STUDY DESIGN

Rationale:
Aligarh is a city in Uttar Pradesh and is situated in the north west of India. Its population according to the Aligarh Nagar Nigam records 1995 is 5,53,041. The total area is 33.98 sq km (Census of India, 1991). The proportion of Muslims to the total population in Aligarh is 34.4% (Ahamed, 1993). The city is 135 km away from the country’s capital New Delhi.

Despite its proximity, there are many aspects of Aligarh – child care of working women for one – that are grossly neglected even after fifty years of independence. Aligarh has grown from a small town to an important center for industry and learning. The city is famous for its lock industry but besides this flourishing industry there are many other small-scale industries.

These small industries rely chiefly on cheap home-based piece rate labor. This large invisible work force is extremely difficult to locate, as they are not part of any national statistics. Rough estimates regarding the female work force in the unorganized sector in India is put at 94% in ShramShakti, a report of the national commission on women in the informal sector.

The very young children of this large segment of our population form the most vulnerable section of society.
present study was undertaken to assess and compare the nutritional status of the young children 1-6 years of working women, factory based and home based.

The effect of the mother's economic activity on the child's nutritional status can be gauged by various methods. The most reliable method of assessing nutritional status are anthropometric measures. The researcher hopes that the findings will help form a basis for formulation of relevant policies.

The four areas selected for the study were Mushtaqnagar, Jeevangarh, Chandaniya and Mahendranagar, all in the city of Aligarh. The location of these areas is shown in the map. The four areas selected did not differ much in the infrastructure – roads, drainage and other community facilities. The socio economic status of the sample studied was also similar. All of them belong to the lower income group. Most of the fathers of the children, if employed were truck loaders or rickshaw pullers. There were drains in all the localities studied but almost all were choked. Heaps of rotting garbage were found at every corner. Though all the four areas studied came under the purview of the Municipal Corporation – provision of sanitary facilities was inadequate. The narrow streets, "galis", were lined with bricks. The drains provided on both sides of the roads were choked and overflowing. Most of the residents did not have access to municipal water in their homes. Public taps were located at
intervals but the respondents complained of erratic water supply. However, most of the houses had hand pumps.

A large number of houses in the Mushtaqnagar area had toilets connected to septic tanks. This practice was gradually being adopted in other areas also. Manual disposal of human excreta was prevalent in parts of Jeevangarh and Chandaniya. Electricity connections were present in all the areas under study though the supply like water was equally erratic. Since a few years, there has been a migration of poor people from adjoining rural areas and also from Bihar, in search of employment. This has resulted in an increase in the city's population. These migrants are willing to work for lower wages than the locals.

**Provisions for Health Care:**

Aligarh city has a medical college under the Aligarh Muslim University, The Jawahar Lal Nehru Medical College. There is also a civil Hospital The Malkhan Singh Hospital and also the Deen Dayal Upadhaya Hospital. There are primary Health Centers and Dispensaries besides private medical practitioners in every street. The allopathic, homeopathic, ayurvedic and unani branches of medicines are practiced here.
Local Industries:

A number of industries were functioning in all the areas studied. They were the lock industry, the metal cap industry for mini bulbs, buckles industry, packaging, electroplating on wire jigging, the making of tin containers and rug making. Another home based industry of Aligarh is the appliqué work or patti work industry. For the present study, the workers of the metal (Brass) cap for mini bulb industry and their children in the age group 1-6 years were observed, questioned and measured.

The metal cap for mini bulbs is an industry where almost the entire labour force consists of home based women workers. In a few areas some women go to the factories to work, leaving their young children in the care of an older sibling. Some women carry the children to the factory – an environment totally unsuited to the well being of the child.

Methodology:

A pilot test was conducted on children of working women in Begumbag an area adjoining Chandaniya. Pretesting was done on 32 children in the age group of 1-6 years, 20 women workers and 3 factories
The sample of factory based and home based working women was selected purposively with the condition that they had at least one child in the age group 1-6 years.

The researcher visited each household and interviewed the mothers. The children were observed and measured. Wherever possible, the work environment was also observed. The age and sex wise distribution of the sample of each area was tabulated for further analysis.

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Mushtaq nagar</th>
<th>Mahendra nagar</th>
<th>Jeevargarh</th>
<th>Chandaniya</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>12-23</td>
<td>6</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>24-35</td>
<td>8</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>36-47</td>
<td>5</td>
<td>9</td>
<td>4</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>48-59</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>60-71</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>72-78</td>
<td>10</td>
<td>12</td>
<td>7</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>44</td>
<td>42</td>
<td>39</td>
<td>34</td>
<td>43</td>
</tr>
</tbody>
</table>

The total sample consisted of 63 factory based working women and 149 non-working women (home based). The child sample consisted of 320 children, 107 of factory based working women and 213 of home based working women.

A three-tier questionnaire was formulated based on the ICMR pre school examination record. The questionnaire for the unit and the worker was constructed with the help of the
Labour Bureau, Ministry of Labour, Govt of India. The questionnaire formulated for the unit required information regarding the annual turnover, number of employees, details of women employees - age, marital status, criteria for fixing wages and actual wages paid, hours of work and welfare measures provided. The employer was also asked if there were provisions for a crèche, water supply, toilet facilities and medical care for the women workers. Questions on training and supervision were also included and lastly reasons for employing or not employing women. After pretesting, as per the requirements of the present empirical study, some pertinent questions were added and the questionnaire was modified for use.

The worker level questionnaire had questions regarding age, religion, marital status, whether local or migrant, the type of family and its size and composition. There also were queries on total family income, time allocations for various activities, food patterns and preferences, treatment of sons and daughters, whether children shared the work area and whether there was any other caretaker other than the mother. The role of the media regarding the food items consumed was also asked. Particulars regarding children's illnesses and deaths were also asked.

Nutritional Status Assessment:
The nutritional status of the children of the sample was assessed primarily by anthropometric measures. Studies on
the physical developments of infants and children are important as they provide determinants of a nation's health

According to the Indian Council of Medical and Research, measurements of height and weight are still the simplest and one of the most reliable means by which the progress of a normal child is evaluated.

The measurement of growth has been a widely used tool of health or nutritional status of children. The process of normal growth and development of children is dependent on an adequate and timely supply of nutrients. Undernutrition is reflected in an impairment of growth and consequently a useful indicator of nutritional status. Growth retardation is an important quantifiable manifestation of undernutrition (Gopalan and Chatterjee, 1985).

Nutritional status may be assessed under three broad headings as follows –

1. Anthropometric
2. Biochemical
3. Clinical Symptoms and Dietary Intake

There are several biochemical and endocrinal parameters like serum albumin, transferrin, thyroxin binding, prealbumin, retinal binding protein, and insulin like growth factor used for assessment, but the need for difficult procedures to be followed make it an impractical tool specially in the
context of the present study. A number of clinical symptoms in Protein Energy Malnutrition and Vitamin Deficiency states may be detected, however a majority of these symptoms are not specific enough for a layperson to identify. Many of the clinical signs of malnutrition do not appear until the child is severely malnourished. Of the three anthropometric indicators of body weight, height, body circumferences are by far the most objective and quantifiable indicators (Rao, 1986). For practical purposes anthropometry is the most useful parameter for assessing the nutritional status of children (Sachdev, 1994). There has also been an international consensus by the WHO working group that for defining the nutritional status of children anthropometry is the most readily available of assessment and therefore the most logical.

A variety of anthropometric measures are used to assess the growth of the child. The measures most commonly used are height, weight, mid upper arm circumference (MUAC), chest circumference, head circumference and calf circumference.

Height is a measure of the linear growth of the body—the degree of skeletal development. This is a measure, which does not change as rapidly as weight. The child to be measured was made to stand bare foot on a flat surface with feet parallel and the heels, buttocks and back of the head touching the measuring rod. The sliding vertical plate was lowered till it gently made contact with the erect head.
Reading was noted to the nearest 0.01 cm. Children who were unable to stand were similarly measured on a flat surface.

Weight is affected within a short duration of inadequate nutrient intake and ill health. The weight of the children was recorded on a lever actuated weighing scale to the nearest 0.01 kg. The scales were checked for accuracy with standard weights. The children were weighed wearing only one light item of clothing and without any footwear. The weight of the mother was also recorded.

The mid upper arm circumference was measured with a steel tape passing around the upper arm mid way between the acromion and the olecranon or at the maximum circumference of the biceps muscle. The measurement of the circumference of the mid upper arm proves to be useful and practical means of assessing protein calorie deficiency of early childhood. This measurement is independent of age and is particularly useful in the nutritional assessment of populations in rural areas where no exact birth records are noted. E.F.P. Jelliffe, 1983, has made a similar observation.

Generally weight, height and mid upper arm circumference have come to be considered the most sensitive parameters of under 5 nutritional status and most practical for the monitoring of individual children or of population of children (Gopalan and Chatterjee, 1985). The MUAC and weight for
height are age independent anthropometric measures. When related for age weight and height provide the means to study a child over a period of time. When a child's age is difficult to gauge, the MUAC and weight for measures may be used. The weight for height may be measured by comparing the child's weight with the expected weight for a healthy child of the same height. These measurements have been used to distinguish different types of malnutrition. Weight and height measures are adequate for assessing nutritional status and not much is gained by additional forms of measurement (Rao et al., 1979).

The head circumference was measured by placing the tape firmly round the frontal bones, above the eyebrows and passing it around the head over the maximum occipital prominence at the back.

The chest circumference was measured by passing the tape around the body of the child at the line of the nipple at right angles to the vertebral column. Chest circumference becomes equal to the head circumference at one year of age and after two years it becomes more than head circumference in a normal well-nourished child. In cases of protein energy malnutrition (PEM) the chest circumference is smaller than the head circumference even beyond two years of age (Mehta, 1999). Calf circumference was measured at the midway of the knee and the ankle at its fullest width.
**Age Assessment of the Child:**
One of the important prerequisites in nutritional anthropometry is an accurate assessment of age. In the selected sample of the present study, birth certificates were not available and hence the exact ages could not be obtained. A local events and festivities calendar was used: 'The child was born just before Bakr-Id 3 years ago, or, during Ramzan last year'. An extra age interval 72-78 months was added to cover any wrong reporting of age.

**Clinical Symptoms and Dietary Intake:**
Obvious clinical symptoms were noted. The eyes, skin and hair, teeth, gums, and nails were examined for protein-energy malnutrition and vitamin deficiencies. The mothers or caretakers were questioned regarding the dietary intake of the child, frequency of feeding, food preferences, and amounts consumed.

**Work Pattern of the Mother:**
The sample consisted of 212 working and non-working mothers, 149 were home-based while 63 were working in factories. The factory-based mothers either took their infants along to the work place or left them with older siblings. The home-based mothers attended to their children, household tasks, and the economic activity within the four walls of their ill-lit and ill-ventilated homes. The literacy levels and
nutritional awareness of the women were observed and noted

Environment Sanitation, Personal Hygiene and Infrastructural Inputs of Health:
Provision for drinking water and water for daily activities of the household were observed. Toilet facilities were also noted. Roads, drains and type of housing were observed as these factors could influence the health status of the children. Garbage and waste disposal facilities were noted. Questions related to the immunization of the child were also asked.

Family Income:
The various sources of income were taken into account. This included the income of the various family members and also income from milch animals and poultry.

Caretakers other than the Mother:
The researcher also noted that the caretaker other than the mother and their role in child care. Repeated visits were made to check and verify observations.

Reference Standards:
The first stage in nutritional anthropometry is recording and grouping the observations in such a way that they are internationally intelligible and comparable. A reference base is needed and it is immaterial from what population that
base is drawn provided that it is large enough for proper statistical definition (Waterlow et al, 1977). Anthropometric measures noted by the experts in anthropology, statistics, nutrition and pediatrics of the Working party of the Indian Council of Medical Research have been referred to in the study. These developmental standards were based on studies on Indian infants and children in a cross sectional study from different states. There is still a lot of debate as to whether an international or national reference standard should be utilized.

The growth standard considered to represent normal growth and which is currently being widely used for the purpose of evaluation of growth performance in many countries including India is the one developed by the National Center of Health Statistics (NCHS) of USA. This is based on growth measurements of large measurements of American children. It was found by an expert group of the World Health Organization (WHO) that the NCHS, CDC growth reference was the best suited for use as an international reference since it met most of the criteria considered necessary for the choice of a standard (Gopalan, 1994).

The NCHS standard does not differ significantly from the Harvard standard in use earlier, especially for young children. Classification on assessment of growth performance suggested by the Indian Academy of Pediatrics' was also using the Harvard Standards Children from the
lower socio economic groups in the developing countries may fall much below the international standards but it does not mean that each nation establishes different sets of standards and in that case any improvement in nutrition in the country will change the 'standard' itself (Gopalan and Chatterjee, 1985)

Basically the standards used must determine the magnitude of the problem and not the problem determine the standards. The current consensus is to use the NCHS data as a international reference population and to use it as a standard appears appropriate (Sachdev, 1994)

Nutritional status of children may be classified in a number of ways. The most commonly used classifications are the Gomez, Jelliffe and the classification by the Indian Academy of Pediatrics. These classifications are based on the weight for age of the child. The NCHS and the Waterlow classifications are based on weight for height, height for age and weight for age based on NCHS standards. These are the currently accepted international classifications.

According to Gomez’s classification, the point of demarcation or cutoff points determines the excess of malnutrition in a study population.

\[
\begin{align*}
90-110\% \text{ of standard weight for age} & \quad \text{Normal} \\
75-90\% & \quad \text{Mild Malnutrition}
\end{align*}
\]
60-74%  Moderate Malnutrition  
Below 60%  Severe Malnutrition  

In Jelliffe's classification there is a slight variation of the cut-off points. This is also based on weight for age.

<table>
<thead>
<tr>
<th>Nutritional Grade</th>
<th>% of Standard Weight for Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>90</td>
</tr>
<tr>
<td>Grade I</td>
<td>80-90</td>
</tr>
<tr>
<td>Grade II</td>
<td>70-79</td>
</tr>
<tr>
<td>Grade III</td>
<td>60-69</td>
</tr>
<tr>
<td>Grade IV</td>
<td>less than 60</td>
</tr>
</tbody>
</table>

(50th Centile of Harvard Standards)

Source: IAP Textbook of Pediatrics

The Nutrition Sub Committee of the Indian Academy of Pediatrics recommended the following classification:

<table>
<thead>
<tr>
<th>Nutritional Grade</th>
<th>% of Standard Weight for Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&gt;80</td>
</tr>
<tr>
<td>Grade I</td>
<td>71-80</td>
</tr>
<tr>
<td>Grade II</td>
<td>61-70</td>
</tr>
<tr>
<td>Grade III</td>
<td>51-60</td>
</tr>
<tr>
<td>Grade IV</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>

The drawbacks of Gomez's, Jelliffe's and IAP classifications are that they are based on Harvard Standards, which are no longer recognized as an international reference. The NCHS Standards do not differ significantly from the Harvard standards as far as the under 5's are concerned though.
There is some minor difference with respect to the older age groups. In national programmes in India, the Harvard Standard has been extensively used for the assessment of growth performance (Gopalan, 1994).

The currently accepted international classification based on NCHS standards is summarized below:

<table>
<thead>
<tr>
<th>Indices</th>
<th>Nomenclature for Deficit of Index</th>
<th>Cut Off Points % of Reference Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight for Height</td>
<td>Wasting</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Height for Age</td>
<td>Stunting</td>
<td>&lt;90</td>
</tr>
<tr>
<td>Weight for Age</td>
<td>Underweight</td>
<td>&lt;80</td>
</tr>
<tr>
<td></td>
<td>Severe underweight</td>
<td>&lt;60</td>
</tr>
</tbody>
</table>

Age independent anthropometry includes measurement of mid upper arm circumference and weight for height. The degree of wasting can be measured by comparing the child's weight with expected weight for a healthy child of the same height. Combinations of these measurements have been used to distinguish different types of malnutrition.
In chronic malnutrition the child is stunted with weight for age and height for age being low. In acute malnutrition height for age is normal but weight for age is low. This condition is referred to as wasting. In nutritional short stature the weight/height is equal, the child may pass off as a normal child of a lower age if the chronological age is not known.

Mid upper arm circumference measurement is age independent. Any child in the age group 1-5 years whose MUAC is less than 12 5cms is classified as undernourished (Parthasarathy, 1999).

The Kanawati Index

It is useful in detecting Protein Energy Malnutrition in young children. It is calculated by dividing the MUAC by the head circumference. The interpretation is as follows –

- Normal: >0.32
- Mild Undernutrition: 0.28-0.32
- Moderate Undernutrition: 0.25-0.28
- Severe Undernutrition: <0.25

The Rao Index

It is calculated as follows –

\[
\frac{\text{Weight}}{\text{Height}^2} \times 100
\]
Values less than 0.15 indicates malnutrition. This remains more or less constant up to 5 years of age.

The Quetlet’s Index
This is based on the relationship between weight and height and is expressed as

\[
\text{Weight (kgs)} / \text{Height (cms)}
\]

Normal values vary from 0.14 to 0.16. In gross malnutrition it is less than 0.14. This is a reliable ratio for assessing malnutrition.

Statistical Methods used for the Analysis of Data:

To analyze the differences in the nutritional status of the children of the factory based working women and the children of the home based working women, the t-test for difference of means was used. The indicator of the nutritional status to be compared was taken to be the weight for height, as it has been seen to be the most reliable indicator of nutritional status.

The t-test values were calculated for each height interval, and comparison was conducted between the weights of the children of the factory based working women and the
children of the home based working women for each of those height categories

Based on the differences between the calculated value of $t$ and the tabulated value of $t$, at different levels of significance, the hypothesis was analyzed as true or false.

Based on the changes in the true and false values with the change in age (months), the trends and patterns in the nutritional status of the children of factory based working women and the children of home based working women was identified which were helpful in examining the relationships between the work pattern of the mother and the nutritional status of the child.

The Hypothesis used for the t-test is as follows:

There is no significant difference between the nutritional status of the children of factory based working women and the children of the home based working women.

To examine the relationship between the mother and the nutritional status of the child, the dependent and independent variables were identified.

The independent variable identified was the presence or absence of the mother.
The dependent variable identified was the nutritional status of the child (either normal or below normal).

The Chi-square test of independence was undertaken using a 2x2 fold contingency table.

The Hypothesis to be tested was defined as

The presence of the mother significantly affects the nutritional status of the child.

The calculated and tabulated values of Chi-square were compared to test the hypothesis put forward by the researcher.