The study entitled “Health and nutritional status of women and preschool children in urban slums of Kochi” was conducted to appraise the health-nutritional profile of the sample and their interdependency and also the extent of influence of living environment on the above parameters. The data collected was analysed with this objective and the results are discussed under the following heads:

4.1. Background information
   4.1.1. Slum wise distribution of the sample
   4.1.2. Family particulars
   4.1.3. Educational and occupational status of parents
   4.1.4. Economic profile
   4.1.5. Housing condition
   4.1.6. Hygienic practices
   4.1.7. Availability and use of basic services

4.2. Nutritional and health status of women
   4.2.1. Nutritional status of women
      4.2.1.1 Nutritional anthropometry
      4.2.1.2 Blood haemoglobin status
      4.2.1.3 Dietary assessment
   4.2.2. Health status of women
      4.2.2.1 Incidence of health problems
      4.2.2.2 Prevalence of goitre
      4.2.2.3 Other reproductive health indicators

4.3. Nutritional and health status of preschool children
   4.3.1. Nutritional status of preschoolers
      4.3.1.1 Nutritional anthropometry
      4.3.1.2 Blood haemoglobin status of preschool children
      4.3.1.3 Dietary assessment of preschool children
   4.3.2. Health status of preschool children
      4.3.2.1 Nutritional disorders among preschool children
      4.3.2.2 Childhood diseases

4.4 Correlation of health/nutritional status of mothers and preschool children
4.1. Background Information

The background information of sample including residing area, family details, socioeconomic status, housing condition, availability and use of basic services, were collected as these factors are known to have either direct or indirect influence on health and well-being of people.

4.1.1 Slum wise distribution of the sample

The details on the sample distribution among the urban slums, the study area, are presented in table 2.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Slums</th>
<th>No. of families in slums</th>
<th>No. of women selected</th>
<th>No. of preschoolers selected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>1.</td>
<td>Atlantis</td>
<td>207</td>
<td>34</td>
<td>22</td>
</tr>
<tr>
<td>2.</td>
<td>Fort Kochi</td>
<td>460</td>
<td>29</td>
<td>17</td>
</tr>
<tr>
<td>3.</td>
<td>Karithala</td>
<td>102</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>Palichal</td>
<td>550</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>5.</td>
<td>Puthuvypu</td>
<td>980</td>
<td>89</td>
<td>55</td>
</tr>
<tr>
<td>6.</td>
<td>Santhom</td>
<td>180</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Thevara</td>
<td>614</td>
<td>43</td>
<td>29</td>
</tr>
<tr>
<td>8.</td>
<td>Vathuruthy</td>
<td>720</td>
<td>61</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3813</td>
<td>334</td>
<td>209</td>
</tr>
</tbody>
</table>
The slums in different locations of Kochi city were included in the study, since they are very crowded and thickly populated. The total number of families in the selected slums (8 numbers) ranged between 102 to 980.

The sample population, women and their preschool children (3 to 5 years of age), was drawn from the eight slums, 334 women and 376 preschool children included in the sample of the total sample size of 710. A good proportion of women (89 no’s) and preschoolers (107 no’s) were from the Puthuvypu slum, which was the largest slum. This was followed by Vathuruthy slum (61 women and 70 preschoolers) Karithala with the lowest number of families, had least representation in the sample. The total number of male children was 209 (55.6%) and female was 167 (44.4%).

4.1.2. Family Particulars:

The type of the family, size and religion are the aspects dealt with in this section.

Type and size of the family

The details on family structure is given in table 3.
Table 3 Distribution of sample based on type and size of the family

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Type of family</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nuclear</td>
<td>207 (62.0)</td>
</tr>
<tr>
<td></td>
<td>Joint</td>
<td>47 (14.0)</td>
</tr>
<tr>
<td></td>
<td>Extended</td>
<td>80 (24.0)</td>
</tr>
<tr>
<td>2.</td>
<td>Family Size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 members</td>
<td>64 (19.1)</td>
</tr>
<tr>
<td></td>
<td>4-6 members</td>
<td>268 (80.3)</td>
</tr>
<tr>
<td></td>
<td>&gt; 6 members</td>
<td>2 (0.6)</td>
</tr>
<tr>
<td>3.</td>
<td>Number of children</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One child</td>
<td>64 (19.1)</td>
</tr>
<tr>
<td></td>
<td>Two</td>
<td>222 (66.5)</td>
</tr>
<tr>
<td></td>
<td>Three</td>
<td>41 (12.3)</td>
</tr>
<tr>
<td></td>
<td>Four</td>
<td>5 (1.5)</td>
</tr>
<tr>
<td></td>
<td>Five</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td></td>
<td>Ten</td>
<td>1 (0.3)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

As the table depicts 62.0 per cent of sample belonged to nuclear family system followed by extended families (24.0%). Joint family system was seen only among 14.0 percent of the sample. Hence nuclear family system was more popular among the sample studied. Kotwal et al. (2008) also stated that usually families in slums are nuclear type. Similar findings were reported by NNMB (2002) and NNMB (2006).

Three among five households in India are nuclear. Nuclear households are defined in NFHS-3 (2008) as households that are comprised of a married couple or a man or a woman living alone or with
unmarried children (biological, adopted, or fostered), with or without unrelated individuals. The proportion of nuclear households is higher in urban areas than in rural areas.

Most of the families included in the sample had 4 to 6 members (80.3%). Even small family with three members (19.1%) also existed in the slums. As per Census of India (2001) the average household size is 5.1 in urban areas, but NFHS-3 stated that the size is 4.6. The findings of the present study are in line with the NFHS-3 report.

The number of children in the families ranged from a single child (19.1%) to ten children (0.3%). It was also observed that majority of the families (66.5%) had two children, Few of the families were found to have four (1.5%), five (0.3%) and ten (0.3%) children.

**Religion and community**

Religion and caste wise distribution of sample is presented in table 4.

**Table 4 Distribution of sample based on religion and community**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Community</th>
<th>Religion</th>
<th>Pooled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Christian</td>
<td>Hindu</td>
</tr>
<tr>
<td>1.</td>
<td>Forward caste</td>
<td>Nil</td>
<td>3 (0.90)</td>
</tr>
<tr>
<td>2.</td>
<td>Other Backward caste</td>
<td>94 (28.14)</td>
<td>100 (29.9)</td>
</tr>
<tr>
<td>3.</td>
<td>Scheduled caste</td>
<td>Nil</td>
<td>33 (9.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Scheduled tribe</td>
<td>2 (0.60)</td>
<td>24 (7.18)</td>
</tr>
<tr>
<td>5.</td>
<td>Pooled</td>
<td>96 (28.74)</td>
<td>160 (47.9)</td>
</tr>
</tbody>
</table>

*(Numbers in parentheses indicate percentages)*

The religion and community wise distribution of the slum inhabitants showed that most of them were from Hindus (47.9%) followed
by Christians (28.74%) and Muslims (23.3%). Whereas caste distribution indicated that people belonged to other backward caste (81.44%) outnumbered other communities like schedule caste (9.88%), schedule tribe (7.78%) and forward caste (0.90%).

4.1.3. Educational and occupational status of parents

Education and Occupation

Education, especially female literacy known to have a great impact on health and nutritional well-being of children. Education of mothers has been shown to diminish morbidity and mortality of their children. The following table shows the educational and occupational status of parents.

### Table 5 Educational and Occupational status of parents

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Father Frequency (n=334)</th>
<th>Mother Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Educational status</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Illiterate</td>
<td>10 (3.0)</td>
<td>9 (2.7)</td>
</tr>
<tr>
<td></td>
<td>Primary School</td>
<td>60 (18.0)</td>
<td>41 (12.3)</td>
</tr>
<tr>
<td></td>
<td>Middle School</td>
<td>84 (25.1)</td>
<td>104 (31.1)</td>
</tr>
<tr>
<td></td>
<td>High school</td>
<td>156 (46.7)</td>
<td>156 (46.7)</td>
</tr>
<tr>
<td></td>
<td>Higher Secondary</td>
<td>17 (5.1)</td>
<td>19 (5.7)</td>
</tr>
<tr>
<td></td>
<td>Degree</td>
<td>7 (2.1)</td>
<td>5 (1.5)</td>
</tr>
<tr>
<td></td>
<td>Professional</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>2.</td>
<td>Occupational status</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>1 (0.3)</td>
<td>274 (82.0)</td>
</tr>
<tr>
<td></td>
<td>Unskilled worker</td>
<td>202 (60.5)</td>
<td>51 (15.3)</td>
</tr>
<tr>
<td></td>
<td>Semiskilled</td>
<td>54 (16.2)</td>
<td>5 (1.5)</td>
</tr>
<tr>
<td></td>
<td>Skilled</td>
<td>57 (17.1)</td>
<td>4 (1.2)</td>
</tr>
<tr>
<td></td>
<td>Clerk/shop owner</td>
<td>20 (6.0)</td>
<td>Nil</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
Educational status of slum dwellers showed that nearly half of the men (46.7%) as well as women (46.7%) had education upto high school level, followed by middle school education and primary school education. Only 2.1 percent of men and 1.5 percent of women were educated upto degree level. There were no professionally qualified people. But 3.0 percent of men and 2.7 percent of women were found to be illiterate.

In Kerala, however the total literacy rate among the study population was 94.2 percent for men and 87.86 for women. High female literacy rate in Kerala has already been reported by Census of India (2001).

Literacy has been considered as one of the most important attributes for social development. Educational deprivation of slum population and gender discrimination in education with females having less access to education than men were highlighted/emphasized by Kumar et al. (2007). According to the authors this is common phenomenon observed not only in slums but also outside the slums in the city.

There is a strong relationship between women’s work lives and health. Lack of education compel women to join low paid sectors (Kotwal et al., 2008). The families’ occupational status showed that most of the men were unskilled workers (60.5%), some of them were fish sellers or fishermen, while skilled (17.1%) as well as semiskilled workers (16.2%) were also present in the slums.
Data on occupational status of women showed that most of them were unemployed (82.0%), whereas unskilled workers (15.3%) were found to be more than semiskilled (1.5%) and skilled workers (1.2%). Among the unskilled, most of them were working as house maids, coolies etc. Low income was a compelling factor for the women folk to opt for petty jobs in unorganized sector (Kotwal et al., 2008).

Mohanthy and Mohanthy (2005) also found that majority of the slum dwellers were migrants from different places within the country and were unskilled workers with low occupational status and low income. In Kochi urbanisation has been associated with a process of casualisation of labour. Kotwal et al. (2008) also reported that slum dwellers were mostly labourers who failed to find regular employment in the modern organized sector. Besides, joblessness is found to be basically a problem of educated youth, leading to their migration to other parts of India (Prakash, 2002).

4.1.4 Economic Profile

Economic status of the family was assessed by in terms of monthly income and other features like ownership of house and land etc. The income classification done is based on Kuppuswamy scale (1981) revised by Kumar et al. (2007).
Table 6 Economic status of the sample

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monthly Income (Rupees)</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Below 980</td>
<td>7(2.1)</td>
</tr>
<tr>
<td></td>
<td>981-2935</td>
<td>260(77.8)</td>
</tr>
<tr>
<td></td>
<td>2936-4893</td>
<td>67(20.1)</td>
</tr>
<tr>
<td></td>
<td>4894-7322</td>
<td>Nil</td>
</tr>
<tr>
<td>2.</td>
<td>Land Ownership</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Owned</td>
<td>271(81.1)</td>
</tr>
<tr>
<td></td>
<td>Not owned</td>
<td>63(18.9)</td>
</tr>
<tr>
<td>3.</td>
<td>Tenure status</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Owned</td>
<td>271(81.1)</td>
</tr>
<tr>
<td></td>
<td>Rented</td>
<td>50(15.0)</td>
</tr>
<tr>
<td></td>
<td>Lease</td>
<td>13(3.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Saving /Debts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Savings</td>
<td>127(38.0)</td>
</tr>
<tr>
<td></td>
<td>Debts</td>
<td>235(70.4)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

Economic status of the family showed that majority (77.8%) of the family had a monthly income between ₹ 981/- to ₹ 2935/-, one out of five of the sample had income in the range of ₹ 2936/- and ₹ 4893/-. Families with income less than ₹ 980 (2.1%) was found to be less.

As UN Habitat (2002) reported that slums are manifestations of urban poverty. The slum dwellers are considered as the poorest section of the urban society (Kumar, 2006). But Mitra et al. (2006) stated that slums do not accommodate all of the urban poor nor are all slum dwellers always poor.
The slum population usually faces land and housing shortage. In the present study it was observed that majority of the families (81.1%) owned land with limited area which has been issued to them. This comes to approximately three and half cents. The house was also built in this land. The rest of the samples migrated from nearby state and they lacked land ownership (18.9%).

Tenure status of the sample showed that house ownership was found among 81.1 percent. Other than these, houses were on rental (15.0%) or lease (3.9%) basis. According to NSSO (2002) 60 percent of the urban households owned the dwelling units. A study conducted by Chandramouli (2003) in Chennai revealed that 40 percent of houses in slums are rented and 3 percent are neither rented nor owned.

Usually slum dwellers earn their wages on daily basis, and it is very inadequate to make. Inspite of this situation few families (38.0%) had the habit of saving money for future. But majority (62.0%) of them had no savings. UN Habitat Report (2003) and South Asia Analysis Group (2006) also reported that slums are largely a physical manifestation of urban poverty and very poor people live in slums.

**Other family assets**

Other possessions of the family ranging from simple labour saving home appliances to vehicles for transportation was noted as asset of the family. The details are given in the table below.
Table 7 Distribution of the sample based on family assets

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cycle/ Two wheeler</td>
<td>205 (61.4)</td>
</tr>
<tr>
<td>2.</td>
<td>Radio</td>
<td>92 (27.5)</td>
</tr>
<tr>
<td>3.</td>
<td>Television</td>
<td>205 (61.4)</td>
</tr>
<tr>
<td>4.</td>
<td>Telephone</td>
<td>41 (12.3)</td>
</tr>
<tr>
<td>5.</td>
<td>Refrigerator</td>
<td>34 (10.2)</td>
</tr>
<tr>
<td>6.</td>
<td>Washing machine</td>
<td>5 (1.5)</td>
</tr>
<tr>
<td>7.</td>
<td>Sewing machine</td>
<td>31 (9.3)</td>
</tr>
<tr>
<td>8.</td>
<td>Mixer/Grinder</td>
<td>112 (33.5)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

Each family found to possess more than one asset listed in the table 7. Television was possessed by majority of the families (61.4%) while radio was present only in 27.5 percent of families. Mixer /Grinder was used by 33.5 percent of families. Refrigerator was present only in 10.2 percent of households. Only 12.3 percent had telephone, 9.3 percent sewing machine and 1.5 percent had washing machine.

**Socioeconomic position (Kuppuswamy Scale)**

A strong association has been found between socioeconomic position (SEP) and poor health status (WHO, 1995). Therefore socioeconomic status of the families was computed using Kuppuswamy scale (1981) revised by Kumar et al. (2007) which is given in appendix-VIII. The sample were categorized accordingly and given in table 8.
Table 8 Distribution of sample based on area and socioeconomic status

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Slums</th>
<th>Socioeconomic status®</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Middle class</td>
<td>Lower class</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Atlantis</td>
<td>12 (35.3)</td>
<td>22 (64.7)</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Fort Kochi</td>
<td>5 (17.2)</td>
<td>24 (82.8)</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Karithala</td>
<td>8 (100.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Pallichal</td>
<td>7 (14.0)</td>
<td>43 (86.0)</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Puthuvypu</td>
<td>3 (3.4)</td>
<td>86 (96.6)</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Santhom</td>
<td>2 (10.0)</td>
<td>18 (90.0)</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Thevara</td>
<td>11 (25.6)</td>
<td>32 (74.4)</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Vathuruthy</td>
<td>2 (3.3)</td>
<td>59 (96.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>42 (12.57)</td>
<td>292 (87.42)</td>
<td></td>
</tr>
</tbody>
</table>

®Ref: Kuppuswamy scale (1981) revised by Kumar et al. (2007)
(Numbers in parentheses indicate percentages)

As the table depicts, majority of slum dwellers (87.42%) had low socioeconomic status as per Kuppuswamy scale (1981). Middle income status was reported by 12.57 percent of families. None had high income status. So the findings of Mitra et al. (2006) saying that slum do not accommodate all urban poor; did not match with the present findings. Socioeconomic status distribution among the individual slums showed that 64.7 to 100 percent of families in the 8 selected slums had low socioeconomic status with highest at Karithala (100.0%), Vathuruthy (96.7%), Puthuvypu (96.6%) and Santhom (90.0%) colonies. In the rest of the slums also majority, had only low socioeconomic status; middle class status was reported by comparatively less number of families (35.3% to 3.3%) and none of the families in the slum found to have a high socioeconomic status as per the Kuppuswamy scale (1981). Middle class
families were comparatively low and it was distributed among Fort Kochi (17.2%), Pallichal (14.0%), Puthuvypu (3.4%), Santhom (10.0%) and Vathuruthy (3.3%).

**Standard of living Index**

Standard of living index was created using criteria suggested by IIPS(2000) which has been commonly used by NFHS as a summary household measure. It is composed of 27 items, including consumer durables, housing conditions and access to basic services. This standard of living index (Appendix-IX) was used to classify the sample under study. The findings are given in table 9.

**Table 9 Distribution of the families based on standard of living index**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Slums</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atlantis</td>
<td>Nil</td>
<td>4 (11.8)</td>
<td>30 (88.2)</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>Fort Kochi</td>
<td>1 (3.4)</td>
<td>3 (10.3)</td>
<td>25 (86.2)</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>Karithala</td>
<td>Nil</td>
<td>Nil</td>
<td>8 (100)</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Pallichal</td>
<td>Nil</td>
<td>9 (18.0)</td>
<td>41 (82.0)</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Puthuvypu</td>
<td>3 (3.4)</td>
<td>11 (12.4)</td>
<td>75 (84.3)</td>
<td>89</td>
</tr>
<tr>
<td>6</td>
<td>Santhom</td>
<td>9 (45.0)</td>
<td>5 (25.0)</td>
<td>6 (30.0)</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>Thevara</td>
<td>1 (2.3)</td>
<td>7 (16.3)</td>
<td>35 (81.4)</td>
<td>43</td>
</tr>
<tr>
<td>8</td>
<td>Vathuruthy</td>
<td>8 (13.1)</td>
<td>27 (44.3)</td>
<td>26 (42.6)</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>22(6.6)</td>
<td>66(19.8)</td>
<td>246(73.7)</td>
<td>334</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

©Ref: IIPS (2000)

The standard of living index used in the NFHS (National Family Health Survey) was applied in the present study to arrive at the standard of living index of the sample. This was calculated using the following...
variables like type of house, toilet facility, source of lighting, fuel used for cooking, source of drinking water, separate room for cooking, ownership of house ownership of land, livestock and ownership of durable goods scoring method was used. A total scores ranging from zero to 14 refers to low standard of living. The scores between 15 and 24 indicates medium standard of living. High standard of living is arrived by a total score ranging between 25 and 66.

The standard of living index thus computed clearly showed that 73.7 percent of the slum dwellers included in the study enjoyed a high standard of living index. This is contrary to the socioeconomic status calculated by Kuppuswamy Scale, where majority were grouped under low status.

This distribution of families with high standard of living index among the eight slums, showed a uniform trend \textit{i.e.,} a progressive reduction in the number of families with declining of living standard index. Only exception to this was Santhom colony, where more number of families (45.0\%) were categorized under low standard of living index.

Economic standard of living concerns the physical circumstances in which people live, the goods and services they are able to consume, and the economic resources they have access to. Basic necessities such as adequate food, clothing and housing are fundamental to well being (South Asia Analysis group, 2006).
In the present study nearness to the urban sector and availability of essential services accessibility and use of health care services due to high female literacy rate may be the reason for the high standard of living index and low socioeconomic status syndrome observed among the slum population in Kochi city.

Majority of women who live in slums belong to lower socioeconomic classes and either they have migrated to the city with the hope of better means of livelihood or forced to migrate with their partners. Majority of them having no education, skill and work experience, have no chance in the competitive job. They pickup low paid jobs such as construction labourers, domestic servants and casual factory workers. Inadequate income, poor housing conditions, overcrowded environment, poor sanitation, occupational hazards and stressful conditions are unfavorable to the health of women residing slums (Kumar and Sinha, 2007).

4.1.5 Housing condition

Housing plays an important role in the health of the individual. Hence an attempt was made to procure information on the housing conditions of the sample and presented in this section.

Type of house and facilities

The details are given in table 10.
### Table 10 Details on basic features of housing

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency(n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Type of house</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kutcha</td>
<td>90 (27.0)</td>
</tr>
<tr>
<td></td>
<td>Semi Pucca</td>
<td>204 (61.0)</td>
</tr>
<tr>
<td></td>
<td>Pucca</td>
<td>40 (12.0)</td>
</tr>
<tr>
<td>2.</td>
<td><strong>No. of rooms</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One room or multi purpose</td>
<td>93 (27.8)</td>
</tr>
<tr>
<td></td>
<td>Two rooms</td>
<td>142 (42.5)</td>
</tr>
<tr>
<td></td>
<td>Three rooms</td>
<td>99 (29.6)</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Separate kitchen</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>260 (77.8)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>74 (22.2)</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Storage area</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>12 (3.59)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>322 (96.41)</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Toilet</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>25 (7.5)</td>
</tr>
<tr>
<td></td>
<td>Separate</td>
<td>61 (18.3)</td>
</tr>
<tr>
<td></td>
<td>Common for two houses</td>
<td>201 (60.2)</td>
</tr>
<tr>
<td></td>
<td>Common for more than two houses</td>
<td>47 (14.1)</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Sanitation facility</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pit toilet</td>
<td>272 (81.4)</td>
</tr>
<tr>
<td></td>
<td>Flush toilet</td>
<td>11 (3.3)</td>
</tr>
<tr>
<td></td>
<td>Open defecation</td>
<td>51 (15.3)</td>
</tr>
<tr>
<td>7.</td>
<td><strong>Total area</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≤100 sq.ft</td>
<td>50 (15.0)</td>
</tr>
<tr>
<td></td>
<td>100-300 sq.ft</td>
<td>215 (64.3)</td>
</tr>
<tr>
<td></td>
<td>300-500 sq.ft</td>
<td>63 (18.9)</td>
</tr>
<tr>
<td></td>
<td>500-700 sq.ft</td>
<td>6 (1.8)</td>
</tr>
<tr>
<td>8.</td>
<td><strong>Plinth level</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ground level</td>
<td>94 (28.1)</td>
</tr>
<tr>
<td></td>
<td>0-1Ft</td>
<td>132 (39.5)</td>
</tr>
<tr>
<td></td>
<td>1.2 Ft</td>
<td>86 (25.7)</td>
</tr>
<tr>
<td></td>
<td>2-3 Ft</td>
<td>22 (6.6)</td>
</tr>
<tr>
<td>9.</td>
<td><strong>Height of ceiling</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less than 6 feet</td>
<td>71 (21.3)</td>
</tr>
<tr>
<td></td>
<td>6-7 feet</td>
<td>243 (72.8)</td>
</tr>
<tr>
<td></td>
<td>7 feet and more</td>
<td>20 (6.0)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
Type of House

Usually the houses in slums all over the world are of inferior quality. In the present study the houses were mostly of semi pucca (61.0%) or kutcha types (27.0%) A structure having walls and roof made of non pucca materials was regarded as a kutcha structure (NSSO, 2004). Pucca houses were only a few (12.0%), pucca structure was the one, having walls and roofs made of pucca materials (NSSO, 2004).

The houses which had brick wall and reinforced cement concrete roofs/tile roof were termed as pucca, while semi pucca houses where those with brick wall with tin/asbestos roof, excluding thatch and reinforced cement concrete roof. Kutcha houses where those with either thatch roof or mud wall. NSSO (2004) reported that in urban slum areas, 65 percent of the dwellings are pucca and in Kerala it was 71 percent. In the present study also pucca and semi pucca houses together constituted 73 percent. In urban India, NSSO (2002) also reported a fall in kutcha construction from 18 percent during 1989-93 to 12 percent during 1998-2002 and a rise in pucca constructions from 64 percent to 74 percent (NSSO, 2002).

Rooms

The numbers of rooms were less in the case of slums. The study revealed that about 42.5 percent of houses had two rooms, followed by three room houses (29.6%). One room apartment was also found among 27.8 percent of houses. As per Census of India (2001) in urban areas of
Kerala two room houses were seen among 23.4 percent, while one room was observed among 9.1 percent. The availability of living space within the house is also a vital parameter for good health (Chandramouli, 2003). Kamla et al. (2009) reported that overcrowding in rooms leads to various infections.

**Kitchen**

Separate kitchen is a necessity for each household, this was present in the case of 77.8 percent of the houses in the slums while it was absent in 22.2 percent. Another essential feature of a kitchen is a raised cooking platform, which was present in majority (63.8%) of houses and absent in 36.2 percent. This is comparable with the reports by Census of India (2001) which states that majority of the households (95.4%) of Kerala. This trend is extended to slums in Kerala also had separate kitchen. Kamla et al. (2009) reported that separate kitchen was present in almost 70 percent of the household than when compared with houses in slums (30%). The need for separate kitchen was further stressed by Chandramouli (2003), availability of a separate kitchen within the house and the type of fuel used for cooking have a direct bearing on the incidence of respiratory diseases especially among women who are directly exposed to smoke emitted by fuels.

Storage area was found to be limited within the house, only 3.59 percent had a separate storage area.
Toilet Facility

While considering the toilet facility, most of the households (60.2%), in the slums studied had one common toilet for two houses. Even sharing of one toilet by more than two houses was also observed among 14.1 percent of slum dwellers. Separate toilets for individual homes were present only in 18.3 percent, while toilet facility was totally absent among 7.5 percent of slum houses. In Kerala, as per Census of India (2001), 8 percent of the houses had no latrines.

The same trend was observed in the slums of the present study. According to Chandramouli (2003) the availability of latrines is an important indicator of the state of sanitation. This in turn is reflected in the spread of several diseases especially those relating to the gastro-intestinal tract and skin etc. Similarly use of non hygeinic toilets also found to be a major cause of the spread of infections by Kamla et al. (2009).

Poor sanitation facilities, absence of toilet and open defecation in the slums and consequently the spread of a host of diseases was also reported by Chandramouli (2003). NSSO (2004) observed that, pit toilet was the most common type found in 81.4 percent of houses and best sanitation facility like flush toilet was available only in 3.3 percent of households where the most unhygienic practice of open defecation was practiced by 15.3 percent of the families. So lack of proper sanitation was found to be the core problem. This is well documented by the UN Habitat Report (2003) saying that improved sanitation facilities was observed among less than 50 percent of the families.
Chapter 4

Results and Discussion

Total area and plinth level

Total area of the house is yet another factor which decides health and well-being of the people live in it. Overcrowding often leads to unhealthy living conditions and infections. In the present study majority of the households (64.3%) had an area between 100 to 300 square feet and 18.9 percent had living area of 300 to 500 square feet. Maximum area of 500 to 700 square feet was enjoyed by only 1.8 percent of the sample and least area by 15 percent. The average floor area of urban household as given by NSSO (2002) is 37 square meters.

Plinth level is defined by NSSO (2004) as the level of the constructed ground floor of the house above the land on which the building was constructed. Most (39.5%) of the houses in the slums had a plinth level of zero to 1 feet, whereas almost 28.1 percent had ground level flooring which was not raised at all, and 25.7 percent of houses had raised plinth level up to 1 to 2 feet. Two to three feet level was observed in 6.6 percent of the houses only. NSSO (2004) found that the richer households generally had higher plinth levels than the poorer households, and to that extent, had more hygienic dwelling units.

Ceiling height

Height of ceiling was important for proper ventilation. In majority (72.8%) of the houses, roofs were as high as 6 to 7 feet, 21.3 percent of the roofs had less than 6 feet height. More than 7 feet was seen in six percent houses.

House Construction materials and finishes

Construction details of houses were studied in terms of materials and finishes used at different parts of house, and the data is furnished in the following table.
Table 11 Details on house construction materials and finishes

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Type of foundation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong</td>
<td>159 (47.6)</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
<td>151 (45.2)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>24 (7.2)</td>
</tr>
<tr>
<td></td>
<td>Material used for foundation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stone</td>
<td>137 (41.0)</td>
</tr>
<tr>
<td></td>
<td>Masonry</td>
<td>120 (35.9)</td>
</tr>
<tr>
<td></td>
<td>Concrete</td>
<td>53 (15.9)</td>
</tr>
<tr>
<td></td>
<td>No foundation</td>
<td>24 (7.2)</td>
</tr>
<tr>
<td>2.</td>
<td>Type of roof</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>273 (81.7)</td>
</tr>
<tr>
<td></td>
<td>Flat</td>
<td>61 (18.3)</td>
</tr>
<tr>
<td></td>
<td>Materials used</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tile roof</td>
<td>177 (53.0)</td>
</tr>
<tr>
<td></td>
<td>Concrete</td>
<td>42 (12.6)</td>
</tr>
<tr>
<td></td>
<td>Light roof</td>
<td>42 (12.6)</td>
</tr>
<tr>
<td></td>
<td>Asbestos</td>
<td>40 (12.0)</td>
</tr>
<tr>
<td></td>
<td>Palm leaf</td>
<td>33 (9.9)</td>
</tr>
<tr>
<td>3.</td>
<td>Wall Finishes (Present Condition)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cracks and cervices</td>
<td>203 (60.8)</td>
</tr>
<tr>
<td></td>
<td>Flaked</td>
<td>15 (4.5)</td>
</tr>
<tr>
<td></td>
<td>Smooth</td>
<td>116 (34.7)</td>
</tr>
<tr>
<td></td>
<td>Materials used</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brick</td>
<td>281 (84.1)</td>
</tr>
<tr>
<td></td>
<td>Hollow brick</td>
<td>11 (3.3)</td>
</tr>
<tr>
<td></td>
<td>Mud</td>
<td>25 (7.5)</td>
</tr>
<tr>
<td></td>
<td>Stone</td>
<td>4 (1.2)</td>
</tr>
<tr>
<td></td>
<td>Wood</td>
<td>13 (3.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Floor finishes (Present Condition)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smooth</td>
<td>104 (31.1)</td>
</tr>
<tr>
<td></td>
<td>Cracks &amp; cervices</td>
<td>196 (58.7)</td>
</tr>
<tr>
<td></td>
<td>Flaked</td>
<td>4 (1.2)</td>
</tr>
<tr>
<td></td>
<td>Unfinished</td>
<td>30 (9.0)</td>
</tr>
<tr>
<td></td>
<td>Material used</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cement</td>
<td>273 (81.7)</td>
</tr>
<tr>
<td></td>
<td>Brick</td>
<td>17 (5.1)</td>
</tr>
<tr>
<td></td>
<td>Tiles</td>
<td>9 (2.7)</td>
</tr>
<tr>
<td></td>
<td>Mud</td>
<td>21 (6.3)</td>
</tr>
<tr>
<td></td>
<td>Other Materials</td>
<td>14 (4.2)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
Foundation

Foundation is said to be the base of any strong building, strength of the foundation depends on the depth and material used. Majority of the houses (47.6%) were found to have strong foundations. But there were also few houses (7.2%) seen without foundation.

Materials commonly used for foundation were stone, concrete and masonry works. Stone the strongest material for foundation was used in 41 percent of houses. Masonry was also used as an alternate for stone by 35.9 percent. Concrete was preferred by 15.9 percent.

Roof

Roof is an important feature for any building. The roof shape usually are of two types, of which slope roof was used in majority (81.7%), of houses in the slums. But 18.3 percent of houses had flat roofs also.

The material used for roof construction by almost half (53.0%) of the sample was tiles, while the second preference went for light roofing (12.6%), and concrete (12.6%) roofing. Asbestos (12.0%) was also preferred by quite a few sample. Census of India (2001) data profile of Kerala showed that tiles (50.2%) and concrete (38.2%) were mostly used as roofing materials.

Wall

Appearance of wall depicted that though it was plastered, there were cracks with cervices (60.8%) all over. Smooth finished walls were also present (34.7%) in the slum houses.
Materials used for constructing walls were bricks for 84.1 percent of the households, mud (7.5%) and wooden planks (3.9%). In some houses stone was used (1.2%), hollow bricks was also observed in 3.3 percent of slum houses. Census of India (2001) reported that brick and stone were the common materials for construction of walls in Kerala.

**Floor**

Floors were also mostly (58.7%) cracked with cervices. Smooth floors were found only in 31.1 percent of houses, while flaked (1.2%) and unfinished surfaces (9.0%) were also observed. NSSO (2002) states that eleven out of hundred houses in urban areas are in bad condition and required immediate major repair.

Different materials for floor finish are available in the market today. Of these cement was the most preferred material by majority (81.7%) of the slum residents. Mud was used by 6.3 percent, next preference was for brick by 5.1 percent. Other material like sheets, and wooden planks etc were laid in 4.2 percent of houses. The least used material was floor tiles (2.7%). Preference for cement in Kerala, as a material for floor finish, was also reported by Census of India (2001).

**Prevailing conditions of houses**

Prevailing conditions of roof, wall and floor, along with details on dampness, lighting and ventilation was analyzed and given in the table below.
Table 12 Details on prevailing housing status

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Roof</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong</td>
<td>219 (65.6)</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
<td>115 (34.4)</td>
</tr>
<tr>
<td>2.</td>
<td>Wall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong</td>
<td>116 (34.7)</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
<td>218 (65.3)</td>
</tr>
<tr>
<td>3.</td>
<td>Dampness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water stagnation inside the house</td>
<td>191 (57.2)</td>
</tr>
<tr>
<td></td>
<td>Dampness</td>
<td>210 (62.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Floor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong</td>
<td>104 (31.1)</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
<td>230 (68.9)</td>
</tr>
<tr>
<td>5.</td>
<td>Ventilation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adequate</td>
<td>157 (47.0)</td>
</tr>
<tr>
<td></td>
<td>Inadequate</td>
<td>177 (53.0)</td>
</tr>
<tr>
<td>6.</td>
<td>Lighting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adequate</td>
<td>53 (15.9)</td>
</tr>
<tr>
<td></td>
<td>Inadequate</td>
<td>281 (84.1)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

The roof of 65.6 percent of the houses was found to be strong whereas 34.4 percent of the houses had weak roof. Similarly the conditions of wall were also not up to the mark 65.3 percent of the houses had walls with cracks and flakes, and unfinished walls were also common.

Since most of the houses are located in the unhygienic environment, mostly low lying areas, and the chances of water stagnation is more, which was quite evident in the present study (57.2%). Heavy rain, poor condition of roofs and walls, all are responsible for the dampness within the house (62.9%).
Lighting (84.1%) and ventilation (53.0%) was also inadequate in most of the dwellings. Ventilation was generally the extent to which the rooms were open to air and light (NSSO, 2004).

4.1.6 Hygienic Practices

Hygienic practices are usually poor among slum dwellers. Over crowding insanitary living conditions, illiteracy and poverty all these are responsible for poor hygienic practices. Hygiene and sanitation found to play an important role in determining the health of the people. The personal hygienic practices of the slum dwellers are given in table.

Table 13 Personal hygienic practices of women

<table>
<thead>
<tr>
<th>S.No</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Brushing teeth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily morning</td>
<td>307 (91.9)</td>
</tr>
<tr>
<td></td>
<td>Before going to bed</td>
<td>10 (3.0)</td>
</tr>
<tr>
<td></td>
<td>Separate tooth brush</td>
<td>307 (91.9)</td>
</tr>
<tr>
<td></td>
<td>Common tooth brush</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td>Using hand inspite of tooth brush</td>
<td>7 (2.1)</td>
</tr>
<tr>
<td>2.</td>
<td>Combing hair</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily combing</td>
<td>303 (90.7)</td>
</tr>
<tr>
<td></td>
<td>Use of separate combs</td>
<td>221 (66.2)</td>
</tr>
<tr>
<td>3.</td>
<td>Bathing habits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>314 (94.0)</td>
</tr>
<tr>
<td></td>
<td>Alternate days</td>
<td>13 (3.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Washing Clothes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily washing</td>
<td>290 (87.1)</td>
</tr>
<tr>
<td></td>
<td>Sun drying</td>
<td>280 (83.83)</td>
</tr>
<tr>
<td>5.</td>
<td>Washing hands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before food with water</td>
<td>302 (90.41)</td>
</tr>
<tr>
<td></td>
<td>Before food with soap and water</td>
<td>287 (85.3)</td>
</tr>
<tr>
<td></td>
<td>After food with water</td>
<td>334 (100.0)</td>
</tr>
<tr>
<td></td>
<td>After food with soap and water</td>
<td>240 (71.8)</td>
</tr>
<tr>
<td></td>
<td>After toilet with soap and water</td>
<td>241 (72.2)</td>
</tr>
<tr>
<td></td>
<td>Cutting nails regularly</td>
<td>283 (84.7)</td>
</tr>
<tr>
<td>6.</td>
<td>Use of Foot wear</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regularly while going out</td>
<td>189 (56.6)</td>
</tr>
<tr>
<td></td>
<td>Not regularly</td>
<td>145 (43.4)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
Poor personal hygiene was observed in a study by Muoki et al. (2008). Brushing the teeth once daily in the morning was practiced by 91.9 percent of the sample. Brushing teeth twice a day, morning and before going to bed was followed by only 3 percent of sample. Combing hair daily was the habit of 90.7 percent of the sample but only 66.2 percent used separate combs.

The habit of bathing daily was observed among 94.0 percent of sample. Only very few (3.9%) bathed on alternate days. Clothes were washed daily (87.1%) and sun dried (83.8%).

Even though majority of sample washed hands before food (90.41%), use of soap and water for washing hands was observed among 85.3 percent. All washed their hands after food (100%), but the use of soap was observed only among 71.8 percent. Washing with soap and water after toilet was practised by 72.2 percent of the sample. Regular cutting of nails (84.7%) was also observed among families.

Regular use of foot wear was found to be less common among slum dwellers (56.6%), rest of them used only occasionally. Poor personal hygiene among slum population was also reported by Muoki et al. (2008). According to Nath (2003) personal and domestic hygienic practices cannot be improved without improving basic amenities, such as water supply, waste water disposal, solid waste management and the problems of human settlements.
Environmental hygiene

Household and environmental hygiene are important factors which has direct impact on health. Environmental factors are the major determinants of almost all non communicable diseases (Ghaffar et al., 2007). The various aspects related to this were assessed and presented in the following table.

Table 14 Cleanliness in the house and its surroundings

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency(n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sweeping the house</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>223 (66.8)</td>
</tr>
<tr>
<td></td>
<td>Twice a week</td>
<td>92 (27.5)</td>
</tr>
<tr>
<td></td>
<td>Weekly</td>
<td>19 (5.7)</td>
</tr>
<tr>
<td>2.</td>
<td>Sweeping the premises</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>325 (97.3)</td>
</tr>
<tr>
<td></td>
<td>Twice a week</td>
<td>8 (2.4)</td>
</tr>
<tr>
<td></td>
<td>weekly</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>3.</td>
<td>Mopping the house</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>231 (69.2)</td>
</tr>
<tr>
<td></td>
<td>Twice a week</td>
<td>54 (16.2)</td>
</tr>
<tr>
<td></td>
<td>Weekly</td>
<td>27 (8.1)</td>
</tr>
<tr>
<td></td>
<td>Once in a while</td>
<td>5( 1.5)</td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>17 (5.08)</td>
</tr>
<tr>
<td>4.</td>
<td>Use of disinfectants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>200 (59.9)</td>
</tr>
<tr>
<td></td>
<td>Twice daily</td>
<td>43 (12.9)</td>
</tr>
<tr>
<td></td>
<td>Once in two days</td>
<td>27 (8.1)</td>
</tr>
<tr>
<td></td>
<td>Weekly</td>
<td>7 (2.1)</td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>57 (17.1)</td>
</tr>
<tr>
<td>5.</td>
<td>Other household cleaning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fortnightly</td>
<td>68 (20.4)</td>
</tr>
<tr>
<td></td>
<td>Once in a month</td>
<td>234 (70.1)</td>
</tr>
<tr>
<td></td>
<td>Rarely</td>
<td>32 (9.6)</td>
</tr>
<tr>
<td>6.</td>
<td>Kitchen cleaning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>200 (59.9)</td>
</tr>
</tbody>
</table>
### Results and Discussion

#### 7. Waste Water Disposal

<table>
<thead>
<tr>
<th>Method</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposal through drains</td>
<td>253 (75.8)</td>
</tr>
<tr>
<td>Cess pool</td>
<td>18 (5.4)</td>
</tr>
<tr>
<td>Disposed to kitchen garden</td>
<td>51 (15.3)</td>
</tr>
<tr>
<td>Soakage pit</td>
<td>12 (3.6)</td>
</tr>
</tbody>
</table>

#### 8. Disposal of solid waste

<table>
<thead>
<tr>
<th>Method</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dumping</td>
<td>164 (49.1)</td>
</tr>
<tr>
<td>Burning</td>
<td>128 (38.3)</td>
</tr>
<tr>
<td>Composting</td>
<td>22 (6.6)</td>
</tr>
<tr>
<td>Tipping</td>
<td>20 (6.0)</td>
</tr>
</tbody>
</table>

#### 9. Type of dumping

<table>
<thead>
<tr>
<th>Type</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste dumped to barren land</td>
<td>62 (38.1)</td>
</tr>
<tr>
<td>Waste bins</td>
<td>83 (50.9)</td>
</tr>
<tr>
<td>Dropped on road side</td>
<td>19 (11.0)</td>
</tr>
</tbody>
</table>

#### 10. Toilet

<table>
<thead>
<tr>
<th>Activity</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular cleaning of bathroom</td>
<td>299 (89.5)</td>
</tr>
<tr>
<td>Drainage to canal</td>
<td>292 (87.4)</td>
</tr>
<tr>
<td>Regular cleaning of toilet</td>
<td>289 (86.5)</td>
</tr>
<tr>
<td>Presence of water seal</td>
<td>298 (89.2)</td>
</tr>
<tr>
<td>Light and ventilation</td>
<td>293 (88.0)</td>
</tr>
</tbody>
</table>

#### 11. Night soil disposal

<table>
<thead>
<tr>
<th>Method</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic tank</td>
<td>150 (44.9)</td>
</tr>
<tr>
<td>Directed to drains</td>
<td>101 (30.2)</td>
</tr>
<tr>
<td>Directed to nearby rivers/kanals</td>
<td>83 (24.9)</td>
</tr>
</tbody>
</table>

#### 12. Pets and livestock

<table>
<thead>
<tr>
<th>Condition</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of stray dogs</td>
<td>250 (74.9)</td>
</tr>
<tr>
<td>Livestock</td>
<td>51 (15.3)</td>
</tr>
<tr>
<td>Pets</td>
<td>82 (24.6)</td>
</tr>
<tr>
<td>Separate accommodation for pets/livestock</td>
<td>32 (9.0)</td>
</tr>
</tbody>
</table>

#### 13. Environmental hygiene

<table>
<thead>
<tr>
<th>Condition</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water stagnation</td>
<td>214 (64.1)</td>
</tr>
<tr>
<td>Polluted canals</td>
<td>204 (61.1)</td>
</tr>
<tr>
<td>Waste dumping place near by</td>
<td>190 (56.9)</td>
</tr>
<tr>
<td>Pollution from industry</td>
<td>49 (14.7)</td>
</tr>
<tr>
<td>Drainage facility</td>
<td>169 (50.6)</td>
</tr>
<tr>
<td>Canals closed by slabs</td>
<td>121 (36.5)</td>
</tr>
</tbody>
</table>

*(Numbers in parentheses indicate percentages)*
Cleanliness inside the house

Household hygiene is as equally important as personal hygiene. Majority of the sample were aware that sweeping daily is essential but it was practiced only by 66.8 per cent. But among some families sweeping was done only twice a week (27.5%) or weekly once (5.7%). Sweeping the premises was considered essential and was practised daily by 97.3 percent, while 2.4 percent did it twice a week.

Daily mopping was practised by 69.2 percent of families, while 16.2 percent did it twice a week. Among the rest, 5.08 percent did not mop the houses at all and 1.5 percent did mop the house once in a while. Mopping the house daily using disinfectants was prevalent only among 59.9 percent of the sample, 12.9 percent used disinfectant twice daily, while 8.1 percent used disinfectant once in two days.

Other household cleaning was done on monthly basis by 70.1 percent of families in slums. Fortnight cleaning was also observed among 20.4 percent. But 9.6 percent did not do such cleaning at all. Cleanliness of the kitchen was an important factor. Majority (59.9%) of them cleaned their kitchen daily followed by weekly cleaning (24.55%) and twice a week (15.56%).

Waste Disposal

Waste water disposal by slum residents, was mainly done through common drains (75.8%). According to NSSO (2004) a system of carrying waste water and liquid waste of the dwelling unit was considered as
drainage system, 15.3 percent disposed the waste water to kitchen garden and 3.6 percent to soakage pit. Water stagnated as cesspool (5.4%) could also be seen in the slums, which is most undesirable and unsafe as it could lead to spread of infections.

Other solid waste was dumped (49.1%) or burned (38.3%), composting (6.6%) and tipping (6.0%) were also practiced. Dumping was the usual mode of disposal; where waste was dumped into the waste bins (50.9%) or to barren land (38.1%). This method of waste disposal is also not safe as it invites flies and insects and make the surrounding unhygienic and unhealthy.

**Toilet hygiene and sanitation**

Toilets should also be kept clean and safe to use. Among the slum residents regular cleaning of toilets (86.5%) was done by majority. Water seal for toilet was present in most (89.2%) of the toilets, 88 percent of the toilets had proper lighting and ventilation. Toilets were connected to septic tank (44.9%), which is considered as a better method by NSSO (2004). Disposal of night soil in drain (30.2%) and also in rivers or nearby canals (24.9%) were also practiced, which was not safe.

**Pets/livestock accommodation**

Even though pets (24.6%) and livestocks (15.3%) were present in the slums, separate accommodation was provided only by 9.0 percent of the slum households. In the majority of cases they were allowed to be on small varandha attached to house or sometimes inside the house also,
which could be considered as a most unhygienic practice. As Nath (2003) pointed out inadequacy of housing in most urban poor invariably leads to poor home hygiene.

**Cleanliness outside the house**

Water stagnation, the breeding place of various diseases, was reported by 64.1 percent slum families. Polluted canals nearby the colony were also posing problem for 61.1 percent of families. More than half (56.9%) of them reported the problems of solid waste dumping in the vicinity. Apart from this industrial pollution (14.7%), lack of drainage facility (49.4%) and open drains (63.5%) were also pointed out as problems of slum residents. According to Nath (2003) problems of the environment and of domestic hygiene are always related to poverty of population and the sanitation of settlements. Slum houses perch on the edges of fetid cesspools as there is inadequate sewer drainage and little access to sanitary latrines (UNICEF, 2008).

**Water hygiene**

Access to water is very essential to ensure sanitation. Normally slums are deprived in terms of access to water and sanitation. Details on sources of water and its handling were studied and presented in table 15.
Table 15 Details on water hygiene

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Source of drinking water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corporation</td>
<td>82 (24.9)</td>
</tr>
<tr>
<td></td>
<td>Street Pipe</td>
<td>160 (47.9)</td>
</tr>
<tr>
<td></td>
<td>Lorry supply</td>
<td>89 (26.6)</td>
</tr>
<tr>
<td></td>
<td>Well water</td>
<td>2 (0.6)</td>
</tr>
<tr>
<td>2.</td>
<td>Types of treatment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plain boiling</td>
<td>242 (72.5)</td>
</tr>
<tr>
<td></td>
<td>Boil with jeera/any other spice</td>
<td>51 (15.3)</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>41 (12.2)</td>
</tr>
<tr>
<td>3.</td>
<td>Storage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Closed container</td>
<td>313 (93.7)</td>
</tr>
<tr>
<td></td>
<td>Open vessels</td>
<td>12 (3.6)</td>
</tr>
<tr>
<td></td>
<td>Bottles</td>
<td>9 (2.7)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

The important source of drinking water was corporation water supplied through street pipes (47.9%), one fourth (24.9%) of the sample had their own water connection at home and the other quarter depending on lorry supply (26.6%) of water. Only 0.6 per cent used well water. NSSO (2004) also reported that major source of drinking water in slums is either tap or tube well. Chandramouli (2003) reported that in Chennai only 26 percent had access to drinking water within their premises. But in the present study majority had access to drinking water, except the ones getting corporation water through lorry supply. As reported by them the irregularity of this water supply cause problems to the slum dwellers very often.

Water was further treated either by plain boiling (72.5%) with or without spices (15.3%). No such treatment was given, prior to drinking, by 12.2 percent of the families. Water storage was as important as treatment. Water was kept in closed containers by majority (93.7%) of the population which is a safe practice. Open vessels (3.6%) and bottles (2.7%) were also
used. Household water treatment and safe storage (HWTS) interventions can lead to dramatic improvements in drinking water quality and reductions in diarrhoeal disease (WHO, 2010).

Food Hygiene and related practices

Food hygiene and related practices are based on the knowledge and awareness of the sample on these aspects. Various factors related to this, about which the women were aware of and practiced in the day to day life, are obtained and given in table 16.

Table 16 Food hygiene and related practices

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Seasonal foods are more nutritious</td>
<td>182 (54.5)</td>
</tr>
<tr>
<td>2.</td>
<td>Food Purchased from roadside is not hygienic</td>
<td>130 (38.9)</td>
</tr>
<tr>
<td>3.</td>
<td>Fresh food is more nutritious</td>
<td>274 (82.0)</td>
</tr>
<tr>
<td>4.</td>
<td>Packed food is more safe</td>
<td>180 (53.9)</td>
</tr>
<tr>
<td>5.</td>
<td>Sun drying of cereals and pulses improves storage quality</td>
<td>68 (20.4)</td>
</tr>
<tr>
<td>6.</td>
<td>Proper storage prevents food spoilage by pests</td>
<td>208 (62.3)</td>
</tr>
<tr>
<td>7.</td>
<td>Food containers should be washed and sun dried</td>
<td>273 (81.7)</td>
</tr>
<tr>
<td>8.</td>
<td>Vegetable should be washed before storing</td>
<td>122 (36.5)</td>
</tr>
<tr>
<td>9.</td>
<td>Leafy vegetables could be stored in moist cloth</td>
<td>54 (16.2)</td>
</tr>
<tr>
<td>10.</td>
<td>Fly proof cover prevent infection</td>
<td>145 (73.7)</td>
</tr>
<tr>
<td>11.</td>
<td>Vegetable should be washed before cutting</td>
<td>293 (87.7)</td>
</tr>
<tr>
<td>12.</td>
<td>Vegetable must be cut into large pieces</td>
<td>141 (42.2)</td>
</tr>
<tr>
<td>13.</td>
<td>Food must be cooked with adequate water to preserve nutrients</td>
<td>254 (76.0)</td>
</tr>
<tr>
<td>14.</td>
<td>Throwing stock depletes nutrients</td>
<td>225 (67.4)</td>
</tr>
<tr>
<td>15.</td>
<td>Vessels should be covered during cooking</td>
<td>301 (90.1)</td>
</tr>
<tr>
<td>16.</td>
<td>Adding of soda destroys nutrients</td>
<td>106 (31.7)</td>
</tr>
<tr>
<td>17.</td>
<td>Iron vessels increase the iron content</td>
<td>95 (28.4)</td>
</tr>
<tr>
<td>18.</td>
<td>Absorption method prevent nutrient loss</td>
<td>143 (72.2)</td>
</tr>
<tr>
<td>19.</td>
<td>Reheating of food depletes nutrients</td>
<td>32 (9.6)</td>
</tr>
<tr>
<td>20.</td>
<td>Food should be kept closed before serving</td>
<td>320 (95.8)</td>
</tr>
<tr>
<td>21.</td>
<td>Serving vessels should be clean</td>
<td>319 (95.5)</td>
</tr>
<tr>
<td>22.</td>
<td>Food should be served in clean surroundings</td>
<td>282 (84.4)</td>
</tr>
<tr>
<td>23.</td>
<td>Spoon feeding for children is better than hand feeding</td>
<td>79 (23.7)</td>
</tr>
<tr>
<td>24.</td>
<td>Tying of hair during cooking is hygienic</td>
<td>310 (92.8)</td>
</tr>
<tr>
<td>25.</td>
<td>Washing hands before cooking is hygienic</td>
<td>311 (92.5)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
Awareness and practice of the sample on various aspects related to food hygiene when studied could bring to light the following facts.

More than 90 percent of women knew about the hygienic measures to be adopted by the food handlers during preparation and serving of food. These included factors like keeping cooked food in covered container (95.8%), serving food in clean vessels (95.5%), tying hair (92.8%), and washing hands (92.5%) before start cooking, cooking food in covered containers (90.1%)

Above 80 percent awareness and practices were reported in the case of techniques to prevent direct contamination of foods such as washing vegetables before cutting (87.7%), importance of serving foods in clean surroundings (84.4%), washing and sundrying of food containers (81.7%) and use of fresh foods (82.0%). Desirable cooking practices like cooking in just enough water (76.0%), absorption method of cooking (72.2%) and use of left over stock (67.4%) were also observed by a good percentage of women.

Least awareness and practice were noticed in food storage practices like storing vegetables after washing (36.5%) and storing by covering with moist cloth (16.2%).

Use of spoon for feeding children was practiced only by 23.7 percent, neither they knew the need of it. Street foods consumption was found to be among 38.9 percent but lack of awareness on their ill effects was also there.
In short women at slums had better awareness and practice on food hygiene aspects particularly during cooking and serving food. Desirable food preparation techniques to conserve nutrients were also followed to an appreciable extent. The gap was mainly on food storage practices and feeding of young children. Street food consumption and techniques to improve the nutritional value of available foods.

**Availability and use of public utilities**

Availability of basic services with special reference to its utility was studied. The basic services include electrification, drinking water, transport, educational, medical, and marketing and recreation. The details are presented in table 17.

**Table 17 Availability and use of basic services**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Availability (n=334)</th>
<th>Usage (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Electrification</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>297 (88.9)</td>
<td>297 (88.9)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>37 (11.1)</td>
<td>Nil</td>
</tr>
<tr>
<td>2.</td>
<td>Street Light</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>279 (83.5)</td>
<td>279 (83.5)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>55 (16.5)</td>
<td>Nil</td>
</tr>
<tr>
<td>3.</td>
<td>Drinking water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corporation</td>
<td>82 (24.9)</td>
<td>82 (24.9)</td>
</tr>
<tr>
<td></td>
<td>Public tap</td>
<td>160 (47.9)</td>
<td>160 (47.9)</td>
</tr>
<tr>
<td></td>
<td>Lorry supply</td>
<td>89 (26.6)</td>
<td>89 (26.6)</td>
</tr>
<tr>
<td>4.</td>
<td>Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Walkable</td>
<td>258 (77.2)</td>
<td>258 (77.2)</td>
</tr>
<tr>
<td></td>
<td>Very near</td>
<td>64 (19.2)</td>
<td>64 (19.2)</td>
</tr>
<tr>
<td></td>
<td>Very far</td>
<td>12 (3.6)</td>
<td>12 (3.6)</td>
</tr>
</tbody>
</table>
### Results and Discussion

#### 5. Transport
- Available: 175 (52.4)
- Not available: 159 (47.6)

#### 6. Education
- Preschool: 332 (99.4) - 312 (96.4)
- Creche: 17 (5.1) - 6 (0.9)
- Primary School: 209 (62.57) - 285 (85.32)
- High School: 126 (37.72) - 156 (46.7)
- Higher Secondary School: 143 (42.81) - 17 (5.1)
- College: 243 (72.8) - 7 (2.1)

#### 7. Medical Facilities
- Govt. Hospitals: 157 (47.0) - 248 (74.25)*
- Private: 67 (20.1) - 45 (13.47)
- Homeo: 92 (27.6) - 30 (8.98)
- Ayurvedha: 18 (5.4) - 11 (3.3)

#### 8. Marketing
- Ration Shop: 228 (68.3) - 254 (76.04)*
- Market place: 264 (79.0) - 314 (94.01)*
- Vegetable shops: 287 (85.9) - 320 (95.8)*
- Medical shop: 210 (62.9) - 220 (65.86)*
- Bakery: 221 (66.2) - 43 (12.9)
- Hotel: 207 (62.0) - 33 (9.9)
- Post Office: 147 (44.0) - 147 (44.0)
- Bank: 106 (31.7) - 44 (13.2)

#### 9. Recreation
- Movie house: 75 (22.5) - 71 (21.3)
- Park: 93 (27.8) - 76 (22.8)
- Reading room: 35 (10.5) - 8 (2.4)
- Play ground: 19 (5.7) - 15 (4.5)

(Numbers in parentheses indicate percentages)
*Not available near slums, but use this services wherever available
Electricity and water

Electricity has become a basic need of the population. Only 79 percent of slum dwellers in Chennai has this facility (Chandramouli, 2003). In this study almost 88.9 percent of the houses in slums are electrified. Street light facility was available for 83.5 percent of slum population.

For drinking water, the slum people mainly dependent on public water taps (47.9%) on those areas where this service is not available, the people had to rely on lorry supply of corporation water (26.6%).

Transportation

Road facility was available for majority (77.2%) of people in the slums. Some had very easy access to the main road (19.2%) and some lived a bit far away (3.6%). Public transport facility was available only for 52.4 percent people.

Educational facilities

Basic facilities like preschool (99.4%) was available, close to the living place and this facility was utilised by 96.4 percent of population. Though 5.1 percent of people reported that there was crèche in their slum, only very few (0.9%) utilised it.

Since most of the slums are situated in urban pockets the educational facilities available in the city was made use of. Majority (85.32%) of the sample utilised primary school as well as high school (46.7%) facilities of the city. While comparatively less number of slum
children had utilised higher secondary (5.1%) and college education (2.1%) facilities.

**Medical Facilities**

Availability of health care facilities like Government (47.0%) and Private hospitals (20.1%), Homeo (27.6%) and Ayurvedha (5.4%) centres in the nearby city was highlighted by the slum residents, of which except Governmental hospital the rest were not fully utilized by the people. Whereas government hospitals in faraway places of the city were also utilized extensively by people in the slums. This may be because of the availability of transport facilities and free medical services.

**Marketing and other facilities**

Ration shop (68.3%), Market place (85.9%), medical shop (62.9%), Post Office (44.0%) and bank (31.7%) were some of the basic services available at the slums studied. As far as utilisation is concerned almost all the above services are extensively used by the slum residents, except bank. Only 13.2 percent made use of this service where as catering services like hotel (62.0%) and bakery (66.0%) though available was utilised sparingly by the sample.

**Recreational facilities**

Movie is an important form of recreation in these days. Movie theatre was accessible to 22.5 percent of slum residents. Park was yet another recreational facilities available (27.8%) and utilized (22.8%) by
people. Regarding the reading room and playground the availability as well as usage were very limited.

4.2. **Nutritional and Health Status of Women**

Women's health and nutritional status is inextricably bound with social, cultural, and economic factors that influence all aspects of their lives, and it has consequences not only on the women themselves but also for the well-being of their children (World Bank Group, 1996).

4.2.1. **Nutritional status of women**

Nutritional status of women covers details like anthropometry, biochemical, clinical and diet survey. The data procured on these lines are analysed and discussed in the following sections.

4.2.1.1 **Nutritional anthropometry**

Nutritional anthropometry has been defined as ‘measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition’ (Jelliffe, 1966). The anthropometric measurements of women in terms of height, weight and body mass index was used for the study. Waist-hip ratio of women was also assessed. The data was systematically analyzed and presented in the following tables.

**Age wise distribution of sample**

The distribution of the sample based on age is presented in table 18.
Table 18 Age wise distribution of women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Age (years)</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20-25</td>
<td>86</td>
<td>25.75</td>
</tr>
<tr>
<td>2</td>
<td>26-30</td>
<td>148</td>
<td>44.31</td>
</tr>
<tr>
<td>3</td>
<td>31-35</td>
<td>70</td>
<td>20.96</td>
</tr>
<tr>
<td>4</td>
<td>36-40</td>
<td>30</td>
<td>8.98</td>
</tr>
<tr>
<td>Total</td>
<td>334</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Majority (44.31%) of the sample were in the age group of 26 to 30 years, because women with children of 3 to 5 years were more in number in this age group. This was followed by 20 to 25 year group (25.75%) and 31 to 35 year group (20.96%). The least (8.98%) represented age group was 36 to 40 years.

Age and area wise distribution of sample

The age wise representation of the sample from eight selected slum locations is presented in table 19.

Table 19 Age and slum wise distribution of women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Slums</th>
<th>Age in years</th>
<th>Pooled (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20-25</td>
<td>26-30</td>
</tr>
<tr>
<td>1</td>
<td>Atlantis</td>
<td>6 (17.6)</td>
<td>13 (38.2)</td>
</tr>
<tr>
<td>2</td>
<td>Fort Kochi</td>
<td>15 (51.7)</td>
<td>10 (34.5)</td>
</tr>
<tr>
<td>3</td>
<td>Karithala</td>
<td>3 (37.5)</td>
<td>2 (25.0)</td>
</tr>
<tr>
<td>4</td>
<td>Pallichal</td>
<td>6 (12.0)</td>
<td>25 (50.0)</td>
</tr>
<tr>
<td>5</td>
<td>Puthuvpyu</td>
<td>21 (23.6)</td>
<td>55 (61.8)</td>
</tr>
<tr>
<td>6</td>
<td>Santhom</td>
<td>6 (30.0)</td>
<td>6 (30.0)</td>
</tr>
<tr>
<td>7</td>
<td>Thevara</td>
<td>6 (14.0)</td>
<td>18 (41.9)</td>
</tr>
<tr>
<td>8</td>
<td>Vathuruthy</td>
<td>31 (50.8)</td>
<td>14 (23.0)</td>
</tr>
<tr>
<td>Pooled</td>
<td>94 (28.1)</td>
<td>143 (42.8)</td>
<td>84 (25.1)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
Maximum number of sample (women) is from Puthuvypu slum (89) followed by vathuruthy (61) and Pallichal (50) as these slums had proportionately more number of women population. Age wise distribution showed that maximum number of sample in the age group of 26 to 30 years were from Puthuvypu (61.8%) followed by Pallichal (50.0%) and Thevara (41.9%) slums. Whereas younger age groups were mostly from Fort Kochi (51.7%) Vathuruthy (50.8%) and Karithala (37.5%).

Thus it is obvious that representation of all age groups from all the selected slums was included in the sample.

Mean height and weight

Mean height and weight of the sample were statistically analysed. The standard values used for comparison are the 50th percentile values of heights and weights specified by NCHS (1987). The results are presented in the table below.

Table 20 Mean height of mothers in comparison with standard height

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Mean ± SD</th>
<th>Standard weight</th>
<th>Standard Error</th>
<th>Mean difference</th>
<th>'t' value</th>
<th>'p' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-25</td>
<td>152.7 ±0.0562</td>
<td>163.3</td>
<td>0.00547</td>
<td>-10.60 (-6.49)</td>
<td>-19.393</td>
<td>0.000**</td>
</tr>
<tr>
<td>26-30</td>
<td>153.4 ±0.0599</td>
<td>162.8</td>
<td>0.00477</td>
<td>-9.36 (-5.77)</td>
<td>-19.649</td>
<td>0.000**</td>
</tr>
<tr>
<td>31-35</td>
<td>153.3 ±0.0624</td>
<td>162.8</td>
<td>0.00637</td>
<td>-9.49 (-5.83)</td>
<td>-14.886</td>
<td>0.000**</td>
</tr>
<tr>
<td>36-40</td>
<td>151.4 ±0.0721</td>
<td>162.8</td>
<td>0.01803</td>
<td>-11.36 (-7.00)</td>
<td>-6.303</td>
<td>0.000**</td>
</tr>
<tr>
<td>Pooled</td>
<td>153.11 ±0.0600</td>
<td>162.92</td>
<td>0.00310</td>
<td>-0.981</td>
<td>-31.666</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

®Ref: NCHS (1987)
(Numbers in parentheses indicate percentage Deviation)
Figure 4 Comparison of mean height with standard

Comparison of mean height with standard indicated height deficit in all age groups. The deviation of mean height from the standard height for respective age ranged between 0-6 to -7.2 percent. The deviation up to 10 percent on either side from standard is considered as normal. However the ‘t’ value calculated clearly indicated that these differences were highly significant (P<0.01).

The NNMB (2006) survey reported a mean height of 151.1 centimeter for adult women and a mean weight of 46.9 kilogram. In the present study the mean value for height (152.2 cm) observed is comparable with the NNMB values.
Table 21 Mean weight of mothers in comparison with standard weight

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Age (yrs)</th>
<th>Mean ± SD</th>
<th>Standard Weight</th>
<th>Standard Error</th>
<th>Mean difference</th>
<th>'t' value</th>
<th>'p' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20-25</td>
<td>50.15 ± 9.059</td>
<td>59.9</td>
<td>0.880</td>
<td>-9.75 (-16.27)</td>
<td>-11.079</td>
<td>0.000**</td>
</tr>
<tr>
<td>2</td>
<td>26-30</td>
<td>50.96 ± 9.076</td>
<td>63.5</td>
<td>0.722</td>
<td>-12.54 (-19.74)</td>
<td>-17.364</td>
<td>0.000**</td>
</tr>
<tr>
<td>3</td>
<td>31-35</td>
<td>52.86 ± 11.593</td>
<td>63.5</td>
<td>1.183</td>
<td>-10.64 (-16.755)</td>
<td>-8.989</td>
<td>0.000**</td>
</tr>
<tr>
<td>4</td>
<td>36-40</td>
<td>51.56 ± 12.431</td>
<td>67.1</td>
<td>3.108</td>
<td>-15.54 (-23.15)</td>
<td>-5.00</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

Pooled 51.24 ± 9.937 | 63.5 | 0.512 | -12.26 | -23.914 | 0.000**

® Ref: NCHS (1987)
(Numbers in parentheses indicate percentage Deviation)

Figure 5 Comparison of mean weight with standard
In the case of body weight also clear evidences of deficit ranged from -16.27 percent to -23.15 percent was observed. The ‘t’ values computed also revealed a highly significant difference (P<0.01) between the observed and standard weight measurements of women. It indicated chronic energy deficiency which was found to increase with the age.

The NNMB (2006) survey reported a mean weight for adult women as 46.9 kilogram. While the present study observed a mean weight 51.2 Kg is higher than the national average (46.9 Kg). Hence it can be stated that, slum women of Kerala although suffer from chronic energy deficiency, they are in a slightly better position when compared with Indian women.

**Age and body mass index**

Body mass index is considered as the most suitable, objective anthropometric indicator of nutritional status of the adult (Shetty, 2005). The body mass index of the sample based on age was categorized using BMI classification given by James *et al.* (1988). The results are presented in detail in the following table.
Table 22 Age and BMI Status of women

<table>
<thead>
<tr>
<th>SL.NO</th>
<th>Age (yrs)</th>
<th>CED III (&lt; 16.0)</th>
<th>CED II (&gt; 16.0 - &lt; 17.0)</th>
<th>CED I (&gt; 17.0 - &lt; 18.5)</th>
<th>Low Normal (&gt; 18.5 - &lt; 20.0)</th>
<th>Normal (&gt; 20.0 - &lt; 25.0)</th>
<th>Over weight (&gt; 25.0 - &lt; 30)</th>
<th>Obese I (&gt; 30 - 34.9)</th>
<th>Obese II (&gt; 35 - 39.9)</th>
<th>Pooled</th>
<th>χ2</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20-25</td>
<td>5(5.3)</td>
<td>4(4.3)</td>
<td>7(7.4)</td>
<td>18(19.1)</td>
<td>44(46.8)</td>
<td>15(16.0)</td>
<td>1(1.1)</td>
<td>Nil</td>
<td>94(28.1)</td>
<td>18.342</td>
<td>0.627 NS</td>
</tr>
<tr>
<td>2</td>
<td>26-30</td>
<td>6(4.2)</td>
<td>7(4.2)</td>
<td>15(10.5)</td>
<td>19(13.3)</td>
<td>77(53.8)</td>
<td>17(11.9)</td>
<td>2(1.4)</td>
<td>1(0.7)</td>
<td>143(42.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>31-35</td>
<td>4(4.8)</td>
<td>4(4.8)</td>
<td>12(14.3)</td>
<td>40(47.6)</td>
<td>13(15.5)</td>
<td>7(8.3)</td>
<td>Nil</td>
<td>64(25.1)</td>
<td>84(25.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>36-40</td>
<td>Nil</td>
<td>1(7.7)</td>
<td>1(7.7)</td>
<td>7(53.8)</td>
<td>2(15.4)</td>
<td>1(7.7)</td>
<td>Nil</td>
<td>13(3.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>15(4.5)</td>
<td>15(4.5)</td>
<td>27(8.1)</td>
<td>50(15.0)</td>
<td>168(50.3)</td>
<td>47(14.1)</td>
<td>11(3.3)</td>
<td>1(0.3)</td>
<td>334</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

©Ref. James et al. (1988)
NS-Not Significant
(Numbers in parentheses indicate percentages)
BMI classification of the sample showed that almost half of the population (50.3%) had normal BMI. Most of women with normal BMI belonged to 26 to 30 years and 36 to 40 years. This was followed by the low normal sample (15.0%).

The number of sample seemed to reduce, as BMI status moved towards either side of the normal states, such as overweight and obesity and the stages of chronic energy deficiency.

Low normal was found more among youngest age group of 20 to 25 years (19.1%) and less among 36 to 40 years (7.7%). Chronic energy deficiency was more among middle aged women of 26 to 30 years. Over weight and obesity were found to increase with age. Women of 31 to 35 years (8.3%) and 36 to 40 years (7.7%) were more affected than younger age groups.

However, the above found differences in the BMI status of women belonged to different age groups were not statistically significant, indicating the fact that age has no binding on BMI status of women residing in the slums.

Indian women are thinner and shorter than women in other parts of Asia. This has consequences for their own health and that of their children. India has one of the highest incidences of low birth weight in the world (UNICEF, 2001). This is not simply because India is economically poor; it has a higher gross national product than many other developing countries and has shown remarkable economic growth in recent years. Gender inequality, deeply entrenched in Indian society may be a factor (Sen, 2001). Thinner women had thinner babies, and also that they were significantly thinner than their husbands (Chorghade et al., 2006).

**Slum locations and body mass index**

Table 23 shows the association between body mass index of the sample and the location of slums.
## Table 23 Slum locations and BMI status of women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Area</th>
<th>CED III (&lt; 16.0)</th>
<th>CED II (16.0-&lt;17.0)</th>
<th>CED I (17.0-&lt;18.5)</th>
<th>Low Normal (&gt; 18.5-&lt;20.0)</th>
<th>Normal (&gt; 20.0-&lt;25.0)</th>
<th>Overweight (&gt; 25.0-&lt;30)</th>
<th>Obese I (&gt;30-34.9)</th>
<th>Obese II (&gt;35-39.9)</th>
<th>Pooled</th>
<th>$\chi^2$</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atlantis</td>
<td>3(8.8)</td>
<td>1(2.9)</td>
<td>3(8.8)</td>
<td>5(14.7)</td>
<td>15(44.1)</td>
<td>6(17.6)</td>
<td>1(2.9)</td>
<td>Nil</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fort Kochi</td>
<td>1(3.4)</td>
<td>Nil</td>
<td>2(6.9)</td>
<td>8(27.6)</td>
<td>15(51.7)</td>
<td>3(10.3)</td>
<td>Nil</td>
<td>Nil</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Karithala</td>
<td>Nil</td>
<td>2(25.0)</td>
<td>1(12.5)</td>
<td>1(12.5)</td>
<td>3(37.5)</td>
<td>1(12.5)</td>
<td>Nil</td>
<td>Nil</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Panchal</td>
<td>3(6.0)</td>
<td>5(10.0)</td>
<td>4(8.0)</td>
<td>6(12.0)</td>
<td>24(48.0)</td>
<td>6(12.0)</td>
<td>2(4.0)</td>
<td>Nil</td>
<td>50</td>
<td>62.04</td>
<td>0.100</td>
</tr>
<tr>
<td>5</td>
<td>Puthuvypu</td>
<td>Nil</td>
<td>3(3.4)</td>
<td>7(14.0)</td>
<td>8(16.0)</td>
<td>52(52.4)</td>
<td>15(15.0)</td>
<td>3(3.4)</td>
<td>1(1.1)</td>
<td>89</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>6</td>
<td>Santham</td>
<td>4(20.0)</td>
<td>2(10.0)</td>
<td>1(5.0)</td>
<td>2(10.0)</td>
<td>9(45.0)</td>
<td>Nil</td>
<td>2(10.0)</td>
<td>Nil</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Thevara</td>
<td>2(4.7)</td>
<td>1(2.3)</td>
<td>6(14.0)</td>
<td>5(11.6)</td>
<td>24(55.8)</td>
<td>5(11.6)</td>
<td>Nil</td>
<td>Nil</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Vathuruthy</td>
<td>2(3.3)</td>
<td>1(1.6)</td>
<td>3(4.9)</td>
<td>15(24.6)</td>
<td>26(42.6)</td>
<td>11(18.0)</td>
<td>3(4.9)</td>
<td>Nil</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td></td>
<td>15(4.5)</td>
<td>15(4.5)</td>
<td>27(8.1)</td>
<td>50(15.0)</td>
<td>168(50.3)</td>
<td>47(14.1)</td>
<td>11(3.3)</td>
<td>1(0.3)</td>
<td>334</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
NS-Not Significant
©Ref: James et al. (1988)
CED: Chronic energy deficiency
As the table depicts majority of slum women (50.3%) were classified under normal BMI. More women from Puthuvypu (58.4%), Thevara (55.8%) and Fort Kochi (51.7%) came under normal category. Over weight and obese women were more in Vathuruthy (22.9%) and Atlantis (20.5%) Puthuvypu (20.3%) slums. Whereas low normal weight and energy deficiencies of varying degrees were observed more among Santhom Pallichal and Atlantis slums.

Hence it can be inferred that no single unit of slum studied, could be referred as having most of the women in undernourished or over nourished category.

However, total absence of obesity in the slums of Fort Kochi, Karithala and Thevara is something need special mention. Here also statistical analysis failed to show any significant difference among slums with respect to BMI status of women residing there.

NNMB (2006) reports that chronic energy deficiency was least in Kerala (21.1%), while obesity was high (24.0%), when compared with other states. This finding is not agreeable with women living in urban slums.

Socioeconomic status and body mass index

The socioeconomic status of the slum population is always less than the other urban population. An attempt was made to compute the socioeconomic status of the sample using socioeconomic scale by Kuppuswamy (1981). The following table presents the details.
### Table 24 Socioeconomic status and BMI status of women

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Socioeconomic Status</th>
<th>CED III (≥ 16.0 &lt; 17.0)</th>
<th>CED II (≥ 17.0 &lt; 18.5)</th>
<th>CED I (≥ 18.5 &lt; 20.0)</th>
<th>Low Normal (≥ 20.0 &lt; 25.0)</th>
<th>Normal (≥ 25.0 &lt; 30)</th>
<th>Overweight (≥ 30-34.9)</th>
<th>Obese I (≥ 35-39.9)</th>
<th>Obese II (≥ 40)</th>
<th>Pooled</th>
<th>χ²</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Middle Class</td>
<td>2</td>
<td>Nil</td>
<td>2</td>
<td>7</td>
<td>21</td>
<td>8</td>
<td>2</td>
<td>Nil</td>
<td>42</td>
<td>4.22</td>
<td>0.754</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.8)</td>
<td>(16.7)</td>
<td>(50.0)</td>
<td>(19.0)</td>
<td>(4.8)</td>
<td>(12.57)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lower Class</td>
<td>13</td>
<td>15</td>
<td>25</td>
<td>43</td>
<td>147</td>
<td>39</td>
<td>9</td>
<td>1</td>
<td>292</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.5)</td>
<td>(5.1)</td>
<td>(8.6)</td>
<td>(14.7)</td>
<td>(50.3)</td>
<td>(13.4)</td>
<td>(3.1)</td>
<td>(0.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Numbers in parentheses indicate percentages*

NS—Not Significant

◎Ref: James et al. (1988)

CED: Chronic energy deficiency
Chapter 4

Results and Discussion

Figure 6 Socioeconomic status and body mass index

The classification based on Kuppuswamy scale (1981) grouped majority (87.42%) of the families in the study under low socioeconomic category. Only 12.57 percent reported to have middle class status. As far BMI status is concerned nearly half of the sample was observed to have normal BMI irrespective of socioeconomic status. Chronic energy deficiency was more common among families of low socioeconomic status. Whereas as women with overweight and obesity were seen mostly in families of middle class status. However high grade obesity was totally absent in both the groups. Figure 6 illustrates these facts.

According to a study by Kumar and Sinha (2007) women in slums are undernourished than women in non slum area. In general better BMI status was found to associate with their socioeconomic status. But this association was found to be statistically insignificant.

Standard of living index and body mass index

The standard of living index was calculated on the basis of possessions and consumer durables and living conditions. The classification developed by IIPS (2000) was applied to arrive at the index. The association between the standard of living index and body mass status of the sample is shown in table 25.
Table 25 Standard of living index and body mass status of women

<table>
<thead>
<tr>
<th>SI. No</th>
<th>Standard of living index</th>
<th>CED III (&lt; 16.0)</th>
<th>CED II (&gt; 16.0 - &lt; 17.0)</th>
<th>CED I (&gt; 17.0 - &lt; 18.5)</th>
<th>Low Normal (&gt; 18.5 - &lt; 20.0)</th>
<th>Normal (&gt; 20.0 - &lt; 25.0)</th>
<th>Over weight (&gt; 25.0 - &lt; 30)</th>
<th>Obese I (&gt; 30 - 34.9)</th>
<th>Obese II (&gt; 35 - 39.9)</th>
<th>Pooled</th>
<th>( \chi^2 )</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low</td>
<td>3 (13.6)</td>
<td>1 (4.5)</td>
<td>1 (4.5)</td>
<td>4 (18.2)</td>
<td>10 (45.5)</td>
<td>1 (4.5)</td>
<td>2 (9.1)</td>
<td>Nil</td>
<td>22 (8.58)</td>
<td>11.28</td>
<td>0.664</td>
</tr>
<tr>
<td>2</td>
<td>Medium</td>
<td>3 (4.5)</td>
<td>3 (4.5)</td>
<td>7 (10.6)</td>
<td>11 (16.7)</td>
<td>30 (45.5)</td>
<td>11 (16.7)</td>
<td>1 (1.5)</td>
<td>Nil</td>
<td>66 (19.76)</td>
<td>1.000</td>
<td>NS</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>9 (3.7)</td>
<td>11 (4.5)</td>
<td>19 (7.7)</td>
<td>35 (14.2)</td>
<td>128 (52.0)</td>
<td>35 (14.2)</td>
<td>8 (3.3)</td>
<td>1 (0.4)</td>
<td>246 (73.65)</td>
<td>0.000</td>
<td>NS</td>
</tr>
</tbody>
</table>

\( \odot \)Ref: BMI James et al(1988)

NS-Not significant

(Numbers in parentheses indicate percentages)

*CED – chronic energy deficiency
As the table presents the standard of living index of sample had no significant relation with body mass status. But it can be observed that women with normal BMI was more (52.0%) among the high standard of living community than middle (45.5%) or low (45.5%) standard of living. Similarly low normal and chronic deficiency cases were found to reduce with increase in standard of living. At the same time incidence of overweight and obesity did not show such a trend (Figure.7).

**Waist-hip ratio**

Waist to hip ratio is the most commonly reported adiposity measure (Ahmad *et al.*, 2007). The standard value for waist-hip ratio suggested by ICMR (2005) was used to analyze the level of obesity. The following table shows the age wise prevalence of abdominal obesity.
Table 26 Age and waist-hip ratio of women

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Age (yrs)</th>
<th>Normal (&lt; 0.8)</th>
<th>Abdominal Obesity (≥0.8)</th>
<th>Pooled</th>
<th>( \chi^2 )</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>20-25</td>
<td>8(8.5)</td>
<td>86(91.5)</td>
<td>94</td>
<td>0.735</td>
<td>0.865</td>
</tr>
<tr>
<td>2.</td>
<td>26-30</td>
<td>13(9.1)</td>
<td>130(90.9)</td>
<td>143</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>31-35</td>
<td>5(6.0)</td>
<td>79(94.0)</td>
<td>84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>36-40</td>
<td>1(7.7)</td>
<td>12(92.3)</td>
<td>13</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Pooled</td>
<td></td>
<td>27(8.1)</td>
<td>307(91.9)</td>
<td>334</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ref: ICMR, 2005
NS-Not significant

Figure 8 Age and waist-hip ratio of women

Adult women with \( \geq 0.80 \) as waist-hip ratio are identified as abdominal obesity (ICMR, 2005). Abdominal obesity was commonly seen in the study population irrespective of age groups.

The prevalence rate among the women in urban slums of Kochi was 91.9 percent. However there observed, a slightly higher rate of prevalence of abdominal obesity (94.0%) among women of 31 to 35 year age group.
NNMB (2006) also reported the highest prevalence of waist-hip ratio (91.8%) among women of Kerala; which is in accordance to the findings of the present study. Figure 8 presents the waist-hip ratio of the sample studied. But the statistical analysis to find out the association between age and waist-hip of women could not show any significant relation between these two factors.

**Slum locations and waist-hip ratio**

Chi square analysis was employed to find the association between slum locations and waist hip ratio of the sample. The results are presented in the following table.

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Slums</th>
<th>Waist-hip ratio</th>
<th>Pooled</th>
<th>( \chi^2 )</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal (&lt; 0.8)</td>
<td>Abdominal Obesity (( \geq 0.8 ))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Atlantis</td>
<td>5 (14.7)</td>
<td>29(85.3)</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fort Kochi</td>
<td>1(3.4)</td>
<td>28(96.6)</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Karithala</td>
<td>Nil</td>
<td>8(100.0)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Pallichal</td>
<td>1(2.0)</td>
<td>49(98.0)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Puthuvypu</td>
<td>14(15.7)</td>
<td>75(84.3)</td>
<td>89</td>
<td>15.265</td>
</tr>
<tr>
<td>6</td>
<td>Santhom</td>
<td>1(5.0)</td>
<td>19(95.0)</td>
<td>20</td>
<td>0.033*</td>
</tr>
<tr>
<td>7</td>
<td>Thevara</td>
<td>3(7.0)</td>
<td>40(93.0)</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Vathuruthy</td>
<td>2(3.3)</td>
<td>59(96.7)</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>27(8.1)</td>
<td>307(91.9)</td>
<td>334</td>
<td></td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

*significant at 5% level
Slum wise distribution of the sample indicated that incidence of abdominal obesity was more among women of Karithala (100%) Pallichal (98.0%) Vathuruthy (96.7%) and Fort Kochi (96.6%) slums. In NFHS-3 reports (2006) also it was mentioned that among Indian women prevalence of overweight and obesity are on rise.

The statistical analysis of waist-hip ratio of women among slum showed that there existed a significant relation (P<0.05) between the locations of slums and obesity.

**Socioeconomic status and waist-hip ratio**

The association between the socioeconomic status and waist-hip ratio of the sample was worked out using chi square analysis. The results are presented in table 28.

**Table 28 Socioeconomic status and waist hip ratio of women**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Socioeconomic status</th>
<th>Waist-hip ratio&lt;sup&gt;®&lt;/sup&gt;</th>
<th>Normal (&lt; 0.8)</th>
<th>Abdominal obesity (≥ 0.8)</th>
<th>Pooled</th>
<th>χ²</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower class</td>
<td></td>
<td>4 (9.5)</td>
<td>38 (90.5)</td>
<td>42</td>
<td>0.134</td>
<td>0.714 NS</td>
</tr>
<tr>
<td>2</td>
<td>Middle class</td>
<td></td>
<td>23 (7.9)</td>
<td>269 (92.1)</td>
<td>292</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td></td>
<td>27(8.1)</td>
<td>307(91.9)</td>
<td>334</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>®Ref : ICMR,2005</sup>

NS-Not Significant

(Numbers in parentheses indicate percentages)
As obtained from the table, there observed a marginal difference in the incident of abdominal obesity of women belonging to two socioeconomic status. Women of middle class social status (92.1%) were more affected than lower class (90.5%). However, this difference was found to be statistically insignificant.

The findings of the NNMB (2006) surveys saying that in Kerala state obesity among women was 26 percent, central obesity was 20 percent truncal obesity was 91.8 percent. Present finding is in line with the NNMB reports. Prevalence rate of abdominal obesity among the sample is shown in figure 9.

**Standard of living index and waist-hip ratio**

Based on their standard of living index the waist-hip ratio of the sample was analysed and the results are presented in the following table.
Table 29 Standard of living index and waist-hip ratio of women

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Standard of living index</th>
<th>Normal (≤ 0.8)</th>
<th>Obese (≥ 0.8)</th>
<th>Pooled</th>
<th>$\chi^2$</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Low</td>
<td>2(9.1)</td>
<td>20(90.9)</td>
<td>22</td>
<td>1.387</td>
<td>0.5 NS</td>
</tr>
<tr>
<td>2.</td>
<td>Medium</td>
<td>3(4.5)</td>
<td>63(95.5)</td>
<td>66</td>
<td>3.104</td>
<td>0.08 NS</td>
</tr>
<tr>
<td>3.</td>
<td>High</td>
<td>22(8.9)</td>
<td>224(91.1)</td>
<td>246</td>
<td>1.387</td>
<td>0.5 NS</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>27(8.1)</td>
<td>307(91.9)</td>
<td>334</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

®Ref : ICMR, 2005  NS –Not significant
(Numbers in parentheses indicate percentages)

Figure 10 Standard of living index and the prevalence of abdominal obesity

As given by the table the women in slums (95.5%) who belonged to medium standard of index were more prone to obesity than other groups. Comparatively less risk was reported among women (90.9%) who belonged to low standard of living index. But the statistical analysis failed to show any significant difference in the incidence of obesity among the three groups studied, indicating the fact that slum women in general are at
the risk of obesity. This finding is illustrated in Figure 10. Waist-hip ratio as given by Ahmad et al. (2007) is the dominant risk factor predicting coronary heart disease.

4.2.1.2 Blood haemoglobin status

Blood samples of the entire study population was collected and analyzed using cyanmethaemoglobin method. The results were compared with WHO (1968) standards and are presented in table 30.

Table 30 Haemoglobin status of women

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Age (yrs)</th>
<th>Blood haemoglobin®</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal (&gt;12 g/dl)</td>
<td>Mild anaemia (&gt;10-11.9 g/dl)</td>
<td>Moderate anaemia (7-10 g/dl)</td>
<td>χ²</td>
<td>Significance</td>
</tr>
<tr>
<td>1</td>
<td>20-25</td>
<td>16 (17.0)</td>
<td>64 (68.1)</td>
<td>14 (14.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>26-30</td>
<td>21 (14.7)</td>
<td>106 (74.1)</td>
<td>16 (11.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>31-35</td>
<td>15 (17.9)</td>
<td>45 (53.6)</td>
<td>24 (28.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>36-40</td>
<td>Nil</td>
<td>11 (84.6)</td>
<td>2 (15.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td></td>
<td>52 (15.6)</td>
<td>226 (67.7)</td>
<td>56 (16.8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)  
*significant at 5% level

*Ref: WHO, 1968

Figure 11 Age wise prevalence of anaemia
The haemoglobin status arrived at, using the anaemia classification recommended by WHO (1968) for adult women (non-pregnant and non-lactating) indicated the prevalence of mild anaemia among majority (67.7%) of the sample. This was followed by moderate anaemia (16.8%). Normal haemoglobin status was seen only among 15.6 percent of the sample.

Age wise classification of haemoglobin status showed that women in the age group of 36 to 40 years were seriously affected either by mild (84.6%) or moderate anaemia (15.4%). Nobody found to have normal haemoglobin status in this group. This was followed by 26 to 30 year age group, where mild and moderate anaemia were detected among 74.1 percent and 11.2 percent of women respectively.

Women of 20 to 25 years of age ranked in the rate of anaemia prevalence. This age wise differences in the incidence of anaemia among women residing in urban slums, was also found to be statistically significant at 5 percent level.

Studies by Bentley and Griffiths (2003) stated that prevalence of anaemia was high among women; 32.4 percent of women had mild anaemia, 14.19 percent had moderate, and 2.2 percent had severe anaemia.

**Slum locations and haemoglobin status**

An attempt was made to find out the association between the area of residence and the prevalence of anaemia among sample. The results are presented in table 31.
### Table 31 Slum locations and haemoglobin status of women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Slums</th>
<th>Normal (&gt;12 g/dl)</th>
<th>Mild anaemia (&gt;10-11.9 g/dl)</th>
<th>Moderate anaemia (7-10 g/dl)</th>
<th>Pooled</th>
<th>χ²</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atlantis</td>
<td>Nil</td>
<td>20 (58.8)</td>
<td>14 (41.2)</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fort Kochi</td>
<td>11 (37.9)</td>
<td>18 (62.1)</td>
<td>Nil</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Karithala</td>
<td>1 (12.5)</td>
<td>7 (87.5)</td>
<td>Nil</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Palichal</td>
<td>17 (34.0)</td>
<td>29 (58.0)</td>
<td>4 (8.0)</td>
<td>50</td>
<td>84.23</td>
<td>0.000**</td>
</tr>
<tr>
<td>5</td>
<td>Puthuvypu</td>
<td>16 (18.0)</td>
<td>70 (78.7)</td>
<td>3 (3.4)</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Santhom</td>
<td>1 (5.0)</td>
<td>11 (55.0)</td>
<td>8 (40.0)</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Thevara</td>
<td>3 (7.0)</td>
<td>33 (76.7)</td>
<td>7 (16.3)</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Vathuruthy</td>
<td>3 (4.9)</td>
<td>38 (62.3)</td>
<td>20 (32.8)</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>52 (15.6)</td>
<td>226 (67.7)</td>
<td>56 (16.8)</td>
<td>334</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)  **Significant at 1% level

Ref: WHO, 1968

It is surprising to note that, all the women residing in Atlantis were anaemic. Women in this slum had either mild (58.8%) or moderate (41.2%) anaemia. Similarly more than 1/3rd of women in Fort Kochi (37.9%) and Palichal (34.0%) had normal haemoglobin value and moderate anaemia was totally absent in these slums. Next in the rank was Puthuvypu, with more non-anaemic cases (18.0%) and less of moderately anaemic cases (3.4%). Women in this slum mostly suffered from mild anaemia (78.7%).

In the rest of the slums anaemic women were much higher in number than the non anaemic women. The statistical analysis also brought out the existence of a highly significant (P<0.01) difference in the incidence of anaemia among women residing in different slum locations.
Yet another notable feature was that the areas like Fort Kochi, Pallichal and Puthuvypu which is located in coastal areas had better haemoglobin status. This may be due to availability and use of fish and other sea foods, a source of protein of high biological value, which facilitate the absorption and utilisation of iron from food.

In addition to body mass index, level of anaemia is also considered to assess the nutritional status of women (Kumar and Sinha, 2007). The highest prevalence of iron deficiency anaemia was found in the age group of 15 to 25 years. Agarwal et al. (2005) state that majority of women in all states, irrespective of socioeconomic and demographic categories were anaemic.

**Socioeconomic status and haemoglobin levels**

The table 32 presents the blood haemoglobin levels in association with socioeconomic status.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Socioeconomic levels</th>
<th>Blood Haemoglobin&lt;sup&gt;®&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal (&gt;12 g/dl)</td>
<td>Mild anaemia (&gt;10-11.9 g/dl)</td>
<td>Moderate anaemia (7-10 g/dl)</td>
<td>χ&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Significance</td>
</tr>
<tr>
<td>1.</td>
<td>Middle class</td>
<td>4 (9.5)</td>
<td>27 (64.3)</td>
<td>11 (26.2)</td>
<td>3.75</td>
<td>0.153 NS</td>
</tr>
<tr>
<td>2.</td>
<td>Lower class</td>
<td>48 (16.4)</td>
<td>199 (68.2)</td>
<td>45 (15.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td></td>
<td>52 (15.5)</td>
<td>226 (67.6)</td>
<td>56 (16.7)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)  
NS-Not Significant  
<sup>®</sup>Ref: WHO, 1968
Chapter 4

Results and Discussion

The statistical analysis to know the association between socioeconomic status and the haemoglobin level showed that no significant relation existed between these two factors. In fact, as the table presents, normal cases (non-anaemic women) were more in number in the lower socioeconomic group (16.4%) than middle class group (9.5%). In general anaemia was more prevalent among middle class group (9.5%). In general anaemia was more prevalent among middle class women either as mild anaemia (64.3%) or moderate anaemia (26.2%) So it is obvious that better socioeconomic status need not necessarily improve the iron nutritional status of women.

Poverty and low purchasing power often referred as factors responsible for low dietary intake (NIPCCD, 2007). But the present study showed that anaemia prevalence is irrespective of economic status.

**Standard of living index and haemoglobin status**

The blood haemoglobin levels of the sample of different standard of living index is shown in table 33.
Table 33 Standard of living index and haemoglobin status of women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Standard of living index</th>
<th>Blood haemoglobin®</th>
<th>χ²</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal (&gt;12 g/dl)</td>
<td>Mild anaemia (&gt;10-11.9 g/dl)</td>
<td>Moderate anaemia (7-10 g/dl)</td>
</tr>
<tr>
<td>1.</td>
<td>Low</td>
<td>2 (9.1)</td>
<td>11 (50.0)</td>
<td>9 (40.9)</td>
</tr>
<tr>
<td>2.</td>
<td>Medium</td>
<td>7 (10.6)</td>
<td>49 (74.2)</td>
<td>10 (15.2)</td>
</tr>
<tr>
<td>3.</td>
<td>High</td>
<td>43 (17.5)</td>
<td>166 (67.5)</td>
<td>37 (15.0)</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>52 (15.5)</td>
<td>226 (67.6)</td>
<td>56 (16.7)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages) *significant at 5% level

Ref: WHO, 1968

Figure 12 Standard of living index and prevalence of anaemia

The above table clearly presents the progressive increase in the number of non-anaemic cases (normal cases) and steady decline in the cases of moderate anaemia with the rise in standard of living index of women.
But prevalence of mild anemia was more among women of medium (74.2%) and high (67.5%) standard of living index than the low (50.0%) index group. Statistical analysis also showed a significant association at 5 percent level, between the haemoglobin status and standard of living index of women at slums.

Mathur and Kachhawaha (2009) found that various factors like vegetarian diet, low socioeconomic status, low iron intake and history of excessive menstrual bleeding showed significant association with anaemia. However age and education did not contribute significantly.

As per the study reports by Verma et al. (2009) clinical signs and haemoglobin estimation showed that 51 percent were anaemic with the haemoglobin level ranging from 6.8 to 10.8 g/dl. NFHS-3 (2006) reported that the anaemia prevalence levels are more than two times higher among women than men with almost half suffered from moderate to severe anaemia.

Women in slums of Jammu city suffered from anaemia, they even showed symptoms like pale conjunctiva, pale nails and pale face. The women experienced weakness, fatigue and breathlessness due to this (Kotwal et al., 2008).

4.2.1.3 Dietary assessment

FAO suggested that dietary surveys among individuals provide information that can be used to describe differences in intake of food and nutrients. Dietary assessment methods are invaluable tools not only for
measuring energy, protein and macronutrient intakes, which serve as the
basis for estimating the prevalence of hunger, but also for assessing
micronutrient deficiencies (ICDAM, 2003).

Food habits and practices

All the 334 families included in the study followed non-vegetarian
food habits.

Food selection

The criteria for food selection are influenced by number of
socioeconomic, cultural and spiritual factors. An attempt was made to
study this aspect as it plays decisive role on the food consumption pattern
of individuals and family. Data gathered in this respect was analysed and
the results are given in table 34.

Table 34 Criteria for food selection

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Frequency* (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ease of Preparation</td>
<td>327 (97.9)</td>
</tr>
<tr>
<td>2.</td>
<td>Freshness</td>
<td>320 (95.8)</td>
</tr>
<tr>
<td>3.</td>
<td>Seasonal food</td>
<td>317 (94.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Local availability</td>
<td>250 (74.9)</td>
</tr>
<tr>
<td>5.</td>
<td>Nutritional Quality</td>
<td>182 (54.5)</td>
</tr>
<tr>
<td>6.</td>
<td>Likes and dislikes of family</td>
<td>151 (45.2)</td>
</tr>
<tr>
<td>7.</td>
<td>Cost</td>
<td>149 (44.6)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

*indicates multiple response

As the table depicts, there were seven criteria that women
considered during food selection either by itself or in combination. The
most commonly considered once were ease of preparation (97.9%), freshness of the food item (95.8%) and seasonality (94.9%).

Likes and dislikes of the family members (45.2%) and the cost of the food (44.6%) were the least preferred ones.

**Food preparation techniques**

Techniques of food preparation can enhance as well as destroy the nutritional quality of the food. Information on these lines were procured and presented in table 35.

**Table 35 Food preparation techniques**

<table>
<thead>
<tr>
<th>SLNo</th>
<th>Food Items</th>
<th>Boiling</th>
<th>Pressure cooking</th>
<th>Steaming</th>
<th>Stewing</th>
<th>Shallow fry</th>
<th>Deep fry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cereals</td>
<td>315(94.3)</td>
<td>19(5.7)</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>2</td>
<td>Pulses</td>
<td>322(96.4)</td>
<td>12(3.6)</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>3</td>
<td>Leafy vegetable</td>
<td>121(36.2)</td>
<td>6(1.8)</td>
<td>124(37.1)</td>
<td>22(6.6)</td>
<td>61(18.3)</td>
<td>Nil</td>
</tr>
<tr>
<td>4</td>
<td>Vegetable</td>
<td>127(38.0)</td>
<td>22(6.5)</td>
<td>64(19.2)</td>
<td>56(16.8)</td>
<td>65(19.5)</td>
<td>Nil</td>
</tr>
<tr>
<td>5</td>
<td>Roots and tubers</td>
<td>160(47.9)</td>
<td>90(26.9)</td>
<td>46(13.7)</td>
<td>33(9.9)</td>
<td>5(1.5)</td>
<td>Nil</td>
</tr>
<tr>
<td>6</td>
<td>Meat</td>
<td>30(9.0)</td>
<td>17(5.1)</td>
<td>Nil</td>
<td>240(71.8)</td>
<td>46(13.7)</td>
<td>1(0.3)</td>
</tr>
<tr>
<td>7</td>
<td>Fish</td>
<td>14(4.2)</td>
<td>Nil</td>
<td>271(81.1)</td>
<td>32(9.6)</td>
<td>17(5.1)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Egg</td>
<td>128(38.2)</td>
<td>Nil</td>
<td>114(34.2)</td>
<td>92(27.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Milk</td>
<td>334(100)</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

*(Numbers in parentheses indicate percentages)*

Though a variety of food preparation techniques were practiced by the sample, the most commonly used were boiling and stewing. Boiling was the technique used to cook almost all food items. Deep frying was used very rarely, that too for meat and fish preparation. Shallow frying
was also used as a preparation technique for most food items except cereals and pulses.

**Food Frequency**

The frequency of consumption of food items by the families was studied and the data is furnished in Table 36.

**Table 36 Frequency of consumption of food**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Food Items</th>
<th>Daily</th>
<th>Weekly</th>
<th>Fortnightly</th>
<th>monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cereals</td>
<td>334 (100)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Pulses</td>
<td>54 (16.2)</td>
<td>229 (68.6)</td>
<td>12 (3.6)</td>
<td>39 (11.7)</td>
</tr>
<tr>
<td>3.</td>
<td>Milk &amp; Products</td>
<td>247 (74.0)</td>
<td>79 (23.7)</td>
<td>5 (1.5)</td>
<td>3 (0.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Fish</td>
<td>253 (75.8)</td>
<td>76 (22.8)</td>
<td>5 (1.5)</td>
<td>Nil</td>
</tr>
<tr>
<td>5.</td>
<td>Meat</td>
<td>4 (1.2)</td>
<td>295 (88.3)</td>
<td>18 (5.4)</td>
<td>17 (5.1)</td>
</tr>
<tr>
<td>6.</td>
<td>Egg</td>
<td>44 (13.2)</td>
<td>186 (55.7)</td>
<td>23 (6.9)</td>
<td>81 (24.3)</td>
</tr>
<tr>
<td>7.</td>
<td>Leafy vegetable</td>
<td>3 (0.9)</td>
<td>175 (52.4)</td>
<td>21 (6.3)</td>
<td>79 (23.7)</td>
</tr>
<tr>
<td>8.</td>
<td>Other vegetable</td>
<td>128 (38.3)</td>
<td>157 (47.0)</td>
<td>48 (14.4)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>9.</td>
<td>Fruits</td>
<td>17 (5.1)</td>
<td>97 (29.0)</td>
<td>219 (65.6)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>10.</td>
<td>Roots and tubers</td>
<td>24 (7.2)</td>
<td>140 (41.9)</td>
<td>164 (49.1)</td>
<td>6 (1.8)</td>
</tr>
<tr>
<td>11.</td>
<td>Sugar</td>
<td>334 (100)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Jaggery</td>
<td>4 (1.2)</td>
<td>68 (20.4)</td>
<td>238 (71.3)</td>
<td>24 (7.2)</td>
</tr>
<tr>
<td>13.</td>
<td>Oil</td>
<td>334 (100)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14.</td>
<td>Salt</td>
<td>334 (100)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

The food items commonly consumed by the sample and the frequency of consumption showed that cereals, sugar, salt and oil were consumed everyday, where as pulses were mostly (68.6%) consumed on weekly basis. Similarly frequency of consumption of meat (88.3%), egg
(55.7%), leafy vegetables (52.4%) and vegetables was mostly on weekly basis. Mostly fruits (65.6%), root and tubers (49.1%) were consumed only once in a fortnight.

Inadequate representation of fruits and leafy vegetable in the daily diet was clearly brought out in the present study. Similar findings were reported by NFHS-3 (2006) stating that 60 percent of women do not consume fruits even once in a week.

**Use of iodised salt**

Iodine deficiency has been called the world's major cause of preventable mental retardation (AIIMS, 2002). On the recommendations of Central Council of Health in 1984, the Government took policy decision to iodise the entire edible salt in the country. The details on consumption of iodised salt is furnished in the following table.

**Table 37 Use of Iodised salt by the sample**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Particulars</th>
<th>Frequency* (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Use of iodised salt</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regular use</td>
<td>208 (62.3)</td>
</tr>
<tr>
<td></td>
<td>Branded packet</td>
<td>228 (68.3)</td>
</tr>
<tr>
<td></td>
<td>Powder form</td>
<td>327 (97.9)</td>
</tr>
<tr>
<td></td>
<td>Quantity 500 gm and more/month</td>
<td>327 (97.9)</td>
</tr>
<tr>
<td></td>
<td>Stored in covered container</td>
<td>296 (88.6)</td>
</tr>
<tr>
<td></td>
<td>Stored in the packet itself</td>
<td>38 (11.4)</td>
</tr>
<tr>
<td></td>
<td>Kept in kitchen shelf</td>
<td>211 (63.2)</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Awareness on iodised salt</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Iodized is better than non iodised</td>
<td>232 (69.5)</td>
</tr>
<tr>
<td></td>
<td>Helps to prevent goitre</td>
<td>182 (54.5)</td>
</tr>
</tbody>
</table>

*(Numbers in parentheses indicate percentages)*

*indicates multiple response*
Regular use of iodised salt was reported by 62.3 percent of the sample, 68.3 percent used the branded packet (68.3%) and powder form (97.9%).

Intake of iodised salt was found to be 500 gm or more per month by a family. As far as storage of the iodised salt is concerned, 88.6 percent of the women stored the salt in covered containers, kept in the kitchen shelf (63.2%).

Women’s awareness on the importance of iodised salt was not upto the mark, 69.5 percent of the women knew that iodised salt and only 54.5 percent were aware that iodised salt prevents goitre.

Figure 13 Purchase pattern of iodised salt
Consumption of inadequately iodised salt combined with the lack of awareness and improper practices is a major hindrance in the elimination of IDD’s (Samal et al., 2009).

Prevalence of goitre was high among school children in Belgaum district (Kamath et al., 2009). A similar study conducted in Trivandrum district of Kerala, also showed that the overall prevalence of goiter in the study population was 12.9 percent even though majority (92.8%) of the subjects claimed to use iodised salt (Libu and Balakrishnan, 2009). As per NFHS-3(2006) reports only about half of the households in India use cooking salt which is adequately iodised.

**Food consumption pattern of women**

**Food intake**

The recommended dietary allowances are estimates of nutrients to be consumed daily to ensure the requirements of all individuals in a given population (ICMR, 2004). The average daily intakes of food was assessed and compared with RDA (ICMR, 2004). The results are furnished in table 38.
Table 38 Mean food intake of women in comparison with RDA

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Food Items</th>
<th>RDA&lt;sup&gt;(g)&lt;/sup&gt;</th>
<th>Mean intake&lt;sup&gt;(g)&lt;/sup&gt;</th>
<th>Standard deviation</th>
<th>Std Error</th>
<th>‘t’ value</th>
<th>Significance</th>
<th>Mean difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cereals</td>
<td>300</td>
<td>245.1 (18.3)</td>
<td>± 61.165</td>
<td>11.167</td>
<td>-4.919</td>
<td>0.000**</td>
<td>-54.93</td>
</tr>
<tr>
<td>2.</td>
<td>Pulses</td>
<td>30</td>
<td>27.5 (8.3)</td>
<td>± 33.367</td>
<td>6.092</td>
<td>-0.410</td>
<td>0.685</td>
<td>-2.50</td>
</tr>
<tr>
<td>3.</td>
<td>GLV</td>
<td>100</td>
<td>1.2 (98.8)</td>
<td>± 3.640</td>
<td>0.665</td>
<td>-148.732</td>
<td>0.000**</td>
<td>-98.83</td>
</tr>
<tr>
<td>4.</td>
<td>Other vegetables</td>
<td>100</td>
<td>48.7 (92.5)</td>
<td>± 32.588</td>
<td>5.950</td>
<td>-8.625</td>
<td>0.000**</td>
<td>-51.33</td>
</tr>
<tr>
<td>5.</td>
<td>Roots</td>
<td>100</td>
<td>7.5 (92.5)</td>
<td>± 11.945</td>
<td>2.181</td>
<td>-42.416</td>
<td>0.000**</td>
<td>-92.50</td>
</tr>
<tr>
<td>6.</td>
<td>Fruits</td>
<td>100</td>
<td>3.3 (98.7)</td>
<td>± 12.685</td>
<td>2.318</td>
<td>-41.738</td>
<td>0.000**</td>
<td>-96.66</td>
</tr>
<tr>
<td>7.</td>
<td>Milk</td>
<td>300</td>
<td>76.3 (74.56)</td>
<td>± 36.434</td>
<td>6.652</td>
<td>-33.624</td>
<td>0.000**</td>
<td>-223.66</td>
</tr>
<tr>
<td>8.</td>
<td>Fats and oil</td>
<td>20</td>
<td>33.2 (+66)</td>
<td>± 16.530</td>
<td>3.018</td>
<td>4.363</td>
<td>0.000**</td>
<td>13.16</td>
</tr>
<tr>
<td>9.</td>
<td>Fish and meat</td>
<td>50</td>
<td>77.8 (+55.6)</td>
<td>± 61.148</td>
<td>11.164</td>
<td>2.493</td>
<td>0.019*</td>
<td>27.83</td>
</tr>
<tr>
<td>10.</td>
<td>Sugar</td>
<td>20</td>
<td>16.8 (-16.0)</td>
<td>± 4.450</td>
<td>0.812</td>
<td>-3.898</td>
<td>0.001**</td>
<td>-3.16</td>
</tr>
</tbody>
</table>

<sup>RDA : ICMR (2004)</sup>
<sup>*Significant at 5 % level</sup><br>
<sup>**Significant at 1% level (Numbers in parentheses indicate percentage deviation)</sup>
The mean food intake of women in the slums was found to be totally inadequate in almost all food items except fats and oils (+13.1g) and fish/meat (+27.8g) where the intake exceeded RDA. This may be due to availability of fish (as the slums are located in coastal area) and preference for the shallow frying as a technique of food preparation. Statistical analysis revealed significantly higher intake of fish and meat (P<0.05) and fats and oils (P<0.01) by the sample.

Among other food items, pulse intake was slightly less (2.5g) than RDA but not to any significant extent.

In the rest of the cases the daily intake was found to be meager with respect to green leafy vegetables (-98.83g), fruits (-96.66g), roots (-92.5 g) and milk (-223.66 g).
These deficits were also found to be statistically significant at 1 percent level. Figure 14 presents the comparison of actual food intake of the sample with RDA.

**Percentage of dietary adequacy**

Figure 15 shows the percentage adequacy of diet consumed by the subjects.

![Figure 15 Percentage adequacy of food intake by women](image)

As the figure depicts there observed a gross inadequacy in the case of green leafy vegetable, roots and fruits. The intake was sufficient to meet only 1.2 percent of RDA for green leafy vegetable, 3.3 percent of RDA for fruits and 7.5 percent of RDA for roots. Milk intake reported a deficit of nearly 75 percent and other vegetables around 50 percent.
Cereals, pulses and sugar could fulfill 81.7 percent, 91.7 percent and 84 percent of RDA respectively. Fats and oils (166.0%) and fish and meat (156.0%) demonstrated a surplus intake above RDA.

Nutrient intake

Measures of nutritional intake estimate the amount of food a person is eating and can be used to assess adequacy of the quantity of dietary supply (Shetty, 2005). Mean nutrient intake of the sample was compared with the recommended allowances and the results are given in the table below.

**Table 39 Mean nutrient intake of women in comparison with RDA**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Nutrients</th>
<th>Mean intake</th>
<th>RDA®</th>
<th>Mean Difference</th>
<th>Standard Deviation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Calories(Kcal)</td>
<td>1439.77 (-76.78)</td>
<td>1875</td>
<td>-435.23</td>
<td>±345.28</td>
<td>0.000**</td>
</tr>
<tr>
<td>2.</td>
<td>Proteins (gm)</td>
<td>50.21 (+100.4)</td>
<td>50</td>
<td>0.21</td>
<td>±21.718</td>
<td>0.959 NS</td>
</tr>
<tr>
<td>3.</td>
<td>Calcium(mg)</td>
<td>255.63 (63.9)</td>
<td>400</td>
<td>-144.36</td>
<td>±108.71</td>
<td>0.000**</td>
</tr>
<tr>
<td>4.</td>
<td>Iron(mg)</td>
<td>7.90 (-26.3)</td>
<td>30</td>
<td>-22.10</td>
<td>±3.87</td>
<td>0.000**</td>
</tr>
<tr>
<td>5.</td>
<td>Vitamin A(µg)</td>
<td>110.53 (17.44)</td>
<td>600</td>
<td>-489.46</td>
<td>±116.25</td>
<td>0.000**</td>
</tr>
<tr>
<td>6.</td>
<td>Vitamin C(mg)</td>
<td>13.57 (33.9)</td>
<td>40</td>
<td>-26.42</td>
<td>±9.24</td>
<td>0.000**</td>
</tr>
<tr>
<td>7.</td>
<td>Fat(gm)</td>
<td>19.50 (97.5)</td>
<td>20</td>
<td>-0.50</td>
<td>±11.23</td>
<td>0.810 NS</td>
</tr>
</tbody>
</table>

Ref: RDA-ICMR(2004)  **significant at 1% level  
(Numbers in parentheses indicate percentage adequacy)  
NS- Not Significant
Nutrient intake of mother showed that there existed highly significant differences (P<0.01) between mean intake and recommended dietary allowances except for protein and fat. In these cases only a marginal difference was noticed between daily intake and RDA. So the difference was statistically insignificant.

Highly significant (P<0.01) difference was observed in rest of the nutrients, where the intake was far below the RDA. Deficit of macronutrients like calories (-435.23 K Cal) and Calcium (-144.36 mg) was glaring and could result in chronic energy and calcium deficiencies, the most common problems of Indian women. Micronutrient malnutrition is primarily the result of inadequate dietary intake (Huffman, 2000).
In the present study also the micronutrient status of women was very pathetic. The mean intake of iron was only 7.9 mg/day as against the RDA of 30 mg/day showing a deficit of 22.1 mg. Similarly vitamin A intake was 110.53 µg and RDA was 600 µg/ day. The deficit was 489.46 µg.

Low dietary intake and poor iron and folic acid intake are major factors responsible for high prevalence of anaemia in India (Shetty, 2005). The micronutrient status of women in developing countries according to Huffman (2000) affects their health during pregnancy and lactation, the outcomes of their pregnancies, and the health of their infants. The high rate of prevalence of anaemia among the study population, reported in the previous section of this report may mainly be due to this dietary inadequacy of iron. Figure 16 illustrates the comparison of actual nutrient intake of women with RDA

Calcium intake was less with mean intake of 255.63 mg, when compared with RDA of 400 mg. The status of iron showed that intake was significantly low, with mean intake of 7.9mg corresponding to a requirement of 30mg. Vitamin C deficiency was also significant with mean intake less than RDA. Fat intake was slightly less than the requirement, while protein intake was slightly more than the requirement.

Percentage of nutritional adequacy

The details are given in figure 17.
The above figure showed the percentage adequacy of nutrient intake in comparison with RDA. The protein intake was adequate (100.4%) and that of fat was also said to be adequate as the intake met 97.5 percent of RDA.

Grave inadequacy was noticed in the case of iron (26.3% of RDA) and vitamin A (17.44% of RDA). This could lead to serious health consequences due to micronutrient deficiency.

Intake of energy, calcium and vitamin C estimated to meet 76.7 percent, 63.9 percent and 33.9 percent of the RDA, respectively also posing acute health problems related to nutritional disorders.
Thus it can be stated that diet consumed by the women of urban slums, under the study, is totally inadequate in quantity as well as quality. As NFHS-3 (2006) reported rather than quantity the diet of the women should made nutrient dense especially micronutrients.

4.2.2 Health status of women

Women’s health during the reproductive or fertile years is relevant not only for themselves, but also has an impact on the health and development of the next generation (WHO, 2009). This section deals with the various health problems, the women encountered during the prime period of life.

4.2.2.1 Incidence of health problems

The health problems were categorised as metabolic related, nutritional deficiencies, reproductive health and other minor ailments. The information gathered in this respect were analysed and the findings are summarised below:
Table 40 Incidence of health problems among women

<table>
<thead>
<tr>
<th>SL.No</th>
<th>Health problems</th>
<th>Age (yrs)</th>
<th>Pooled</th>
<th>$\chi^2$ value</th>
<th>P’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metabolic related</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>6(8.5)</td>
<td>12(8.4)</td>
<td>3(23.1)</td>
<td>35(10.5)</td>
</tr>
<tr>
<td></td>
<td>Cancer</td>
<td>Nil</td>
<td>3(2.1)</td>
<td>Nil</td>
<td>3(0.8)</td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
<td>5(6.3)</td>
<td>9(6.3)</td>
<td>19(22.6)</td>
<td>5(38.5)</td>
</tr>
<tr>
<td></td>
<td>CVD</td>
<td>7(7.4)</td>
<td>9(6.3)</td>
<td>8(8.5)</td>
<td>2(15.4)</td>
</tr>
<tr>
<td>2</td>
<td>Nutritional deficiencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chronic energy deficiency</td>
<td>16(17.02)</td>
<td>27(18.9)</td>
<td>12(14.3)</td>
<td>2(15.4)</td>
</tr>
<tr>
<td></td>
<td>Anaemia</td>
<td>78(82.9)</td>
<td>122(85.31)</td>
<td>68(32.14)</td>
<td>13(100)</td>
</tr>
<tr>
<td></td>
<td>Goitre</td>
<td>39(37.23)</td>
<td>71(49.65)</td>
<td>35(41.66)</td>
<td>7(53.84)</td>
</tr>
<tr>
<td>3</td>
<td>Reproductive health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vaginal discharge</td>
<td>14(14.9)</td>
<td>20(14.0)</td>
<td>6(7.1)</td>
<td>2(15.4)</td>
</tr>
<tr>
<td></td>
<td>Polycystic ovary</td>
<td>6(6.4)</td>
<td>9(6.3)</td>
<td>5(6.0)</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td>Frequent micturition</td>
<td>12(12.8)</td>
<td>14(9.8)</td>
<td>6(7.1)</td>
<td>3(23.1)</td>
</tr>
<tr>
<td>4</td>
<td>Other ailments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abdominal pain</td>
<td>19(20.2)</td>
<td>30(21.0)</td>
<td>12(14.3)</td>
<td>5(38.5)</td>
</tr>
<tr>
<td></td>
<td>Backpain</td>
<td>22(23.4)</td>
<td>26(16.2)</td>
<td>14(16.7)</td>
<td>5(38.5)</td>
</tr>
<tr>
<td></td>
<td>Asthma</td>
<td>40(42.6)</td>
<td>61(42.7)</td>
<td>31(36.9)</td>
<td>5(38.5)</td>
</tr>
<tr>
<td></td>
<td>Migraine</td>
<td>7(7.4)</td>
<td>9(6.3)</td>
<td>10(11.9)</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td>Thyroid enlargement</td>
<td>48(51.1)</td>
<td>75(52.4)</td>
<td>38(42.9)</td>
<td>3(6.42)</td>
</tr>
<tr>
<td></td>
<td>Lymph node enlargement</td>
<td>14(14.9)</td>
<td>21(14.7)</td>
<td>9(10.7)</td>
<td>2(15.4)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

*Significant at 5% level

**significant at 1% level

NS-Not Significant
Metabolic related problems

The metabolic disorders like hypertension (10.5%), diabetes (11.4%), CVD (7.8%) and Cancer (0.9%) were diagnosed through medical screening of women, residing in slums. All these were found to occur even at the younger age of 20 to 25 years among women residing in slums. The rate of incidence was highest in the case of hypertension (8.5%) and lowest for diabetes (5.3%) and CVD (7.4%) ranked in between. As the age advances incident rate was also progressively increased and at middle age there observed the highest prevalence of diabetes (38.5%), hypertension (23.1%) and CVD (15.4%). High blood pressure is the leading risk for adult women everywhere and is responsible for 18 percent of deaths of women over 20 years of age. High blood pressure, high blood glucose levels, physical inactivity and high serum cholesterol cause similar proportions of deaths across all income levels (WHO, 2010).

Incidence of cancer (breast cancer) was reported among 2.1 percent of women. Statistical analysis proved to have a highly significant association (P<0.01) between age and prevalence of diabetes among women. But the rest of the diseases failed to show any significant association with age. However it is worth noticed that diabetes and hypertension were on increase among women at productive age (20 to 40
years) which may soon develop as cardio vascular problems leading to
disability and low productivity.

In 2004, cancers killed just fewer than one million women aged 20 to
59 years, with 80 percent of these deaths occurring in low and middle-
income countries, where women consistently have a lower cancer survival
rate because of limited access to screening, late diagnosis and inadequate
access to effective treatment (Kamangar et al., 2005; Parkin et al., 2002).

Nutritional deficiencies

Another observation through clinical screening of the sample was
incidence nutritional deficiency diseases, such as anaemia (82.9%), goitre
(37.23%) and chronic energy deficiency (17.02%) at the age of 20 to 25
years.

Prevalence of anaemia and goitre, both tend to increase with age.
Whereas chronic energy deficiency failed to show such a trend. One
hundred percent anaemia was reported in the age group of 36 to 40 years,
with an overall prevalence of 84.43 percent disturbed menstrual cycle
excessive bleeding and low intake of iron all may contribute to the above
situation. Role of goitre and related hormonal imbalance also, cannot be
overlooked in this respect.

Goitre prevalence at the age 36 to 40 years, was 53.84 percent with
an overall prevalence of 44.31 percent. This situation also warrants
immediate attention. The association of age with incidence of nutritional
deficiencies, when studied a statistical significance at 5 percent level was
obtained only in the case of iron deficiency anaemia.

**Reproductive health**

Vaginal discharge, a symptom of reproductive tract infection was
detected among 12.6 percent of women at slums. The problem was more
among the age group of 36 to 40 years (15.4%), and 20 to 25 years (14.9%).
Irrespective of the age around 6.0 percent of the sample had polycystic
ovary syndrome. The problem of frequent micturition was also reported
by 10.5 percent of the sample, with highest incidence among 36 to 40 years
(23.1%).

The significant differences in reproductive health outcomes exist
among women from slum and non-slum. The use of skilled delivery care
was found to be significantly associated with age, level of education,
economic status, parity, and prior antenatal visits (Hazarika, 2010). The
health of women is also linked to their status in the society (Rao et al.,
2010).

**Other ailments**

Other ailments like thyroid enlargement (49.4%), asthma (41.0%),
back pain (20.1%) and abdominal pain (19.8%) were also noticed among
the sample. Thyroid enlargement was more among women of 26 to 30
years (52.4%), all the other age groups also had a relatively high incidence of this problem.

Asthma was yet another problem commonly found among women. Relatively high incidence was reported by all age groups. Insanitary living environment may be a reason for this episode.

Back pain was more among the older age group of 36 to 40 years (38.5%), and about 23.4 percent in the age group of 20 to 25 years of age.

Asthma, heart disease, arthritis, depression and diabetes are common in women and they are seen particularly in poorer women and those living in rural areas (World Health Survey, 2009). Migraine problems were more among 31 to 35 years of age (11.9%), and least among 25 to 30 years of age (6.3%). Among the entire sample 7.8 percent had migraine.

**Slum locations and health problems**

Slum wise prevalence of various health problems was statistically analysed. The results are shown in table 41.
Table 41 Slum locations and health problems of women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Health problems</th>
<th>Atlantis</th>
<th>Fort Kochi</th>
<th>Karikala</th>
<th>Pallichal</th>
<th>Puthuvype</th>
<th>Santhomeri</th>
<th>Thevara</th>
<th>Vathuruthy</th>
<th>Pooled</th>
<th>$\chi^2$ value</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Metabolic related</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>5(14.7)</td>
<td>3(10.3)</td>
<td>2(25.0)</td>
<td>7(14.0)</td>
<td>6(6.7)</td>
<td>2(10.0)</td>
<td>3(7.0)</td>
<td>7(11.5)</td>
<td>35(10.5)</td>
<td>5.064</td>
<td>0.852NS</td>
</tr>
<tr>
<td></td>
<td>Cancer</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>2(4.0)</td>
<td>Nil</td>
<td>1(5.0)</td>
<td>Nil</td>
<td>Nil</td>
<td>30(0.0)</td>
<td>11.53</td>
<td>0.117NS</td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
<td>4(11.8)</td>
<td>2(6.9)</td>
<td>1(12.5)</td>
<td>14(28.0)</td>
<td>7(7.9)</td>
<td>3(15.0)</td>
<td>2(4.7)</td>
<td>5(8.2)</td>
<td>38(11.4)</td>
<td>16.18</td>
<td>0.011**</td>
</tr>
<tr>
<td></td>
<td>CVD</td>
<td>5(14.7)</td>
<td>4(13.8)</td>
<td>Nil</td>
<td>5(10.0)</td>
<td>4(4.5)</td>
<td>1(5.0)</td>
<td>2(4.7)</td>
<td>5(8.2)</td>
<td>26(7.8)</td>
<td>6.91</td>
<td>0.439NS</td>
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<tr>
<td>2</td>
<td><strong>Nutritional deficiencies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chronic energy deficiency</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anaemia</td>
<td>7(20.6)</td>
<td>3(10.3)</td>
<td>3(37.5)</td>
<td>12(24.0)</td>
<td>10(11.2)</td>
<td>7(35.0)</td>
<td>9(21.0)</td>
<td>6(9.8)</td>
<td>57(17.1)</td>
<td>62.05</td>
<td>0.100NS</td>
</tr>
<tr>
<td></td>
<td>Goitre</td>
<td>34(100)</td>
<td>18(61.8)</td>
<td>7(7.5)</td>
<td>33(60.0)</td>
<td>73(81.7)</td>
<td>19(95.0)</td>
<td>40(94.0)</td>
<td>59(96.7)</td>
<td>203(60.7)</td>
<td>84.231</td>
<td>0.0005**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12(35.3)</td>
<td>12(41.4)</td>
<td>4(50.0)</td>
<td>28(56.0)</td>
<td>45(50.4)</td>
<td>14(70.0)</td>
<td>20(47.0)</td>
<td>13(21.3)</td>
<td>140(44.3)</td>
<td>48.64</td>
<td>0.009**</td>
</tr>
<tr>
<td>3</td>
<td><strong>Reproductive health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vaginal Discharge</td>
<td>1(2.9)</td>
<td>5(17.2)</td>
<td>1(12.5)</td>
<td>3(8.0)</td>
<td>19(21.3)</td>
<td>6(30.0)</td>
<td>3(7.0)</td>
<td>4(6.6)</td>
<td>42(12.6)</td>
<td>29.401</td>
<td>0.005**</td>
</tr>
<tr>
<td></td>
<td>Poly cystic ovary</td>
<td>2(5.9)</td>
<td>5(17.2)</td>
<td>1(12.5)</td>
<td>3(8.0)</td>
<td>4(4.5)</td>
<td>Nil</td>
<td>2(4.7)</td>
<td>2(4.7)</td>
<td>19(5.7)</td>
<td>9.014</td>
<td>0.252NS</td>
</tr>
<tr>
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<td>Frequent Micturation</td>
<td>1(2.9)</td>
<td>3(10.3)</td>
<td>1(12.5)</td>
<td>6(12.0)</td>
<td>10(11.2)</td>
<td>4(20.0)</td>
<td>3(7.0)</td>
<td>7(11.5)</td>
<td>35(10.5)</td>
<td>4.632</td>
<td>0.689NS</td>
</tr>
<tr>
<td>4</td>
<td><strong>Other ailments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abdominal Pain</td>
<td>2(5.9)</td>
<td>7(24.1)</td>
<td>2(25.0)</td>
<td>17(34.0)</td>
<td>15(16.9)</td>
<td>8(40.0)</td>
<td>7(16.3)</td>
<td>8(13.1)</td>
<td>60(19.7)</td>
<td>18.882</td>
<td>0.009**</td>
</tr>
<tr>
<td></td>
<td>Backpain</td>
<td>6(17.6)</td>
<td>8(27.6)</td>
<td>4(50.0)</td>
<td>14(28.0)</td>
<td>12(13.5)</td>
<td>5(25.0)</td>
<td>4(9.3)</td>
<td>14(23.0)</td>
<td>63(18.8)</td>
<td>13.712</td>
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</tr>
<tr>
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<td>Asthma</td>
<td>13(38.2)</td>
<td>11(37.9)</td>
<td>3(37.5)</td>
<td>19(38.0)</td>
<td>41(46.1)</td>
<td>11(55.0)</td>
<td>22(51.2)</td>
<td>17(27.9)</td>
<td>137(41.0)</td>
<td>9.915</td>
<td>0.029NS</td>
</tr>
<tr>
<td></td>
<td>Migraine</td>
<td>2(5.9)</td>
<td>2(6.9)</td>
<td>1(12.5)</td>
<td>3(8.0)</td>
<td>8(9.0)</td>
<td>1(5.0)</td>
<td>3(7.0)</td>
<td>16(26.2)</td>
<td>30(10.7)</td>
<td>1.465</td>
<td>0.993NS</td>
</tr>
<tr>
<td></td>
<td>Thyroid enlargement</td>
<td>16(47.1)</td>
<td>13(44.8)</td>
<td>4(50.0)</td>
<td>29(58.0)</td>
<td>41(46.1)</td>
<td>14(70.0)</td>
<td>21(49.8)</td>
<td>27(44.3)</td>
<td>165(45.4)</td>
<td>6.238</td>
<td>0.512NS</td>
</tr>
<tr>
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<td>Lymph node enlargement</td>
<td>2(5.9)</td>
<td>2(6.9)</td>
<td>Nil</td>
<td>3(6.0)</td>
<td>17(18.1)</td>
<td>3(15.0)</td>
<td>3(7.0)</td>
<td>16(26.2)</td>
<td>46(13.7)</td>
<td>18.554</td>
<td>0.010*</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
NS – Not Significant
** Significant at 1% level
* Significant at 5% level
The prevalence of health problems of women was studied under four heads, and it was found that the overall prevalence rate was highest for nutritional deficiencies (17.1% to 84.7%), followed by other ailments (10.7% to 49.4%). Reproductive health related problems (5.7% to 12.6%) and metabolic disorders (0.92% to 11.4%) contributed a comparatively minor share to the disease profile.

The slum wise distribution of health problems brought out very clearly the distressing state of Santhom slum, with highest prevalence of maximum number of episodes of illness. Next in the list was Karithala and Pallichal. Women in both the slums were equally exposed to serious health problems.

A comparatively better profile was presented by Atlantis and Thevara slums having slightly less number of acute cases. But incidence of anaemia, goitre and asthma was invariably high in all slums including Atlantis and Thevara.

Statistical analysis further revealed that the difference observed in the incidence of metabolic disorders like hypertension, cancer, diabetes and CVD among women residing in different slums, were not to any significant extend, except the incidence of diabetes. In the case of diabetes,
the difference was found to be statistically significant at one percent level (P<0.01).

For nutritional deficiencies also a statistically significant difference (P<0.01), in the incidence of anaemia and goitre among slums was reported, showing the strong influence of slum locations on the nutritional status of women.

As far as the reproductive health problems are concerned, women having the problems of vaginal discharge showed a statistically significant difference (P<0.01) with slums.

Similarly among other ailments, like abdominal pain and lymphnode enlargement were the two health problems showed statistically significant difference in their occurrence in slums.

Socioeconomic status and health problems
Table 42 Socioeconomic status and health problems of women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Health problems</th>
<th>Middle Class</th>
<th>Low Class</th>
<th>Pooled</th>
<th>$\chi^2$ value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metabolic related</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>6(14.3)</td>
<td>29(9.9)</td>
<td>35(10.5)</td>
<td>0.742</td>
<td>0.389 NS</td>
</tr>
<tr>
<td></td>
<td>Cancer</td>
<td>2(4.8)</td>
<td>1(0.3)</td>
<td>3(0.9)</td>
<td>8.025</td>
<td>0.005**</td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
<td>5(11.9)</td>
<td>33(11.3)</td>
<td>38(11.4)</td>
<td>0.013</td>
<td>0.908NS</td>
</tr>
<tr>
<td></td>
<td>Cardio vascular disease</td>
<td>6(14.3)</td>
<td>20(6.8)</td>
<td>26(7.8)</td>
<td>2.829</td>
<td>0.093 NS</td>
</tr>
<tr>
<td>2</td>
<td>Nutritional deficiencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chronic energy deficiency</td>
<td>4(9.5)</td>
<td>53(18.2)</td>
<td>57(17.1)</td>
<td>4.22</td>
<td>0.754NS</td>
</tr>
<tr>
<td></td>
<td>Anaemia</td>
<td>38(90.5)</td>
<td>244(83.6)</td>
<td>282(84.4)</td>
<td>3.75</td>
<td>0.153NS</td>
</tr>
<tr>
<td></td>
<td>Goitre</td>
<td>21(50.0)</td>
<td>127(43.5)</td>
<td>148(44.3)</td>
<td>1.75</td>
<td>0.782NS</td>
</tr>
<tr>
<td>3</td>
<td>Reproductive health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vaginal Discharge</td>
<td>6(14.3)</td>
<td>36(12.3)</td>
<td>42(12.6)</td>
<td>0.128</td>
<td>0.721 NS</td>
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<tr>
<td></td>
<td>Polycystic ovary</td>
<td>4(9.5)</td>
<td>16(5.5)</td>
<td>20(6.0)</td>
<td>1.067</td>
<td>0.302 NS</td>
</tr>
<tr>
<td></td>
<td>Frequent micturition</td>
<td>4(9.5)</td>
<td>33(11.3)</td>
<td>35(10.5)</td>
<td>1.674</td>
<td>0.196 NS</td>
</tr>
<tr>
<td>4</td>
<td>Other ailments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abdominal Pain</td>
<td>5(11.9)</td>
<td>61(20.9)</td>
<td>66(19.8)</td>
<td>1.870</td>
<td>0.171 NS</td>
</tr>
<tr>
<td></td>
<td>Back pain</td>
<td>7(16.7)</td>
<td>60(20.5)</td>
<td>67(20.1)</td>
<td>0.345</td>
<td>0.557 NS</td>
</tr>
<tr>
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<td>Asthma</td>
<td>23(54.8)</td>
<td>114(39.0)</td>
<td>137(41.0)</td>
<td>3.751</td>
<td>0.053*</td>
</tr>
<tr>
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<td>Migraine</td>
<td>nil</td>
<td>26(8.9)</td>
<td>26(7.8)</td>
<td>4.055</td>
<td>0.044*</td>
</tr>
<tr>
<td></td>
<td>Thyroid enlargement</td>
<td>23(54.8)</td>
<td>142(48.6)</td>
<td>165(49.4)</td>
<td>0.552</td>
<td>0.457 NS</td>
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<tr>
<td></td>
<td>Lymph node enlargement</td>
<td>4(9.5)</td>
<td>42(14.4)</td>
<td>46(13.8)</td>
<td>0.730</td>
<td>0.393 NS</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages) **Significant at 1% level
NS-Not Significant *Significant at 5% level

The health problems of women in slums were categorized on the basis of socioeconomic status computed based on Kuppuswamy scale (1981). The results are given in table 42.
Metabolic related problems

As the table depicts metabolic related disease found to reduce with the lowering of socioeconomic status. These diseases are often referred as the diseases of the elite group and product of sedentary life style, changing food habits and stressful environment. The double burden of malnutrition and life style diseases among Indian poor has been reported by several authors.

The present situation is a replica of the above report. Inactivity, low fibre diet and most importantly the stress situation for slum dwellers may be the contributory factors for the incidence of metabolic diseases even among the low income group. This may be slow beginning of an alarming situation in the future.

The statistical analysis could not show any significance between middle and low class status in the incidence of metabolic disorders except cancer. There the difference was highly significant (P<0.01) statistically. Gopalan (1998) and Popkin et al. (2001) also reported that diabetes, hypertension, asthma, cardiovascular disease, some cancers, gall bladder disease and osteoarthritis – all of which are on the rise in developing countries, particularly among the middle-class, urban populations.

Nutritional deficiencies

As shown in the table, there observed a marginal decline in anaemia and goitre with lowering of socioeconomic status. Incidence of anaemia was found to be slightly more among middle (90.5%) than low class
(83.6%). Goitre was also more among middle class (50.0%) and less (43.5%) in low class. At the same time higher prevalence of energy deficiency (18.2%) was reported among middle class group than their low income counterparts (9.5%). However the difference observed in the incidence of nutritional deficiencies due to socioeconomic status were not significant statistically.

Reproductive health

A reduction in the reproductive health problems like vaginal discharge and polycystic ovary was reported with the lowering of social status of women in slum and a reverse trend was seen in the case of frequent micturition. But statistical analysis proved that there existed no significant difference in the occurrence of health problems and social status of women.

Other ailments

Abdominal pain, back pain, migraine and lymphnode enlargement were found increasing with lowering of social status. Whereas thyroid enlargement and asthmatic cases were declined as the social status shifted from middle to lower level. However these difference in the prevalence were statistically significant at 5 percent level only in the case of asthma and migraine and insignificant in the rest of the ailments.

Standard of living index and health problems

The details are given in table 43.
Table 43 Standard of living index and health problems of women

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Health problems</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Pooled</th>
<th>$\chi^2$ value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metabolic related</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>4(18.2)</td>
<td>7(10.6)</td>
<td>24(9.8)</td>
<td>35(10.5)</td>
<td>1.530</td>
<td>0.485NS</td>
</tr>
<tr>
<td></td>
<td>Cancer</td>
<td>Nil</td>
<td>2(3.0)</td>
<td>1(0.4)</td>
<td>3(0.9)</td>
<td>4.216</td>
<td>0.121NS</td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
<td>3(13.6)</td>
<td>5(7.6)</td>
<td>30(12.2)</td>
<td>38(11.4)</td>
<td>1.221</td>
<td>0.543NS</td>
</tr>
<tr>
<td></td>
<td>CVD</td>
<td>1(4.5)</td>
<td>5(7.6)</td>
<td>20(8.1)</td>
<td>26(7.8)</td>
<td>0.366</td>
<td>0.833NS</td>
</tr>
<tr>
<td>2</td>
<td>Nutritional deficiencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chronic energy deficiency</td>
<td>5(22.7)</td>
<td>13(19.7)</td>
<td>39(15.9)</td>
<td>57(17.0)</td>
<td>11.28</td>
<td>0.664NS</td>
</tr>
<tr>
<td></td>
<td>Anaemia</td>
<td>20(91.0)</td>
<td>59(89.4)</td>
<td>203(82.5)</td>
<td>282(84.4)</td>
<td>11.84</td>
<td>0.019*</td>
</tr>
<tr>
<td></td>
<td>Goitre</td>
<td>6(27.3)</td>
<td>28(42.4)</td>
<td>114(46.3)</td>
<td>148(44.3)</td>
<td>10.57</td>
<td>0.227NS</td>
</tr>
<tr>
<td>3</td>
<td>Reproductive health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vaginal Discharge</td>
<td>5(22.7)</td>
<td>10(15.2)</td>
<td>27(11.0)</td>
<td>42(12.6)</td>
<td>3.034</td>
<td>0.219NS</td>
</tr>
<tr>
<td></td>
<td>Polycystic ovary</td>
<td>1(4.5)</td>
<td>2(3.0)</td>
<td>17(6.9)</td>
<td>20(6.0)</td>
<td>1.479</td>
<td>0.477NS</td>
</tr>
<tr>
<td></td>
<td>Frequent micturition</td>
<td>4(18.2)</td>
<td>8(12.1)</td>
<td>23(9.3)</td>
<td>35(10.5)</td>
<td>1.916</td>
<td>0.384NS</td>
</tr>
<tr>
<td>4</td>
<td>Other ailments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abdominal Pain</td>
<td>7(31.8)</td>
<td>10(15.2)</td>
<td>49(19.9)</td>
<td>66(19.8)</td>
<td>2.905</td>
<td>0.234NS</td>
</tr>
<tr>
<td></td>
<td>Backpain</td>
<td>5(22.7)</td>
<td>11(16.7)</td>
<td>51(20.7)</td>
<td>67(20.1)</td>
<td>0.641</td>
<td>0.726NS</td>
</tr>
<tr>
<td></td>
<td>Asthma</td>
<td>5(22.7)</td>
<td>30(45.5)</td>
<td>102(41.5)</td>
<td>137(41.0)</td>
<td>3.599</td>
<td>0.165NS</td>
</tr>
<tr>
<td></td>
<td>Migraine</td>
<td>2(9.1)</td>
<td>2(3.0)</td>
<td>22(8.9)</td>
<td>26(7.8)</td>
<td>2.590</td>
<td>0.274NS</td>
</tr>
<tr>
<td></td>
<td>Thyroid enlargement</td>
<td>7(31.8)</td>
<td>38(57.6)</td>
<td>120(48.8)</td>
<td>165(49.4)</td>
<td>4.523</td>
<td>0.104NS</td>
</tr>
<tr>
<td></td>
<td>Lymph node enlargement</td>
<td>4(18.2)</td>
<td>10(15.2)</td>
<td>32(13.0)</td>
<td>46(13.8)</td>
<td>0.587</td>
<td>0.746NS</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

Metabolic related diseases

Regarding metabolic disorders a declining trend in hypertension and an increasing trend in CVD were reported with improvement in standard of living index. These trend were also found to be insignificant statistically. Hypertension was found to be more (18.2%) among women of low standard of living index than middle (10.6%) and high (9.8%).
Diabetes was prevalent more among low (13.6%) as well as high (12.2%) standard living than medium standard of living (7.6%). The incidence of CVD was highest among women of high standard of living, followed by medium (8.1%) and low standard of living index (4.5%).

**Nutritional Deficiencies**

As the table presents the standard of living index did not have any significant influence on the health profile of women in the slum areas except for anaemia only here, the standard of living index found to have a positive influence which was statistically significant at 5 percent level. Such as improvement in standard of living correspondingly reduced the incidence of anaemia among women. Among other nutritional deficiencies chronic energy deficiency also followed the same trend but not to any significant extent. But goitre presented a reverse trend which was also significant statistically.

**Reproductive health problem**

Similarly reproductive health problems were also noticed to reduce with betterment in standard of living index, but to any significant extent. Problems related to reproductive health generally tended to reduce with improvement in standard of living index. But statistically, these changes in the occurrence of reproductive health problems proved to be insignificant.

**Other ailments**

With regard to other health problems there was no uniform trend noticed in their occurrence though changes were noticed in their
incidence, with variations in standard of living, these were not proved to be significant statistically.

### 4.2.2.2 Prevalence of goitre

Iodine deficiency disorder is known to be a significant public health problem in 118 countries. About 200 million people are at risk of iodine deficiency disorder in India (AIIMS, 2002). High rate of prevalence of goitre among the study population, as revealed by the clinical survey prompted for their analysis of the available data. The results are discussed in this section.

**Incidence of goitre**

The details on the incidence of goitre among women residing in the slums are given in table 44

**Table 44 Incidence of goitre among women**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Age (yrs)</th>
<th>Normal</th>
<th>Grade I</th>
<th>Grade II</th>
<th>Grade III</th>
<th>Toxic goiter</th>
<th>$\chi^2$ value</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>20-25</td>
<td>59 (62.8)</td>
<td>14 (14.9)</td>
<td>7 (7.4)</td>
<td>14 (14.9)</td>
<td>Nil</td>
<td>7.97</td>
<td>0.788</td>
</tr>
<tr>
<td>2.</td>
<td>26-30</td>
<td>72 (50.3)</td>
<td>26 (18.2)</td>
<td>23 (16.1)</td>
<td>21 (14.7)</td>
<td>1 (0.7)</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>3.</td>
<td>31-35</td>
<td>49 (58.3)</td>
<td>13 (15.5)</td>
<td>12 (14.3)</td>
<td>9 (10.7)</td>
<td>1 (1.2)</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>4.</td>
<td>36-40</td>
<td>4 (46.2 )</td>
<td>3 (23.1)</td>
<td>2 (15.4)</td>
<td>2 (15.4)</td>
<td>Nil</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Pooled</td>
<td></td>
<td>186 (55.7)</td>
<td>56 (18.8)</td>
<td>44 (13.2)</td>
<td>46 (13.8)</td>
<td>2 (0.6)</td>
<td></td>
<td>0.788</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages) 
© Ref: ICMR (2005)

The table above shows age wise distribution of goitre. Nearly 44.4 percent of the sample reported to have goitre of varying degrees. Further Grade I, II and III type of goitre found to exist with similar intensity
among women of all age groups, 37.2 percent of women of 20 to 25 years, 49.7 percent from 26 to 30 years, 41.7 percent from 31 to 35 years, and 53.9 percent of above 36 years group were reported to be affected. When the age factor was considered with different grades of goitre, it was seen that Grade I goitre was more prevalent (23.1%) among women of 36 to 40 years. Irrespective of age Grade II and III goitre was seen among all age groups.

So statistical analysis failed to show any significant association between age of women and prevalence of goitre. However, seriousness of the problem cannot be overlooked, because of its wider coverage and greater intensity; in spite of living in coastal areas.

Studies by Jain et al. (2009) also revealed that severe and moderate iodine deficiency disorder was reported among 6 percent of children. Living on the sea coast does not guarantee iodine sufficiency and significant pockets of iodine deficiency have been reported from the Goa, Mumbai, Kerala and Andaman and Nicobar Islands. Even those areas which are presently relatively free of this problem can become endemic because of intensive agricultural operations and subsequent depletion of soil (AIIMS, 2002).

**Slum locations and incidence of goitre**

Iodine deficiency has been called the world's major cause of preventable mental retardation. Slum wise distribution of sample with varying degrees of goitre is given in table 45.
Table 45 Slum locations and incidence of goitre among women

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Slums</th>
<th>Normal</th>
<th>Grade I</th>
<th>Grade II</th>
<th>Grade III</th>
<th>Toxic goitre</th>
<th>Pooled</th>
<th>$\chi^2$ value</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atlantis</td>
<td>22(64.7)</td>
<td>8(23.5)</td>
<td>2(5.9)</td>
<td>2(5.9)</td>
<td>Nil</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fort Kochi</td>
<td>17(58.6)</td>
<td>5(17.2)</td>
<td>3(10.3)</td>
<td>4(13.8)</td>
<td>Nil</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Karithala</td>
<td>4(50.0)</td>
<td>3(37.5)</td>
<td>1(12.5)</td>
<td>Nil</td>
<td>Nil</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Pallichal</td>
<td>22(44.0)</td>
<td>8(16.0)</td>
<td>6(12.0)</td>
<td>14(28.0)</td>
<td>Nil</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Puthuvypu</td>
<td>44(49.4)</td>
<td>16(18.0)</td>
<td>16(18.0)</td>
<td>11(12.4)</td>
<td>2(2.2)</td>
<td>89</td>
<td>48.64</td>
<td>0.009**</td>
</tr>
<tr>
<td>6</td>
<td>Santhom</td>
<td>6(30.0)</td>
<td>4(20.0)</td>
<td>7(35.0)</td>
<td>3(15.0)</td>
<td>Nil</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Thevara</td>
<td>23(53.5)</td>
<td>9(20.9)</td>
<td>4(9.3)</td>
<td>7(16.3)</td>
<td>Nil</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Vathuruthy</td>
<td>48(78.7)</td>
<td>3(4.9)</td>
<td>5(8.2)</td>
<td>5(8.2)</td>
<td>Nil</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>186(55.7)</td>
<td>56(16.8)</td>
<td>44(13.2)</td>
<td>46(13.8)</td>
<td>20(6.1)</td>
<td>334</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages) ** Significant at 1% level

Slum wise distribution of goitre cases showed that the overall prevalence of goitre was highest in Santhom (70.0%) followed by Pallichal (56.0%) Puthuvypu (50.6%) and Karithala (50.0%). In Santhom only 30 percent of the sample were categorised as normal. Grade III goitre cases were more in Pallichal slum (28.0%) Grade II in Santhom (35.0%), and Grade I in Karithala (37.5%).

So Santhom, Pallichal and Karithala were the slums having acute situation as far as goitre prevalence is concerned, although none of the slums were free from the iodine deficiency disorders.

The variations in the occurrence of goitre among the slums was also found to be statistically significant at one percent level.

The results of the present study were in concordance with the findings of Agarwal et al. (2009), which indicated that increased iodine supply should be maintained to the women to decrease the potential...
consequences of low iodine intake on maternal thyroid economy and neonatal thyroid functions.

**Socioeconomic status and incidence of goitre**

The association between socioeconomic level and incidence of goitre was analysed and the results are presented in the following table.

**Table 46 Socioeconomic status and the incidence of goiter among women**

<table>
<thead>
<tr>
<th>Socioeconomic status</th>
<th>Normal</th>
<th>Grades of goitre</th>
<th>Total</th>
<th>$\chi^2$ value</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Grade I</td>
<td>Grade II</td>
<td>Grade III</td>
<td>Toxic Goitre</td>
</tr>
<tr>
<td>Middle class</td>
<td>21(50.0)</td>
<td>8(19.0)</td>
<td>5(11.9)</td>
<td>8(19.0)</td>
<td>Nil</td>
</tr>
<tr>
<td>Lower class</td>
<td>165(56.5)</td>
<td>48(16.4)</td>
<td>39(13.4)</td>
<td>38(13.0)</td>
<td>2(0.7)</td>
</tr>
<tr>
<td>Pooled</td>
<td>186(55.7)</td>
<td>56(16.8)</td>
<td>44(13.2)</td>
<td>46(13.8)</td>
<td>2(0.8)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

NS –Not Significant

**Figure 18 Socioeconomic status and prevalence of goitre**

As the table depicts socioeconomic status had no role to play on the incidence of goitre among the women at slum areas. The statistical analysis also failed to show any significant association between these two factors.
Occurrence of different grades of goitre was more among middle class status than lower status but toxic goitre (0.7%) was noticed in the low socioeconomic group. Figure 18 illustrated the details.

**Standard of living index and incidence of goitre**

The association between standard of living index and incidence of goitre was analysed and the results are presented in the following table.

**Table 47 Standard of living index and incidence of goitre among women**

<table>
<thead>
<tr>
<th>Grade of goitre</th>
<th>Normal</th>
<th>Grades of goitre</th>
<th>Toxic goitre</th>
<th>( \chi^2 ) value</th>
<th>'p' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>16 (72.7)</td>
<td>2 (9.1)</td>
<td>2 (9.1)</td>
<td>1 (4.5)</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Medium</td>
<td>38 (57.6)</td>
<td>11 (16.7)</td>
<td>9 (13.6)</td>
<td>8 (12.1)</td>
<td>Nil</td>
</tr>
<tr>
<td>High</td>
<td>132 (53.7)</td>
<td>43 (17.5)</td>
<td>33 (13.4)</td>
<td>37 (15)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Pooled</td>
<td>186 (55.7)</td>
<td>56 (16.8)</td>
<td>44 (13.2)</td>
<td>46 (13.8)</td>
<td>334</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

NS-Not Significant

As obtained from the table, incidence of varying degrees of goitre was found to increase with increase in standard of living index, except grade I (Figure 22). But it was not to any statistically significant extent. A noticeable feature was that normal sample were more (72.7%) among low
standard of living index than medium (57.6%) and high standard of living index (53.7%).

Studies showed goitre as a moderate public health problem (Purty et al., 2009). Similar studies was reported by Goyle and Saxena (2009), which showed children were mildly deficient, this can be related to the study by Sinh et al. (2009) which states that only one fourth of the children consumed iodised salt.

4.2.2.3 Other reproductive health indicators

Reproductive health is based on various factors like age at menarche, marriage, first delivery, birth spacing as well as pregnancy related problems. The details are given in table 48.

Table 48 Other reproductive health indicators

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency (n=334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age of menarche (yrs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11-13</td>
<td>218 (65.2)</td>
</tr>
<tr>
<td></td>
<td>14-16</td>
<td>116 (34.8)</td>
</tr>
<tr>
<td>2.</td>
<td>Age at marriage (yrs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13-16</td>
<td>19 (5.6)</td>
</tr>
<tr>
<td></td>
<td>16-18</td>
<td>72 (21.5)</td>
</tr>
<tr>
<td></td>
<td>18-20</td>
<td>83 (24.9)</td>
</tr>
<tr>
<td></td>
<td>20-25</td>
<td>128 (38.4)</td>
</tr>
<tr>
<td></td>
<td>&gt; 25</td>
<td>32 (9.6)</td>
</tr>
<tr>
<td>3.</td>
<td>Age at first delivery (yrs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt; 17 years</td>
<td>12 (3.6)</td>
</tr>
<tr>
<td></td>
<td>17-19</td>
<td>51 (15.2)</td>
</tr>
<tr>
<td></td>
<td>20-25</td>
<td>200 (60.0)</td>
</tr>
<tr>
<td></td>
<td>&gt; 25</td>
<td>71 (21.2)</td>
</tr>
<tr>
<td>4.</td>
<td>Birth spacing between children</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Only child</td>
<td>66 (19.9)</td>
</tr>
<tr>
<td></td>
<td>≤2 years</td>
<td>157 (47.0)</td>
</tr>
<tr>
<td></td>
<td>≥3 years</td>
<td>111 (33.1)</td>
</tr>
<tr>
<td>5.</td>
<td>Pregnancy related</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prenatal care</td>
<td>309 (92.5)</td>
</tr>
<tr>
<td></td>
<td>Normal delivery</td>
<td>241 (72.2)</td>
</tr>
<tr>
<td></td>
<td>Post natal care</td>
<td>241 (72.2)</td>
</tr>
<tr>
<td></td>
<td>Miscarriage</td>
<td>71 (21.3)</td>
</tr>
<tr>
<td></td>
<td>Abortion (MTP)</td>
<td>32 (9.6)</td>
</tr>
<tr>
<td></td>
<td>Infant mortality</td>
<td>17 (5.1)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
The details of reproductive health showed that the age for menarche was mostly between 11 to 13 years (65.2%). The age at marriage was between 20 to 25 years in majority of cases (38.4%), but the age was as low as 13 to 16 years among 5.6 percent of the sample.

The age at first delivery was found to be 20 to 25 years (60.0%), but it was less than seventeen years for 3.6 percent and 17 to 19 years for 15.2 percent. Birth spacing was mostly (47.0%) less than 2 years. Prenatal care (92.5%) and post natal care (72.2%) were taken by the sample, but it can be observed that post natal care was not given much importance as that of prenatal care. According to USAID (2010) reported pregnancies in women under twenty years of age are associated with significant perinatal risks and that pregnancies in women under sixteen are associated with significant maternal as well as perinatal risks. NFHS-3 (2006) reported that in Kerala, 93.9 percent of women had at least three antenatal care for their last birth.

Miscarriages were more (21.3%) than abortions (9.6%). Cases of infant mortality were also present (5.1%). Reduction in perinatal mortality rate may be possible with focussed medical services to women of low socioeconomic status having bad obstetrical history and those delivering before term (Kapoor et al., 1996).

The infant mortality rate over this period was 37.9 per 1000 live births. Over half (54.3%) of the deaths occurred in the neonatal period (Vaid and Vaid, 2005).
4.3 Nutritional and health status of preschool children

Preschool children, a nutritionally vulnerable segment of population, are also very much susceptible to morbidity due to infections. Undernutrition among preschool children is one of the greatest public health problems in developing countries. Undernutrition is the factor closely associated with child mortality rates (WHO, 1983). The following sections deal with the various components of nutritional status of preschool children.

4.3.1 Nutritional status of preschoolers

Nutrition is an input to and foundation for health and development (WHO, 2010). Childhood undernutrition remains a major health problem in India especially in slums (Bisai et al., 2009). To assess the nutritional status of children a number of techniques are made use of in these days.

4.3.1.1 Nutritional anthropometry

Child growth is the most widely used indicator of nutritional status (World Health Statistics, 2009). Anthropometric measurements are the most widely used method to assess nutritional status. The use of these measurements depends on age assessment and normal values for comparison (ICMR, 2005).

Age and gender wise distribution

Age and gender wise distribution of the sample is presented in table.
Table 49 Age and gender wise distribution of preschool children

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Age (yrs)</th>
<th>Male</th>
<th>Female</th>
<th>Pooled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>54 (25.83)</td>
<td>57 (34.13)</td>
<td>111 (29.52)</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>30 (14.35)</td>
<td>20 (11.97)</td>
<td>50 (13.29)</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>60 (28.7)</td>
<td>37 (22.15)</td>
<td>97 (25.79)</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>27 (12.91)</td>
<td>11 (6.58)</td>
<td>38 (10.10)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>38 (18.18)</td>
<td>42 (22.15)</td>
<td>80 (21.27)</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>209 (55.6)</td>
<td>167 (44.4)</td>
<td>376 (100)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

Figure 20 Age wise and gender wise distribution of preschool children

Sample for the study included 376 children out of which 55.6 percent were boys and 44.4 percent girls.

Age wise distribution indicated that children of 3 years constituted 29.52 percent of the sample which was the highest followed by 4 year old children (25.79%) and five years (22.15%). Female population outnumbered males in the age group of three and five years Figure 20 presents age and gender wise distribution of preschool children.
Birth spacing and birth weight

Birth spacing is one of the important factors contributing to maternal and child health. Pregnancy timing and spacing are important to improve infant, child, and maternal health (WHO, 2009). The following table presents the details.

Table 50 Birth spacing between the children

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Birth spacing (yrs)</th>
<th>Spacing between 1st and 2nd child</th>
<th>Spacing between 2nd and 3rd child</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>1</td>
<td>One</td>
<td>41</td>
<td>12.3</td>
</tr>
<tr>
<td>2</td>
<td>Two</td>
<td>119</td>
<td>35.6</td>
</tr>
<tr>
<td>3</td>
<td>Three</td>
<td>58</td>
<td>17.4</td>
</tr>
<tr>
<td>4</td>
<td>Four</td>
<td>33</td>
<td>9.9</td>
</tr>
<tr>
<td>5</td>
<td>Five</td>
<td>14</td>
<td>4.2</td>
</tr>
<tr>
<td>6</td>
<td>Six</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>7</td>
<td>Seven</td>
<td>2</td>
<td>0.6</td>
</tr>
<tr>
<td>8</td>
<td>Eight</td>
<td>1</td>
<td>0.3</td>
</tr>
</tbody>
</table>

The above table reveals that birth spacing ranged between one to eight years. Most of the families had two children, among them 35.6 percent had a birth spacing of two years. Three years of spacing were found among 17.4 percent, whereas only one year duration was seen among 12.3 percent. Spacing more than five years was seen among few. This finding is in line with the WHO (2009) recommendations such as, birth-to-pregnancy intervals of at least two years but not longer than five years, are associated with the healthiest pregnancy outcomes.
Birth spacing was an ancient and very widespread tradition among various African populations. In traditional societies, the average birth interval is less than three years. Birth spacing is valued and non-observation of birth spacing is frowned upon (Damessi, 1992).

The World Health Organization has defined the term “low birth weight” as birth weight less than 2500 grams (Garau et al., 2004; UNICEF, 2009). Birth weight of the selected sample based on their age and gender are presented in table 51.

**Table 51 Birth weight of preschool children**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Age (yrs)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (&lt; 2.5 Kg)</td>
<td>Normal (≥2.5 Kg)</td>
<td>Pooled</td>
</tr>
<tr>
<td>1.</td>
<td>3.0</td>
<td>9(16.7)</td>
<td>45(83.3)</td>
</tr>
<tr>
<td>2.</td>
<td>3.5</td>
<td>5(16.7)</td>
<td>25(83.3)</td>
</tr>
<tr>
<td>3.</td>
<td>4.0</td>
<td>20(33.3)</td>
<td>40(66.7)</td>
</tr>
<tr>
<td>4.</td>
<td>4.5</td>
<td>9(33.3)</td>
<td>18(66.7)</td>
</tr>
<tr>
<td>5.</td>
<td>5.0</td>
<td>10(26.3)</td>
<td>28(73.7)</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>53(25.4)</td>
<td>156(74.6)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

The percent of children with low birth weight (<2.5 Kg) was more among females (31.1%) than males (25.4%). Almost 74.6 percent of boys and 68.9 percent of girls had normal birth weight. The mean birth weight was found to be 2.65 kilogram with a standard deviation of 0.44.

The prevalence of low birth weight was high among Indian babies (Chhabra et al., 2004) and was a significant contributor to neonatal mortality (Bang et al., 2005). Indian babies have a lower birth weight than
their western counterparts (Yajnik et al., 2003). Among the low birth weight babies, boys suffered 9.7 episodes of sickness, and girls 8.6 episodes of sickness (Renu, 2007).

Both maternal and paternal birth weight are strong determinants of offspring’s birth weight. Birth weight in India is lower than that seen in developed nations. Maternal birth weight emerged as a significant predictor of offspring birth weight (Agnihotri et al., 2008). Risk factors for low birth weight include low parental socioeconomic status, increased maternal age and multiple fertility, harmful parental behaviours such as smoking, excessive alcohol consumption and poor nutrition during pregnancy, as well as a poor level of pre-natal care (UNICEF, 2009).

Height and weight measurements

Height Measurement

Although height of an individual is dependent on hereditary and environment; the most important factor was nutrition (Bamji et al., 1998). The following table presents the mean height of the sample with standard values of NCHS (1987).
Table 52 Mean height of preschool children in comparison with standard height

<table>
<thead>
<tr>
<th>SLNO</th>
<th>Age (yrs)</th>
<th>Male (n=209)</th>
<th>Female (n=167)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean Height (cm)± SD</td>
<td>Std Height® (cm)</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>89.02±4.5</td>
<td>94.6</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>93.2±4.88</td>
<td>99.1</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>96.47±12.35</td>
<td>102.8</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>99.37±5.93</td>
<td>106.6</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>104.24±4.15</td>
<td>109.9</td>
</tr>
</tbody>
</table>

®Ref:NCHS,1987
** Significant at 1% level

Figure 21 Comparison of mean height of boys with NCHS standards
A progressive increase in the height of the sample both boys and girls, was noticed. But observed values were far behind the standard measurement of height suggested by NCHS (1987). Though the negative deviation was only 5.15 percent to 6.78 percent for boys and 3.93 percent to 5.99 percent for girls (within the acceptable limits) the ‘t’ value calculated indicated that there was a statistically significant deficit in the heights of both boys and girls; when compared with the standard (Figure 21 and 22 presents the details).

NNMB (2006) and NFHS (2008) also found stunting (low height for age) among 62.2 percent of preschoolers. IIPS (2007) also reported that India has more than 47 million stunted children nearly about one third of the global total.
Though NNMB (2006) observed more stunting among girls than boys, in the present study girl children were in a slightly better position with respect to height measurements.

Comparison of weight

The mean weight of the sample in comparison with the standard recommended by NCHS (1987) is presented in table 53.

Table 53 Mean weight of preschool children in comparison with standard weight®

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Age (yrs)</th>
<th>Mean Weight (Kg)±SD</th>
<th>Std®Weight (Kg)</th>
<th>“t” value</th>
<th>P Value</th>
<th>Mean Weight (cm)±SD</th>
<th>Std®Weight (cm)</th>
<th>“t” value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>11.63±1.85</td>
<td>14.6</td>
<td>-11.830</td>
<td>0.001**</td>
<td>11.21±1.75</td>
<td>14.1</td>
<td>-12.891</td>
<td>0.001**</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>13.7±2.12</td>
<td>15.7</td>
<td>-5.168</td>
<td>0.001**</td>
<td>12.9±1.8</td>
<td>15.1</td>
<td>-5.455</td>
<td>0.001**</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>14.19±2.61</td>
<td>16.7</td>
<td>-7.452</td>
<td>0.001**</td>
<td>13.54±2.53</td>
<td>16.2</td>
<td>-5.903</td>
<td>0.001**</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>14.07±2.57</td>
<td>17.7</td>
<td>-7.328</td>
<td>0.001**</td>
<td>14.55±2.11</td>
<td>16.8</td>
<td>-3.538</td>
<td>0.001**</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>15.79±1.71</td>
<td>18.7</td>
<td>-10.486</td>
<td>0.001**</td>
<td>14.98±2.01</td>
<td>17.7</td>
<td>-8.800</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

®Ref: NCHS, 1987

** Significant at 1% level
Chapter 4
Results and Discussion

Figure 23 Comparison of mean weight of boys with NCHS standards

Figure 24 Comparison of mean weight of girls with NCHS standards
The mean weight of both boys and girls, although much lower than the standard values, with a statistical significance at 1 percent level; showed a progressive increase with age.

However the height deficit found to range between 12.73 percent to 20.5 percent for boys and 13.39 percent to 20.49 percent for girls; indicating wasting of varying degrees. Severe condition was observed in the 3 year old boys (20.34%) and girls (20.4%) and 4.5 year old boys (20.5 %). Similar findings were also reported by Mitra et al. (2007) Figure 23 and 24 illustrates the weight profile of the sample.

Childhood undernutrition remains a major health problem in India, (Bose et al., 2007). As given by Nandy, et al. (2005) undernutrition continues to be a primary cause of ill-health and premature mortality among children in developing countries and chronic undernutrition in childhood is linked with slower cognitive development and serious health impairments of later in life that reduce the quality of people (Scrimshaw, 1996).

**Nutritional status based on Gomez classification**

Various methods have been suggested to classify children into various nutritional grades, the most widely used one is the Gomez classification (Gomez et al., 1956), in which the children are classified as having first, second or third degree malnutrition if their weight for age range is 75 to 90 percent, 60 to 75 percent or less than 60 percent.
respectively of the reference median (Bamji et al., 1998). The following table presents the details.

Table 54 Nutritional profile of preschool children based on Gomez classification®

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Male(n=209)</th>
<th>Female(n=167)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal (≥90)</td>
<td>Grade I Malnutrition (75-89.99)</td>
</tr>
<tr>
<td>3.0</td>
<td>11(20.4)</td>
<td>23(42.6)</td>
</tr>
<tr>
<td>3.5</td>
<td>11(38.7)</td>
<td>14(46.7)</td>
</tr>
<tr>
<td>4.0</td>
<td>15(25.0)</td>
<td>29(48.3)</td>
</tr>
<tr>
<td>4.5</td>
<td>5(18.5)</td>
<td>9(33.3)</td>
</tr>
<tr>
<td>5.0</td>
<td>14(38.8)</td>
<td>17(44.7)</td>
</tr>
<tr>
<td>Pooled</td>
<td>56(26.79)</td>
<td>92(44.01)</td>
</tr>
</tbody>
</table>

®Ref: Gomez et al. (1956)  
(Numbers in parentheses indicate percentages)

Figure 25 Nutritional profile of boys based on Gomez classification
As per Gomez classification 26.79 percent boys and 29.94 percent of girls were found to have normal nutritional status. Girls were in a slightly better position than boys. More number of normal children irrespective of gender were in the age group of 5 years.

Among the various grades of malnutrition, majority of boys (44.01%) and girls (44.91%) had Grade I malnutrition followed by Grade II and Grade III. Here also gender differences was not noticed much.

The rate of prevalence of Grade I malnutrition was uniformly high in all age groups among boys (33.3% to 48.3%). Almost half of the population fell under this category. Grade II malnutrition found to occur among 27.27 percent with highest incidence among 4.5 year age group. Grade III malnutrition was observed on only 1.91 percent of boys. This was also noticed among 4.5 to 5 year age group.
This trend in prevalence of malnutrition among various age groups was followed in the case of girls also; with the highest incidence of (44.91%) followed by Grade II (23.35%) and Grade III (1.79%). The only difference observed was the incidence of severe malnutrition (Grade III) among younger age groups (3 yrs) in girls; as against older groups (4.5 to 5.0 years) in boys.

According to a study conducted by Mridhula et al. (2004) as per IAP criteria 60.5 percent underfive children were found to be suffering from various grades of protein energy malnutrition and severe protein energy malnutrition was present in 5.2 percent. Girl children are more likely to be undernourished than boys (Chaudhuri, 2007).

**Slum location and nutritional status of preschool children**

The details regarding the nutritional status are given in table 55.

<table>
<thead>
<tr>
<th>Slums</th>
<th>Gomez classification®</th>
<th>Pooled</th>
<th>χ² value</th>
<th>'p' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantis</td>
<td>Normal (≤90)</td>
<td>Grade I Malnutrition (75-89.99)</td>
<td>Grade II Malnutrition (60-74.99)</td>
<td>Grade III Malnutrition (&lt;60)</td>
</tr>
<tr>
<td>Fort Kochi</td>
<td>1(2.9)</td>
<td>17(48.6)</td>
<td>17(48.6)</td>
<td>NIl</td>
</tr>
<tr>
<td>Karithala</td>
<td>2(22.2)</td>
<td>3(33.3)</td>
<td>3(33.3)</td>
<td>1(11.1)</td>
</tr>
<tr>
<td>Pallichal</td>
<td>6(11.8)</td>
<td>25(49.0)</td>
<td>18(35.3)</td>
<td>2(3.9)</td>
</tr>
<tr>
<td>Puthuvypu</td>
<td>52(48.6)</td>
<td>44(41.1)</td>
<td>11(10.3)</td>
<td>NIl</td>
</tr>
<tr>
<td>Santhom</td>
<td>3(11.5)</td>
<td>17(65.4)</td>
<td>6(25.1)</td>
<td>NIl</td>
</tr>
<tr>
<td>Thevara</td>
<td>9(18.8)</td>
<td>20(41.7)</td>
<td>16(33.3)</td>
<td>3(6.3)</td>
</tr>
<tr>
<td>Vathuruthy</td>
<td>31(44.3)</td>
<td>28(40.0)</td>
<td>11(15.7)</td>
<td>NIl</td>
</tr>
<tr>
<td>Pooled</td>
<td>106(28.2)</td>
<td>167(44.4)</td>
<td>96(25.5)</td>
<td>7(1.9)</td>
</tr>
</tbody>
</table>

®Ref: Gomez et al. (1956) **significant at 1% level
(Numbers in parentheses indicate percentages)
Figure 27 Slum locations and nutritional status of preschool children

The slum wise classification of malnutrition showed that Atlantis had comparatively more number of malnourished children (97.2%) mainly having Grade I and Grade II types. Next was Fort Kochi (93.3%) followed by Pallichal (88.2%) and Karithala (77.7%).

The slum with lowest problem was Puthuvypu (51.4%). These differences in the incidence of malnutrition among slums was also found to highly significant (P<0.01) statistically.

Socioeconomic status and nutritional status of preschool children

Socioeconomic scale formulated by Kuppuswamy (1981) was used for reference to classify the economic status of the sample. The association between socioeconomic status and different grades of malnutrition was studied and presented in table 56.
Table 56 Socioeconomic status and nutritional status of preschool children

<table>
<thead>
<tr>
<th>Socioeconomic status</th>
<th>Gomez classification(^\text{®})</th>
<th>Pooled</th>
<th>(\chi^2) value</th>
<th>'p' value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal ((\leq 90))</td>
<td>Grade I Malnutrition (75-89.99)</td>
<td>Grade II Malnutrition (60-74.99)</td>
<td>Grade III Malnutrition (&lt; 60)</td>
</tr>
<tr>
<td>Middle</td>
<td>10 (22.2)</td>
<td>16 (35.6)</td>
<td>17 (37.8)</td>
<td>2 (4.4)</td>
</tr>
<tr>
<td>Low</td>
<td>96 (29.0)</td>
<td>151 (45.6)</td>
<td>79 (23.9)</td>
<td>5 (1.5)</td>
</tr>
<tr>
<td>Pooled</td>
<td>106 (28.2)</td>
<td>167 (44.4)</td>
<td>96 (25.5)</td>
<td>7 (1.9)</td>
</tr>
</tbody>
</table>

\(^\text{®}\)Ref: Gomez et al (1956)  
NS- Not significant

Ref. Kuppuswamy scale (1981)  
(Numbers in parentheses indicate percentages)

Figure 28 Socioeconomic status and nutritional status of preschool children

Socioeconomic status of family affects the nutritional status (Harishankar et al., 2004). When the incidence of different grades of malnutrition was distributed as per socioeconomic status.
There observed no significant difference. This indicated that children in both middle and low socioeconomic status were equally affected by malnutrition. Figure 28 presents the details.

It was also surprising to note that children with normal nutritional status were more in the low socioeconomic status (29.0%) than the middle class group (22.2%). So also the Grade II and Grade III malnutrition. Middle class more affected than the low status group.

Birth order, age, type of family, number of living children, literacy status of mother and calorie intake were significantly associated with grades of malnutrition and frequent episodes of infection are also correlated to stunting (Hassan and Jain, 2009). Children of poor socioeconomic status group had moderate and severely malnourished (Elankumaran, 2003). In the present study middle class group was also equally affected suggesting that the factors other than poverty and poor access to services play an important role as determinants of under nutrition in preschool children (Ramachandran, 2007).

**Standard of living index and nutritional status of preschool children**

The sample was classified based on the standard of living index (IIPS, 2000). Chi-square analysis was used to find out the association between nutritional grades and standard of living. The details are presented in the following table.
Table 57 Standard of living index and nutritional status of preschool children

<table>
<thead>
<tr>
<th>Standard of living index</th>
<th>Gomez classification(^{\circ})</th>
<th>Pooled</th>
<th>(\chi^2) value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal ((\leq 90))</td>
<td>Grade I Malnutrition ((75-89.99))</td>
<td>Grade II Malnutrition ((60-74.99))</td>
<td>Grade III Malnutrition ((&lt; 60))</td>
</tr>
<tr>
<td>Low</td>
<td>14(50.0)</td>
<td>8(28.6)</td>
<td>6(21.4)</td>
<td>Nil</td>
</tr>
<tr>
<td>Medium</td>
<td>21(29.2)</td>
<td>33(45.8)</td>
<td>17(23.8)</td>
<td>1(1.4)</td>
</tr>
<tr>
<td>High</td>
<td>71(25.7)</td>
<td>126(45.7)</td>
<td>73(26.4)</td>
<td>6(2.2)</td>
</tr>
<tr>
<td>Pooled</td>
<td>106(28.2)</td>
<td>167(44.4)</td>
<td>96(25.5)</td>
<td>7(1.9)</td>
</tr>
</tbody>
</table>

\(^{\circ}\)Ref: Gomez et al. (1956)       NS: Not significant
(Numbers in parentheses indicate percentages)

Figure 29 Standard of living index and nutritional status of preschool children

Classification based on nutritional status and standard of living index showed that there was no significant relation between these two factors. However normal children were more (50.0%) in the low standard of living index group than middle (29.2%) and high (25.7%) index groups.
The different grades of malnutrition also found to increase with increase in standard of living index.

Das et al. (2009) stated that half of the child population was found malnourished, the problem was more among males. One third of preschool children from households with high standard of living are undernourished.

**Mid upper arm circumference**

Mid upper arm circumference has been proposed as an alternative index of nutritional status. MUAC appears to be superior predictor of childhood mortality (WHO, 1995).

**Age and mid upper arm circumference of preschool children**

Age wise distribution of the mean MUAC of preschoolers are given in table 58.

### Table 58: Age and MUAC of preschool children

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>MUAC of Boys (cm)(n=209)</th>
<th>MUAC of girls (cm)(n=167)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Standard Value</td>
</tr>
<tr>
<td>3.0</td>
<td>14.77 ± 1.1</td>
<td>15.7</td>
</tr>
<tr>
<td>3.5</td>
<td>14.5 ± 1.03</td>
<td>15.9</td>
</tr>
<tr>
<td>4.0</td>
<td>15.26 ± 1.33</td>
<td>16.1</td>
</tr>
<tr>
<td>4.5</td>
<td>14.71 ± 1.11</td>
<td>16.3</td>
</tr>
<tr>
<td>5.0</td>
<td>14.8 ± 1.12</td>
<td>16.5</td>
</tr>
<tr>
<td>Pooled</td>
<td>14.87 ± 1.18</td>
<td>14.57</td>
</tr>
</tbody>
</table>

*Ref: WHO growth standards (1995)*  
*significant at 5% level*
Figure 30 Age and mean MUAC of preschool children

Mid upper arm circumference is useful not only for identifying malnutrition but also in determining the mortality risk in children. It is said to correlate well with weight, weight for height and clinical signs (Park, 2004).

The mean MUAC values of both boys and girls were found to be less than that of the standard values suggested by WHO (1995) growth standards. The negative deviation from the standard in all the cases irrespective of gender was also found to be statistically significant at one percent level.

Further it was notices that the mean MUAC values of preschoolers, demonstrated a progressive trend up to the age of 4 years for boys as well as girls and then declined. This indicated that inspite of the low MUAC values than standard, preschool children in the urban slums tend to show a progressive increase with respect to MUAC up to 4 years.
The sudden decline after that may be due to repeated episodes of infections like respiratory infections and diarrhea, which increase the demand for nutrients at the same time reduce the intake. This ultimately leads to muscle wastage.

**Grading of malnutrition based on mid upper arm circumference**

Mid upper arm circumference is used for the assessment of nutritional status by grading the sample as normal, mild and severe malnutrition as suggested by WHO (1995).

**Table 59 Nutritional status based on MUAC ®**

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Male(n=209)</th>
<th>Female(n=167)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal (13.5 cm-15cm)</td>
<td>Mild Malnutrition (12.5cm-13.5cm)</td>
</tr>
<tr>
<td>3.0</td>
<td>50 (92.6)</td>
<td>2 (3.7)</td>
</tr>
<tr>
<td>3.5</td>
<td>26 (86.7)</td>
<td>4 (13.3)</td>
</tr>
<tr>
<td>4.0</td>
<td>55(91.7)</td>
<td>5(8.3)</td>
</tr>
<tr>
<td>4.5</td>
<td>24(88.9)</td>
<td>2(7.4)</td>
</tr>
<tr>
<td>5.0</td>
<td>36(94.7)</td>
<td>1(2.6)</td>
</tr>
</tbody>
</table>

Significance: $\chi^2$ value = 7.220 $p = 0.513$ NS

<table>
<thead>
<tr>
<th></th>
<th>Female(n=167)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pooled</td>
<td>14(6.7)</td>
</tr>
</tbody>
</table>

$\chi^2$ value = 5.773 $p = 0.673$ NS

NS- Not Significant

(Numbers in parentheses indicate percentages)
As the table depicts majority of the male children (91.4%) were found to have normal nutritional status with an MUAC value of 13.5 cm to 15 cm. Mild malnutrition in this respect was reported by 6.7 percent of children and severe malnutrition by 1.9 percent of children. As the age
advanced mild malnutrition showed a declining trend except in the age group of 3 year old boys. So also with severe malnutrition.

With respect to girls normal nutritional status a arrived by MUAC was seen comparatively less number of sample (87.4%) than boys (91.4%). Girls with mild malnutrition (12.0%) was almost double than that of boys (6.7%). However these differences were found to be statistically insignificant.

### 4.3.1.2 Blood haemoglobin status

Blood haemoglobin status of sample was assessed using cyanmethaemoglobin method. The standards used for comparison was Sinha et al. (2008) which was also quoted by WHO (1968). Anaemia in infants and children is associated with retardation of physical and intellectual growth, psychomotor development as well as reduced resistance to infections (Lozoff et al., 1991).

**Haemoglobin status of preschool children**

Iron is an essential element necessary for the formation of haemoglobin. Haemoglobin plays an important role in the transport of oxygen to the tissues. Reduction in haemoglobin in blood leads to anaemia. WHO (1968). Mean haemoglobin levels based on age groups is presented in table. Haemoglobin cut off values recommended by Sinha et al. (2008) has been used to categorised anaemic and non anaemic.
Table 60 Mean haemoglobin levels of preschool children®

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Age (years)</th>
<th>Male</th>
<th>Female</th>
<th>“t” value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>1</td>
<td>3.0</td>
<td>10.3 ± 1.25</td>
<td>9.9</td>
<td>± 1.16</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>10.06 ± 1.27</td>
<td>10.45</td>
<td>± 0.85</td>
</tr>
<tr>
<td>3</td>
<td>4.0</td>
<td>10.33 ± 1.12</td>
<td>9.75</td>
<td>± 1.11</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>10.35 ± 1.18</td>
<td>9.99</td>
<td>± 1.41</td>
</tr>
<tr>
<td>5</td>
<td>5.0</td>
<td>10.09 ± 1.02</td>
<td>10.49</td>
<td>± 1.04</td>
</tr>
</tbody>
</table>

®Ref: Sinha et al. (2008)

*significant at 5% level
NS- Not significant

Figure 33 Mean haemoglobin levels of preschool children

Haemoglobin status of the preschool children is depicted in the table 60 and figure 33. The mean haemoglobin for different age groups among male children ranged between 10.06 and 10.35 g/dl, whereas that of the female children ranged between 9.75 g/dl and 10.49 g/dl. Which was below the cut off values suggested by Sinha et al. (2008).

Comparison of mean haemoglobin values of boys and girls did not show any statistically significant difference in all age groups except 4 year old preschoolers, where the difference was significant at 5 percent level.
Blood haemoglobin and incidence of anaemia

Blood haemoglobin levels are directly related to anaemia. Age and sex wise distribution of anaemia incidence among preschool children presented in table 61.

Table 61 Blood haemoglobin levels and incidence of anaemia among preschool children

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Normal (&gt; 11 g/dl)</th>
<th>Mild anaemia (10-10.9 g/dl)</th>
<th>Moderate anaemia (7-9.9 g/dl)</th>
<th>Severe anaemia (&lt; 7 g/dl)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>3.0</td>
<td>5(9.3)</td>
<td>Nil</td>
<td>29(52.7)</td>
<td>27(47.3)</td>
<td>18(36.2)</td>
</tr>
<tr>
<td>3.5</td>
<td>26(7.3)</td>
<td>2(6.7)</td>
<td>13(43.3)</td>
<td>15(75.0)</td>
<td>15(50.0)</td>
</tr>
<tr>
<td>4.0</td>
<td>4(12.7)</td>
<td>1(2.7)</td>
<td>38(33.3)</td>
<td>12(32.4)</td>
<td>28(33.3)</td>
</tr>
<tr>
<td>4.5</td>
<td>1(2.7)</td>
<td>1(2.7)</td>
<td>15(55.6)</td>
<td>5(36.4)</td>
<td>11(40.7)</td>
</tr>
<tr>
<td>5.0</td>
<td>1(2.6)</td>
<td>1(2.4)</td>
<td>21(55.3)</td>
<td>30(71.4)</td>
<td>16(42.1)</td>
</tr>
<tr>
<td>Pooled</td>
<td>11(5.3)</td>
<td>3(1.8)</td>
<td>116(55.5)</td>
<td>88(52.7)</td>
<td>81(38.8)</td>
</tr>
</tbody>
</table>

®Ref: Sinha et al. (2008)
(Numbers in parentheses indicate percentages)

Figure 34 Incidence of anaemia among boys
Prevalence of anaemia was found to be more among girls (98.2%) than boys (94.8%) of preschool age. Only 5.3 percent of boys and 1.8 percent of girls were found to have normal haemoglobin values.

Haemoglobin level of boys found to reduce with age and made them susceptible to anaemia of varying degrees. Mild anaemia was more prominent among boys (55.5%) than girls (52.7%) where as moderate anaemia was more among girls (45.5%) than boys (38.8%). Figure 34 and figure 35 illustrate the incidence of anaemia. Similar results were reported by Deshmukh et al. (2009) that anaemia was detected in 80.3 percent of children and 59.6 percent were undernourished.

The results of the study by Prasad et al. (2009) indicated that the impact of iron deficiency on cognition was best demonstrated among those children with the highest prevalence of the iron deficiency.
anaemic children were found to perform better on cognitive function test than mild anaemic and moderate anaemic.

**Socioeconomic status and incidence of anaemia in preschoolers**

Socioeconomic status affects the nutritional status of children (Elamkumaran, 2003). In this context, incidence of anaemia was studied based on the socioeconomic status of sample. The results are given below.

**Table 62 Socioeconomic status and incidence of anaemia in preschool children**

<table>
<thead>
<tr>
<th>Socioeconomic status</th>
<th>Blood haemoglobin status&lt;sup&gt;®&lt;/sup&gt;</th>
<th>Total</th>
<th>$\chi^2$ value</th>
<th>'p' value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal (&gt; 11 g/dl)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>3(6.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>11(3.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>14(3.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mild anaemia (10-10.9 g/dl)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>23(51.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>181(54.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>204(54.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate anaemia (7.9-9.9 g/dl)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>18(40.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>139(42.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>157(41.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Severe anaemia (&lt; 7 g/dl)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>1(2.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Nil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>1(0.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ref: Sinha et al. (2008)  
*significant at 5% level  
(Numbers in parentheses indicate percentages)
Socioeconomic status of the sample found to influence the incidence of anaemia to a significant (at 5% level) extent, although there observed a progressive increase in incidence of anaemia with reduction in social status. Children with normal haemoglobin status were also seen to be more among middle class (6.7%) than the low class (3.3%) category. Severe anaemia case (2.2%) was also reported among children of middle socioeconomic status.

A strong association between low socioeconomic position and poor health has already been reported by WHO (1995). The inadequate intake of iron in children of lower socioeconomic status, might influence their overall nutritional status (Islam et al., 2009). Sheikh et al. (2009) concluded that 86 percent children were anaemic.

**Standard of living index and Incidence of anaemia in preschoolers**

Micronutrient deficiency, particularly an inadequate intake of iron, has a direct impact on the nutritional status of young children and is the most common cause of anaemia. The NFHS standard of living index (IIPS, 2000) was used to classify the standard of living of the sample. The prevalence of anaemia among sample of different standard of living index is shown in table 63.
Table 63 Standard of living index and incidence of anaemia in preschool children

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Standard of living index</th>
<th>Blood haemoglobin status&lt;sup&gt;®&lt;/sup&gt;</th>
<th>Total</th>
<th>( \chi^2 ) value</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard of living index</td>
<td>Normal (&gt; 11 g/dl)</td>
<td>Mild anaemia (10-10.9 g/dl)</td>
<td>Moderate anaemia (7-9.9 g/dl)</td>
<td>Severe anaemia (&lt; 7 g/dl)</td>
</tr>
<tr>
<td>1</td>
<td>Low</td>
<td>1(3.6)</td>
<td>12(42.9)</td>
<td>15(53.6)</td>
<td>Nil</td>
</tr>
<tr>
<td>2</td>
<td>Medium</td>
<td>4(5.6)</td>
<td>34(47.2)</td>
<td>34(47.2)</td>
<td>Nil</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>9(3.3)</td>
<td>158(57.2)</td>
<td>108(39.1)</td>
<td>1(0.4)</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>14(3.7)</td>
<td>204(64.2)</td>
<td>157(41.7)</td>
<td>1(0.3)</td>
</tr>
</tbody>
</table>

<sup>®</sup>Ref: Sinha et al. (2008)  
<sup>NS</sup>- Not significant  
(Numbers in parentheses indicate percentages)

Figure 37 Standard of living index and incidence of anaemia in preschool children

As obtained from the table and figure, the standard of living index of the sample did not found to influence the incidence of anaemia among preschoolers to any significant level. Whereas, there observed a progressive increase in mild anaemia with improvement of standard of living index and vice versa with moderate anaemia. Here again one sample with severe anaemia belong to the high standard of living index;
which clearly indicated the role of multiple factors in precipitating anaemia among preschool children (Bisla et al., 2009). Figure 37 presents the standard of living index and prevalence of anaemia among the sample.

4.3.1.3 Dietary assessment

Diet is a vital determinant of health and nutritional status of children. Dietary assessment includes data related to food habits, infant feeding practices, food intake and nutrient intake.

Food habits and practices of preschoolers

Dietary practices of preschoolers were obtained in terms of food preference, consumption, habits and number of meals and are given in the following table:

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency (n=376)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Food habits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non vegetarian</td>
<td>337</td>
<td>89.5</td>
</tr>
<tr>
<td></td>
<td>Vegetarian</td>
<td>39</td>
<td>10.5</td>
</tr>
<tr>
<td>2.</td>
<td>No. Of meals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two main meals</td>
<td>23</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>Three main meals</td>
<td>240</td>
<td>63.8</td>
</tr>
<tr>
<td></td>
<td>Four main meals</td>
<td>110</td>
<td>29.3</td>
</tr>
<tr>
<td></td>
<td>May vary</td>
<td>3</td>
<td>0.9</td>
</tr>
<tr>
<td>3.</td>
<td>Food Preference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bakery Products</td>
<td>44</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td>Fast Food</td>
<td>74</td>
<td>19.8</td>
</tr>
<tr>
<td></td>
<td>Homemade food</td>
<td>258</td>
<td>68.6</td>
</tr>
<tr>
<td>4.</td>
<td>Fast Food Consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequently</td>
<td>156</td>
<td>41.6</td>
</tr>
<tr>
<td></td>
<td>Occasional</td>
<td>27</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>Rare</td>
<td>193</td>
<td>51.2</td>
</tr>
</tbody>
</table>

Table 64 Dietary habits and practices of preschool children
Although all the families under the purview of the study followed non-vegetarian food habits, only 89.5 percent of the preschoolers were fed with non-vegetarian foods. This may be due to customs and beliefs prevailing among the people on not to feed non vegetarian foods until certain age. Thus fish and other marine foods available in plenty were not given to children of preschool age.

Most of them followed 3 meals pattern (63.8%) followed by four meals a day (29.3%). Either frequent (41.6%) or rare (51.2%) consumption of fast foods by the preschoolers was also reported. When 11.6 percent and 19.8 percent preferred bakery and fast foods respectively for their children. While 68.6 percent had given only homemade food to them which is very promising. Use of fast foods in early childhood and incidence of obesity and other metabolic related problems in adult have been emphasized by many authors.

**Infant feeding practices**

One of the major factors which modulate nutritional status during early childhood include birth weight, infant and young child feeding practices, morbidity due to infections, treatment of infections, nutrition care during infection and convalescence (Ramachandran, 2007). Since feeding practices seem to play an important role in the well being of the child, details pertaining to this were studied.
Breast feeding

Exclusive breastfeeding for the first six months of life followed by a combination of breastfeeding and complementary feeding up to age two years or beyond, helps to prevent malnutrition (WHO, 2009). With reference to this fact breast feeding practices of the sample was analyzed in detail.

Table 65 Breast feeding practices

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Frequency (n=376)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Initiation of breast feeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soon after birth</td>
<td>362</td>
<td>96.4</td>
</tr>
<tr>
<td></td>
<td>2-3 hours</td>
<td>7</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>2-3 days</td>
<td>7</td>
<td>1.8</td>
</tr>
<tr>
<td>2.</td>
<td>First feed other than breast milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Holy water</td>
<td>158</td>
<td>42.2</td>
</tr>
<tr>
<td></td>
<td>Honey</td>
<td>3</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Milk</td>
<td>11</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Sugar water</td>
<td>3</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Gold and honey</td>
<td>73</td>
<td>19.5</td>
</tr>
<tr>
<td></td>
<td>Nothing</td>
<td>126</td>
<td>33.5</td>
</tr>
<tr>
<td>3.</td>
<td>Fed colostrums</td>
<td>347</td>
<td>92.8</td>
</tr>
<tr>
<td>4.</td>
<td>Reasons for discarding colostrum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elder’s advise</td>
<td>14</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>Not digestible</td>
<td>3</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Not good for the child</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>5.</td>
<td>Duration of Breast feeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-3 month</td>
<td>11</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>3-6 month</td>
<td>17</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>6-1 year</td>
<td>92</td>
<td>24.6</td>
</tr>
<tr>
<td></td>
<td>1-1.5 years</td>
<td>109</td>
<td>29.0</td>
</tr>
<tr>
<td></td>
<td>1.5-2 years</td>
<td>137</td>
<td>36.6</td>
</tr>
<tr>
<td></td>
<td>more than 2 years</td>
<td>10</td>
<td>2.4</td>
</tr>
</tbody>
</table>
As given in the table, 100 percent of the preschoolers were breast fed during infancy. Of which initiation of breast feeding soon after birth was reported by 96.4 percent of mothers. Holy water (42.2%) and honey and gold (19.5%) were given as per their customs, to the new born baby. But 33.5 percent of the mothers did not give any such things but breast milk, this is considered as a best practice.

Colostrum feeding was found to be common (92.8%). Those who discarded colostrums believed that it is indigestible (0.6%) or not good for the baby (3.0%). But mostly they did so as per the advice of elders in the family (3.6%).

Duration of breast feeding was found to be 1.5 to 2.0 years in majority of cases (36.6%) followed by 1.0 to 1.5 years (29.0%) and 6 months to 1.0 year (24.6%).

Habicht and Pierre (2008) stated that children who are undernourished, not optimally breastfed or suffering from micronutrient deficiencies have substantially lower chances of survival than children who are well nourished. Prevalence of morbidity was low in the first 3 months when infants were mostly solely breastfed and had lower exposure to poor environmental hygiene (Ramachandran and Gopalan, 2009). NFHS-3(2006) also states that exclusively breastfed infants weighed more as compared to those receiving additional milk in the first few months.
Bottle feeding practices

The bottle feeding creates hazards due to over dilution of milk. This increased susceptibility to infection (Watl, 2000). In addition to this fact, the slum children grow up without hygiene (Rode, 2009). Hence practices related to bottle feeding was considered as an important factor in the well being of children. The following table presents the details.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Frequency (n=376)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Breast Feeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solely breast fed</td>
<td>246</td>
<td>65.6</td>
</tr>
<tr>
<td></td>
<td>Solely Bottle feed</td>
<td>43</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>87</td>
<td>23.1</td>
</tr>
<tr>
<td>2</td>
<td>Dilution of milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1:1(milk: water)</td>
<td>61</td>
<td>46.7</td>
</tr>
<tr>
<td></td>
<td>1:2(milk: water)</td>
<td>29</td>
<td>22.3</td>
</tr>
<tr>
<td></td>
<td>1:3(milk: water)</td>
<td>35</td>
<td>27.2</td>
</tr>
<tr>
<td></td>
<td>Whole milk</td>
<td>5</td>
<td>3.8</td>
</tr>
<tr>
<td>3</td>
<td>Sterilizing bottle</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before and after each use</td>
<td>98</td>
<td>75.4</td>
</tr>
<tr>
<td></td>
<td>Absence of sterilization</td>
<td>32</td>
<td>24.6</td>
</tr>
</tbody>
</table>

Children were solely breast fed by 65.6 percent of mothers. Both bottle feeding as well as breast feeding was practiced by 23.1 percent are solely bottle fed was 11.4 percent. During bottle feeding, milk was diluted by most of the mothers in the ratio of 1:1 (46.7%). but even 1:3 (27.2%) or
1.2 (22.3%). Only 3.8 percent gave whole milk without dilution to infants. Sterilisation of feeding bottles was done before and after use by 75.4 percent of mothers. This was not practiced by the rest (24.6%). The absence of sterilization of feeding bottle is a most undesirable practice, observed among a quarter of population. This may lead to a number of infectious diseases like diarrhoea and other gastrointestinal problems. Repeated episodes of diarrhoea is a major factor for chronic undernutrition and mortality among infants.

**Weaning practices**

Introduction of food supplements along with breast feeding is necessary for infants by 4 to 6 months of age (ICMR, 1991). Details on the weaning practices are furnished in the following table.

<table>
<thead>
<tr>
<th>Weaning foods</th>
<th>Time of initiation</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fourth month</td>
<td>Sixth month</td>
</tr>
<tr>
<td>Cereals</td>
<td>179 (47.6)</td>
<td>134 (35.6)</td>
</tr>
<tr>
<td>Pulses</td>
<td>12 (3.3)</td>
<td>50 (13.2)</td>
</tr>
<tr>
<td>Fruits</td>
<td>8 (2.1)</td>
<td>23 (6.0)</td>
</tr>
<tr>
<td>Vegetable</td>
<td>11 (3.0)</td>
<td>108 (28.7)</td>
</tr>
<tr>
<td>Fish</td>
<td>Nil</td>
<td>36 (9.6)</td>
</tr>
<tr>
<td>Egg</td>
<td>Nil</td>
<td>37 (9.9)</td>
</tr>
<tr>
<td>Meat</td>
<td>Nil</td>
<td>3 (0.9)</td>
</tr>
<tr>
<td>Roots &amp; Tubers</td>
<td>Nil</td>
<td>2 (0.6)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)
As obtained by the table the first introduction of supplementary foods was at the age of 4th month in majority of cases (47.6%) followed by 6th month (35.6%) and even one year (16.8%). The first food introduced was cereal based, that too in semisolid consistency (82.9%). Fruits (9.9%), pulses (83.5%) and vegetables (68.3%) were first introduced at the age of one year. These were mostly introduced in the semisolid form (31.4% to 94.9%). Non-vegetarian foods like fish, egg and meat were not given to infants upto fourth month. As the infant reached one year they were given all flesh foods (90.4% to 99.4%).

So the table presents that the infants were familiarized with all kinds of food available locally by the time they reach one year of age.

As ICMR (2004) referred provision of adequate and appropriate supplements to young children prevents malnutrition. Promotion of optimal growth in infants calls for introduction of adequate food supplements in addition to breast feeding from 4-6 months onwards.

**Food Consumption pattern of preschool children**

Preschoolers are vulnerable to infections. They succumb readily where the diet is poor in quality and quantity. The rate of growth depends on the adequacy of diet (Swaminathan, 2003). Food consumption pattern of preschoolers was assessed in terms of food and nutrient intake.
Mean food intake in comparison with RDA

The mean food intake of preschoolers in comparison with recommended dietary allowances specified by ICMR (2004) is shown in the following table.

### Table 68 Mean food intake of preschool children in comparison with RDA®

<table>
<thead>
<tr>
<th>Food Items</th>
<th>RDA (g)</th>
<th>Mean Intake (g)</th>
<th>Standard Deviation</th>
<th>Mean difference</th>
<th>Std Error</th>
<th>t value</th>
<th>p’value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>200</td>
<td>160.7 (19.7)</td>
<td>± 31.24</td>
<td>-39.3</td>
<td>5.705</td>
<td>-6.889</td>
<td>0.000**</td>
</tr>
<tr>
<td>Pulses</td>
<td>50</td>
<td>13.7 (72.6)</td>
<td>± 17.85</td>
<td>-36.3</td>
<td>3.260</td>
<td>-11.145</td>
<td>0.000**</td>
</tr>
<tr>
<td>GLV</td>
<td>75</td>
<td>0.8 (99.93)</td>
<td>± 3.239</td>
<td>-74.2</td>
<td>0.591</td>
<td>-125.433</td>
<td>0.000**</td>
</tr>
<tr>
<td>Other vegetables</td>
<td>50</td>
<td>34.7 (30.6)</td>
<td>± 38.48</td>
<td>-15.3</td>
<td>6.681</td>
<td>-2.302</td>
<td>0.029*</td>
</tr>
<tr>
<td>Roots</td>
<td>50</td>
<td>5.7 (88.6)</td>
<td>± 9.625</td>
<td>-44.3</td>
<td>1.757</td>
<td>-25.228</td>
<td>0.000**</td>
</tr>
<tr>
<td>Fruits</td>
<td>50</td>
<td>7.7 (84.6)</td>
<td>± 20.28</td>
<td>-42.3</td>
<td>3.704</td>
<td>-11.229</td>
<td>0.000**</td>
</tr>
<tr>
<td>Milk</td>
<td>200</td>
<td>77.7 (81.15)</td>
<td>± 2.24</td>
<td>-122.3</td>
<td>7.712</td>
<td>-15.864</td>
<td>0.000**</td>
</tr>
<tr>
<td>Fats &amp; Oil</td>
<td>25</td>
<td>29.7 (18.8)</td>
<td>± 8.401</td>
<td>4.7</td>
<td>1.534</td>
<td>3.043</td>
<td>0.005**</td>
</tr>
<tr>
<td>Fish &amp; Meat</td>
<td>30</td>
<td>56.7 (89.0)</td>
<td>± 30.83</td>
<td>28.7</td>
<td>5.629</td>
<td>4.737</td>
<td>0.000**</td>
</tr>
<tr>
<td>Egg</td>
<td>30</td>
<td>8.3 (72.33)</td>
<td>± 18.95</td>
<td>-21.7</td>
<td>3.460</td>
<td>-6.262</td>
<td>0.000**</td>
</tr>
<tr>
<td>Sugar</td>
<td>40</td>
<td>17.5 (56.25)</td>
<td>± 4.69</td>
<td>-22.5</td>
<td>0.856</td>
<td>-26.285</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

*Ref : ICMR(2004)
(Numbers in parentheses indicate percentage adequacy)  ** Significant at 1% level
*Significant at 5% level

Figure 38 Comparison of mean food intake of preschool children with RDA
As there is no difference in the recommended intake of food with respect to gender, male and female children were not considered separately. The intake of almost all kinds of foods except fats and oils, and fish and meat was found to be far below the RDA suggested by ICMR (2004). In all the above items the mean intake was significantly lower (at 1 % level) than RDA.

The extreme inadequacies observed in the case of green leafy vegetable, fruits, milk and pulses may lead to the problem of protein as well as micronutrient deficiencies, the major contributors of childhood morbidities.

Fish and meat intake, almost double of the RDA, would be helpful to compensate protein inadequacies to certain extent. But micronutrient deficiencies still remain as a high sensitive issue challenging the health and well being of preschoolers (Figure 38).

**Percentage adequacy of food intake by preschool children**

Figure 39 shows the percentage adequacy of diet consumed by the subjects.
As the figure depicts there observed a gross inadequacy in the case of green leafy vegetable, roots and fruits. The intake was sufficient to meet only 1.07 percent of RDA for green leafy vegetable, 15.4 percent of RDA for fruits and 11.4 percent of RDA for roots. Milk intake reported a deficit of nearly 38.8 percent and other vegetables around 69.4 percent.

Cereals, pulses and sugar could fulfill 80.7 percent, 27.4 percent and 43.75 percent of RDA respectively. Fats and oils (118.8%) and fish and meat (189.0%) demonstrated a surplus intake above RDA.

**Mean nutrient intake in comparison with RDA**

Mean nutrient intake by the sample was analyzed and compared with the RDA (ICMR, 2004). The following table furnishes the details.

**Table 69 Mean nutrient intake of preschool children in comparison with RDA**

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Mean intake</th>
<th>RDA®</th>
<th>Mean Difference</th>
<th>Standard Deviation</th>
<th>t’ value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories (KCal)</td>
<td>967.4(-42.7)</td>
<td>1690</td>
<td>-722.636</td>
<td>± 177.974</td>
<td>-19.045</td>
<td>0.000**</td>
</tr>
<tr>
<td>Proteins (g)</td>
<td>30.5(+1.66)</td>
<td>30</td>
<td>0.529</td>
<td>± 8.039</td>
<td>0.309</td>
<td>0.761NS</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>193.6(-51.6)</td>
<td>400</td>
<td>-206.350</td>
<td>± 81.112</td>
<td>-11.932</td>
<td>0.000**</td>
</tr>
<tr>
<td>Iron(mg)</td>
<td>4.6(-74.4)</td>
<td>18</td>
<td>-13.3659</td>
<td>± 1.9224</td>
<td>-32.586</td>
<td>0.000**</td>
</tr>
<tr>
<td>Vitamin A (µg)</td>
<td>108.9(-72.77)</td>
<td>400</td>
<td>-295.85</td>
<td>± 116.69</td>
<td>-25.865</td>
<td>0.000**</td>
</tr>
<tr>
<td>Vitamin C(mg)</td>
<td>12.5(-68.75)</td>
<td>40</td>
<td>-27.477</td>
<td>± 5.498</td>
<td>-23.440</td>
<td>0.000**</td>
</tr>
<tr>
<td>Fat(g)</td>
<td>14.1(43.6)</td>
<td>25</td>
<td>-10.901</td>
<td>± 5.115</td>
<td>-9.996</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

® Ref: ICMR(2004)  
NS- Not significant  
** Significant at 1% level
Figure 40 Comparison of mean nutrient intake of preschool children with RDA

As the gender difference in RDA is not there, the male and female sample were considered together. The mean nutrient intake of the sample fell short of RDA in all the nutrients studied. The difference was also found to be statistically significant at 1 percent level except for protein.

As observed in the previous table the intake of fish and meat in surplus by the preschoolers help to compensate the dietary inadequacy of protein, which would have been aroused otherwise due to lowered intake of pulses and milk.

The grave deficiencies of energy, iron, vitamin A and Vitamin C in the diet of the sample, however will be seriously interfering with the growth and development of the preschoolers in the slums (Figure 40 presents the details).
Similar findings were also reported by Gaur and Suman (2009) stating that intake of calories, proteins by children was found to be satisfactory while the intake of micronutrients (vitamin A and iron) was found below the recommended dietary intake because of the practice of packing lunch without fresh fruits and vegetables.

Prasad et al. (2009) found that intake of vitamin A and C was significantly less in lower socioeconomic status.

**Percentage of nutritional adequacy**

The details are given in figure 41.

![Figure 41 Percentage adequacy of nutrient intake by preschool children](image)

The above figure showed the percentage adequacy of nutrient intake in comparison with RDA. The protein intake was adequate (101.6%)
and that of fat was said to be inadequate as the intake met 56.5 percent of RDA.

Grave inadequacy was noticed in the case of iron (25.6% of RDA) and vitamin A (27.23% of RDA). This could lead to serious health consequences due to micronutrient deficiency.

Intake of energy, calcium and vitamin C estimated to meet 57.3 percent, 48.4 percent and 31.25 percent of the RDA, respectively also posing acute health problems related to nutritional disorders.

Thus it can be stated that diet consumed by the children of urban slums, under the study, is totally inadequate in quantity as well as quality. As NFHS-3 (2006) reported rather than quantity the diet should made nutrient dense especially micronutrients.

4.3.2 Health status of preschool children

Health of children is invariably bound with their living conditions. Slum children always succumb to infections which strongly affect their health status.

4.3.2.1 Nutritional disorders

Nutrients obtained through food have vital effects on physical growth and development, maintenance of normal body function, physical activity and health. Nutritious food is important to sustain life (ICMR, 1991). Nutritional disorders occur on deficiency of nutrient intake.
Occurrence of clinical manifestations

Clinical examination has always been and remains an important practical method for assessing nutritional status of a community (Jelliffe, 1966). The data procured by the clinical survey conducted among the preschoolers, was analysed and presented in this section.

Clinical signs of protein energy and mineral malnutrition

Protein energy malnutrition is the most common nutritional disorder among children in developing countries like India (Bamji et al., 1998). Age wise distribution of sample based on clinical signs is furnished in the following table:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Age in years(n=376)</th>
<th>Pooled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protein energy deficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of hair luster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>12 (22.3)</td>
<td>3 (10)</td>
<td>6 (10)</td>
</tr>
<tr>
<td>Girls</td>
<td>15 (26.4)</td>
<td>2 (10)</td>
<td>2 (5.4)</td>
</tr>
<tr>
<td>2</td>
<td>Iron deficiency</td>
<td>Pale tongue</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>7 (13.0)</td>
<td>2 (6.7)</td>
<td>2 (3.3)</td>
</tr>
<tr>
<td>Girls</td>
<td>3 (5.3)</td>
<td>2 (10.0)</td>
<td>3 (8.1)</td>
</tr>
<tr>
<td>3</td>
<td>Flourosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>11 (20.6)</td>
<td>10 (33.3)</td>
<td>12 (20.0)</td>
</tr>
<tr>
<td>Girls</td>
<td>13 (22.8)</td>
<td>4 (20.0)</td>
<td>8 (21.6)</td>
</tr>
<tr>
<td>4</td>
<td>Dental Caries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>13 (24.1)</td>
<td>13 (43.4)</td>
<td>30 (50.0)</td>
</tr>
<tr>
<td>Girls</td>
<td>25 (43.9)</td>
<td>7 (3.5)</td>
<td>14 (37.8)</td>
</tr>
</tbody>
</table>

Numbers in parentheses indicate percentages

Protein energy malnutrition was present among the children of all age groups, but severe cases of kwashiorkor and marasmus were absent.
While symptoms like lusterless dry rough hair was found among the boys (15.4%) as well as girls (19.2%).

Anaemia cases were there in both the groups. The symptoms of paleness of tongue was observed, while koilonychia was absent. Irrespective of gender, paleness of tongue was seen among both boys (7.7%) and girls (7.8%). The incidence of anaemia among 3 year boys and 4.5 year girls.

Flourosis was noticed among the sample involving 26.3 percent of male and 26.9 percent of female children. Severe form of flourosis as chalky, pitted and mottled teeth was seen among 5 year old boys (47.4%) and 4.5 year old girls (45.5%).

Results of dental observation showed that dental hygiene was low among the children. Dental caries was comparatively more in girls (41.9%) than in boys (39.2%). Half of the boys in the age group of 4 years and girls of 5 years had dental caries.

In short, the clinical manifestation of protein energy and iron deficiencies were more prevalent among the preschoolers in the slum areas severe form of flourosis was also seen in all age groups irrespective of gender. Dental caries was the most prominent problem, affecting both boys (39.2%) and girls (41.9%). Girls in general were more affected than boys.

Age wise prevalence showed that irrespective of gender the upper age groups (4.5 to 5 years) were more seriously affected than younger ones. Only exception was the nutritional deficiencies among boys, where 3 year old children were most affected.

**Clinical signs of vitamin deficiencies**

The details are shown in table 71.
## Table 71 Clinical signs of vitamin deficiencies among preschoolers

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Age (years)</th>
<th>Pooled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>1.</td>
<td>Vitamin A deficiency</td>
<td>Night blindness</td>
<td>Boys</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Conjunctival Xerosis</td>
<td>Boys</td>
<td>5(9.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Bitot's Spot</td>
<td>Boys</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Corneal Xerosis</td>
<td>Girls</td>
<td>1(1.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Vitamin B Complex deficiency</td>
<td>Boys</td>
<td>3(5.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Angular stomatitis</td>
<td>Girls</td>
<td>4(7.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Cheilosis</td>
<td>Boys</td>
<td>1(1.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Glossitis</td>
<td>Girls</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Vitamin C deficiency</td>
<td>Boys</td>
<td>2(3.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Spongy and bleeding gums</td>
<td>Girls</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Vitamin D deficiency</td>
<td>Boys</td>
<td>1(1.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Knock knee</td>
<td>Girls</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Bow legs</td>
<td>Boys</td>
<td>2(3.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Boys</td>
<td>Girls</td>
<td>1(1.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Numbers in parentheses indicate percentages*

### Vitamin A deficiency

Conjunctival xerosis and corneal xerosis, the two manifestations of vitamin A deficiency were diagnosed among the preschoolers. Among the sample 15.3 percent of boys and 15.6 percent of girls had conjunctival
xerosis followed by corneal xerosis involving 1.4 percent of boys and 3.6 percent of girls. Only one case each of nightblindness and bitot’s spot was also reported among 5 year old boys. Age wise distribution indicated that that senior age group (4.5 to 5.0 years) was slightly more affected; although not much a difference was observed among the different age groups studied.

In India, Vitamin A Deficiency (VAD) is still a major micronutrient deficiency lurking beneath childhood morbidity and mortality due to common illnesses (Bains et al., 2009). Vitamin A deficiency often in association with protein energy malnutrition principally affects preschool children. It is estimated that almost 250 million children in developing countries are at risk (NIPCCD, 2007).

As given by Aneja et al. (2000) signs of Vitamin A deficiency like bitot’s spot, xerophthalmia and increased morbidity in terms of repeated bouts of acute respiratory illness, diarrhoeal disease in infants and children and resultant mortality as well as night blindness in pregnant women were rampant across most communities.

Ocular signs of vitamin A deficiency were more present among the children aged 1-5 years. Children of illiterate mothers suffered from vitamin- A deficiency. Nutrient intake decreases with the increase of family size, and in children of multipara mothers (Chatterjee et al., 2009).

The prevalence of night blindness, conjunctival xerosis and bitot’s spot was more and it increased significantly with increase in age, even this was
higher among the children of lower socioeconomic communities, in 3-5-year age group and those children of illiterate mothers (Arlappa et al., 2009). All the deficiencies were more common amongst male children (Sharma et al., 2009).

Vitamin A supplementation proved to be definitely effective to improve the health status of the slum dwellers, about 75 percent of them suffered from at least one episode of acute respiratory infections irrespective of the vitamin A supplementation (Kar et al., 2001).

Das et al. (2009) observed the overall prevalence of night blindness, bitot’s spot and conjunctival xerosis. Higher morbidity rate of diarrhoea, respiratory disease, measles and skin disease was suggestive of high prevalence of vitamin A deficiency.

Vitamin B complex deficiency

Angular stomatitis, cheilosis, glossitis and phrynoderma were the symptoms observed. Of which angular stomatitis and glossitis presented a slightly more prevalence rate than others. However the overall prevalence rate was less than 5 percent. Here also girls of all age groups were more affected than boys.

Vitamin C deficiency

Occurrence of vitamin C deficiency as spongy and bleeding gums was found only among 1.5 percent of the sample; that too among boys, not among girls.
Vitamin D deficiency

Knock knee (1.2 % to 2.4%) and bow legs (less than 1.0%) were the two manifestations observed among preschool children. The age group of 3.0 years and 4.5 years were more affected than other age groups.

Other Clinical signs

Table 72 Other clinical signs among the preschool children

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Clinical signs</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Palpable liver</td>
<td>62(16.5)</td>
</tr>
<tr>
<td>2.</td>
<td>Lymph node enlargement</td>
<td>130(34.57)</td>
</tr>
<tr>
<td>3.</td>
<td>Tonsil</td>
<td>62(16.5)</td>
</tr>
<tr>
<td>4.</td>
<td>Red raw &amp; Ulcered tongue</td>
<td>16(4.25)</td>
</tr>
<tr>
<td>5.</td>
<td>Ulcer</td>
<td>3(0.79)</td>
</tr>
<tr>
<td>6.</td>
<td>Dermatitis</td>
<td>53(28.19)</td>
</tr>
<tr>
<td>7.</td>
<td>Seborrhea</td>
<td>9(2.4)</td>
</tr>
<tr>
<td>8.</td>
<td>Hypo pigmentation</td>
<td>22(5.85)</td>
</tr>
<tr>
<td>9.</td>
<td>Changes in skin texture</td>
<td>81(21.54)</td>
</tr>
</tbody>
</table>

Numbers in parentheses indicate percentages)

Among other clinical signs the most prominent ones were lymphnode enlargement (34.57%), dermatitis (28.19%), and other changes in skin texture (21.54%). Tonsils (16.5%) and palpable liver (16.5%) were also noticed among quite a good number of children.

4.3.2.2 Childhood diseases

Child health indicators among slum residents showed that their health is 2 to 3 times worse than in urban areas (Rao and Thakur, 2007).
Incidence of vaccine preventable diseases

The universal immunisation programme provides children with vaccinations against six vaccine-preventable diseases namely tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles (Kamla et al., 2009). The incidence of vaccine preventable diseases is given in the following table.

Table 73 Incidence of vaccine preventable diseases

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Diseases</th>
<th>Incidence (n=376)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>Percent</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Diphtheria</td>
<td>1</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Whooping cough</td>
<td>Nil</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Tetanus</td>
<td>Nil</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Polio</td>
<td>Nil</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Chicken pox</td>
<td>Nil</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Mumps</td>
<td>3</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Measles</td>
<td>1</td>
<td>0.3</td>
<td></td>
</tr>
</tbody>
</table>

Vaccine preventable diseases such as chicken pox, whooping cough, tetanus and polio were totally absent. Only mumps was present, but that too was negligible (0.9%) extent. Still lesser cases of measles and diphtheria was (0.3%) reported.

Immunisation Coverage

Immunisation prevents the childhood diseases and the resultant mortality to certain extent. The details of immunisation coverage are given in table 74.
Table 74 Immunisation coverage of preschoolers

<table>
<thead>
<tr>
<th>Immunisation coverage</th>
<th>No. of children (n=376)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>267 (71.0)</td>
</tr>
<tr>
<td>Complete upto the age</td>
<td>83 (22.2)</td>
</tr>
<tr>
<td>Incomplete</td>
<td>21 (5.6)</td>
</tr>
<tr>
<td>Not immunised</td>
<td>5 (1.2)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

Figure 42 Immunisation details of children

Immunisation coverage of the sample showed that most (71.0%) of the subjects were completely immunised, while 22.2 percent had completed immunisation upto the present age. Incompletely immunised (5.6%) as well as not at all immunised (1.2%) subjects were also present (figure 42).

The major causes of incomplete immunisation was postponement of immunisation due to the illness of the child, lack of information about
venue and place, schedule and prescribed age of immunisation. Lack of appropriate information is still the main hurdle for success of primary immunisation in slum areas (Kar et al., 2001).

Maternal education was found to be positively associated with the knowledge about immunisation, but was not significantly associated with actual immunisation practice (Freeman et al., 1992). According to NFHS-3 only 44 per cent of the children are fully immunised (NFHS-3, 2006).

Studies states that the proportion of fully immunised children was higher in female than males. Slums do have more morbidity as there is no one being at home to take the child to health services for vaccinations (Freeman et al., 1992).

**Occurrence of other childhood illnesses**

The morbidity burden due to respiratory and gastrointestinal illness is high in a south Indian urban slum, with children ill for approximately one fifth of infancy, mainly with respiratory and gastrointestinal illness. The risk factors identified were younger age, male sex, cold/wet season and household environment (Gladstone et al., 2007). Frequency of occurrence of childhood diseases is presented in table 75.
Table 75 Frequency of occurrence of other childhood illness

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Childhood illnesses</th>
<th>Frequency of occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Frequently</td>
</tr>
<tr>
<td>1</td>
<td>Cold</td>
<td>360 (95.8)</td>
</tr>
<tr>
<td>2</td>
<td>Cough</td>
<td>349 (92.8)</td>
</tr>
<tr>
<td>3</td>
<td>Asthma</td>
<td>350 (93.1)</td>
</tr>
<tr>
<td>4</td>
<td>Fever</td>
<td>332 (88.3)</td>
</tr>
<tr>
<td>5</td>
<td>Vomiting</td>
<td>27 (7.2)</td>
</tr>
<tr>
<td>6</td>
<td>Diarrhoea</td>
<td>8 (2.1)</td>
</tr>
<tr>
<td>7</td>
<td>Worm infection</td>
<td>12 (3.3)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

The frequency of childhood illnesses showed that cold (95.8%), asthma (93.1%), cough (92.8%) and fever (88.3%) were the most common illnesses among preschoolers in slum areas. Occasionally diarrhoea (97.3%) and worm infestation (96.7%) were also found to occur.

Worm infestation may be an important contributing factor for anaemia among preschoolers in the slums of Kochi. Bisla et al. (2009) also of the opinion that worm infestation was also the main cause of iron deficiency in children. Anaemia was one of the factors responsible for increased morbidity in preschool children (Mattoo et al., 2009). Urbanization has profound effects on child health, globally; these must be recognized so that harmful influences of urbanisation can be reduced for the benefit of all children (Gracey, 2002).

**Occurrence of common infections and infestations**

National family health survey-3 reported that acute respiratory infection (ARI) and diarrhoeal diseases are one of the leading causes of
childhood morbidity and mortality throughout the world. Occurrence of these illnesses and their statistical significance were found out and presented in the table below.

**Table 76 Slum wise occurrence of common infections and infestations**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Slums</th>
<th>Respiratory infection</th>
<th>Diarrhoal diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Atlantis</td>
<td>16(47.1)</td>
<td>26(74.3)</td>
</tr>
<tr>
<td>2.</td>
<td>Fort Kochi</td>
<td>20(66.7)</td>
<td>11(36.7)</td>
</tr>
<tr>
<td>3.</td>
<td>Karithala</td>
<td>6(66.7)</td>
<td>8(88.9)</td>
</tr>
<tr>
<td>4.</td>
<td>Pallichal</td>
<td>29(56.9)</td>
<td>36(70.6)</td>
</tr>
<tr>
<td>5.</td>
<td>Puthuvyppu</td>
<td>39(36.4)</td>
<td>99(92.5)</td>
</tr>
<tr>
<td>6.</td>
<td>Santhom</td>
<td>12(46.2)</td>
<td>20(76.9)</td>
</tr>
<tr>
<td>7.</td>
<td>Thevara</td>
<td>17(35.4)</td>
<td>34(70.8)</td>
</tr>
<tr>
<td>8.</td>
<td>Vathuruthy</td>
<td>26(38.2)</td>
<td>51(72.9)</td>
</tr>
</tbody>
</table>

$\chi^2$ value: 16.536  43.99

‘p’ value: $p=0.021^*$  $p=0.000^{**}$

(Numbers in parentheses indicate percentages)  *Significant at 5% level  ** Significant at 1 % level

The incidence of respiratory infection among the urban slums ranged between 34.5 percent to 66.7 percent. This indicated that quite a good number of preschoolers in urban slums had respiratory infection.

The highest incidence was reported in the Fort Kochi (66.7%) and Karithala (66.7%) slums. Next in the list was Pallichal (56.9%) followed by Atlantis (47.1%).
Statistical analysis revealed that the difference in the occurrence of respiratory infection among preschoolers of eight different slums was significant at 5 percent level.

Occurrence of diarrhoeal diseases among preschoolers ranged between 36.7 percent to 92.5 percent. Here the highest incidence was reported in Puthuvypu (92.5%), followed by Karithala (88.9%), Santhom (76.9%) and Atlantis (76.3%). This difference in the incident rate of diarrhoeal diseases was found to be significant statistically at 1 percent level.

In short diarrhoeal diseases and respiratory infections were the most pressing health problems of preschoolers in the slums although there observed a significant difference in their occurrence in different slum studied.

As stated by UNICEF (2008) poor sanitation leads to an increased prevalence of diarrhoea and other parasitic diseases. A study conducted by Gladstone et al. (2007) in Indian slum reports that one fifth of the children spend their infancy with an illness, respiratory and gastrointestinal symptoms were most common. The study also indicated that the incidence of respiratory illnesses was lower among children of mothers with higher education.

According to USAID (2010) reports more than 1.5 million children under the age of five die each year from diarrhoeal diseases, which is one of the most frequent childhood illnesses.
Even the deficiencies of micronutrients such as zinc and vitamin A. It may contribute to increased severity and duration of diarrhoea as well as diarrhoea-associated mortality (Roy, 2009).

According to WHO (2010) every year there are 2 million diarrhoeal deaths related to unsafe water, sanitation, and hygiene the vast majority among children under five. More than one billion people lack access to an improved water source.

**Stool Examination**

High incidence of diarrhoeal diseases and anaemia prompted to do stool examination of the sample. Hence stool examination was done on sub sample of thirty children, the results are furnished in the following table.

**Table 77 Results of stool examination**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Percent (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bacteria</td>
<td>30 (100)</td>
</tr>
<tr>
<td>2.</td>
<td>Fat Globules</td>
<td>26 (86.6)</td>
</tr>
<tr>
<td>3.</td>
<td>Undigested Food</td>
<td>24 (80.0)</td>
</tr>
<tr>
<td>4.</td>
<td>Pus cells</td>
<td>22 (73.3)</td>
</tr>
<tr>
<td>5.</td>
<td>Hook worm</td>
<td>12 (40.0)</td>
</tr>
<tr>
<td>6.</td>
<td>Round worm</td>
<td>10 (33.3)</td>
</tr>
</tbody>
</table>

(Numbers in parentheses indicate percentages)

**Figure 43 Stool examination results**
The table specifies the details of stool examination. As obtained from the table bacteria (100.0%), fat globules (86.6%) and pus cells (73.3%) were present in the stool. Hook worm (40.0%) and round worm (33.3%) infestations were also found.

High incidence of worm infestation, especially hook worm may be the cause of anaemia among the preschoolers (figure 43).

4.4 Correlation of health/nutritional status of mothers and children

Maternal health and nutritional status effects the health and nutritional status of children. Other factors like socioeconomic condition and domestic hygiene also influence the nutritional status of children.

Age wise descriptive statistics of nutritional status

Age wise descriptive statistics was analyzed using Pearson’s correlation and is presented in table.

Table 78 Age wise descriptive statistics of boys

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Criteria (n=209)</th>
<th>Height</th>
<th>Weight</th>
<th>MUAC</th>
<th>Haemoglobin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>0.563**</td>
<td>0.513**</td>
<td>0.036</td>
<td>-0.028</td>
</tr>
<tr>
<td>2</td>
<td>Weight</td>
<td>0.544**</td>
<td>....</td>
<td>0.224**</td>
<td>-0.131</td>
</tr>
<tr>
<td>3</td>
<td>Height</td>
<td>....</td>
<td>0.544**</td>
<td>0.150*</td>
<td>0.053</td>
</tr>
<tr>
<td>4</td>
<td>Haemoglobin</td>
<td>0.053</td>
<td>-0.131</td>
<td>0.111</td>
<td>....</td>
</tr>
<tr>
<td>5</td>
<td>MUAC</td>
<td>0.150*</td>
<td>0.224**</td>
<td>....</td>
<td>0.111</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 1% level
*Correlation is significant at 5% level

The correlation of various nutritional parameters of boys with age indicated a highly significant (at 1% level) correlation between age of the
boys and their heights and weights. This indicated that height and weight of the boys significantly correlated with their age. In the case of MUAC, an increase was seen with age but not to any significant extent. Whereas, haemoglobin status showed a negative correlation with age of the children (Boys) which was not statistically significant.

The weight of the boys showed a highly significant (at 1% level) positive correlation with height of boys and MUAC; and insignificant negative correlation was observed with haemoglobin status: i.e., as the weight increase height and MUAC of boys also increased significantly (at 1% level) but haemoglobin status decreased though not to any significant level.

Height of boys also found to increase with body weight (significant at 1% level) and MUAC (significant at 5% level). Haemoglobin status failed to show any significant correlation with height, weight and MUAC. At the same time MUAC had a significant correlation with height of boys (P<0.01) and weight of boys (P< 0.01).

**Age wise descriptive statistics of girls**

Pearson’s correlation was applied to find out various factors used in the assessment of nutritional status and their correlation. The details are presented in the following table.
### Table 79 Age wise descriptive statistics of girls

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Criteria</th>
<th>Particulars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Height</td>
</tr>
<tr>
<td>1</td>
<td>Age</td>
<td>0.690**</td>
</tr>
<tr>
<td>2</td>
<td>Weight</td>
<td>0.736**</td>
</tr>
<tr>
<td>3</td>
<td>Height</td>
<td>......</td>
</tr>
<tr>
<td>4</td>
<td>Haemoglobin</td>
<td>0.260**</td>
</tr>
<tr>
<td>5</td>
<td>MUAC</td>
<td>0.406**</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 1% level
*Correlation is significant at 5% level

The descriptive statistics for female children showed that all factors were mutually correlated significantly. Age showed highly significant correlation at 1% level with weight and height, and 5% level with MUAC and haemoglobin status. Similarly the correlation of weight with height (P<0.01), MUAC (P<0.01) and haemoglobin status (P<0.05) was also found to be statistically significant.

Height’s correlation with weight, MUAC and haemoglobin status was also reported a statistical significance of one percent level. So also the haemoglobin status, shown to have a significant correlation with height, weight and MUAC. All these correlations were found to be positive indicating the fact that increase in one parameter invariably resulted in the proportionate increase in others.

**Correlation of weights of mothers and preschool children**

The following table furnishes the details.
Table 80 Correlation of weights of mothers and preschool children

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Mean Weight (Kg)</th>
<th>Standard deviation</th>
<th>Correlation coefficient</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Weight of Mother</td>
<td>51.23</td>
<td>±9.95</td>
<td>0.137</td>
<td>0.008*</td>
</tr>
<tr>
<td>2</td>
<td>Weight of child</td>
<td>13.45</td>
<td>±2.57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The weight of the mothers and that of their preschool children had a positive correlation which was statistically significant at 5 percent level. This indicated that mothers with normal body weight give birth to babies with normal birth weight (>2.5 Kg). Low birth weight babies were born to undernourished mothers whose baby weight was subnormal. Maternal and child health indicators among slum dwellers show that their health is 2 to 3 times worse than in urban areas (Rao and Thakur, 2007).

Correlation of haemoglobin status of mothers and preschool children

The following table analyzes the correlation between the haemoglobin status mother and child.

Table 81 Correlation of haemoglobin status of mothers and preschool children

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Mean Haemoglobin value (g/dl)</th>
<th>Standard Deviation</th>
<th>Correlation coefficient</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mother</td>
<td>11.03</td>
<td>±1.15</td>
<td>0.073</td>
<td>0.155 NS</td>
</tr>
<tr>
<td>2</td>
<td>Children</td>
<td>10.17</td>
<td>±1.15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table revealed that haemoglobin distribution of mother and child are positively correlated but this was statistically not significant. The mean haemoglobin level of mother was 11.03 and of children was 10.17. Nutritional
anaemia and poor educational status of mother’s are the most important risk factors of acute childhood morbidity (Deshmukh et al., 2009).

General low and inadequate food intake may be the contributing factor for poor biochemical profile among children (Sireesha and Kusuma, 2009).

Health/Nutritional index of mothers and preschool children

Health and nutritional index of mother as well as child were computed separately using Spearman rank correlation analysis of indices, and also with other environmental factors known to have influence on these indices. The results are presented in the following table. The results are presented in the following table.

Table 82 Spearman Rank correlation on factors affecting Nutritional /health status of mother and child

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Indices</th>
<th>Correlation Coefficient (r)</th>
<th>p - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nutritional index of child</td>
<td>Health index of child</td>
<td>0.138</td>
<td>0.007**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nutritional index of mother</td>
<td>0.122</td>
<td>0.018*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health index of mother</td>
<td>0.155</td>
<td>0.003**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental sanitation</td>
<td>0.171</td>
<td>0.001**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic hygiene</td>
<td>0.117</td>
<td>0.023*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water and food hygiene</td>
<td>0.106</td>
<td>0.040*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Housing condition</td>
<td>0.105</td>
<td>0.043*</td>
</tr>
<tr>
<td>2</td>
<td>Health Index of Child</td>
<td>Nutritional index of mother</td>
<td>0.062</td>
<td>0.233 NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health index of mother</td>
<td>0.153</td>
<td>0.003**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental sanitation</td>
<td>0.198</td>
<td>0.001**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic hygiene</td>
<td>0.088</td>
<td>0.089 NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water and food hygiene</td>
<td>0.091</td>
<td>0.080 NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Housing condition</td>
<td>0.214</td>
<td>0.001**</td>
</tr>
<tr>
<td>3</td>
<td>Nutritional Index of Mother</td>
<td>Health index of mother</td>
<td>0.018</td>
<td>0.725NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental sanitation</td>
<td>0.082</td>
<td>0.112NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic hygiene</td>
<td>0.052</td>
<td>0.317NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water and food hygiene</td>
<td>0.047</td>
<td>0.361NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Housing condition</td>
<td>0.060</td>
<td>0.244NS</td>
</tr>
<tr>
<td>4</td>
<td>Health Index of Mother</td>
<td>Environmental sanitation</td>
<td>0.097</td>
<td>0.061NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic hygiene</td>
<td>0.119</td>
<td>0.021*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water and food hygiene</td>
<td>0.027</td>
<td>0.595NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Housing condition</td>
<td>0.258</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

* Significant at 5 % level
** Significant at 1% level
NS-Not Significant
The above table gives a detailed picture of the health and nutritional index of mothers and preschool children as well as related factors influencing them.

**Nutritional and Health index of children**

From the table it is obvious that nutritional index of children has a direct correlation with all the factors studied. The factors like health index of child ($P<0.01$), health index of mother ($P<0.01$) and environmental sanitation ($P<0.01$) showed a highly significant correlation with nutritional index of child. Whereas statistical significance at 5 percent level was reported by other parameters like nutritional index of mother ($P<0.05$) housing condition ($P<0.05$) and hygienic practices like domestic ($P<0.05$) and water food hygiene ($P<0.05$).

At the same time health index of the children did not show any significant correlation with nutrition index of mother and hygienic practices of the family. Whereas health index of the mother ($P<0.01$) housing condition ($P<0.01$) and environmental sanitation ($P<0.01$) all had highly significant correlation with the health index of the children. Poor housing condition and the resultant insanitary living environment in the slums are conducive for the spread of infectious diseases. As stated by Chandramouli (2003) living conditions have a direct impact on public health.
Nutritional and health index of mothers

Nutritional index of mothers found to have no significant correlation with any of the parameters studied. This is to mean that health index of mothers, housing conditions and environmental and domestic, water and food hygiene none of these could influence the nutritional index of mothers.

But health index of the mothers was significantly correlated with housing conditions (P<0.01) and domestic hygiene (P<0.05).

All these findings direct to say that more than the nutritional deprivation; housing conditions and poor hygiene and insanitary environment in slums, are more decisive in the health and nutritional well being of mothers and children. The environmental sanitation playing an important role on the nutritional status has already been reported by UNICEF (2009).

Further personal and domestic hygienic practices according to Nath (2003) cannot be improved without improving basic amenities, such as water supply, waste water disposal, solid waste management and the problems of human settlements.

UNICEF (2009) stated that a child’s future nutrition status is affected before conception and is greatly dependent on the mother’s nutrition status prior to and during pregnancy. A chronically undernourished woman will give birth to a baby who is likely to be
undernourished as a child, causing the cycle of undernutrition to be repeated over generations.

**Health/Nutritional index of mothers versus health/nutritional index preschoolers**

Health and nutritional status of the mother is considered as a basic factor in deciding the health and nutritional well being of the offsprings. Hence an attempt was made to correlate these two aspects and the results are given in table 83.

**Table 83 Health/Nutritional index of mothers versus Health/Nutritional index of preschoolers**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Other indices</th>
<th>Correlation Coefficient (r)</th>
<th>p - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritional Index of Mother</td>
<td>Health index of mother</td>
<td>0.018</td>
<td>0.725 NS</td>
</tr>
<tr>
<td>Nutritional index of child</td>
<td>Health index of child</td>
<td>0.138</td>
<td>0.007**</td>
</tr>
<tr>
<td>Nutritional Index of Mother</td>
<td>Nutritional index of child</td>
<td>0.122</td>
<td>0.018*</td>
</tr>
<tr>
<td>Health index of mother</td>
<td>Health index of child</td>
<td>0.153</td>
<td>0.003**</td>
</tr>
<tr>
<td>Nutritional Index of Mother</td>
<td>Health index of child</td>
<td>0.062</td>
<td>0.233 NS</td>
</tr>
<tr>
<td>Health index of mother</td>
<td>Nutritional index of child</td>
<td>0.155</td>
<td>0.003**</td>
</tr>
</tbody>
</table>

* Significant at 5 % level  
** Significant at 1% level  
NS - Not Significant

The comparison of various indices clearly brought out the fact that for preschool children, there was a highly significant (P<0.01) correlation between their own nutritional and health status. Such as better nutritional status resulted in better health of children. Mother’s nutritional (P<0.05) as well as health status (P<0.01) also found to correlate significantly with the nutritional status of children.

Regarding health status of preschool children, mother’s health status was found to be more influential (significant correlation at 1 % level) than mother’s nutritional status.
As far as mothers are concerned, the statistical analysis failed to show any significant correlation between their health and nutritional status.

It could be concluded that mothers’ health and nutritional status are strong determinants of health and nutritional well-being of preschool children.

As stated by UNICEF (2009), the nutritional and health status of a child in his future life is programmed in the mother’s womb and is greatly dependent on the mother’s nutritional status prior to and during pregnancy. A chronically undernourished mother of poor health will give birth to a baby who is likely to be undernourished as a child, causing the cycle of undernutrition and poor health to be repeated over generations.

Figure 44 Illustrates the interrelation of risk factors