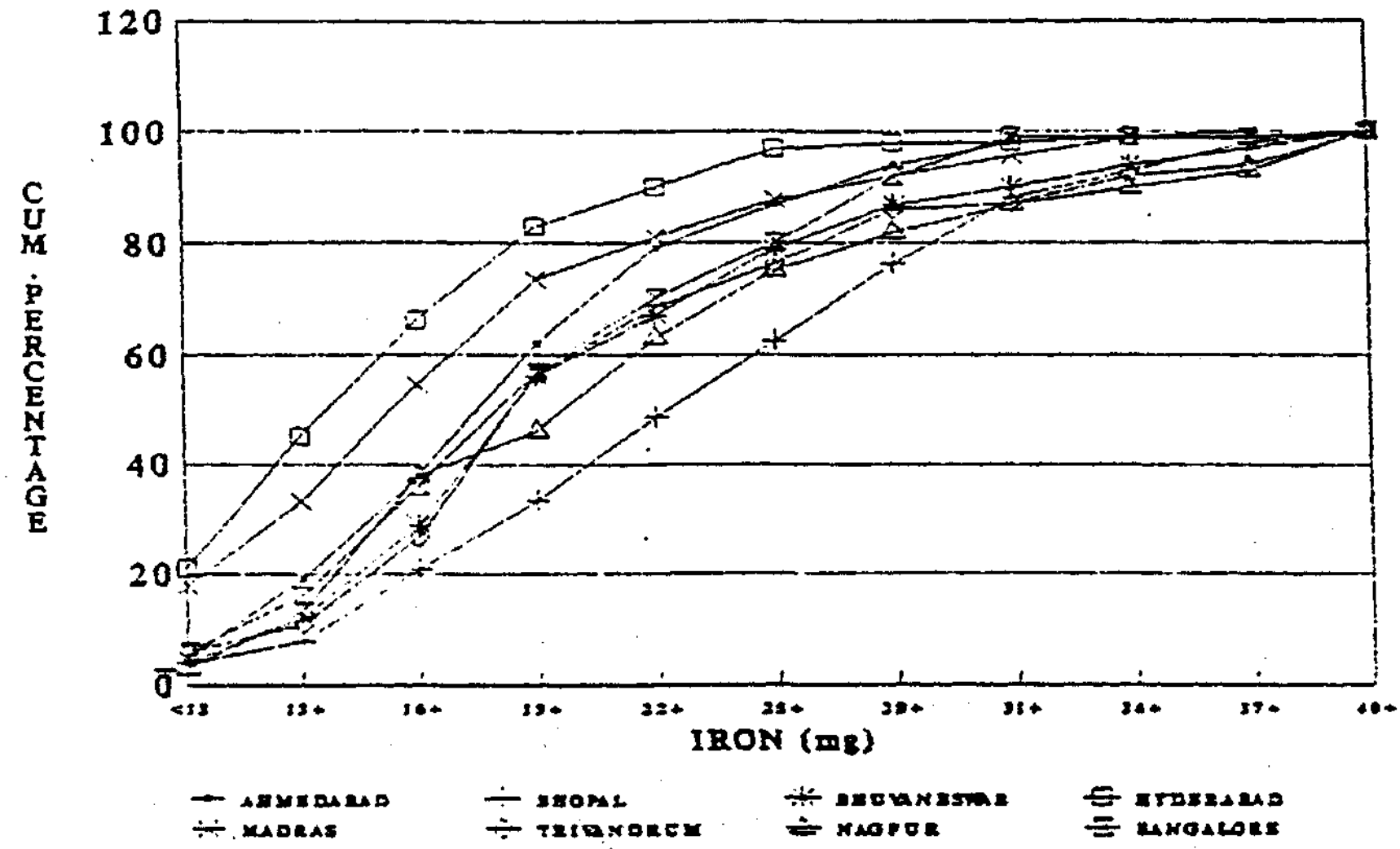
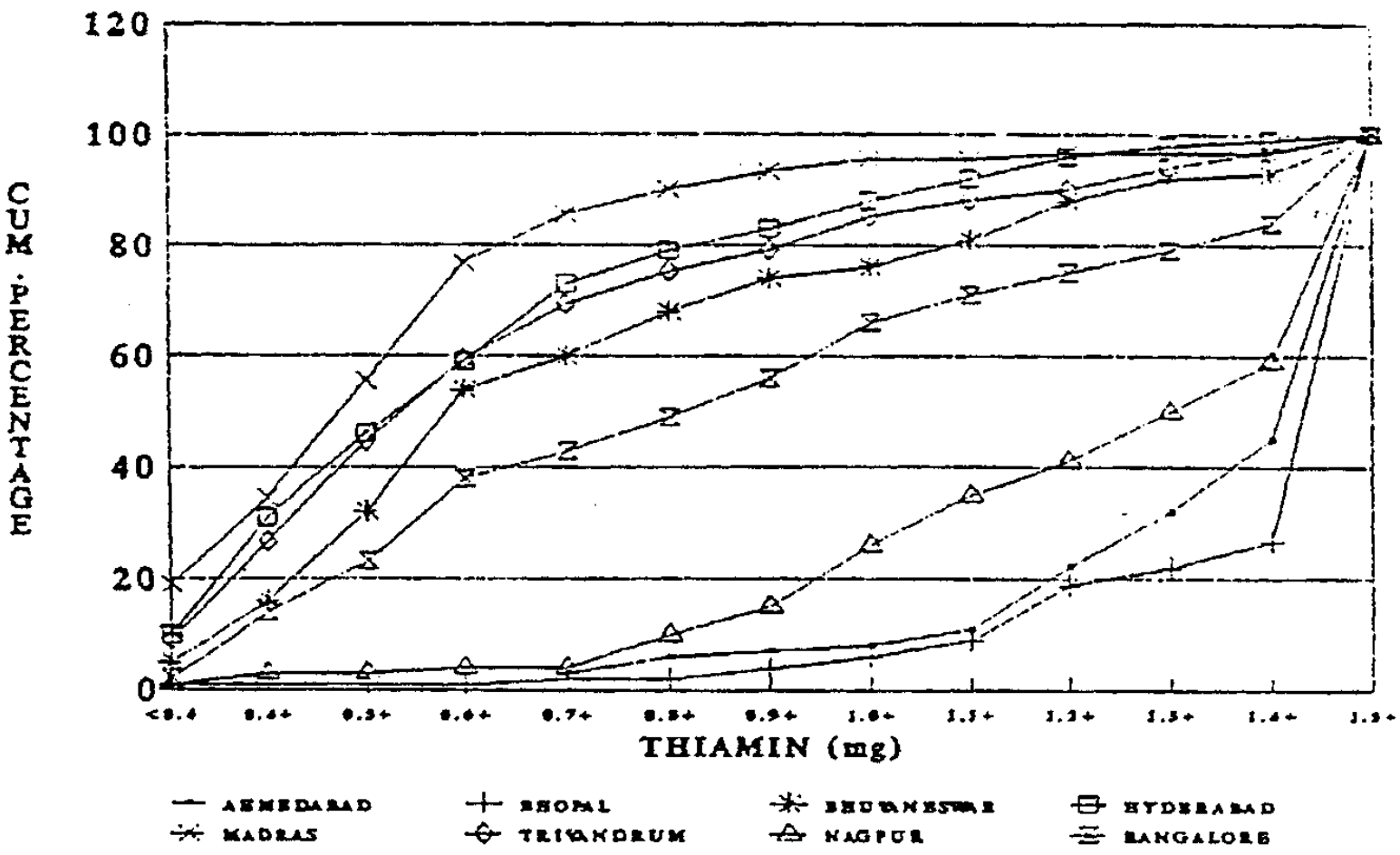

CUM. PERCENT DISTRIBUTION OF HOUSEHOLDS
CUM. PERCENTAGE
120
100
80
60
40
20
0
<13
13+
16+
19+
22+
25+
28+
31+
34+
37+
40+
IRON (mg)
AHMEDABAD
BHOPAL
BHUVANESWAR
HYDERABAD
MADRAS
TRIVANDRUM
NAGPUR
BANGALORE

Fig.11


CUM. PERCENT DISTRIBUTION OF HOUSEHOLDS
CUM. PERCENTAGE
120
100
80
60
40
20
0
<0.4
0.4+
0.5+
0.6+
0.7+
0.8+
0.9+
1.0+
1.1+
1.2+
1.3+
1.4+
1.5+
THIAMIN (mg)
AHMEDABAD
BHOPAL
BHUBANESWAR
HYDERABAD
MADRAS
TRIVANDRUM
NAGPUR
BANGALORE

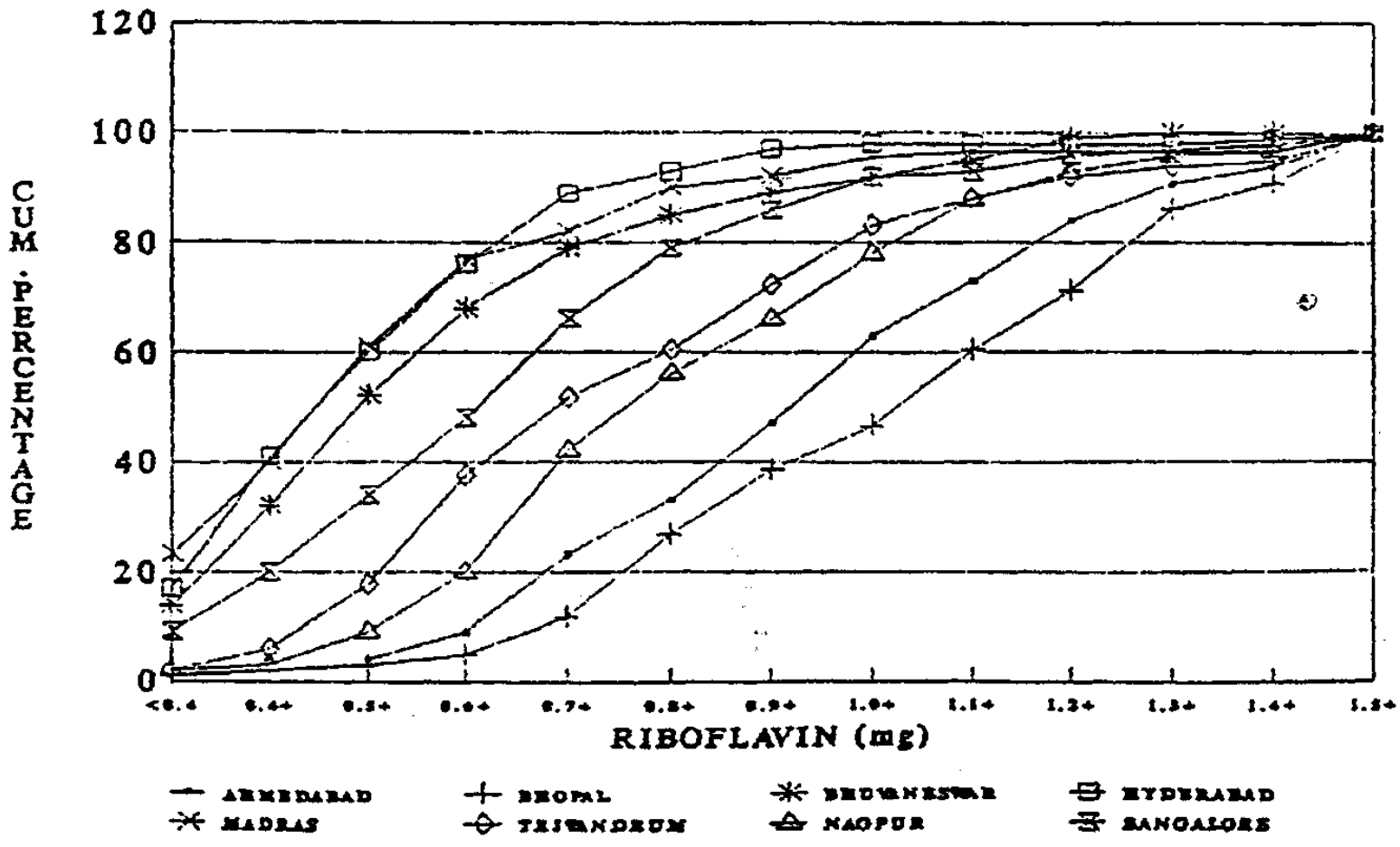

CUM. PERCENT DISTRIBUTION OF HOUSEHOLDS
CUM. PERCENTAGE
120
100
80
60
40
20
0
<0.4
0.4+
0.5+
0.6+
0.7+
0.8+
0.9+
1.0+
1.1+
1.2+
1.3+
1.4+
1.5+
RIBOFLAVIN (mg)
AHMEDABAD
BHOPAL
BHUBANESWAR
HYDERABAD
MADRAS
TRIVANDRUM
NAGPUR
BANGALORE

Fig.12

CUM. PERCENT DISTRIBUTION OF HOUSEHOLDS

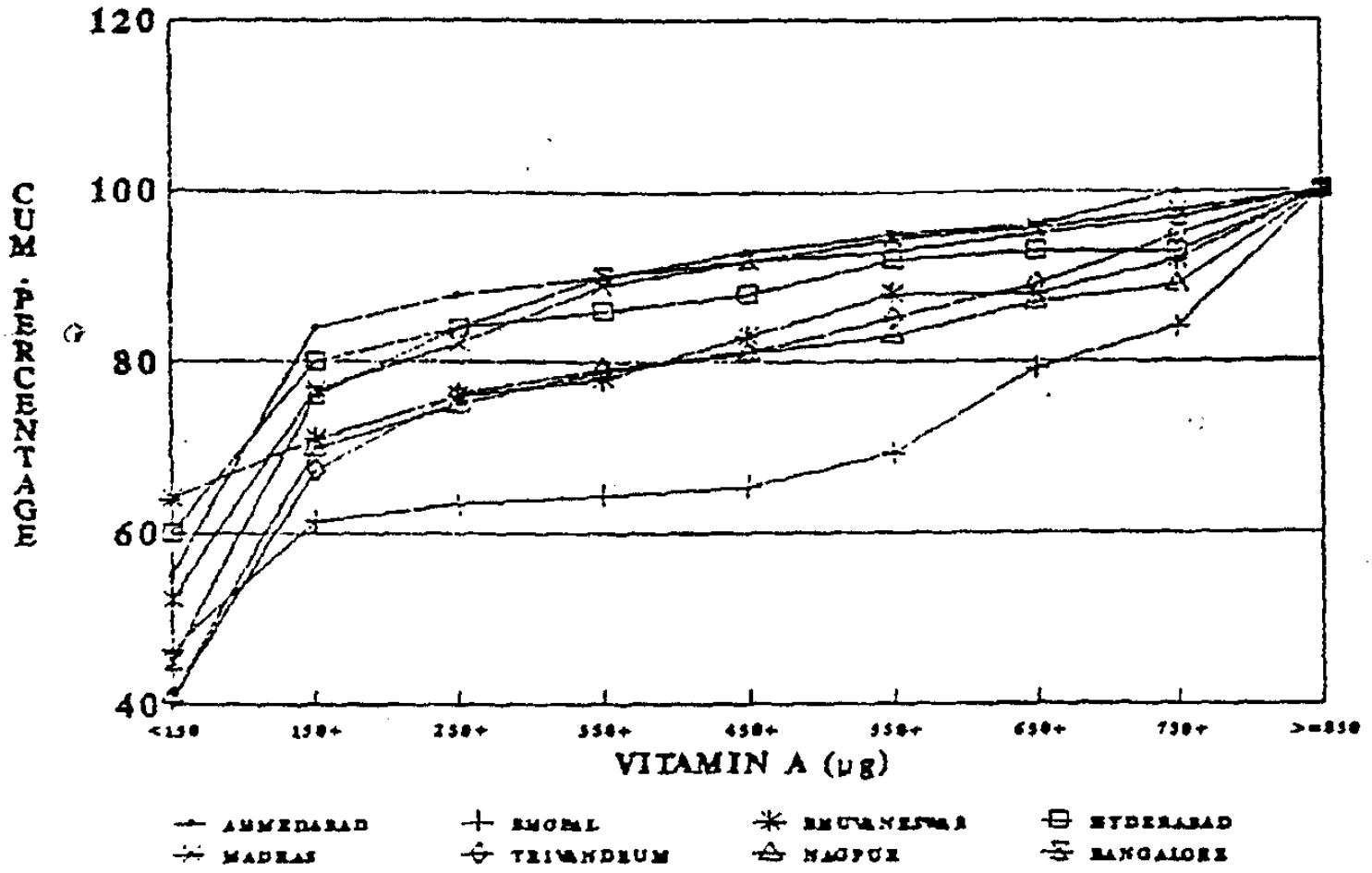
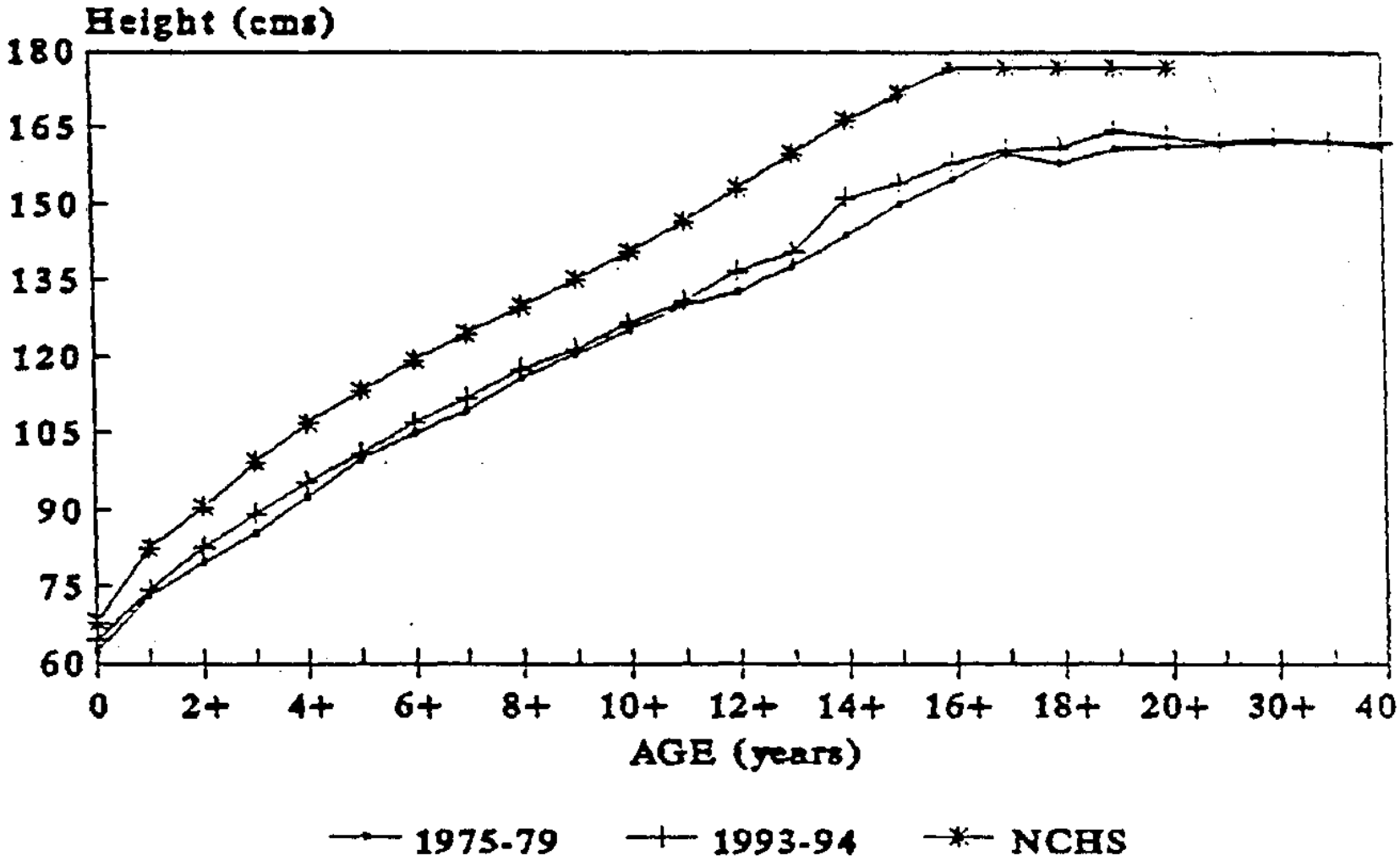


Fig.13

MEAN HEIGHTS BY AGE - MALES



MEAN WEIGHTS BY AGE - MALES

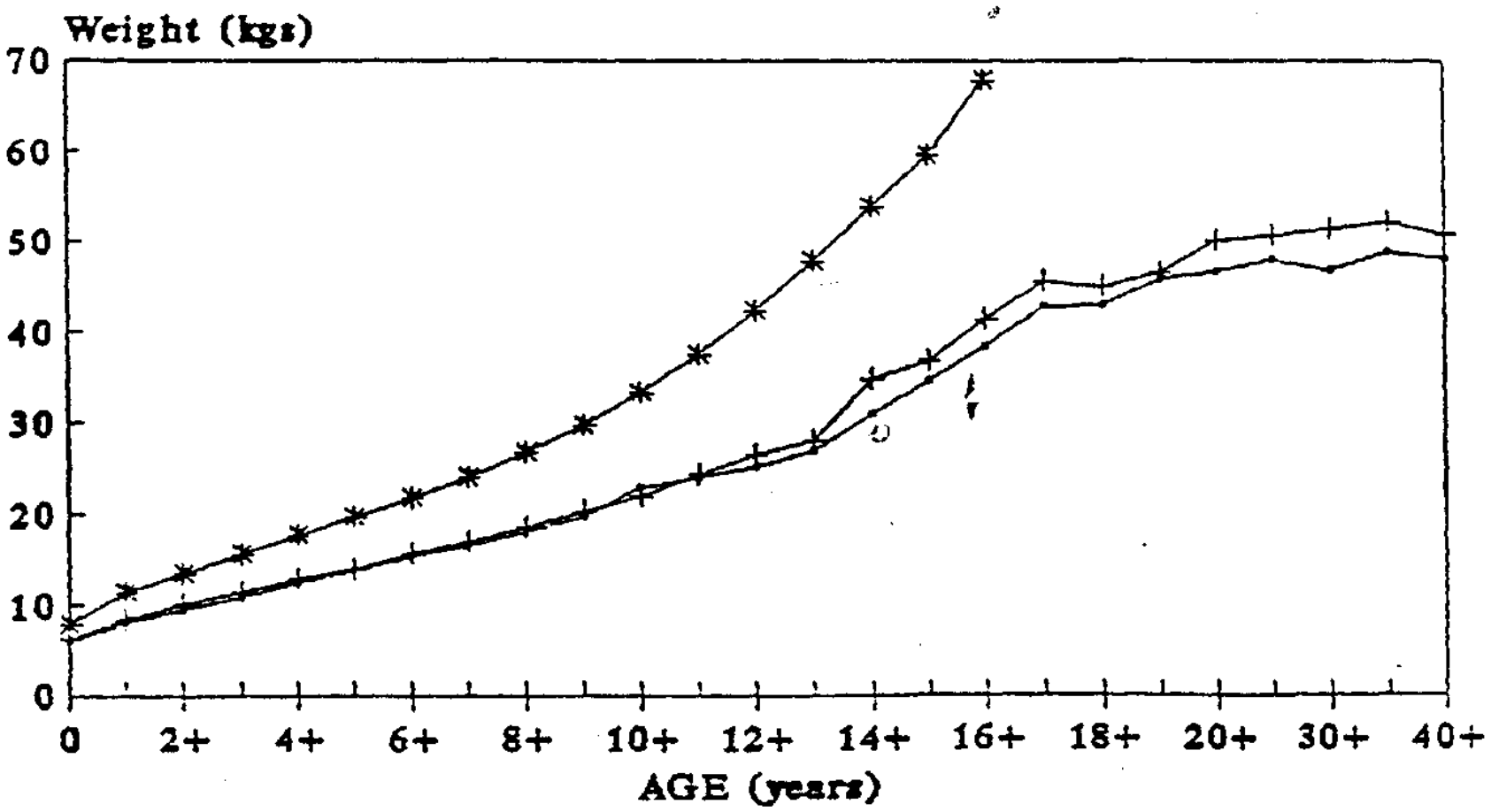
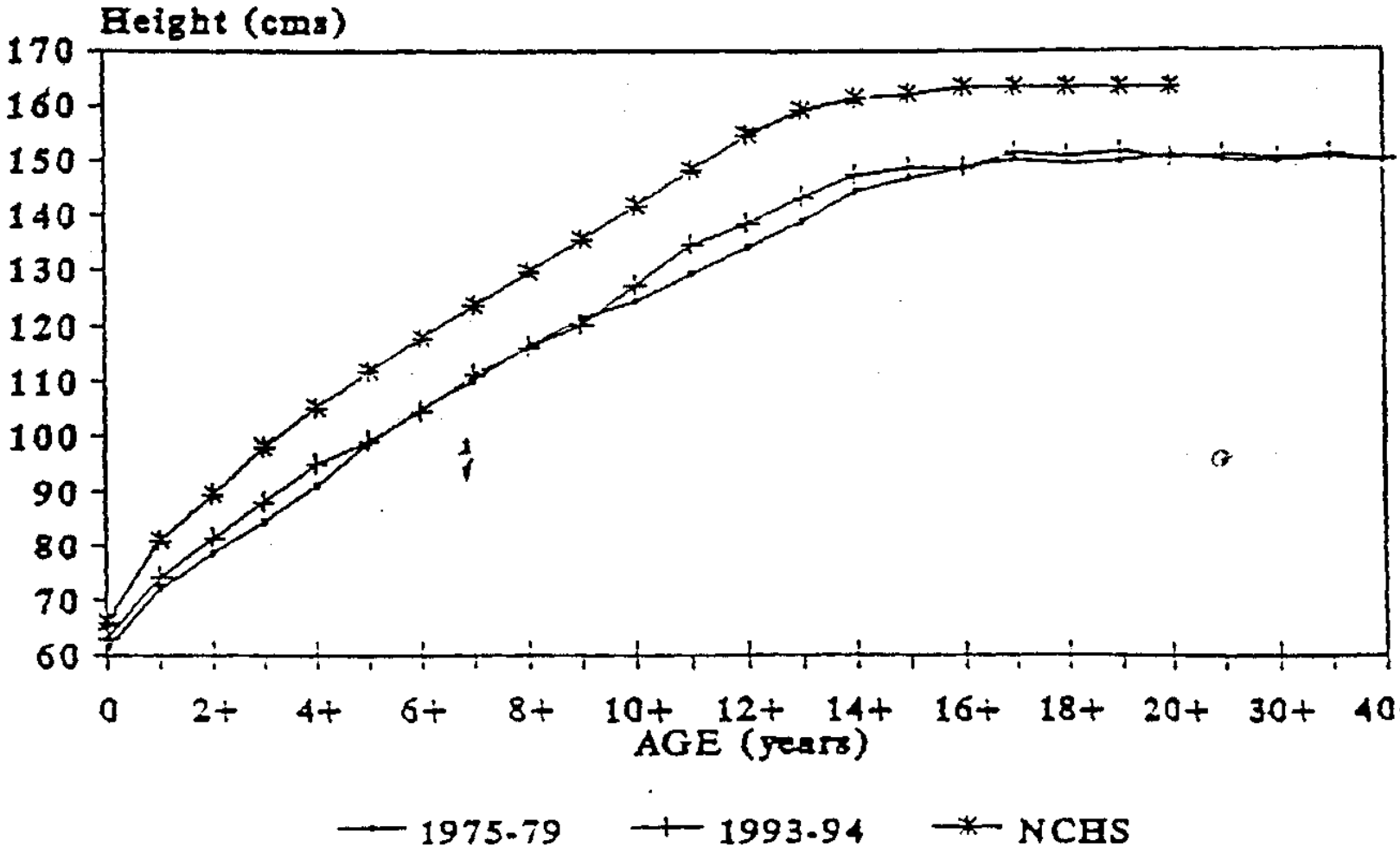


Fig.14

MEAN HEIGHTS BY AGE - FEMALES



MEAN WEIGHTS BY AGE - FEMALES

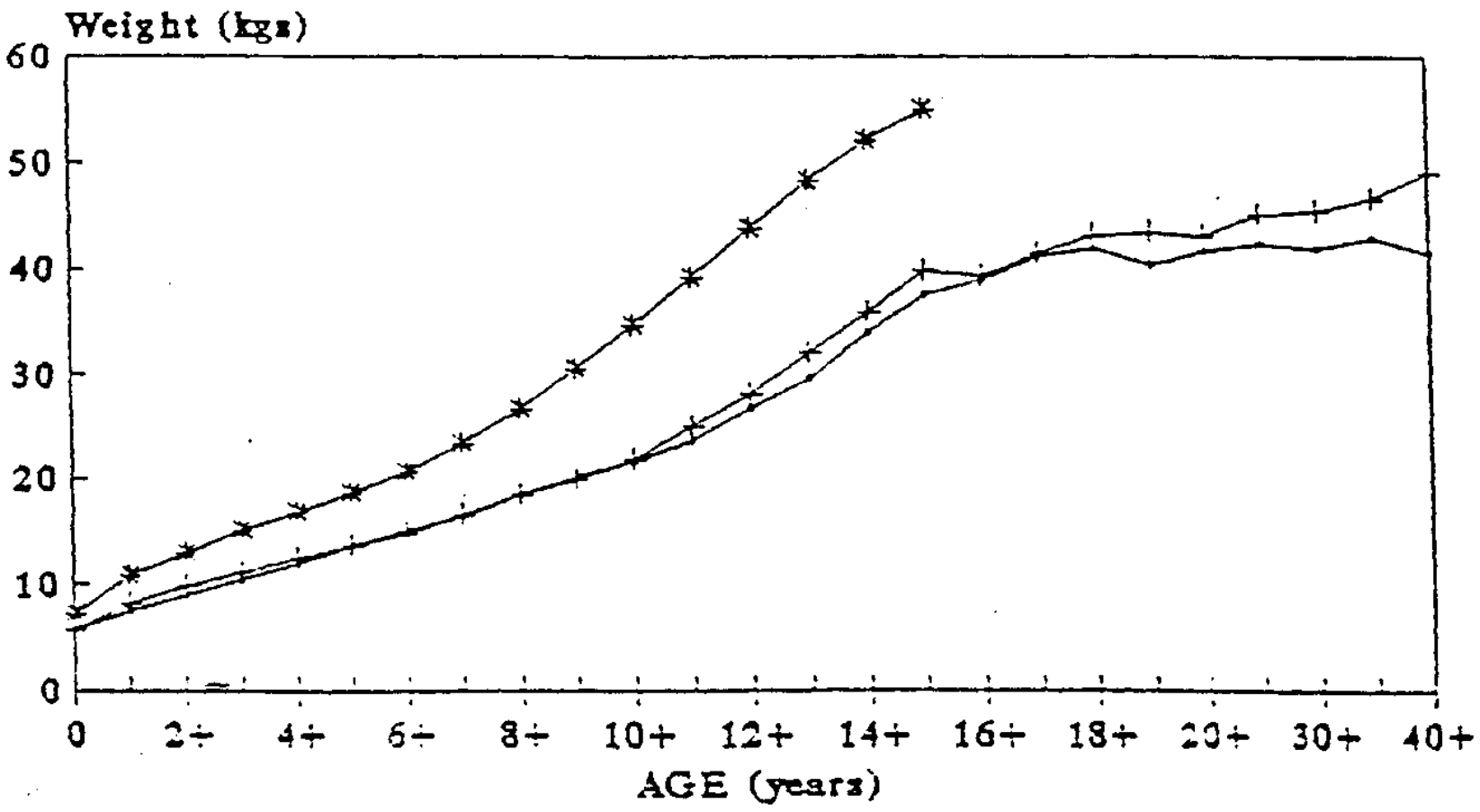


Fig.15

situation in the case of Hyderabad where, oespite its low intakes both quantitatively and qualitatively the weight—for-age distribution was better.

In the case of adults, the prevalence of CED was higher in adult men than that of adult women. In fact, the prevalence of overweight/obesity (BMI>25.0%) was higher among females than males.

The households in Trivandrum had higher mean per capita income (Rs.104/— pm) than the other cities - Ahmedabad (Rs.53/- pm), Madras (Rs.65/- pm) and Hyderabad (Rs.70/- pm). The observations that the slum dwellers in Hyderabad with lower intake of nutrients were better nutritionally (as judged by anthropometry and clinical examination), and that those in Bhubaneshwar/Cuttack, inspite of relatively better energy intakes had poor nutritional status are difficult to explain. Nutritional status is a resultant effect of dietary and non-nutritional factors like socio-demographic and agro-economic factors. The discrepancies between dietary intakes and nutritional status observed in the present survey may be due to several non-nutritional factors, the data about which is not available.

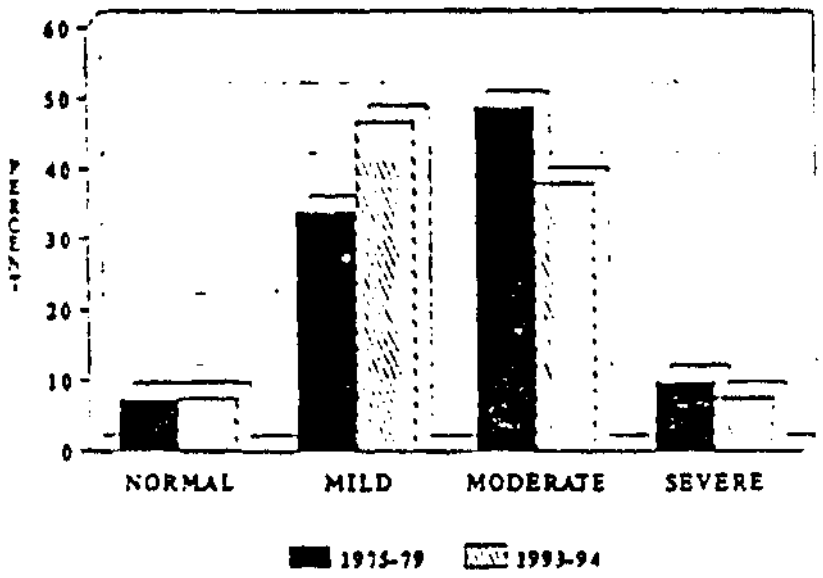
per capita income has limitations, in view of difficulties in assessing accurately the family income. The mean per capita income per month showed considerable variation between the cities ranging between Rs.43/— in

Bhubaneshwar to Rs. 104/- in Kerala. The apparent contradictions cannot be explained on per capita income. Secondly, the limitations of dietary assessment, based on one day survey, should be kept in mind in interpreting the relationship between diet and nutrition.

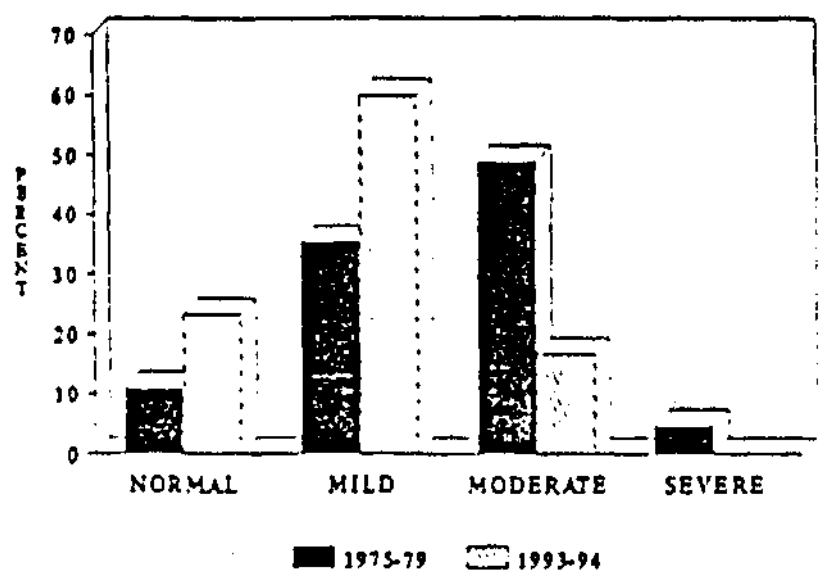
Though, there was no significant change in overall intakes at the household level between the figures reported by NNMB for the seventies (1975-79) and for the year 1993-94, in the present study, there was an increasing trend in the proportion of normal children with simultaneous decline in the extent of severe grade malnutrition as judged by weight for age (Figs.16-20). This might be due, perhaps, to the impact of the various target oriented nutrition and poverty alleviation interventions, and other development programmes which have been in operation since the past several years all over the country.

COMPARISON OF GOMEZ DISTRIBUTION - BOYS

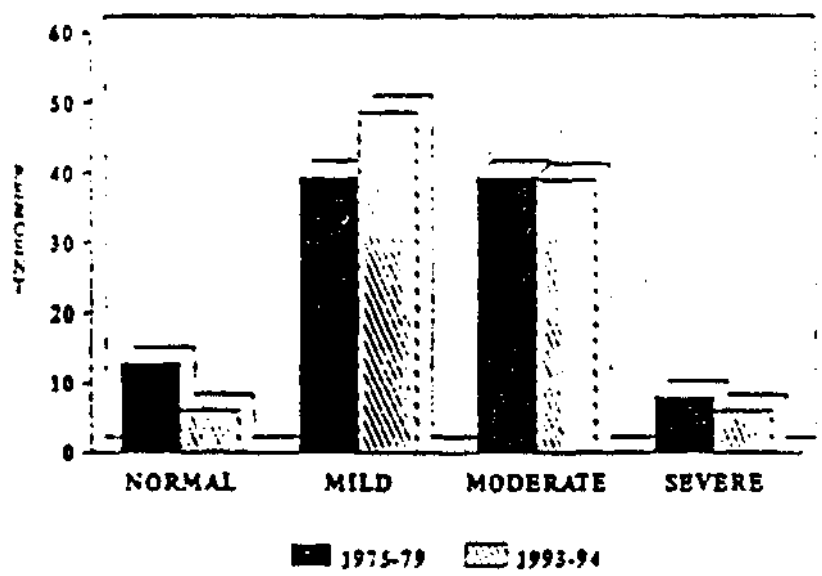
(Based on well-to-do Hyderabad standards)



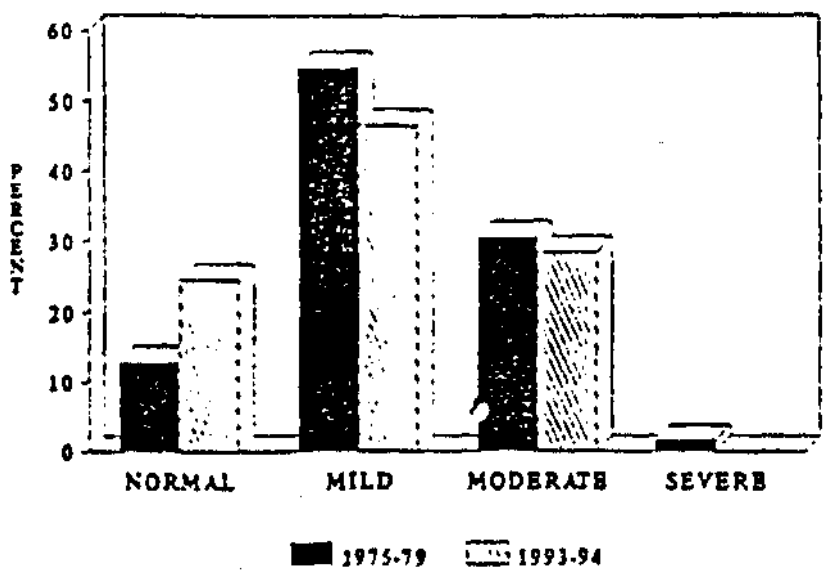
AHMEDABAD



HYDERABAD



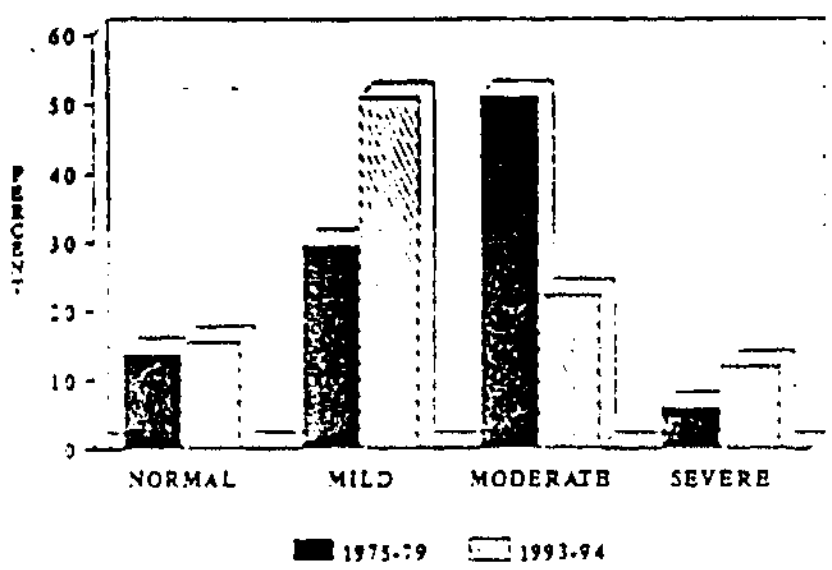
MADRAS



TRIVANDRUM

Fig.16

COMPARISON OF GOMEZ DISTRIBUTION - GIRLS



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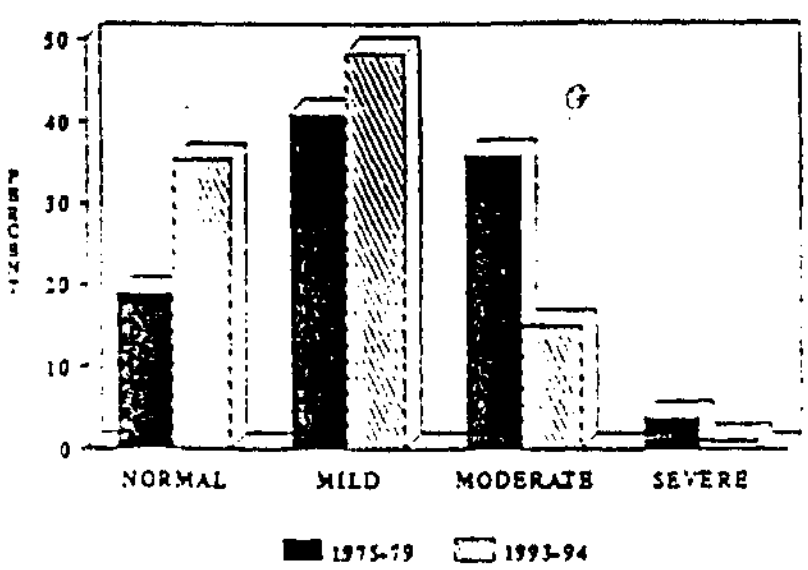
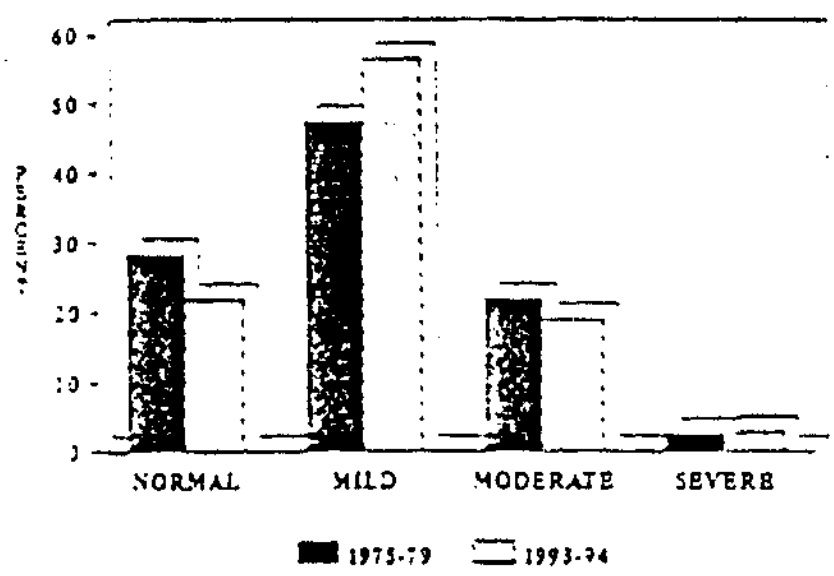
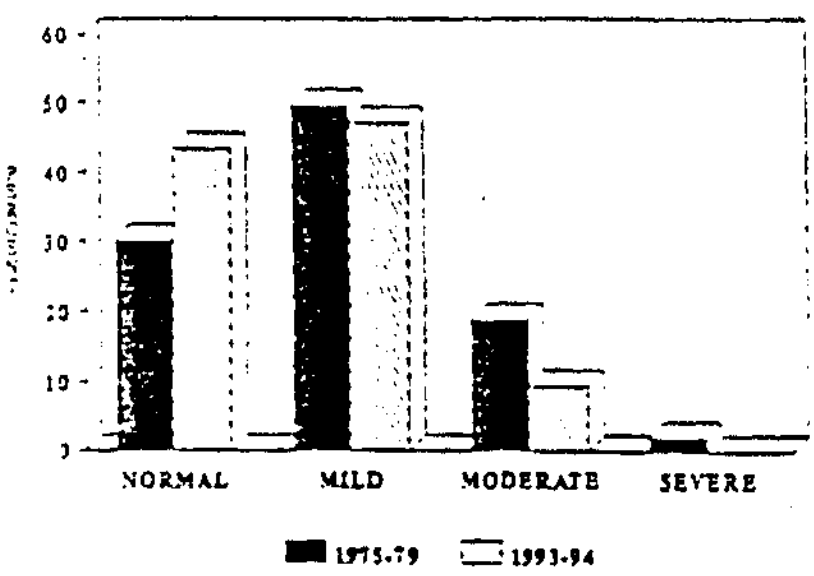


HYDERABAD



MADRAS



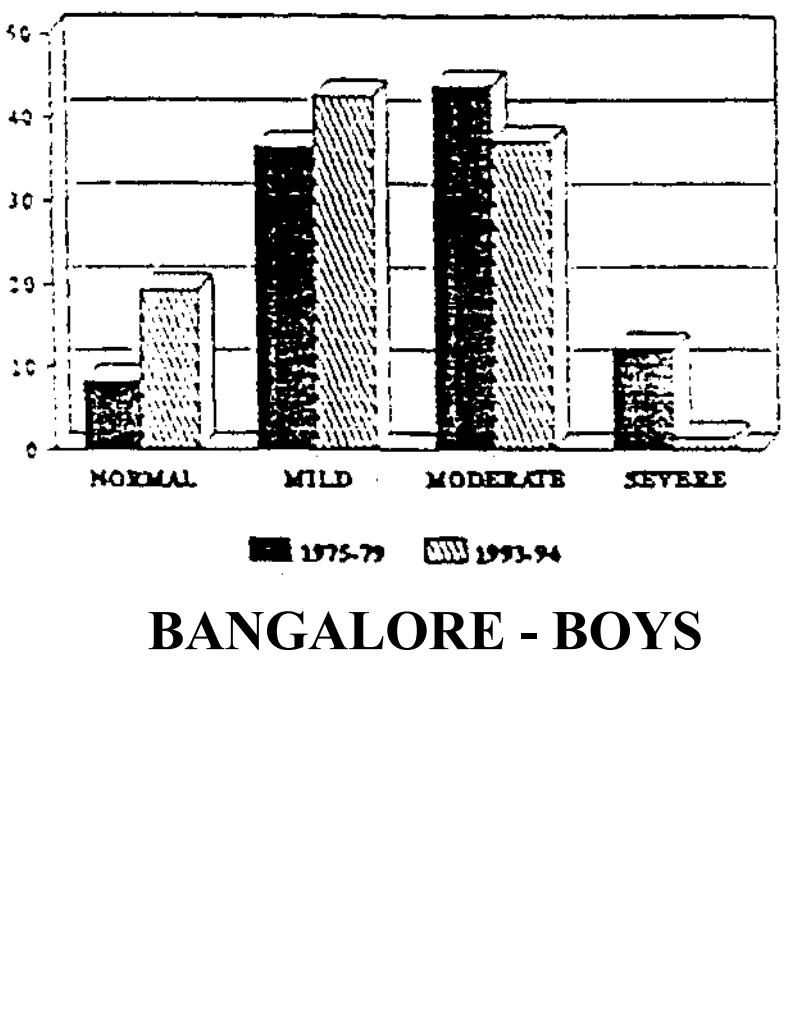
TRIVANDRUM

(Based on well-to-do Hyderabad standards)

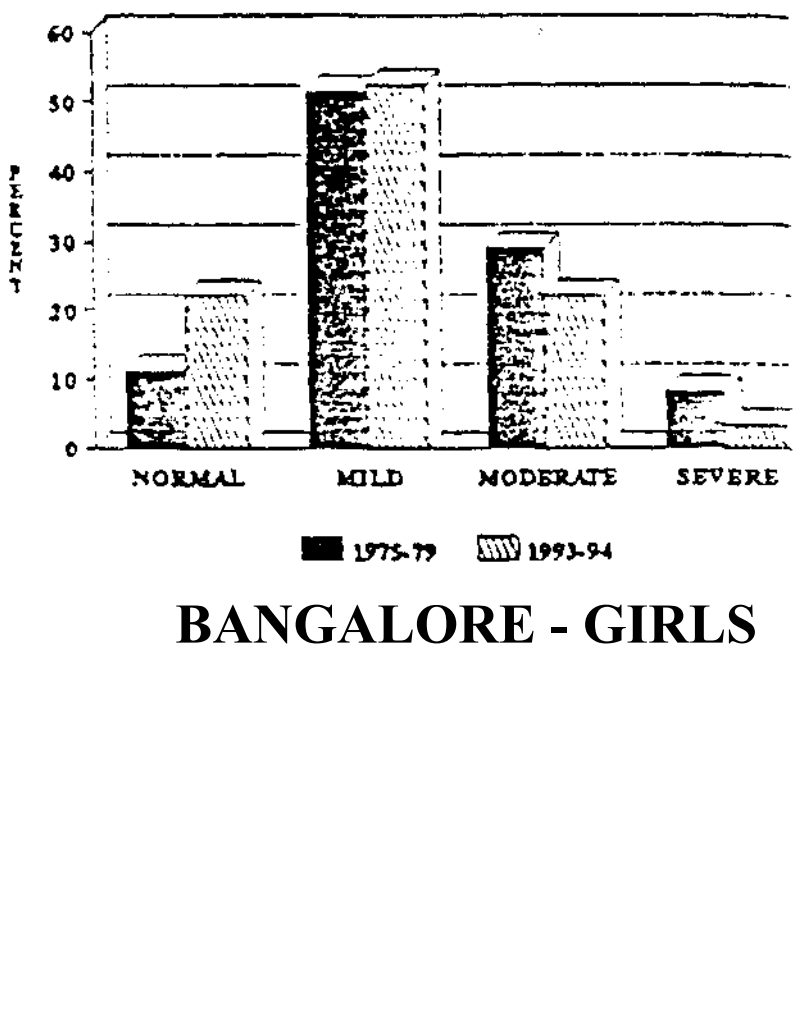
Fig.17

COMPARISON OF GOMEZ DISTRIBUTIONS

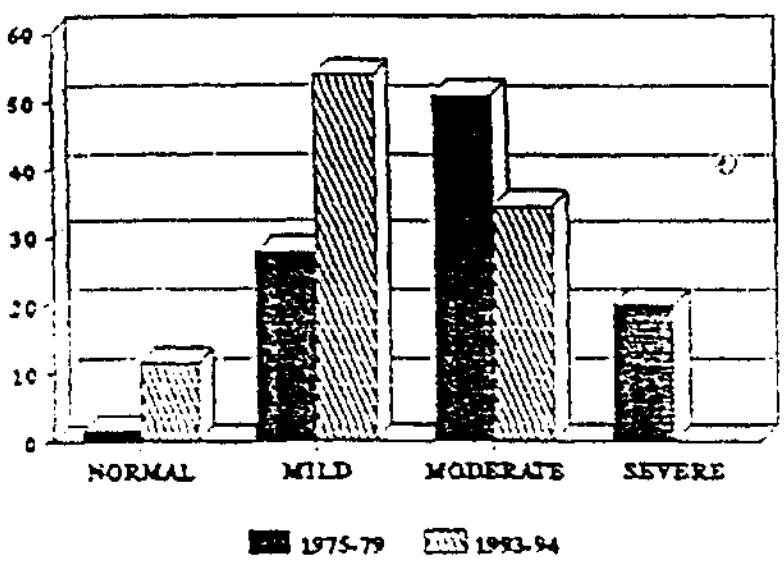
(Based on Well-to-do Hyderabad standards)



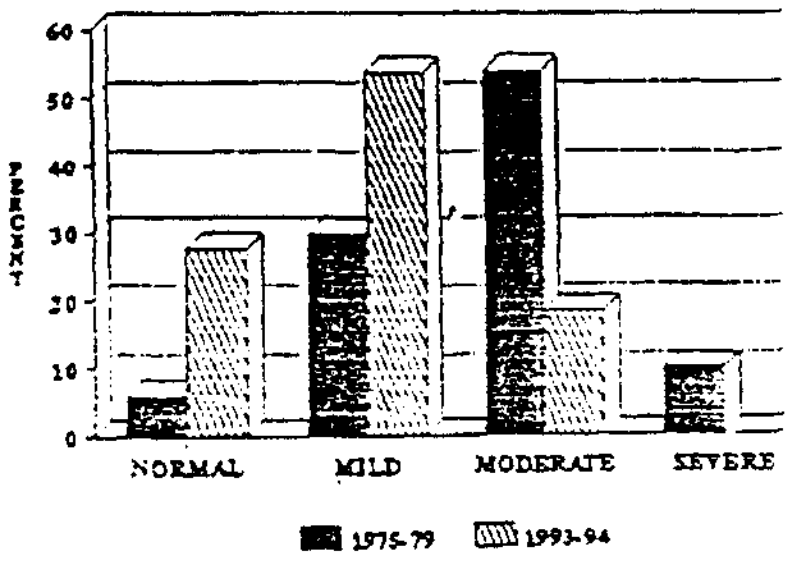
BANGALORE - BOYS



BANGALORE - GIRLS



NAGPUR - BOYS



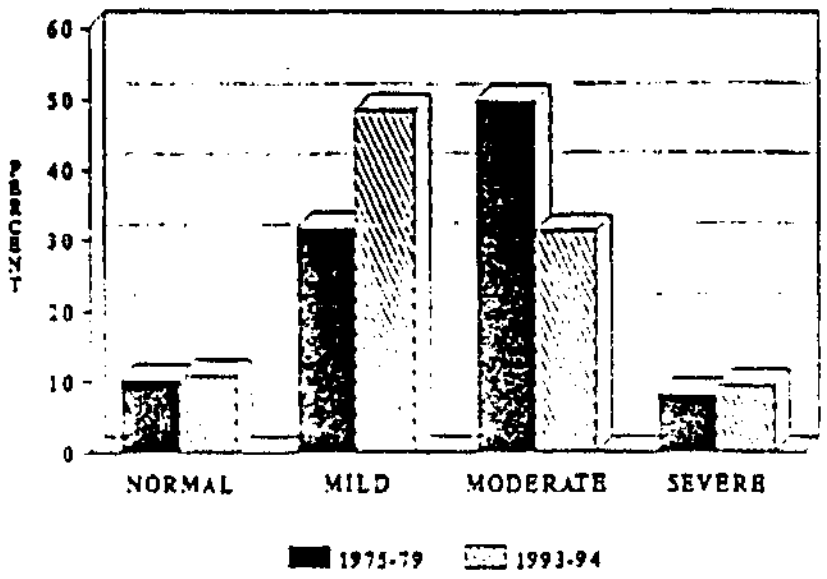
NAGPUR - GIRLS

Fig.18

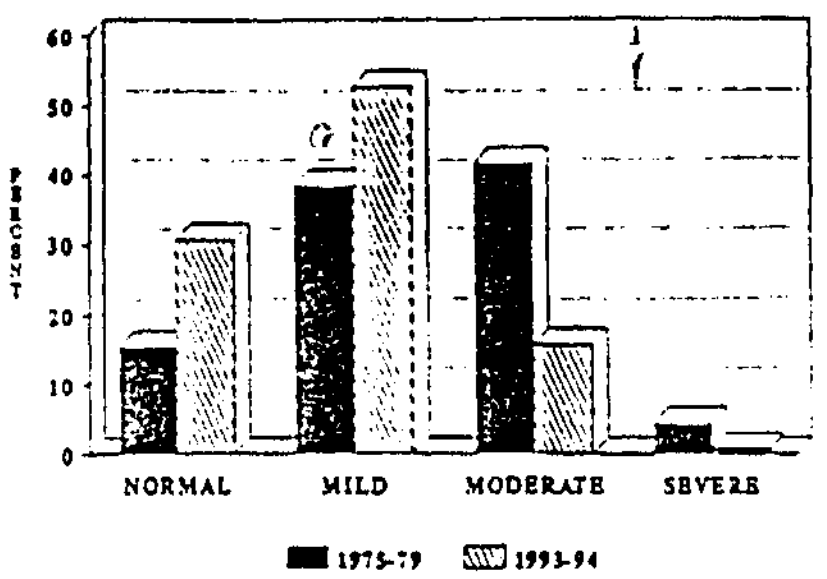
COMPARISON OF GOMEZ DISTRIBUTION

PRESCHOOL CHILDREN (1-5 years)

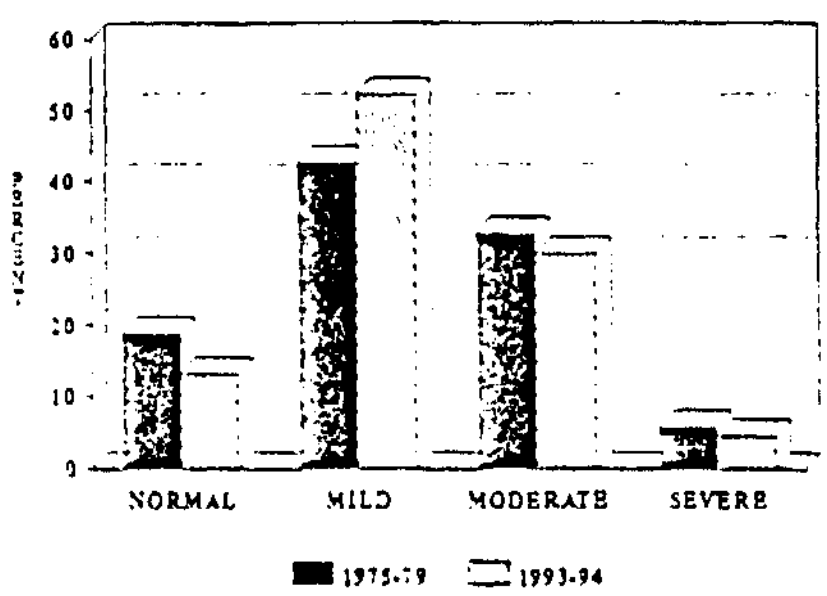
Based on well-to-do Hyderabad standards)



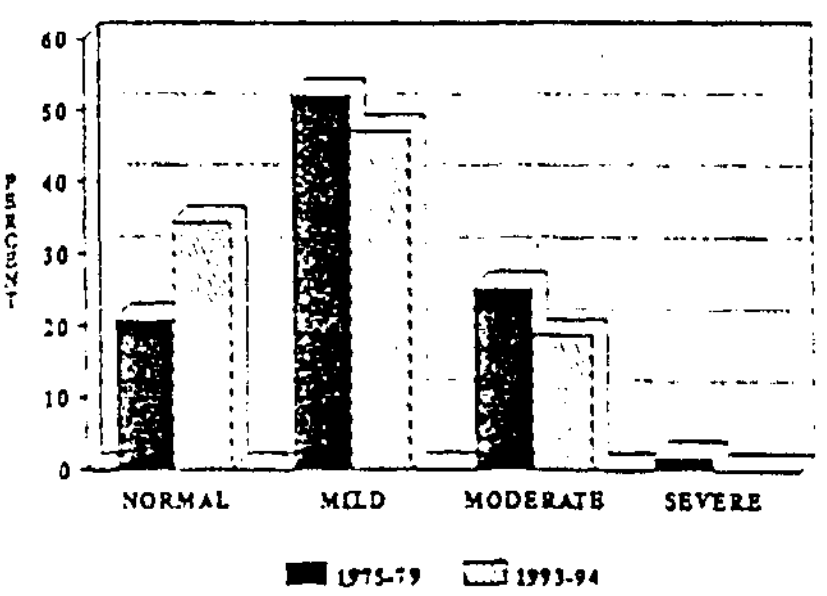
AHMEDABAD



HYDERABAD



MADRAS



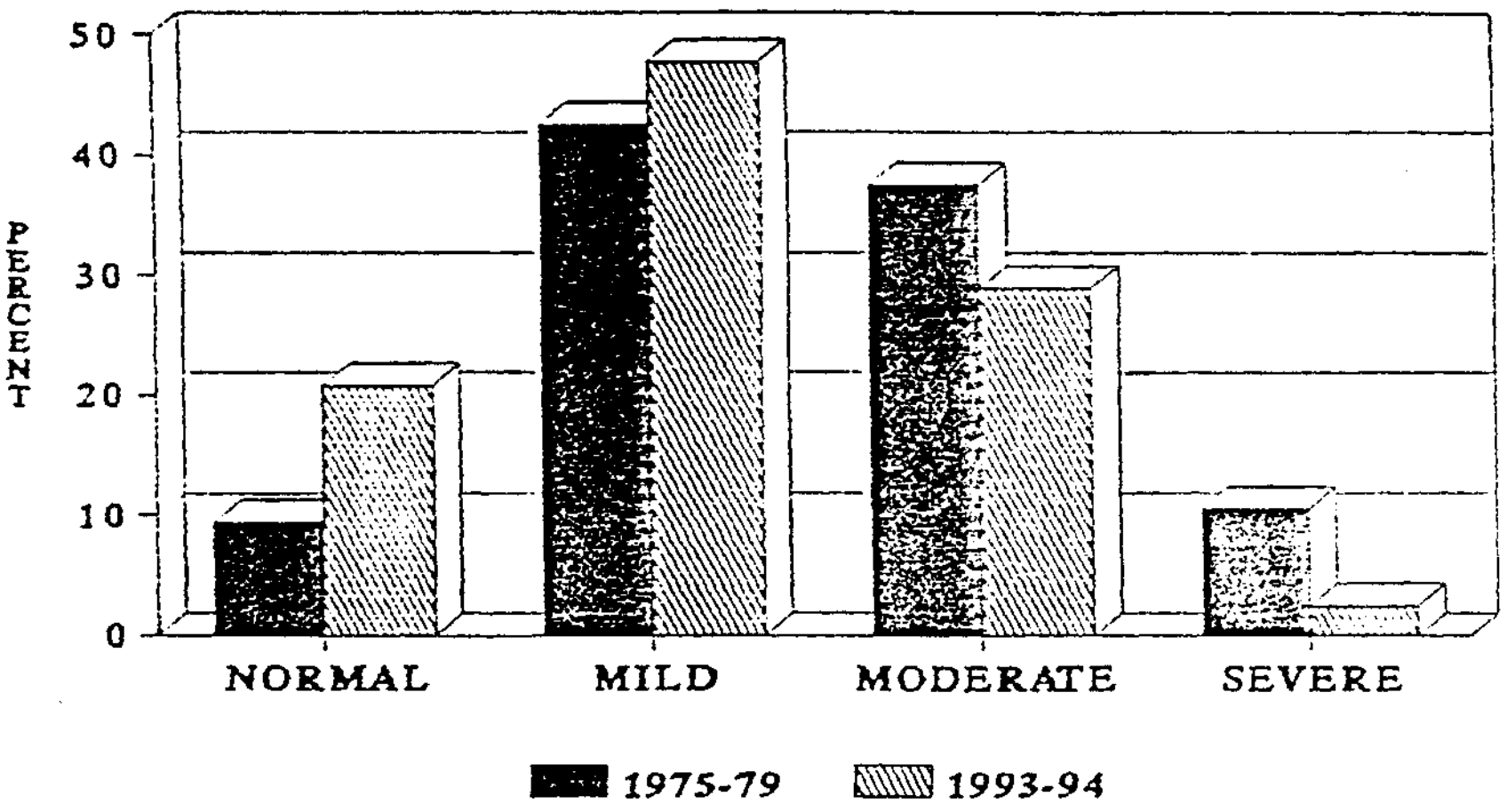
TRIVANDRUM

Fig.19

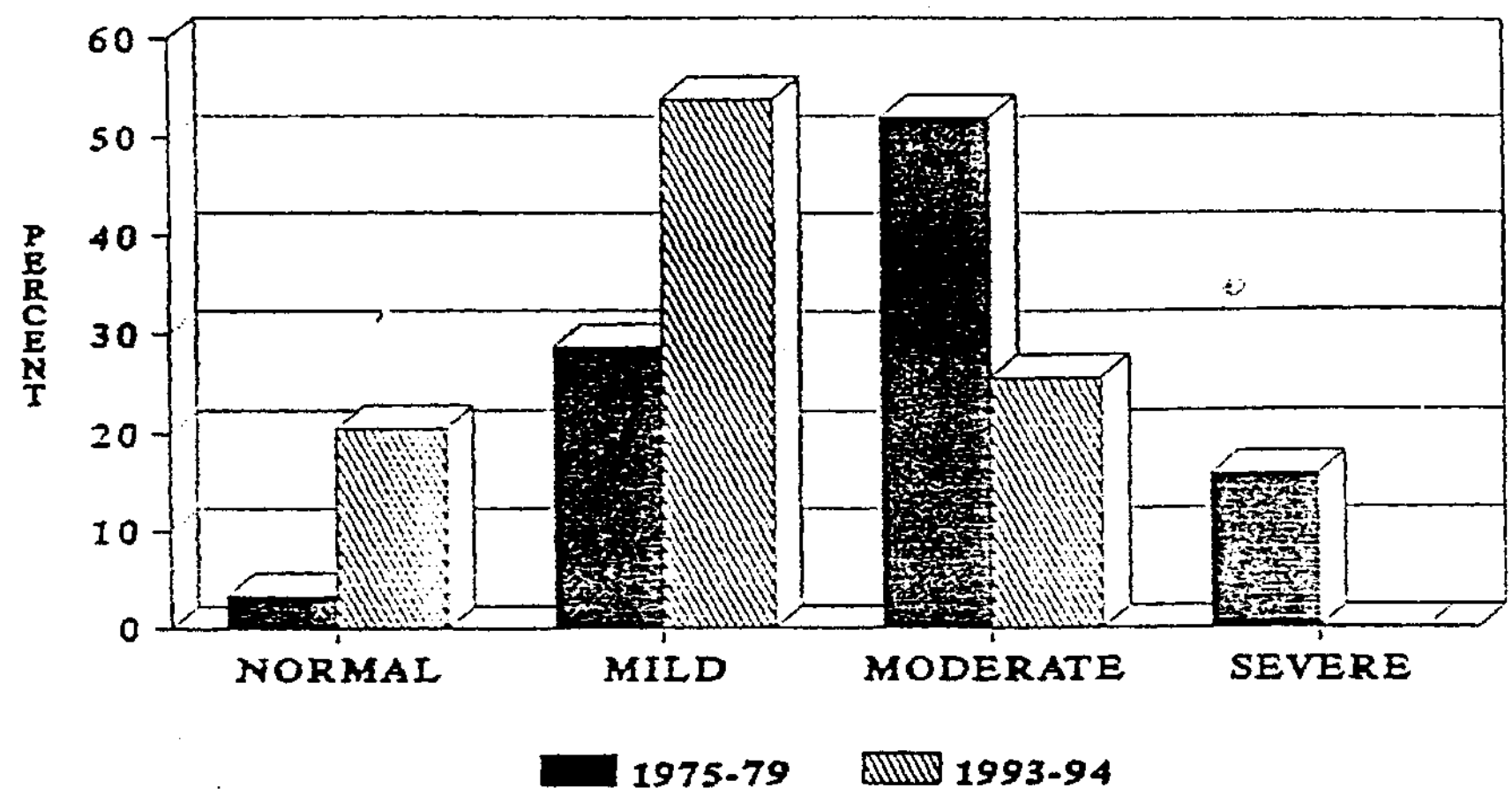
COMPARISON OF GOMEZ DISTRIBUTION

PRESCHOOL CHILDREN (1-5 years)

(Based on Well-to-do Hyderabad standards)



BANGALORE



NAGPUR

Fig.20

SUMMARY

A diet and nutrition survey was carried cut among the population living in the slums of eight cities in the States of Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu, during the year 1993-94, where NNMB has been in operation.

In each city, 200 households were covered for diet Survey (weightment : 100, and oral questionnaire : 100), while about 800 individuals were covered for the nutrition assessment.

The consumption of different foods particularly the protective foods like pulses, GLV and milk and milk products were lower than the RDI. In all the cities the fat intakes were also very low. Consequently, the intake of various nutrients was also below the RDI. The slum population of Hyderabad, in general, had poor diets both quantiatively and qualitatively, while the diets-were relatively superior in Ahmedabad, Bangalore, Bhubaneshwar/Cuttack and Trivandrum.

The lower levels of intake may be due to poor purchasing power as a result of low income levels of households as incicated by the fact that more than 60%. of the households had a mean percapita income of less than Rs.2/- per day, at 1975 prices.

The prevalence, of severe malnutrition. in presonool children as judged by weight for age was highest in the slums of Ahmedabad, while it was lowest in Trivandrum.

Comparison of these findings with those obtained in 1975 seemed to indicate that there was slight improvement in the nutritional status now.

Chronic energy deficiency as assessed by BMI, was noticed in adults. The females had lower prevalence of CED and higher prevalence of over weight.

Among the cities, the slums dwellers in Hyderabad exhibited better nutritional status, though food and nutrient intakes were lower, while those in Bubaneshwar/Cuttack showed poor nutritional status inspite of better consumption level. It may be due to the role of non-nutritional factors, information about which was not collected in this survey.

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D: nnmb: urban 1. rep

A N N E X U R E - I

Table - 1

Coverage of households - Urban Slums

State	No. of Households covered				Nutrition Assess-ment	Overal1 coverage (%)
	Weighment		Oral			
	Target	Cavered	Target	Covered		
Ahmedabad	100	100	100	100	865	100
Bangalore	100	100	100	100	723	
Bhopal	100	101	100	100	No Coverage	
Bhubaneshwar/ Cuttack	100	100	100	100	737	100
Hyderabad	100	100	100	100	850	100
Madras	100	90	100	100	840	100
Nagpur	100	101	100	100	695	100
Trivandrum	100	101	100	99	737	100
Calcutta)	Analysis is in progress					
Lucknow)	Na coverage					

Table - 2

Average intake of Food stuffs (g/CU/day) - Urban Slums

Food Stuffs	City/Town								
	Ahmedabad	Bangalore	Bhopal	Bhubaneshwar/ Cuttack	Hyderabad	Madras	Nagpur	Trivandrum	Balanced diet
No. of HHs	100	100	101	100	100	90	101	101	-
Cereals & Millets	340	410	375	438	368	385	365	364	460
Pulses	29	33	31	31	22	26	34	10	40
Leafy vegetables	6	8	30	22	11	8	27	16	40
Other vegetables	47	45	36	66	32	39	85	26	60
Roots & Tubers	56	32	36	102	25	42	48	69	50
Nuts & Oil seeds	0	10	0	*	*	5	*	90	-
Condiments & spices	9	18	8	2	10	17	10	21	-
Fruits	7	32	13	9	68	36	30	14	-
Fish	2	2	0	24	*	14	1	112	-
Other flesh foods	8	4	7	4	11	13	6	1	-
Milk	129	81	103	23	53	74	41	98	150
Fats and Oils	31	12	18	12	13	15	23	9	40
Sugar and Jaggery	36	23	20	11	13	18	31	27	30

* Consumption less than one gram

Table - 4

Protein-Calorie adequacy and inadequacy status - Urban Slums

State	N	P C - -	P C - +	P C + +	P C + -	P -	P +	C -	C +
Ahmedabad	100	9.0	0	27.0	64.0	9.0	91.0	73.0	27.0
Bangalore	100	25.0	0	39.0	36.0	25.0	75.0	61.0	39.0
Bhopal	101	5.0	0	27.7	67.3	5.0	95.0	72.3	27.7
Bhubaneshwar / Cuttack	100	19.0	0	35.0	46.0	19.0	81.0	65.0	35.0
Hyderabad	100	44.0	1.0	15.0	40.0	45.0	55.0	84.0	16.0
Madras	90	36.7	0	32.2	31.1	36.7	63.3	67.8	32.2
Magpur	101	14.9	0	30.7	54.4	14.9	85.1	69.3	30.7
Trivandrum	101	5.9	0	56.5	37.6	5.9	94.1	43.6	56.4

P = Protein +Adequate

C = Calories - Inadequate

Table - 3

Average Nutrient Intake (CU/day) - Urban Slums

Nutrients	City/Town								
	Afuaedabad	Bangalore	Bhopal	Bhubaneshwar/ Cuttack	Hyderabad	Madras	Nagpur	Trivandrua	RDI
No. of HHs	100	100	101	100	100	90	101	101	–
Protein (g)	53.5	45.6	57.6	50.7	39.8	45.4	51.3	62.7	60
Calories (Kcal)	1914	1913	1822	1993	1685	1843	1900	2249	2350
Calciun (mg)	448	551	471	368	279	413	392	865	450
Iron (mg)	21.1	22.0	25.5	23.0	17.6	19.3	24.5	23.9	24.0
Vitamin A (ug)	200	228	391	276	242	219	367	306	600
Thiamine (ag)	1.6	0.9	1.8	0.8	0.6	0.6	1.4	0.7	1.2
Riboflavin (mg)	1.0	0.7	1.1	0.6	0.5	0.6	0.9	0.8	1.4
Niacin (mg)	16.1	10.5	18.7	13.1	10.1	9.7	15.3	13.9	16.0
Vitamin C (mg)	32	35	41	54	31	36	59	39	40

Table - 5

Percent distribution of children (1–5 years) according to Gomez classification – urban slums

City/Town	No. surveyed	Normal	Mild	Moderate	Severe
		Boys			
Ahmedabad	79	7.6	46.8	38.0	7.6
Bangalore	73	19.2	42.4	37.0	1.4
Bhubaneshwar/	120	24.2	47.5	25.0	3.3
Cuttack	60		60.0	16.7	0
Hyderabad	82	23.3	48.8	39.0	6.1
Madras	52	6.1	53.9	34.6	0
Nagpur	49	11.5	46.9	28.6	0
Trivandrum		24.5			
		Girls			
Ahmedabad	59	15.3		22.0	
Bangalore	86	22.1	50.8	22.1	11.9
Bhubaneshwar/	121	38.0	52.3	16.5	
Cuttack	93	35.0	44.7	15.1	3.5
Hyderabad	69	21.7		18.8	
Madras	65	27.7	48.3	18.5	0.8
Nagpur	53	43.4	56.6	9.4	
Trivandrum			53.9		1.1
			47.2		2.9
		Pooled			
Ahmedabad	138	10.9	48.5	31.2	9.4
Bangalore	159	20.8	47.8	28.9	2.5
Bhubaneshwar/	241	31.1	46.1	20.7	2.1
Cuttack	153	30.7	52.9	15.7	0.7
Hyderabad	151	13.2	52.4	29.8	4.6
Madras	117	20.5	53.9	25.6	0
Nagpur	102	34.3	47. 1	18.6	0
Trivandrum					

Hyderabad well-to-do values were used as standards

Table - 6

Percent distribution of preschool children according to Gomez classification* - Urban Slums

City/Town	No. surveyed	Normal	Mild	Moderate	Severe
		Boys			
Anmedabad	79	2.5	29.1	54.5	13.9
Bangalore	75	5.5	32.9	57.5	4.1
Bnubanesnwar/ Cuttak	120	10.3	45.0	38.4	5.8
Hyderabad	60	12.6	45.7	39.2	2.5
Madras	82	3.7	25.5	61.0	9.8
Nagpur	52	3.3	12.2	34.6	7.7
Trivandrum	49		47.0	53.9	4.1
			27.1	36.7	23.7
		Girls	41.9	40.7	8.1
Ahmedabad	59	8.5	45.5	50.0	6.6
Bangalore	86	0	45.0	33.9	2.0
Bhubaneshwar/ Cuttack	121	14.0	37.7	35.2	4.3
Hyderabad	93	17.8	41.5	52.2	1.5
Madras	69	5.3	43.4	50.8	3.S
Nagpur	65	6.2		26.4	
Trivandrum	53	26.4			
		Pooled			
Ahmedabad	133	5.1	28.3	48.5	18.1
Bangalore		2.5	37.7	53.5	6.3
Bhubaneshwar/ Cuttack	159	12.4	45.2	36.2	*6.2*
Hyderabad		15.2	45.4	37.2	2.2
Madras	241	4.6	31.1	57.0	7.3
Nagpur		5.1	39.5	52.1	4.3
Trivandrum	153	19.6	45.1	31.4	3.9
	151				

* NCHS values were used as standards

Table-7

Distribution of Adults according to Body Mass index (BMI) - Urban Slums

BMI	City/Town								
	Ahmedabad	Bangalore	Bhopal	Bhubaneshwar/ Cuttack	Hyderabad	Madras	Nagpur	Trivandrum	Pooled
Males									
n	113	75	87	83	113	115	144	130	662
<16.0	12.2	8.0	16.1	10.8	4.4	13.9	9.7	4.6	9.7
16.0 - 17.0	19.1	9.0	16.1	15.7	9.7	15.0	11.8	6.2	12.3
17.0 - 18.5	17.4	24.0	26.4	31.3	24.8	20.0	31.9	16.9	23.9
18.5 - 20.0	19.1	20.0	13.8	18.1	18.3	25.2	26.4	25.2	21.4
20.0 - 25.0	27.4	34.7	20.7	24.1	37.2	25.2	18.1	36.2	27.7
25.0 - 30.0	5.3	5.3	6.9	0	3.8	2.6	2.1	4.2	4.6
> 30.0	0	0	0.0	0	1.8	0	0	0.8	0.4
Females									
n	251	220	163	219	269	240	208	340	1910
<16.0	10.0	5.9	14.7	10.5	9.3	15.0	14.9	4.7	10.1
16.0 - 17.0	7.2	7.7	8.6	18.3	9.7	10.8	12.5	3.5	9.3
17.0 - 18.5	18.3	17.7	17.8	27.8	17.1	15.0	24.5	14.1	18.7
18.5 - 20.0	22.7	22.3	17.8	21.9	10.8	29.0	17.3	13.8	18.0
20.0 - 25.0	33.5	37.7	31.3	17.4	36.1	31.7	25.0	46.5	32.4
25.0 - 30.0	7.2	8.6	8.0	4.1	14.1	5.4	4.3	14.1	8.8
> 30.0	1.2	0	1.8	0	3.0	2.1	1.4	3.2	1.5
Pooled									
n	364	295	250	302	382	355	352	470	2572
<16.0	10.7	6.4	15.2	10.6	7.8	14.6	12.8	4.7	10.0
16.0 - 17.0	10.9	7.8	11.2	17.5	9.7	11.6	12.2	4.3	10.3
17.0 - 18.5	18.0	19.3	20.8	28.8	19.4	16.6	27.6	14.9	20.3
18.5 - 20.0	21.6	21.7	16.4	20.9	11.5	21.7	21.0	18.1	19.0
20.0 - 25.0	31.4	37.0	27.6	19.2	36.4	29.6	22.2	43.6	31.6
25.0 - 30.0	6.6	7.9	7.6	3.0	12.6	4.5	3.4	11.9	7.5
> 30.0	0.8	1	1.2	0	2.6	1.4	0.8	2.8	1.3

Percent Distribution of Preschool Children according to Gomez Grades* - Urban Slums

City/Town	Period of Survey	Number Studied	Nutritional Grade			
			Normal	Mild	Moderate	Severe
Ahmedabad	1975-79	219	0.9	23.7	54.8	20.6
	1993-94	138	5.1	28.3	48.5	18.1
Bangalore	1975-79	251	2.0	29.1	52.2	16.7
	1993-94	159	2.5	37.7	53.5	6.3
Bhubaneshwar/ Cuttack	1975-79		----- Not covered ------			
	1993-94	241	12.4	45.2	36.2	6.2
Hyderabad	1975-79	177	4.5	28.2	57.1	10.2
	1993-94	153	15.0	43.6	36.0	5.2
Madras	1975-79	198	8.1	31.8	48.0	12.1
	1993-94	151	4.6	31.1	57.0	7.3
Nagpur	1975-79	114	0.9	13.2	50.9	35.0
	1993-94	117	5.1	38.5	52.1	4.3
Trivandrum	1975-79	114	4.4	41.2	41.2	13.2
	1993-94	102	19.6	45.1	31.4	3.9

* Standard : NCHS

Lable - 8

Percent distribution of deficiency signs among infants

Nutritional disorders	City/Town					
	Ahmedabad	Bangalore	Bhubaneshwar/ Cuttack	Hyderabad	Nagpur	Trivandrum
Number	24	49	18	46	29	26
MAD	91.7	98.0	100.0	100.0	89.7	100.0
Oedema	0	0	0	0	0	0
Emaciation	0	0	0	0	6.9	0
Marasmus	0	0	0	0	3.4	0
Bitot's spot	0	0	0	0	0	0
Angular Stomatitis	0	0	0	0	0	0

'n' is small in all cities.

Table - 9

Percent distribution of deficiency signs among
Preschool Children (B + G Pooled) - Urban Slums

Nutritional disorders	City/Town					
	Ahmedabad	Bangalore	Bhubaneshwar/ Cuttack	Hyderabad	Nagpur	Trivandrum
Number	138	159	241	153	117	102
NAD	71.7	85.5	87.1	94.1	94	89.2
Oedema	0.0	0	0	0	0	0
Emaciation	0.7	0	2.1	0.7	0	0
Marasmus	0.7	0	0	0	0	0
Bitot's spots	1.4	0	2.5	0	0.9	0
Angular Stomatitis	2.2	3.8	1.7	2.0	2.6	2.9
Caries	17.4	3.1	5.0	3.3	3.4	5.9

Table - 10

Percent distribution of deficiency signs among School age Children (B + G Pooled) - Urban Slums

Nutritional disorders	City/Town					
	Ahmedabad	Bangalore	Bhubaneshwar/ Cuttack	Hyderabad	Nagpur	Trivandrum
Number	210	174	136	169	125	64
NAD	49.0	73.6	58.1	75.7	75.2	70.3
Oedema	0	0	0	0	0	0
Emaciation	0	0.6	0	0	0.8	0
Marasmus	0	0	0	0	0	0
Bitot's spots	6.2	5.2	5.9	1.2	0	0.0
Angular Stomatitis	3.8	8.6	3.7	5.9	4.0	0.0
Caries	32.4	6.3	27.2	18.9	21.6	28.1

Table - 11

Percent distribution of deficiency signs among Adolescents (B + G Pooled) - Urban Slums

Nutritional disorders	City/Town					
	Ahmedabad	Bangalore	Bhubaneshwar/ Cuttack	Hyderabad	Nagpur	Trivandrum
Number	168	76	42	152	11 1	130
	67.3	81.6	88.1	86.2	78.4	67.7
NAD	0	0	0	0	0	0
Oedema	0	0	0	0	0	0.8
Emaciation	0	0	0	0	0	0
Marasmus	0	0	0	0	0	0
Bitot's spots	1.8	0	0	0	1.8	0.0
Angular Stomatitis	3.0	1.3	2.4	2.0	18.9	26.9
Caries	22.6	2.6	7.1	5.3		

Table - 12

Percent distribution of *deficiency* signs among Adults (M + F) Pooled - Urban Slums

Nutritional disorders	City/Town					
	Ahmedabad	Bangalore	Bhubaneshwar/ Cuttack	Hyderabad	Nagpur	Trivandrum
Number	324	265	285	330	313	414
NAD	69.1	82.3	92.6	76.7	69.0	60.1
Oedema	0	0	0	0	0	0
Emaciation	0	0	0	0	0	0.5
Bitot's spots	0.3	1.1	0	0.6	0	0.2
Angular Stomatitis	2.5	1.1	2.1	1.2	1.0	0.2
Caries	28.4	3.0	2.8	13.9	29.1	35.7

Table - 13

Comparison of clinical prevalence rates

Population Groups	Survey Period	Number	NAD	Maras-mus	Bitot spots	Angular stomatitis	Caries
1. Infants	1975-79	217	92.2	3.7	-	-	-
	1993-94	130	96.7	0.6	-	-	-
2. Preschoolers	1975-79	932	72.3	2.4	3.0	7.7	0.9
	1993-94	754	86.5	0.1	0.7	2.6	6.5
3. Schoolage children	1975-79	1254	63.3	-	3.8	15.7	10.3
	1993-94	910	63.7	-	3.7	6.4	23.2
4. Adolescent children	1975-79	1271	72.2	-	2.5	8.9	5.8
	1993-94	758	74.1	-	0.4	2.1	16.4
5. Adults	1975-79	2343	66.8	-	1.2	4.6	3.8
	1993-94	1874	73.5	-	0.4	1.0	21.0

(Pooled Data for Six Cities -
Ahmedabad, Bangalore, Bhopal, Hyderabad, Nagpur, Trivandrum

A N N E X U R E - I I

MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : AHMEDABAD **SEX : MALES**

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR. (cm)		FFT (mm)	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	15	66.3	6.68	7.1	1.74	13.6	1.39	12.6	2.06
1-2	14	71.3	5.63	8.0	1.27	13.7	0.84	10.9	2.11
2-3	19	81.0	5.10	9.4	1.54	14.0	0.93	10.8	2.42
3-4	23	87.1	4.87	10.9	1.39	14.5	1.53	10.4	2.48
4-5	23	95.8	4.67	13.0	1.72	15.1	1.14	9.3	2.42
05	18	99.5	6.36	13.7	1.93	14.5	1.41	8.1	2.80
06	17	107.0	4.56	15.9	2.14	15.2	1.61	6.7	3.96
07	18	111.8	6.37	16.7	2.14	14.9	0.94	7.4	2.15
08	22	115.4	7.33	17.8	2.13	15.6	1.15	7.8	1.57
09	17	120.6	7.51	19.4	3.21	15.6	1.50	7.3	1.69
10	14	124.7	9.09	22.3	4.20	16.8	1.34	8.9	3.01
11	9	129.5	6.91	25.2	6.27	17.0	2.20	8.0	3.32
12	11	135.6	5.06	26.0	3.20	17.2	2.16	8.9	1.97
13	10	136.1	8.52	26.4	5.91	17.6	1.84	8.4	2.17
14	13	154.0	9.37	37.1	6.59	20.3	1.90	9.2	2.44
15	10	149.3	11.10	35.8	9.69	19.5	2.89	8.3	1.70
16	4	166.5	5.11	45.7	6.59	22.7	2.07	11.0	2.94
17	3	164.7	6.53	49.4	6.99	23.9	1.01	10.7	3.51
18	5	167.9	2.32	46.6	5.06	22.8	1.61	9.8	0.84
19	3	157.1	5.31	39.8	2.61	21.7	1.10	8.3	2.52
20-24	18	163.2	3.93	48.9	5.01	24.1	1.72	8.9	3.53
25-29	16	160.1	6.35	48.7	7.05	23.9	2.27	10.6	4.80
30-34	14	162.5	6.55	50.3	10.96	22.6	7.29	9.4	5.75
35-39	18	164.5	6.85	55.2	7.92	25.3	2.17	11.3	4.73
40-44	14	160.7	5.74	50.9	11.69	24.3	3.57	9.9	4.99
45-49	8	157.2	8.11	48.8	12.10	23.8	3.51	9.9	5.54
50-54	6	158.5	6.32	45.8	9.13	22.6	3.73	11.0	4.94
55-59	6	158.2	3.06	51.8	9.40	23.9	1.76	10.7	4.32
>=60	7	157.7	7.09	46.5	7.49	23.0	2.49	10.4	2.94

II. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : AHMEDABAD SEX : FEMALES

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR. (cm)		FFT (mm)	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	9	61.3	5.23	5.8	1.13	12.7	1.80	9.7	2.92
1-2	13	69.9	5.59	6.8	1.54	13.0	2.12	9.3	3.07
2-3	16	79.6	4.81	9.6	1.41	14.1	0.85	11.0	2.25
3-4	13	83.8	6.07	10.4	1.39	14.2	0.92	11.5	2.44
4-5	17	94.3	7.33	12.4	2.05	14.9	1.12	10.5	1.77
05	14	95.8	6.50	13.0	1.95	14.8	0.88	10.1	1.51
06	23	104.0	6.07	15.1	2.19	15.3	1.11	9.8	2.87
07	11	111.0	4.68	16.3	2.22	15.4	1.56	8.0	1.90
08	8	116.6	5.56	19.0	2.08	16.0	1.02	9.0	1.77
09	16	121.2	6.14	20.0	3.40	15.2	4.39	10.1	3.02
10	17	127.4	5.45	21.2	3.52	15.4	4.09	9.8	3.00
11	6	134.2	8.51	25.9	6.58	17.3	2.98	6.5	4.14
12	15	135.1	11.59	26.6	8.86	18.6	2.01	10.4	2.06
13	10	140.5	6.97	31.1	6.51	19.6	2.38	9.6	2.32
14	15	146.4	8.65	35.5	5.86	21.0	1.79	12.0	2.80
15	14	144.6	4.79	38.5	5.76	21.7	1.89	13.7	2.56
16	9	147.8	4.66	40.5	7.42	22.4	2.81	13.8	3.27
17	12	149.1	5.47	40.3	5.32	21.9	1.81	12.9	3.15
18	11	151.2	3.81	40.4	6.74	21.6	1.74	13.1	3.75
19	7	146.6	6.94	37.4	4.44	21.8	1.51	12.3	2.06
20-24	41	150.0	6.54	44.0	7.09	23.4	2.23	14.2	4.34
25-29	49	149.6	4.69	44.4	7.96	23.3	2.97	13.3	4.79
30-34	49	148.5	5.57	43.7	7.33	23.3	2.34	13.8	4.98
35-39	27	149.6	6.23	42.6	5.08	23.4	2.14	13.8	4.79
40-44	24	150.3	5.79	47.1	8.02	24.7	2.72	14.5	4.12
45-49	13	148.6	4.70	48.7	11.19	25.3	3.51	15.9	6.10
50-54	13	150.5	5.67	46.6	10.07	24.3	3.20	15.0	5.70
55-59	8	148.5	3.81	43.8	8.05	23.8	2.33	11.3	3.69
>=60	9	145.5	5.74	45.9	7.93	23.4	3.86	15.7	3.08

III. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : BHUBANESWAR SEX : MALES

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR.(cm)		FFT (mm)	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	18	63.9	6.94	6.6	1.57	12.2	1.19	2.6	0.26
1-2	29	74.1	6.31	8.6	1.46	12.4	1.04	2.7	0.34
2-3	37	83.5	5.28	10.6	1.99	13.3	1.10	2.7	0.34
3-4	25	90.3	5.36	12.0	1.73	13.0	1.09	2.8	0.43
4-5	29	96.6	5.38	13.8	1.70	13.4	0.81	3.0	0.41
05	11	97.5	4.42	14.0	2.41	13.6	0.89	3.1	0.51
06	12	105.6	5.08	15.9	2.14	13.7	1.04	3.0	0.26
07	21	106.9	5.71	16.5	1.78	14.0	1.46	3.0	0.42
08	8	118.6	8.02	19.7	3.67	14.4	1.29	3.3	0.65
09	4	119.3	5.18	20.9	1.41	15.0	0.59	3.3	0.50
10	5	123.3	2.70	21.8	1.84	14.7	0.30	3.7	0.84
11	5	129.8	5.87	24.2	3.29	15.6	0.43	3.3	0.27
12	4	134.1	7.10	26.3	4.19	16.4	1.02	3.9	1.44
13	3	140.9	3.69	29.7	3.59	16.9	1.53	3.7	0.76
14	2	150.1	1.84	33.8	0.35	18.1	1.27	4.8	1.06
15	1	165.7	*****	44.0	*****	19.4	*****	4.5	*****
16	2	156.6	9.26	43.5	10.61	20.5	0.99	4.5	0.71
17	0	*****	*****	*****	*****	*****	*****	*****	*****
18	2	147.6	10.54	37.9	7.21	20.5	3.61	5.3	1.06
19	0	*****	*****	*****	*****	*****	*****	*****	*****
20-24	6	157.7	8.67	49.3	7.86	22.5	2.41	7.0	3.18
25-29	17	159.2	7.18	47.7	5.87	22.9	1.58	7.2	2.56
30-34	17	160.5	5.77	49.0	7.61	22.3	1.49	6.9	2.08
35-39	22	160.8	8.10	47.9	8.57	22.3	2.57	6.3	1.83
40-44	5	156.9	6.82	42.0	4.80	20.4	1.63	4.7	1.04
45-49	6	160.2	6.59	41.8	4.24	19.8	1.47	4.8	1.47
50-54	1	167.5	*****	47.0	*****	20.6	*****	5.0	*****
55-59	2	153.1	4.20	39.7	5.44	20.2	0.57	4.8	0.71
>=60	5	160.2	6.59	46.8	5.72	20.2	1.96	4.8	1.13

MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : BHUBANESWAR SEX : FEMALES

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR. cm)		FFT (mm	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	18	81.7	6.99	8.0	1.36	11.8	1.21	2.6	0.39
1-2	31	74.3	5.50	8.2	1.15	12.1	1.11	2.5	0.36
2-3	38	81.8	5.91	10.1	2.24	12.5	1.03	2.7	0.39
3-4	34	90.8	6.36	11.8	1.56	13.0	1.18	2.9	0.31
4-5	19	96.9	4.97	13.0	1.44	13.2	0.67	3.0	0.63
05	9	99.3	6.12	13.8	1.48	13.0	0.82	2.9	0.17
06	15	102.9	6.41	14.4	2.57	13.3	1.00	2.9	0.32
07	10	121.9	7.32	17.8	2.06	14.3	1.02	3.2	0.42
08	13	113.3	7.92	17.8	2.08	14.5	0.94	3.2	0.38
09	12	116.6	9.75	19.5	3.41	14.8	1.48	3.3	0.58
10	4	122.5	6.91	20.7	3.29	15.3	1.11	3.1	0.48
11	7	133.8	4.90	25.3	2.26	16.1	0.95	3.5	0.71
12	4	148.3	7.15	32.8	6.10	18.0	1.24	3.8	0.29
13	2	137.0	0.29	25.3	1.70	17.1	0.14	3.5	0.00
14	1	144.3	*****	33.9	*****	19.6	*****	4.5	*****
15	2	143.8	6.72	33.5	7.42	19.1	2.12	4.8	1.77
16	3	148.4	3.11	40.1	1.91	21.1	1.15	5.2	1.44
17	1	155.8	*****	53.8	*****	21.8	*****	8.5	*****
18	0	*****	*****	*****	*****	*****	*****	*****	*****
19	2	146.5	2.12	35.4	0.57	18.0	1.13	4.3	0.35
20-24	54	149.2	5.57	40.9	5.13	20.3	1.90	5.4	1.03
25-29	74	150.4	5.36	41.3	5.69	20.4	1.78	5.5	1.59
30-34	43	151.6	5.30	43.1	7.51	21.0	1.95	5.7	1.60
35-39	16	151.4	7.21	41.1	6.68	20.2	1.66	5.5	1.02
40-44	4	151.2	5.75	41.5	6.09	20.6	2.08	5.3	0.65
45-49	2	152.4	3.32	48.8	0.21	22.0	1.70	5.5	0.71
50-54	4	148.9	5.17	50.1	3.33	23.1	2.06	7.1	2.66
55-59	4	148.6	2.13	38.1	2.16	20.5	0.38	5.1	0.85
>=60	16	149.0	6.57	44.9	10.19	22.2	2.88	7.7	3.89

V. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : HYDERABAD SEX : MALES

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR. (cm)		FFT (mm.	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	29	64.4	5.57	6.5	1.75	12.6	1.03	9.2	2.13
1-2	16	75.4	4.38	9.1	1.38	13.6	0.92	8.8	1.33
2-3	18	84.6	4.20	11.2	1.39	14.2	1.18	9.0	1.47
3-4	17	91.3	2.55	12.2	1.01	14.5	0.82	9.0	1.76
4-5	9	94.4	5.25	12.9	1.23	14.0	1.11	7.9	2.57
05	12	101.2	6.71	14.8	1.73	14.4	0.79	6.8	1.30
06	12	109.9	3.63	16.8	1.95	15.1	1.05	6.7	1.37
07	21	113.2	7.38	18.2	2.98	15.1	0.84	6.5	1.38
08	15	121.7	7.24	20.5	3.32	16.2	2.51	6.5	1.45
09	8	124.9	4.15	22.5	2.45	16.0	1.30	6.5	0.96
10	16	131.2	8.26	23.8	4.12	16.6	1.19	6.5	2.16
11	5	130.5	6.93	25.6	3.85	17.1	1.29	6.2	3.82
12	12	143.1	8.33	30.6	5.05	18.5	1.74	7.1	1.92
13	8	140.3	8.53	29.6	5.75	18.0	1.85	7.6	1.60
14	4	164.4	1.98	41.4	4.94	20.7	2.55	7.0	2.35
15	6	160.4	1.86	40.7	3.39	21.2	1.48	5.9	0.58
16	3	155.8	4.82	48.0	4.48	24.1	2.76	10.5	3.97
17	3	162.2	4.87	50.5	8.40	24.9	2.10	7.5	2.29
18	2	163.3	10.25	48.2	3.39	26.4	1.98	7.0	2.12
19	5	169.1	2.99	50.7	1.37	23.9	1.77	7.1	1.78
20-24	23	163.8	6.16	54.3	9.32	25.6	3.16	9.8	5.41
25-29	12	166.7	5.30	56.6	12.78	25.9	3.37	9.6	5.68
30-34	12	163.7	6.72	53.8	11.04	25.6	3.81	9.6	4.90
35-39	20	165.0	5.39	54.1	9.32	25.1	2.72	9.1	4.32
40-44	9	164.7	6.24	56.2	7.14	26.4	1.70	9.8	5.15
45-49	5	164.6	7.69	50.2	4.61	23.5	1.95	5.8	0.57
50-54	6	165.0	3.55	67.2	13.62	27.0	2.31	16.9	7.55
55-59	4	162.9	5.70	57.2	10.76	25.9	2.39	10.8	5.38
>=60	15	161.9	7.32	53.4	8.35	24.3	2.68	9.6	4.06

VI. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : HYDERABAD SEX : FEMALES

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR. (cm)		FFT (mm)	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	17	62.3	5.28	6.0	1.52	12.7	1.05	9.6	2.19
1-2	15	74.3	4.86	8.4	2.05	13.0	0.45	8.0	1.41
2-3	28	83.0	5.26	10.1	1.59	13.7	0.90	8.5	1.37
3-4	27	87.9	5.12	12.1	1.53	14.3	0.85	9.4	1.86
4-5	23	94.0	6.06	12.5	1.50	14.2	0.88	8.2	1.57
05	14	104.6	4.05	15.3	1.90	14.6	0.86	7.0	1.47
06	12	106.7	4.00	16.2	1.94	15.1	1.07	8.4	2.62
07	11	112.5	6.72	17.7	3.10	15.2	1.34	7.0	1.10
08	16	117.1	5.79	18.8	3.10	15.4	1.49	8.3	2.09
09	10	124.5	8.74	22.7	4.56	17.0	1.51	8.4	1.42
10	13	126.0	9.72	23.3	5.42	17.2	2.64	8.3	3.29
11	4	134.3	7.59	26.1	2.09	17.1	1.08	8.8	2.90
12	16	141.4	8.78	30.3	6.18	18.7	1.84	8.9	1.89
13	9	145.9	8.95	36.7	5.85	21.7	1.89	11.6	4.31
14	5	149.9	8.55	39.5	3.94	21.1	3.46	9.6	2.70
15	12	148.5	6.93	38.8	8.06	21.1	2.51	12.0	4.50
16	16	148.5	6.74	38.7	4.47	21.2	1.90	12.0	3.88
17	6	155.8	7.72	41.4	6.09	21.8	1.56	12.3	5.89
18	18	153.5	5.51	46.4	8.37	23.0	2.89	12.9	4.57
19	10	155.0	9.73	45.9	8.03	23.3	2.74	12.5	4.97
20-24	65	152.0	6.33	44.5	7.99	22.5	2.61	11.7	4.71
25-29	50	151.8	5.74	47.7	10.71	24.2	3.70	14.0	5.80
30-34	30	152.0	6.40	50.3	9.47	24.5	3.49	13.8	5.27
35-39	20	153.3	5.61	50.5	11.57	25.0	3.60	15.0	4.96
40-44	20	151.1	5.55	54.0	13.98	26.4	4.41	17.2	6.48
45-49	16	150.7	7.02	54.1	13.61	26.3	4.37	15.0	4.36
50-54	13	149.1	5.01	48.9	10.53	24.7	3.73	14.9	6.44
55-59	3	156.4	1.97	56.2	5.33	26.6	0.72	19.0	1.73
>=60	24	148.4	7.92	47.0	8.15	24.4	2.55	13.7	5.09

VII. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : MADRAS SEX : MALES

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR.(cm)		FFT (mm)	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	21	66.7	5.71	6.4	1.48	13.9	1.34	6.3	2.10
1-2	13	75.1	2.45	7.8	1.00	14.1	1.23	6.3	1.87
2-3	20	84.3	5.57	9.7	1.63	14.8	1.11	7.1	1.57
3-4	22	90.1	7.10	11.2	2.33	14.8	1.22	7.5	1.37
4-5	27	95.8	7.80	12.8	1.93	15.2	1.24	7.8	1.04
05	13	100.9	3.06	14.0	1.22	15.6	0.95	7.5	1.33
06	12	107.6	4.88	15.4	1.68	15.4	0.74	7.3	0.87
07	14	111.1	4.62	16.6	1.53	15.8	0.90	6.8	0.97
08	12	117.4	5.06	19.0	2.15	16.2	1.01	6.8	2.53
09	13	123.4	7.81	19.7	2.31	15.0	4.63	6.9	3 .40
10	12	122.9	11.72	20.3	4.97	16.6	1.71	7.1	1.00
11	22	128.8	6.72	22.9	3.01	17.6	1.18	6.4	0.91
12	12	134.1	4.75	24.6	1.69	18.2	0.84	6.9	1.00
13	16	139.0	6.17	27.9	3.50	18.9	1.09	6.8	1.18
14	6	144 .2	5.75	32.8	4.88	19.5	1.97	7.2	1.60
15	11	147.0	7.06	32.9	4.19	19.9	1.87	6.4	1.12
16	9	156.3	5.97	40.7	5.78	22.1	2.36	7.4	3 .84
17	3	152.7	5.37	41.7	6.33	23.3	2.52	8.0	1.73
18	9	159.4	13.20	44 .4	11.23	22.9	2.96	5.7	1.41
19	6	164.5	7.29	46.5	5.37	23.3	1.72	5.8	1.94
20-24	18	165.9	4.84	50.6	7.95	24.6	3.12	6.3	1.49
25-29	21	160.6	8.13	48 .1	8.53	23.4	2.14	6.1	2.06
30-34	15	164.9	4.39	53.6	8.77	25.8	3.71	7.8	2 .08
35-39	9	156.8	9.05	50.4	5.78	24.4	2.23	7.6	1.74
40-44	12	161.1	5.96	49.4	7.18	24.3	1.76	7.3	2.10
45-49	9	158.5	7.28	49.7	6.96	24.7	2.40	9.6	4.13
50-54	5	156.8	9.64	44.0	7.52	23.0	1.53	10.4	6.95
55-59	6	161.8	4.62	49.6	6.28	24.9	2.46	6.8	1.33
>=60	5	160.3	9.01	45.8	4.42	22.7	2.56	7.4	2.70

VIII. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : MADRAS **SEX : FEMALES**

AGE (Yrs)	N	HEIGHT (cm) MEAN	SD	WEIGHT (kg) MEAN	SD	ARM CIR.(cm) MEAN	SD	FFT (mm) MEAN	SD
0-1	26	66.2	8.62	5 .6	1.53	13.5	1.30	5.3	1.51
1-2	13	76.2	3.07	8 .3	0.94	14.3	0.93	6.8	1.42
2-3	17	85.1	6.48	10 .1	1.31	14 .9	0.83	7.2	2.44
3-4	19	86.6	5.36	10.5	1.34	15.0	0.93	7.6	1.81
4-5	20	95.6	5.52	12.1	1.38	15.3	0.70	8.6	1.43
05	19	100.9	7.42	13.1	1.89	15.3	0.87	8.1	1.93
06	15	104.6	3.89	14.4	1.81	14.6	3.83	7.7	0.98
07	18	110.3	5.61	15.7	2.29	15.6	0.89	7.3	0.96
08	10	115.5	5.87	18.2	2.67	16.8	1.07	7.6	0.97
09	9	119.8	4.23	19.0	1.20	16.9	0.62	7.4	1.13
10	12	128.3	6.33	22.5	3.55	17.3	1.47	6.8	1.27
11	10	134.2	4.94	24.9	2.99	18.0	0.91	7.5	1.18
12	5	131.9	6.12	24.5	3.77	18.0	1.27	7.2	0.45
13	7	140.4	2.44	30.0	3.98	19.2	1.73	7.9	1.07
14	7	150.4	5.30	37.9	6.41	21.6	1.99	8.6	2.94
15	3	147.2	5.51	42.2	6.29	23 .3	1.53	11.0	1.73
16	6	149.4	5.32	38.7	3.66	22.0	1.90	9.7	1.63
17	6	152.7	7.54	41.5	5.22	22.8	1.33	8.3	1.51
18	11	151.3	8.47	43 .0	5.21	23.5	1.96	9.2	2.04
19	12	153.0	9.09	43.8	9.68	22.6	2.44	9.1	2.54
20-24	53	150.8	5.47	42.3	6.82	22.3	2.45	9.0	3.26
25-29	52	150.7	6.54	44.3	7.83	24.5	9.61	10.6	9.23
30-34	28	151.5	5.63	43.0	7.01	22.8	2.59	9.4	3.86
35-39	24	149.1	6.37	49.1	12.08	25.1	4.36	12.8	6.11
40-44	12	149.5	4.54	47.9	9.40	24.7	3.22	10.3	3.08
45-49	15	152.1	6.03	45.1	11.77	23.5	4.27	10.3	5.15
50-54	16	147.6	4.76	45.3	13.47	23.8	3.46	11.8	5.38
55-59	5	146.3	5.00	40.4	2.82	22.7	1.10	10.2	2.59
>=60	12	148.5	3.75	45.0	7.15	23.3	3.17	10.3	3.89

IX. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : TRIVANDRUM **SEX : MALES**

AGE (Yrs)	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR.(cm)		FFT (mm)	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	17	65.2	5.46	6.4	1.46	13.0	1.41	10.4	3.08
1-2	12	77.3	4.14	9.8	1.53	13.8	0.89	12.0	3.08
2-3	11	83.8	3.17	10.6	1.38	14.4	0.95	11.7	2.50
3-4	14	90.3	4.77	11.4	2.18	14.6	1.39	11.4	2.70
4-5	12	99.8	8.77	13.8	1.27	14.9	1.09	10.7	3.61
05	14	102.7	5.96	14.6	1.99	14.8	1.32	10.5	1.76
06	1	104.0	*****	18.0	*****	15.0	*****	11.0	*****
07	5	113.1	7.87	15.1	2.61	14.1	0.70	8.8	1.61
08	5	114.8	4.98	16.4	2.97	14.8	0.50	10.2	0.79
09	0	*****	*****	*****	*****	*****	*****	*****	*****
10	10	126.5	7.32	22.4	2.50	16.7	1.21	9.9	3.24
11	4	131.1	6.09	27.0	2.45	16.7	1.78	9.8	2.99
12	6	134.8	4.86	27.3	2.16	20.8	5.09	9.7	1.49
13	2	154.5	10.61	37.5	4.95	20.4	0.57	11.6	1.41
14	5	153.2	8.84	36.8	5.54	18.4	1.69	8.6	0.55
15	5	156.9	10.71	46.2	8.73	22.7	2.77	13 .4	3.25
16	5	161.2	7.50	44.8	4.49	22.5	1.31	11.5	2.33
17	8	159.6	3.62	45.8	4.60	23.4	1.01	11.2	2.77
18	4	161.1	3.47	47.3	5.06	23.1	1.00	11.4	4.80
19	4	162.8	2.79	50.5	3.70	24.3	1.45	10.0	1.41
20-24	24	163.2	6.78	51.0	6.62	24.9	2.48	10.6	4.05
25-29	19	162.9	8.11	57.4	10.50	27.0	3.02	12.5	4.61
30-34	13	160.0	7.78	53.3	6.53	27.8	4.63	12.8	5.45
35-39	17	161.3	5.82	54.2	9.33	25.7	2.75	10.4	3.30
40-44	9	164.4	4.23	52.1	5.01	25.9	1.89	9.6	4.12
45-49	10	163 .1	7.08	59.2	11.80	26.9	3.85	14 .0	6.44
50-54	6	160.3	3.06	51.6	9.02	24.3	2.85	13.3	6.50
55-59	11	159.3	3.26	49.5	5.96	25.3	2.02	10.1	3.25
>=60	13	157.7	4.49	50.3	11.37	24.1	2.98	10.4	3.20

X. MEAN ANTHROPOMETRIC MEASUREMENTS - URBAN SLUMS

CITY/TOWN : TRIVANDRUM SEX : FEMALES

AGE	N	HEIGHT (cm)		WEIGHT (kg)		ARM CIR.(cm)		FFT (mm)	
		MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
0-1	9	64 .0	7.68	6.7	1.57	13.1	1.53	12 .7	2.18
1-2	16	75.1	3 .88	9.4	1.76	13 .8	1.25	12.8	2.97
2-3	16	81.6	4.64	10.2	1.41	14.5	1.22	13 .1	3.14
3-4	10	87.3	5.70	11.7	1.64	14.9	1.03	11.6	3.23
4-5	11	98.5	4.95	13 .7	2.25	15.6	1.82	15.1	3.36
05	9	100.6	6.80	13 .4	1.59	14.9	1.10	12 .7	2.50
06	2	114.3	0.35	17.0	1.41	14.8	0.78	14 .6	0.57
07	2	118.2	14.42	19.5	4.95	16.4	2.26	10.5	0.71
08	2	118.2	5.87	18.0	4.24	15.8	1.41	11.0	1.41
09	2	120.7	3 .32	23.3	3.18	16.2	0.28	9.0	4.24
10	5	127.2	8 .08	23 .2	4.15	16.2	2 .15	9.6	1.34
11	3	131.4	4.56	24.3	2.08	17.3	0.99	11.6	1.48
12	4	137.9	4.79	27.5	3.79	17.4	2.45	11.5	2.52
13	8	147.0	6.97	35.8	5.99	19.8	2.25	13 .0	3.96
14	5	142.5	8.19	33 .6	4.98	20.4	2.22	12.8	3.70
15	4	156.9	2.73	48.0	8.29	23 .4	2.74	17.2	5.74
16	11	150.6	6.66	41.1	7.71	22.3	2 .37	15.4	4.98
17	10	151.5	6.02	44.4	3.34	23.3	1.66	18.9	5.55
18	16	149.1	5.83	44.3	9.05	23.3	3.07	17.9	5.79
19	15	152.3	7.12	47.2	7.24	23.9	2.14	18.3	3.57
20-24	62	151.3	5.92	47.5	7.26	24.1	2.69	17.8	5.65
25-29	61	152.5	6.21	48.7	8.55	24.9	3.59	18.	5.43
30-34	51	149.5	5.13	50.5	10.49	25.6	3.57	18.2	6.07
35-39	39	150.5	6.01	52.1	6.78	26.1	2.70	19.6	5.38
40-44	20	148 .1	5.46	55.8	10.11	27.4	3.68	21.5	6.08
45-45	19	147.6	4.72	48.6	8.55	25.3	2.93	18.9	4.61
50-54	9	147.0	6.19	48.1	8.22	25.1	2.59	19.4	4.99
55-59	15	149.2	6.54	46.4	11.97	24.4	3.66	17.4	5.09
>=60	28	145.3	6.87	43.4	10.45	24.4	5.88	16.0	6.36