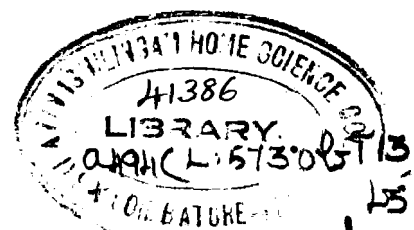


**EVALUATION OF THE SCHOOL LUNCH PROGRAMME IN
FOUR SELECTED PRIMARY SCHOOLS IN
COIMBATORE CITY**

**By
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LIST OF CONTENTS

<u>Chapter</u>		<u>Page</u>
	LIST OF TABLES	
	LIST OF FIGURES	
	LIST OF APPENDICES	
I	INTRODUCTION	.. 1
II	REVIEW OF LITERATURE	.. 5
	A. Importance of school lunch	.. 5
	B. Parameters used for evaluating school lunch programmes	.. 11
	C. Studies pertaining to the evaluation of school lunch programmes	.. 19
III	EXPERIMENTAL PROCEDURE	
	A. Selection of the schools and samples	.. 24
	B. Conducting the study	.. 25
	C. Analysing the data	.. 28
IV	RESULTS AND DISCUSSION	
	A. Hygienic practices followed during cooking and serving of the school lunch	.. 29
	B. Adequacy of the lunch in terms of its quality	.. 33
	C. Comparison of the heights and weights of children of different schools, participating in the school lunch programmes	.. 34
	D. Nutritional knowledge of the selected children participating in the school lunch programmes	.. 39

<u>Chapter</u>		<u>Page</u>
	E. Class performance and attendance of the Children taking part in the school lunch programmes	.. 40
	F. Hygienic practices followed by the pupils, their attitudes, likes and dislikes and the amount of waste during the lunch time	.. 41
	G. Parents' opinions about the school lunch programmes	.. 43
V	SUMMARY AND CONCLUSION	.. 52
	BIBLIOGRAPHY	.. 54
	APPENDICES	.. 64

LIST OF TABLES

<u>Table</u>		<u>Page</u>
I	SCORES FOR THE HYGIENIC PRACTICES FOLLOWED DURING COOKING AND SERVING OF THE SCHOOL LUNCH	.. 30
II	NUTRIENTS PROVIDED BY THE SCHOOL LUNCH	.. 33
III	MEAN HEIGHTS OF THE CHILDREN	.. 36
IV	MEAN WEIGHTS OF THE CHILDREN	.. 38
V	MARKS OBTAINED IN THE TEST CONDUCTED REGARDING NUTRITIONAL KNOWLEDGE	.. 39
VI	CLASS PERFORMANCE OF PARTICIPATING CHILDREN IN THE SCHOOL LUNCH PROGRAMME	.. 40
VII	ATTENDANCE OF THE SCHOOL LUNCH CHILDREN	.. 41
VIII	INCOME AND OCCUPATION OF THE PARENTS	.. 44
IX	REASONS FOR ADMITTING THE CHILD IN THE SCHOOL LUNCH PROGRAMME	.. 46
X	PREPARATIONS SERVED IN THE SCHOOL LUNCH PROGRAMME AND LIKES AND DISLIKES	.. 48
XI	COMMENTS MADE BY THE CHILDREN AT HOME ABOUT THE SCHOOL LUNCH	.. 49
XII	OPINIONS OF THE PARENTS ABOUT THE SCHOOL LUNCH PROGRAMMES	.. 51

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1.	THE ASPECT OF SERVING IN SCHOOL 'A'	.. 31
2.	THE ASPECT OF SERVING IN A MUNICIPAL SCHOOL	.. 32
3.	COMPARISON OF THE MEAN HEIGHTS OF CHILDREN OF SCHOOLS A, B, C and D	.. 35
4.	COMPARISON OF THE MEAN WEIGHTS OF CHILDREN OF SCHOOLS A, B, C and D	.. 37

LIST OF APPENDICES

<u>Appendix</u>	<u>Page</u>
I	ITEMS OF MEALS PROVIDED IN THE SCHOOLS A, B, C AND D. .. 64
II	OBSERVATION SCHEDULE .. 65
III	PARENTS' OPINIONS ABOUT THE SCHOOL LUNCH PROGRAMMES .. 68
IV	1. NUTRIENTS PROVIDED BY THE SCHOOL 'A' LUNCH .. 71 a
	2. NUTRIENTS PROVIDED BY THE SCHOOLS B, C AND D LUNCH .. 71 b
V	FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS
	HEIGHT: 1. INITIAL .. 72
	2. FINAL .. 73
	3. DIFFERENCE .. 74
VI	FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS
	WEIGHT: 1. INITIAL .. 75
	2. FINAL .. 76
	3. DIFFERENCE .. 77
VII	MARKS OBTAINED IN THE TEST CONDUCTED REGARDING NUTRITIONAL KNOWLEDGE OF THE CHILDREN TAKING LUNCH AT SCHOOL
	ANALYSIS OF VARIANCE TABLE .. 78
VIII	CLASS PERFORMANCE OF THE CHILDREN TAKING LUNCH AT SCHOOL
	ANALYSIS OF VARIANCE TABLE .. 79
IX	ATTENDANCE OF THE CHILDREN TAKING LUNCH AT SCHOOL
	ANALYSIS OF VARIANCE TABLE .. 80

I. INTRODUCTION

Knowledge of the nutritional status of the population is the foundation for planning and implementing programmes of nutritional improvement. The recognition that nutritional adequacy from the time of gestation is important for an individual to function fully, has led to the launching of several nutrition programmes.

Childhood is the period of rapid physical and mental growth and development. Optimum health of children is the biggest development project in the form of future man power potential. Their nutritional status, pattern of growth and development reflect the health of the community.

The nutritional requirements of children are higher per unit of body weight than those of adults. Good food, which is adequate in quantity and quality is essential to stimulate and maintain growth, to regulate body functions, to repair the tissues already formed and to supply energy for work. When children do not receive the nourishment they need under nutrition and malnutrition result, (Devadas et al 1966 and Read 1970). Damage to health in childhood due to malnutrition may become irreversible, (Parpia 1968).

The age range from 0 to 9 years is a vulnerable stage. There are 554.9 lakhs of children attending the primary schools to day in India, (Ministry of education - 1971). Jelliffe (1966) warns that most of these school children are under nourished.

Children from the lower socio economic group attend schools without even breakfast. They remain hungry throughout the long scholastic day. As a result, not only their health but also their studies are affected. Due to inadequate availability of food, low purchasing power and environmental factors like infection, malnutrition is widely prevalent, (Bagchi 1968). It affects all aspects of development of children. The class performance and school attendance of malnourished children are poor. Most of the school dropouts come from such families, (Hamarajani 1968).

The Central and State Governments and voluntary agencies are taking various steps to arrest the school dropouts. The feeding programmes have been expanded to check malnutrition which is a major factor causing high mortality and morbidity among children in India, (Karanad 1972). Nutrition programmes effecting more than 42 per cent of the children, on whom lies the future of our country need priority, (Guha 1972). Among these the

Tamil Nadu Midday Meals Scheme stands foremost. The main purpose of the Midday Meals Scheme is to supply an inexpensive meal in the school and thereby inculcate in children proper dietary habits. The school meals can help children also develop socially regardless of differences in castes and social and economic status. Emotional integration of the nation can thus be facilitated.

How far do the schools help to achieve these goals by providing meals in a happy and clean environment remains to be evaluated. Only a few studies are available on how far the present school lunch programmes in our country are useful. Collection of information about the factors involved in organising good school lunch programmes and how far such programmes can help in overcoming malnutrition and promoting health are keenly felt needs.

This study was undertaken as a step in that direction. It was aimed to evaluate the school lunch programmes in selected four schools in Coimbatore city on a sample of 1000 children of both sexes in the age range from 5 to 12 years during a period of six months. The initial and final heights and weights of the children were recorded.

The practices followed during cooking and serving of school lunch, nutrient content of the school lunch, impact of the nutrition education given to the children in school and class performance and attendance of the children, the opinions of the parents and participants about the school lunch programme were evaluated.

II. REVIEW OF LITERATURE

The review of literature for this study pertains to the following aspects:

- A. Importance of school lunch.
- B. Parameters used for evaluating school lunch programmes.
- C. Studies pertaining to the evaluation of school lunch.

A. Importance of school lunch:

The importance of school lunch is reviewed under the following headings:

1. Objectives of school lunch
2. School lunch programmes in India
3. School lunch programmes in other countries

1. Objectives of school lunch:

Children 1 to 9 years of age are considered as the vital section of our population. In India, nearly 2.5 crores of children are attending primary schools, from a poor socio-economic background. Children living in tropical areas constitute three quarters of the world's population, are generally malnourished due to inadequate intake of food, (Geddes 1968). The child who wakes up hungry, goes to school hungry, cannot develop into a good

citizen, (Washington 1970). As suggested by Barooah (1965) the best solution to solve the problem of malnutrition is school lunch.

The main objective of the school lunch programme is to ensure that pupils get a nutritious meal at noon, (Bartolotta 1971). Ulibari (1972) views that free meals should be provided for all those in the class. This would serve as an opportunity and a duty of the school to assist in helping children to grow.

Through participation in the school lunch children are helped to develop a liking for nutritious foods and to overcome food prejudices. They are guided in food selection to become familiar with the essentials of an adequate diet, (Robinson 1967). Devadas (1966) states that there are evidences that school meals help children and parents to eat nutritious foods which are not ordinarily included in the family meals. Johnson (1968) found a positive effect on school attendance due to the availability of food through school lunch programme. Ross and Esquef, (1970) state that the aim of the school feeding is to fill the child's stomach. The school meal is meant to provide protein and other nutrients in addition to calories. The concept of learning by doing is a major feature of many school feeding programmes.

Dandekar (1955) views that the feeding programmes must aim at providing food which is nutritionally superior to the one normally consumed by subjects in their homes. According to World Health Organization (1959) school feeding programmes can serve several useful purposes.

- a. Directly to improve the child's nutritional status during the phase of his rapid development.
 - b. Stimulate local community interest in nutrition in general.
 - c. Demonstrate practically effects of food and nutrition.
 - d. Provide opportunities and illustrative material for nutrition education, health education and agricultural education during class work in various subjects.
- and
- e. Training parents who may be involved in the preparation of meals or snacks and in food production programmes to support them.

Seth (1972) and Peterson et al (1972) are of the opinion that dietary practices established during childhood through schools, influence life time eating habits of children which in turn provide good nutrition. Martin (1953) states the objectives of school lunch programmes as

- a. Furnishing a nutritionally adequate noon meal.
- b. Providing an educational basis and experience for forming good food habits.
- c. Providing chances for the social and emotional development of children through assuming responsibilities of duties performed as to their age and ability.

- d. Learning good manners and consideration for others.
- e. Providing for the sanitary handling of foods.
- and f. Getting the satisfaction of working with others in carrying out a successful project.

Usha (1955) states that school lunch gives a child a chance to learn about the importance of food, the need to eat nutritious foods and also to form good food habits. Sharma (1957) explains that by sitting together daily, they would develop the feeling of unity and will learn to overcome the differences in rich and poor. According to Humphery (1958) school lunch not only provide strength for the body but also enlightenment to the mind.

The psychology of school lunch can be thought of as the art of dealing with the behaviour of people, their attitudes, their feelings, their intellectual ability and aspirations, (McClary 1966). Smith (1971) and Hallisall (1971) point out that the school meal can be a valuable form of education not only in the nutritional sense but also socially, especially in depressed areas.

The Committee on Preschool Feeding Programmes stress several areas of priority which include the communication of right ideas of hygiene, environmental sanitation and nutrition to both mother and child, (Pandotra 1972).

Chowdhuri (1972) lists that the aims of midday meal programmes are to improve health and encourage sound dietary habits among children and to provide approximately 1/3 of the dietary and nutritional requirements of the children in the school meal from locally available foods.

2. School lunch programmes in India:

Since 1925 supplementary school feeding programmes have been in operation in different parts of India. Midday meals programmes are now provided to poor children on a modest scale in several states in India, (Guha 1972). The Government of Madras was the first to give momentum to the scheme with a substantial grant in 1957 and after observing the good results of local participation and contributions to the midday meals programme in many centres CARE assisted in 1961, (Harvey 1967). Through this grant the Government pays six paise towards the cost of a meal which is expected to cost 10 paise per head to which the local donors contribute 4 paise per meal. This scheme is in operation in 30,603 elementary schools, throughout the state. Nearly 18.2 lakhs of children are now being served by this programmes which is the largest sample covered in India, (Devadas 1972).

The Department of Education of the Government of Andhra Pradesh runs a free midday meal scheme for children

of 5 to 14 years of age. Assam has instituted a midday meals scheme only in the Kamalabani Development Block. In Bihar the East India Railway Administration assisted by the Government runs, a midday meals scheme for its schools. Midday meals programme is in operation in Dangs District in Gujarat. From 1961-62 all the schools in Kerala had midday meals programme in operation. In Punjab and Rajasthan the school lunch programme is in operation assisted by CARE Organisation. In Uttar Pradesh the school lunch programme is in operation under voluntary basis, (Devadas et al 1965).

3. School lunch programmes in other countries:

The origin and development of school lunch programmes in the different countries reveal the universal concern all over the world for the welfare of growing children. The earliest beginning were in Germany, France and other Continental countries. The most rapid development began in England early in 1900's. In 1952 roughly one half of the children in Great Britain were having their midday meals in school, (Martin 1963).

It was started in Germany before the First World War and in Austria before Second World War. The midday meals programme had its origin in Ceylon in 1935, in Malaya in 1945, in Japan in 1946 and in Pakistan in 1950.

The percentage of children participating in the school lunch programme in the different countries are: Belgium and Sweden 70 per cent, Japan 64 per cent, England and North Ireland 50 per cent, Italy, Scotland and United States 33 per cent and Yugoslavia nearly all. These school lunch programmes are financed either by local or by partial or full national Government grants. Every nation attempts to serve nutritionally balanced and attractive meals based on the eating habits and staple foods of the country. In some countries attempts are made to raise school gardens to assist the feeding programmes, (Devadas et al 1954 and School Food Service Journal 1977).

B. Parameters used for evaluating school lunch programmes:

Among the parameters used for evaluating school lunch programmes are

1. Nutritional status
 2. Nutrition education
 3. Hygienic practices
- and
4. Nutritive value of school lunch

Evaluation is an essential element of planning. It is the process of arriving at a considerable judgement, (Chakrabarthe 1967). Evaluation helps to determine the progress of any programme from its starting point towards

established objectives and helps to keep the programme on useful and practical lines, (Ritchie 1950 and Usha et al 1965). Evaluation of a school lunch programme can be through assessing nutritional status, nutrition education, hygienic practices and through the nutritive value of foods. For a meaningful evaluation, the device used should be reliable, accurate, valid and measure what it is supposed to measure and include items of varying degrees of difficulty, (Devadas 1958).

1. Nutritional status:

Martin (1963) defines nutritional status as the condition of the health of the individual as influenced by the utilization of the nutrients. The nutritional status of a population is influenced by many factors such as geography, agriculture, transportation, education, economics, social conducts, infections and parasitic diseases, (Schaefer 1960).

Nutritional status can be assessed by surveys, (Usha and Devadas 1964). Pike and Brown (1967) state that its goal is to define a population in terms of its specific factors.

Methods of assessing nutritional status:

As revealed by Martin (1963) and ICHND (1963) the methods available for assessing the nutritional status are

anthropometry that is rate or increments of physical growth, clinical evaluation, dietary surveys and biochemical investigations. Davidson and Passmore (1959) include the study of vital statistics also.

Anthropometry:

According to Jelliffe (1958) nutritional anthropometry is concerned with the measurement of the variations of the physical dimensions and the gross composition of the body at different age levels and degrees of nutrition. Scribshaw and Gordon (1968) and Rahman (1968) indicate that anthropometry provides important, though limited tools for the assessment of the nutriture of both the individual and community, and to indicate the secular changes from generation to generation. Mathen (1969) states that weight is the easiest measurement to investigate and it gives the over all index of the body mass. Height of an older child and adult or length of an infant is an useful linear measurement.

Anthropometric studies have their own limitations. Sometimes they identify naturally small but healthy children as being undernourished or as nourished, a group of population whose nutritional status is inadequate, although their weight is within the range of average for their height and age, (Nelson, 1967).

The balance used for taking weight must be accurate and need to be checked regularly and recalibrated if necessary. It is seldom possible to weigh children naked. Therefore a correction is usually needed for the articles of clothing worn. Weight should be measured against a flat surface and the subject must stand as upright as possible without raising the heels from the ground. A sliding head piece is needed for accurate recording. For infants crown heel length is taken, (Jelliffe 1955).

Clinical assessment:

The clinical examination adopted in nutritional studies is a careful physical examination, including medical history with special attention given to various symptoms and signs more or less associated with nutritional deficiencies, (Hague General State Printing Office 1948, Nelson 1953 and Swaminathan 1959).

Dietary surveys:

Dietary surveys are carried out to obtain information on dietary intakes, and the nutritional level and health of people, and to identify groups and individuals suffering from malnutrition and ill balanced diets, (ICMR report 1935-1948, Martin 1958, Nicholls 1957, Nelson 1957, Davidson and Passmore 1959 and FAO of UN 1970). Dietary surveys

yield data which support the interpretation of the results of clinical and biochemical appraisals, (Maynard 1950).

Biochemical methods:

The most objective means for assessing nutritional status and to evolve some normal patterns of deficiency are based on biochemical analysis of materials such as blood and urine that can be sampled easily, (Someswara Rao 1951, Wilson 1954 and White head 1959).

2. Nutrition education:

Nutrition education is the foundation on which any programmes for nutritional improvements can be built, (Devadas 1970). During the span of the elementary grades, a child's habit may more easily be changed, without necessary drastic steps in later life, (Godshall 1958).

Nutrition education involving dissemination of knowledge regarding proper food habits can be promoted through a variety of schemes, (Fourth Five Year Plan 1969-74).

The FAO (1967) states that in the developing countries where primary education is rapidly becoming available, the school provides an opportunity to reach a large section of the population. At the school age, education in nutrition may be by a well planned curriculum

incorporating principles and importance of a balanced diet as well as through the school lunch programmes, (FAO 1958, Nigam 1964, Fry 1969 and Children's Day Annual 1970).

The school has a major responsibility to teach the child about maintaining his health and growth through the food he eats, (Bash 1966, McWilliams 1966 and Champakam and Bala Subramanian 1967, '69).

The advantages of nutrition education in the school are, children are flexible, openminded, curious, eager to learn and are easily reached at school. They are liable to accept the new knowledge and new habits and can serve as a bridge in carrying the nutrition education to their families, (Food Service Journal 1972).

The objectives of the nutrition education are to improve nutritional status to show how a family can be fed adequately at lower cost and to orient demands for food in line with government food production policy, (Davey and McNaughton 1969).

The general goals of nutrition education in schools are:

To promote good health and development.

To establish good food practices.

To develop a healthy attitude towards food and enjoyment of well prepared nutritious meals.

To teach pupils the principles of good nutrition and the important applications of these in daily life.

To teach children to choose and enjoy a variety of foods and helping them understand the connection between good food habits and growing tall, strong and healthy.

To help them acquire skills in the production, storage, selection and preparation of food. Schools can help to achieve these goals by providing a sympathetic, happy and clean environment in which teachers set a good example from the health and nutritional stand points and in which children are encouraged to explore problems and try out new things by establishing a regime in which the children learn through daily performance, to follow rules of health and hygiene and to eat a good diet, (Food service Journal 1972 and Ritchie 1957).

The main aim of nutrition education is to alert people on the dangers of malnutrition and alter their food habits, (Gupta 1972). Careful studies are needed to assess and to guide the progress of nutrition education programmes. Information on progress can be obtained by observation, interview, questioning, measuring the heights and weights of children, counting the money earned from the school gardens, talking to parents about the home diets of the children or weighing the food eaten at school, (Ritchie 1957).

3. Hygienic Practices:

Devadas (1955) stipulates the conditions necessary for maintaining the sanitation of the school lunch room as

- a. The lunch room and the equipment procured should be sanitary and easy to clean. They should be of such a material to prevent the harbouring of rodents, vermin, or infection.
- b. Sanitary facilities for the storage of dry foods and perishable products are essential.
- c. Washing facilities also should be made possible. (Devadas 1966).

Sanitation is necessary to ensure protection to any person eating in the lunch room from any possibility of food contamination, (Milwaykee 1972).

According to George and Heckler (1960) sanitation includes all practices that prevent the spread of infectious disease and the contamination or infection of food. The typical problems pointed by WHO (1956) include improper handling procedures, unclean containers and utensils, dirty hands and lengthy exposure to local surroundings.

Gonan (1962) states that dirty hands spread germs. Hence hands and fingernails should be washed thoroughly with soap and water before work. The utensils should be clean and handled carefully. After use, all utensils should be scraped, washed clean in hot water, carefully dried and stored.

Food may be infected by coughs, sneezes, handling dirty equipment, vermin animals and wastes. It should be protected during storage, preparation, display and service. Personal health habits of workers should be encouraged, (George and Heckler 1960).

4. Nutritive value of school lunch:

In general the diets in our community are ill balanced because they contain too much cereals and too little of other foods, such as milk and milk products, meat, fish, eggs, vegetables and fruits. In terms of nutrients such regional diets are deficient in vitamin A, vitamins of the B group and high quality protein, (FAO 1958 and Kaul 1954). The kinds of foods recommended to meet the nutrient needs of the healthy, active school age children are similar to those of the pre school child, while the amounts of food needed to supply calories and nutrients are greater, (Anderson et al 1961).

The school lunch should be planned just as carefully as any other meal to supply at least one third of the day's food needs for energy, growth and repair, protection and regulation of body tissues, (Cerke 1960).

Robinson (1971) states that food must taste good to be eaten by children. Martin (1971) suggests that the attractiveness of foods, their flavour, texture, odour and appearance are nutritionally important since foods are nutritious only when consumed.

C. Studies pertaining to the evaluation of school lunch:

A study on the nutritional status and diet of children with and without a school lunch in two selected

elementary schools in Cumberland by Velat et al (1951) showed that all the children were fairly in good condition physically and no deficiency symptoms shown and had normal hemoglobin picture.

An investigation carried out by the Nutrition Department of the All India Institute of Hygiene and Public Health, Calcutta on about 1000 school going children showed that the students received supplementary feeding were observed to have a more rapid increase in body weight than the children who were kept as a control, (Report of the School Meal Committee 1951).

A supplementary feeding trial in the Poonalle Health unit with 550 school children revealed that under-nutrition of children in the poor economic groups can be combated through supplementary feeding, (Report of the School Meal Committee 1951).

Devadas et al (1954) found that the mean increases in weight and hemoglobin and improvement in nutritional status of children in the experimental group in balanced school lunch to be significantly greater than the corresponding values obtained for those in the control group. The results indicated that provision of a nutritionally balanced school lunch would help to correct the nutritional deficiencies in the home diet and bring about improvements

in the growth and nutritional status of children. It also showed that school lunch programme could also help in improving the nutritional knowledge of children, imparting nutrition education to their parents and the social development, attendance and class performance of the school children.

Anandam et al (1954) conducted a study on effect of incorporation of leafy and nonleafy vegetables in the school lunch on the growth and nutritional status of the children and revealed that the improvement and mental development and nutritional status of children receiving green leafy vegetables were definitely better than that observed in children receiving nonleafy vegetables.

Devadas et al (1954) conducted another study on school lunch programme and found that the mean increases in weight, hemoglobin level and RBC count of children receiving school lunch were significantly greater than the control groups consuming home lunch, with no significant differences in the increases in height.

A study conducted by Devadas et al (1957) showed that the children whose diets were supplemented with Indian Multipurpose food and skim milk with school lunch had the greatest increase in body weight, height, hemoglobin and RBC count.

The effect of supplementing the school lunch with neera was investigated in two schools and showed that the food intake, nutritional status and attendance of the children in the groups receiving school lunch with neera was higher than those receiving lunch without neera and much higher than the groups on homelunch, (Devadas et al 1947).

The study by Mitzinger (1958) aimed at finding out the nutrients supplied by Type A lunch served to children aged 9 to 12 years in South Louisiana revealed that 733 calories, 32 g. of fat, 28 g. of protein and 409 mg. of calcium were supplied.

The study on the assessment of the nutritional status of children participating in the school lunch programme in two villages in Coimbatore district by Kamalanathan et al (1969) revealed that the intake of protein was satisfactory in the school lunch group in both the villages while all the groups were short of calories and there was no significant differences between those participating and non participating in the school lunch with regard to height and weight. The school lunch was not found to influence the attendance or performances of the children in these two schools because most of the children were found to be going home after lunch.

The study by Devadas et al (1970) aimed at finding out the nutrient contribution of CSM and skim milk in a school lunch, revealed that while all the children in the different groups had registered increases in heights and weights, children who had received skim milk showed higher increases in height.

Emmons et al (1971) conducted a study on the school lunch in two rural New York schools having school lunch, aimed at finding out what effects the programme had on the nutrition of children who had different economic and nutritional needs, and looked into the attitudes of children and their parents towards school breakfast and lunch. They concluded that if the purpose of free school feeding programme is to serve children who can benefit most from them, both national and economic criteria should be used to identify the children in such need.

Jennings (1971) conducted a study on adding liver to beef loaf to increase iron intake of school children was an acceptable way of increasing the intake.

Changing the school atmosphere at lunch time, through a game room of Hawaii school found that it can be the key to changing the school atmosphere for the entire day. It can also bring improved relation among students, teachers and parents and between school and community, (Food Service Journal 1972).

III. EXPERIMENTAL PROCEDURE

The experimental procedure for this study on the evaluation of the school lunch programmes in selected four schools in Coimbatore city consisted of the following steps.

- A. Selection of the schools and samples
- B. Conducting the study
- C. Analysing the data

A. Selection of the schools and samples:

Four elementary schools with the school lunch programme in operation were selected in Coimbatore city for the purpose of this study. Among the four schools, school 'A' was under the private management where a separate kitchen was maintained. The other schools B, C and D were under the Municipality which was responsible for the programme. Cooking for the Municipal schools was done in the central kitchen. In this study the municipal schools were compared with school 'A' in regard to the school lunch offered. The subjects were the pupil-participants of the school lunch programme. The total number of children taking part in the school lunch programme in these four schools was 1350. Out of these, 500 children were randomly selected for the study from all the age groups. The heights and weights were recorded initially and at the conclusion of the study for 1000 selected children.

B. Conducting the study:

The school lunch programmes were evaluated using the following criteria:

1. Hygienic practices
2. Nutrient supply by the school lunch
3. Heights and weights of the children
4. Nutritional knowledge of the children
5. Attendance and class performance of the selected children
6. Children's attitudes and their food likes and dislikes
7. Parents' opinion about the school lunch programme

1. Hygienic practices followed during cooking and serving and the amount of wastage:

A score card was evolved for evaluating the hygienic practices followed during cooking and serving of the school meals. It included scores for cooking practices, serving and cleanliness of the different areas. The amount of food wastage was found by observing the children during the lunch time.

2. Nutritive value of the school lunch:

The nutritive value of the school lunch (Appendix I) was calculated using the figures given in the publication "Nutritive Value of Indian Foods" by Gopalan et al (1971).

3. Heights and weights of the children:

The heights and weights of the children taking part in the school lunch programme were recorded at the beginning and at the end of the six months study. A stadiometer was used to take the heights to the nearest 0.1 cm. For taking weights to the nearest 0.5 kg. a portable spring balance "Soehnle" was used. The balance was tested for accuracy with standard weights before every weighing. The precautions followed while taking these measurements were: the weights were taken with minimum clothing, and for recording heights, children were made to stand with their heads erect and heels properly fixed on to the stadiometer. The heights and weights were taken without parallax error.

4. Nutritional knowledge of the children:

According to Devadas (1972) nutrition education is the foundation on which any programme of nutritional improvement can be built. Hence knowledge of the pupil's regarding nutrition was obtained by conducting written tests in nutrition.

5. Attendance and class performance of the children:

The attendance and class performance of the children were recorded from the registers maintained in the class and from the examination marks respectively.

6. Children's attitudes and their food likes and dislikes:

Children's attitudes and their food likes and dislikes were checked through observations during the lunch time using an observation schedule, evolved for the purpose as given in Appendix II. The schedule called for details of the pupils concerned with regard to appearance, attitudes, health, attitude towards school lunch, cleanliness, acceptance of dishes served, sociability while eating and quantity of food consumed. These observations were made at the initial and final stages of the study.

7. Parents' opinion regarding the school lunch programme:

A questionnaire was evolved as shown in Appendix III to obtain the parents' opinions regarding the school lunch programme. The main considerations were reasons for allowing the child take part in the school lunch, since how long the child was taking part in school lunch, opinions about the foods served in the school lunch, changes noticed in the child after joining the school lunch in terms of health status, attitude towards new foods, comments made by the child at home about the school lunch and parents' opinions about the school lunch and other remarks of the parents about the school lunch.

C. Analysing the data:

The data regarding the heights and weights, nutritional knowledge of the children and the class and attendance performance were analysed statistically for their significance.

IV. RESULTS AND DISCUSSION

The results of the study on the evaluation of school lunch programme in four selected schools in Coimbatore city are presented and discussed in the following order.

- A. Hygienic practices followed during cooking and serving of the school lunch
- B. Adequacy of the lunch in terms of its quality
- C. Comparison of the heights and weights of children participating in the school lunch
- D. Nutritional knowledge of the selected children participating in the school lunch programme
- E. Class performance and attendance of the children taking part in the school lunch programme
- F. Hygienic practices, followed by the pupils, their attitudes, likes and dislikes and the amount of wastage during the lunch time
- G. Parents' opinion regarding the school lunch programme

4. Hygienic practices followed during cooking and serving of the school lunch:

The score card administered to all the four schools, with regard to the hygienic practices followed during cooking and serving of the school lunch is given in Table I.

TABLE I
SCORES FOR THE HYGIENIC PRACTICES FOLLOWED DURING
COOKING AND SERVING OF THE SCHOOL LUNCH

S. No.	Aspects scored	Scores obtained			
		A	B	C	D
1.	The cook takes care to keep herself neat and tidy	10	5	5	5
2.	The utensils are washed well before and after cooking	10	10	10	10
3.	The utensils containing cooked foods are kept closed always	10	10	10	10
4.	The cooking is done hygienically	10	10	10	10
5.	The plates and tumblers are washed well before serving	10	0	0	0
6.	Only spoons are used for serving food and not hands	10	0	0	0
7.	The dining area is cleaned well before and after the lunch time	10	5	5	5
8.	The left over foods (wastage) are disposed off immediately after the lunch is over	10	10	10	10
9.	The authorities take care to keep away the flies and mosquitoes from the cooking and dining area	10	0	0	0
10.	The kitchen is kept always clean	10	10	10	10
Total		100	50	50	50

Note: Maximum marks for each aspect = 10

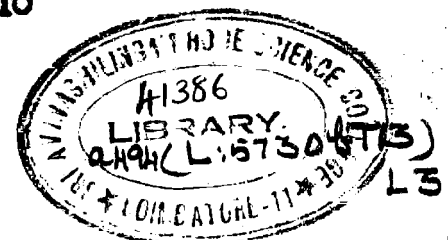




FIGURE 1.

THE ASPECT OF SERVING
IN SCHOOL 'A'



FIGURE. 2

THE ASPECT OF SERVING
IN A MUNICIPAL SCHOOL

The scores reveal that school A had secured the maximum marks 100 whereas the schools B, C and D obtained only 50 per cent. All the aspects mentioned in the score card were found to be practised by the School A. Whereas in the case of other schools, the lunch was prepared in the central kitchen in an expected hygienic way but other practices like washing the plates and tumblers before serving, using spoons for serving, keeping away flies and mosquitoes from the dining area were not practised well. The aspect of serving in School A and in a Municipal school is represented in Fig 1 and 2.

B. Adequacy of the school lunch in terms of quality:

The comparison of the nutrients supplied by the school lunch in all the schools with 1/3 of the ICMR Recommended Allowances is given in Table II.

TABLE II

NUTRIENTS PROVIDED BY THE SCHOOL LUNCH

School	Calo-ries	Pro-tein	Cal-cium	Iron	Reti-nol	This-mine	Ribo-flavin	Ascor-bic acid
	g.	g.	mg.	mg.	mcg.	mg.	mg.	mg.
A	636	17.3	390.3	24.6	812	0.76	0.414	72.9
*B, C & D	357	9.7	74.1	8.4	133.5	0.44	0.15	5.0
**1/3RDA	600	11.0	134.2	5.7	200	0.20	0.23	10.27

* B, C & D = Same lunch

** RDA = Recommended Dietary Allowance, ICMR 1971.

The lunch in School A had 35 more calories than the Recommended Allowances whereas the lunch in the other three schools were grossly deficient in calories receiving only 357 instead of 600. The protein supplied through the school lunch by the school A was also 5.3 g. more than the Recommended Allowance. But the schools B, C and D received 1.3 g. of protein less than the ICMR Recommended Allowance. With reference to the other nutrients such as calcium, iron, vit. A, thiamine and riboflavin, School A supplied more than the Recommended Allowance. In the case of the schools B, C and D nutrients other than iron and thiamine, were supplied in quantities less than the Recommended Allowance. Regarding ascorbic acid, the supply of school A was seven times greater than that of Recommended Allowance, and the supply in the other schools were only half that of Recommended Allowance. Details of all these calculations are given in the Appendix IV.

C. Comparison of heights and weights of the children participating in the school lunch:

The comparison of the mean heights of all the children of the four schools is given in Table III and Appendix V.

FIG. 3.

COMPARISON OF THE MEAN HEIGHTS OF CHILDREN OF SCHOOLS 'A, B, C AND D'

SCALE

Y AXIS 1 CM = 2 CMS

X AXIS 2 CMS = 1 YEAR

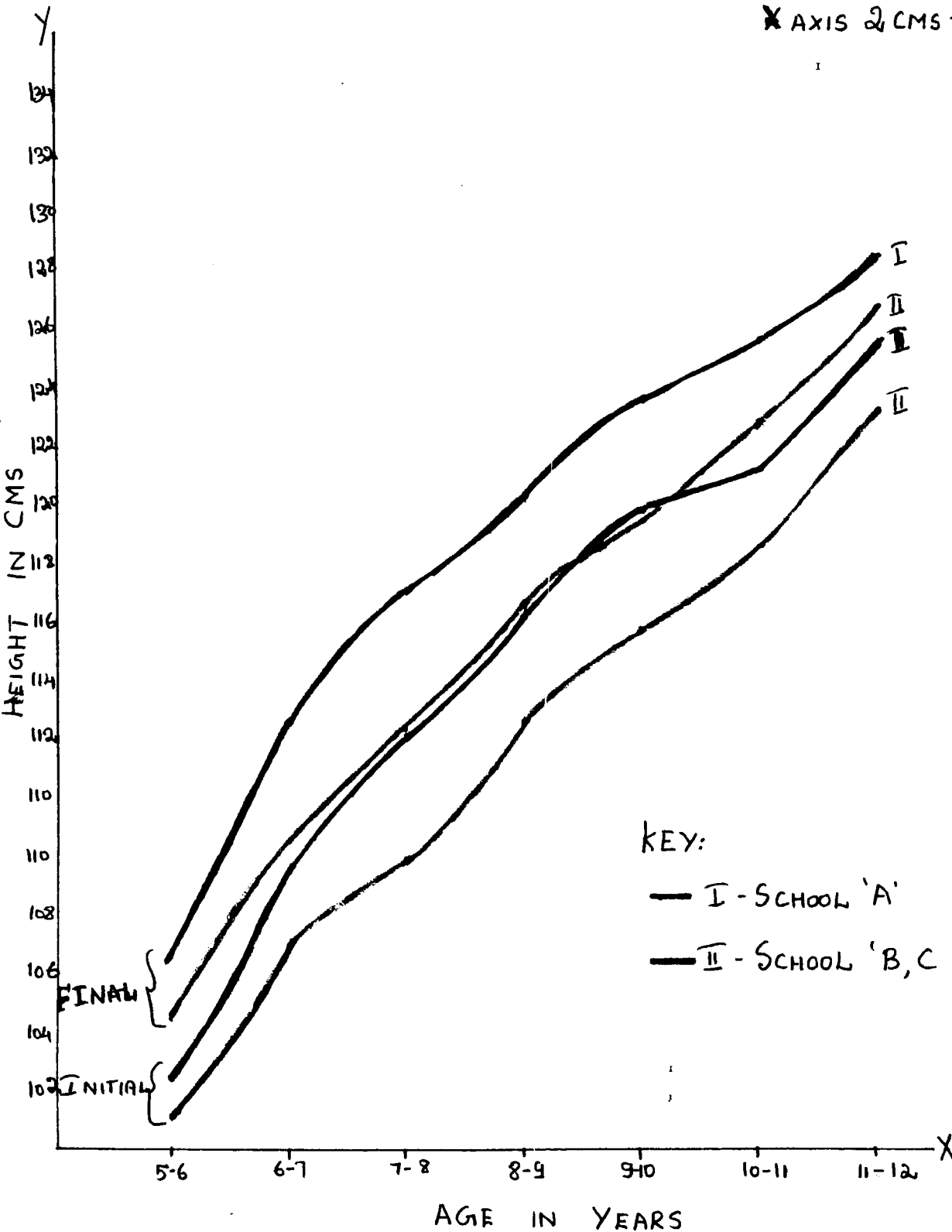


TABLE III

MEAN HEIGHTS OF THE CHILDREN

School	Sample	Initial Mean ± S.D. kg.	Final Mean ± S.D. kg.	Mean Difference ± S.D. kg.	School is compared	't' value
A	124	115.8±1.70	119.95±1.83	4.2±3.83	A vs B	5.8**
					A vs C	5.2**
					A vs D	5.8**
B	306	113.9±1.52	117.1±1.71	3.2±2.31	B vs D	0.83
					B vs C	0
C	288	112.8±1.51	116.1±1.71	3.3±1.89	C vs D	0.87
D	282	113.4±1.65	115.6±1.78	3.2±1.86		

** Significant at 1% level

The mean height of the children of school A was superior to that registered by children in the other three schools. The difference was significant at 1% level. There was no significant difference between the three Municipal Schools in this regard.

The mean weight of children of school A in comparison with that of the other schools is shown in the Table IV and Appendix VI.

FIG. 4.

COMPARISON OF THE MEAN WEIGHTS OF CHILDREN OF SCHOOLS A, B, C AND D.

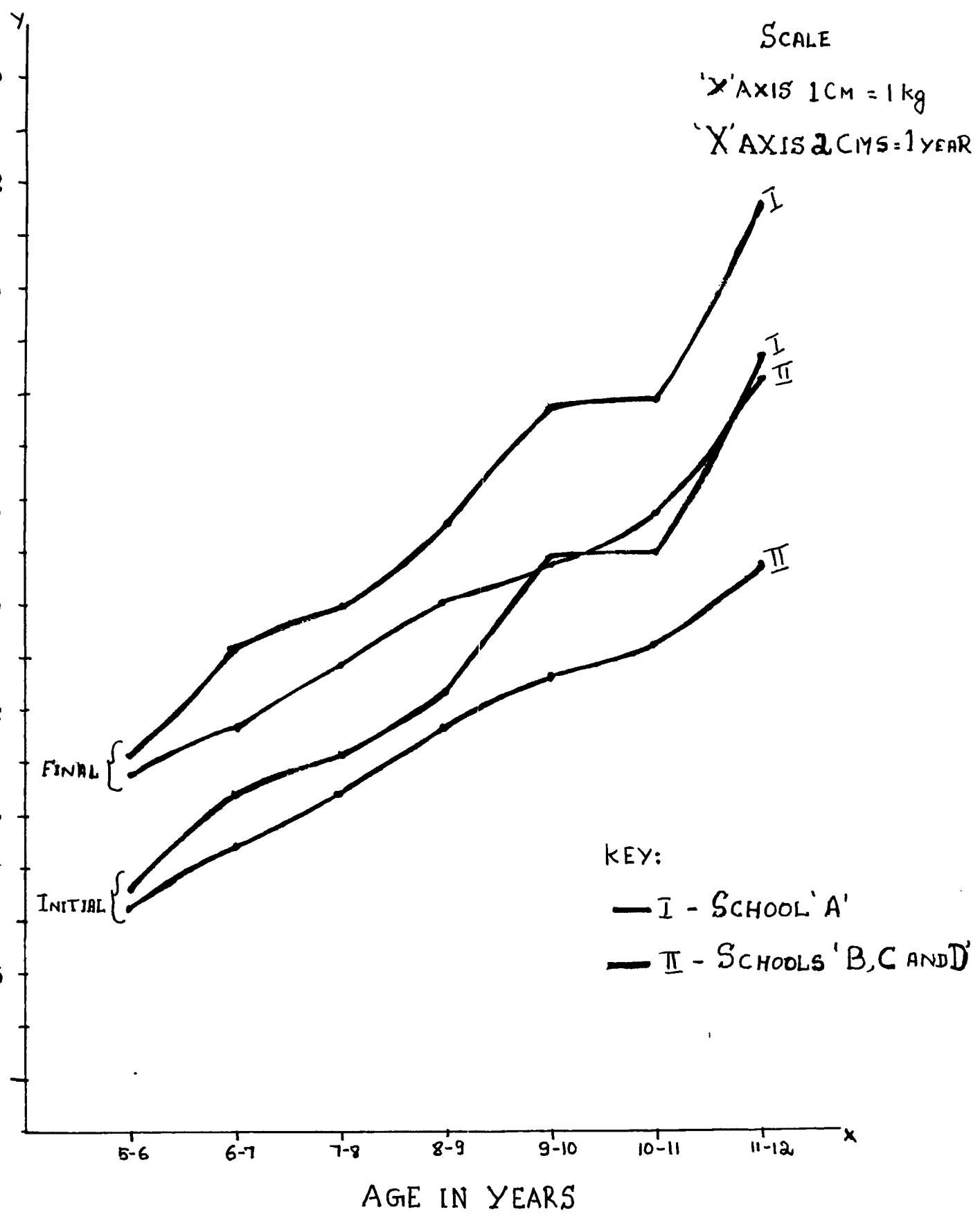


TABLE IV
MEAN WEIGHTS OF THE CHILDREN

School	Sample	Initial Mean + S.D. kg.	Final Mean + S.D. kg.	Mean Difference + S.D. kg.	Schools compared	't' value
A	124	18.7±1.68	21.1±1.54	2.4±1.52	A V _s B	0.65
					A V _s C	0.58
					A V _s D	1.21
B	306	16.9±1.69	19.2±1.44	2.3±1.40	B V _s C	0
					B V _s D	0.8
C	288	16.8±1.48	19.1±1.51	2.3±1.55	C V _s D	1.0
D	282	16.8±1.55	19.0±1.36	2.2±1.51		

There was a difference between the weights of school A and other schools. But the difference is statistically insignificant.

The impact of the school lunch programme on School A and other schools is evident from the increase in the heights and weights of children. The influence was greater in the case of school A which is significant statistically. Fig. 3 and 4 represent the initial and the final mean heights and weights of the children (5 to 12 years of age). In all the age groups the mean height and weight of children in school A was greater than that of the other three schools. But there was an increase in the height and weight of all the children in all the schools.

D. Nutritional knowledge of the selected children participating in the school lunch:

The results of the test conducted on nutritional knowledge are presented in Table V.

TABLE V
MARKS OBTAINED IN THE TEST CONDUCTED REGARDING NUTRITIONAL KNOWLEDGE

School	Marks obtained (in %)		
	III Std.	IV Std.	V Std.
A	26	35	45
B	11	16	19
C	9	16	22
D	12	17	21

The mean marks obtained by the different standards revealed that the children of the III, IV and V standards of School A secured more marks than their counterparts in the other schools. This inference can be reasoned to the attempts of imparting nutrition education to the children of School A. The lower grades obtained by the other schools indicate their level of nutritional knowledge is far below than that of School A. The statistical evidence show that this difference is significant at 1% level.

The statistical analysis is given in Appendix VII.

E. Class performance and attendance of the children taking part in the school lunch programme:

1. Class performance:

The class performance of the sample is tabulated standardwise in Table VI.

TABLE VI

CLASS PERFORMANCE OF PARTICIPATING CHILDREN IN THE SCHOOL LUNCH PROGRAMME

School	Marks obtained (in %)				
	I Std.	II Std.	III Std.	IV Std.	V Std.
A	52	55	51	52	45
B	35	48	49	50	41
C	50	49	41	49	42
D	47	45	39	32	31

The scores received by school A is relatively higher than those received by the other schools. Statistical evidence prove that this difference is significant at 5% level, (Appendix VIII).

2. Attendance performance:

Table VII gives the percentage attendance of the different schools.

TABLE VII
ATTENDANCE OF THE SCHOOL LUNCH CHILDREN

School	Attendance (in %)				
	I Std.	II Std.	III Std.	IV Std.	V Std.
A	96	99	98	97	95
B	89	89	92	95	96
C	96	97	96	97	98
D	88	90	95	88	87

The primary objective of the school lunch programme when it was started, was to minimize the school dropouts. Accordingly the influence on the attendance performance of the children seemed to be greater with regard to all the schools. Statistically there was a significant difference between School A and other three Schools at 1% level. No significant difference between the three schools B, C and D.

Details of the statistical analysis is given in Appendix IX.

F. Hygienic practices, attitudes, likes and dislikes and the amount of wastage during lunch time:

All the children belonging to school A were seemed to be neat, tidy and happy, when compared to the

children of the other schools who were found to be happy in attitudes and fairly neat in their appearance. The health status of children of school A seemed to be improved during the study period. Whereas in the case of the schools B, C and D though there was an observable increase in height and weight they seemed to be moderately healthy. Children in all the schools had a positive approach towards the lunch served in the school. None of the children of the other three schools were found to wash their hands and feet before eating during both initial and final observation. It was also evident that most (77) of the children belonging to school A were found to wash their hands and feet before eating and 37 children were found to wash their hands and feet after their teacher's reminding. The final observation revealed that all the children in school A were practising that habit.

The initial and final observations with regard to the acceptance of the dishes served revealed that children of school A consumed all the three preparations, which included a cereal preparation, a vegetable preparation and CSM payasam. In the case of schools B, C and D CSM was not given in the form of payasam but as a savoury dish mixed with vegetable and cereal.

Seventy per cent of the children belonging to the schools B, C and D were asking for more servings. None had indifferent attitude towards the school lunch. There was no plate wastage with regard to all the schools.

All the children participating in the school lunch were found to be more sociable than their classmates who were not participating in the school lunch. None of the children made any remark regarding school lunch at lunch time. Both the initial and final observations revealed that after eating, all the children washed their hands and plates and played happily. Only with regard to putting back the plates on the racks in an orderly manner, only school A seemed to practise the habit whereas schools B, C and D who brought their own plates from home, put them back inside their school bags.

G. Parents' opinion about the school lunch programme:

The income and occupation of the heads of the 440 families surveyed are given in Table VIII.

TABLE VIII
INCOME AND OCCUPATION OF THE PARENTS

School	Income in Rs.								Occupation			
	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	Unskilled labourer	Petti business	Skilled labourer	Business
A	32	38	24	9	4	3		39	41	21	9	
B	36	72	2					97	13			
C	53	56	1					102	8			
D	73	35	1					108	2			

In school A, 38 families had an income of Rs. 100 to 200 per month with 16 families enjoying an income of Rs. 300-500 per month. Among the other schools a majority of the families in school B had an income ranging from Rs. 100-200 per month. With regard to the other two schools C and D 56 and 73 families which were the larger proportion of the sample surveyed were having a monthly income ranging from Rs. 100 to 200 per month and Rs. 0 to 100 per month respectively. The data on the occupational status revealed that in the other three schools on an average of 107 families out of 110 were unskilled labourers. In the case of school A only 39 were unskilled labourers and 9 were business men. In all the schools 90 per cent of the children of the whole sample had joined the school lunch from I standard onwards.

Table IX indicate the reasons for admitting the children to the school lunch programme.

TABLE IX

REASONS FOR ADMITTING THE CHILD IN THE SCHOOL LUNCH PROGRAMME

School	Poverty	Occupation	Long distance from school	No lunch at home	Balanced lunch is given	Co-operation & sociability	No Reason
A	50	9	11	--	27	13	--
B	79	8	4	6	--	--	3
C	88	4	3	14	--	--	1
D	107	3	--	--	--	--	--

The heads of the families of children belonging to school A pointed out that poverty (38) and serving a balanced lunch (27), and co-operation and sociability (13) as the reasons for admitting their children. Eighty eight per cent of the schools B, C and D reasoned that their poor socioeconomic background was the major factor motivating them to admit their children to the school lunch programme.

The likes and dislikes of the children for various preparations served in the school lunch and the reasons were given in Table X.

TABLE X

PREPARATIONS SERVED IN THE SCHOOL LUNCH PROGRAMME AND LIKES AND DISLIKES

Sch- ools	Foods served	Liked	Reasons			Reasons			
			Taste	Nutri- tious	No re- ason	Dis- liked	Tas- te	Diarr- hoea	No rea- son
A	Tamarind rice, dhal and green kootu, raw vegetable	110	57	44	9	--	--	--	--
	Line rice	110	57	44	9	--	--	--	--
	Dhal rice	110	57	44	9	--	--	--	--
	Uppuma	34	9	19	6	75	39	23	14
	Total	364	180	151	33	75	39	23	14
B	Sambar rice	110	81	10	19	--	--	--	--
	Tamarind rice	110	100	2	8	--	--	--	--
	Uppuma	22	10	4	8	88	73	12	3
	Total	242	191	16	35	88	73	12	3
C	Sambar rice	110	100	3	7	--	--	--	--
	Tamarind rice	110	110	--	--	--	--	--	--
	Uppuma	44	3	4	32	56	45	11	9
	Total	264	213	7	39	56	45	11	9
D	Sambar rice	110	110	--	--	--	--	--	--
	Tamarind rice	107	107	--	--	3	3	--	--
	Uppuma	27	12	--	15	83	52	12	9
	Total	244	229	--	15	86	55	12	9

Among the foods served, all the cereal and vegetable preparations except uppuma were liked by all the children. The equally important reasons pointed out by school A were taste and nutritious. Whereas hundred per cent of the parents of schools B, C and D preferred taste as the main criteria for liking the preparations. The main reasons pointed out by the four schools with regard to the dislike for the preparation 'uppuma' included taste and onset of diarrhoea.

The comments made by the children at home about the school lunch are presented in Table XI.

TABLE XI

COMMENTS MADE BY THE CHILDREN AT HOME ABOUT THE SCHOOL LUNCH

School	Taste	Sociality	Good food habits	Want more	Does not like uppuma	Nothing specific
A	54	31	10	--	12	3
B	48	22	2	7	13	13
C	40	20	1	17	13	19
D	75	3	--	7	12	13

Taste was commented upon mainly by most of the children. Other comments, included 'good for health', 'sociability', 'good food habits', 'wanting more' and 'dislike for uppuma'.

The data on the eating habits of the children indicate that among school A, 52 children had desire towards eating before joining the school lunch, whereas only 48 children had similar desire in the other three schools. After joining the school lunch, the increase in the number of children who were eager towards eating was 24 and 48 respectively in School A and in the Schools B, C and D.

As for the time taken to complete a meal before joining the school lunch on an average of 51, 48 and 10 children were found to finish their meals within 10 to 20, 20 to 30 and 30 and more minutes respectively. After joining the school lunch, the number of children decreased from 48 to 27 who took 20 - 30 mts. to finish their lunch.

The number of children wasting food while eating decreased from 60 to 20 after joining the school lunch programme. The acceptance of new preparations by the children after joining the school lunch was increased from 29 to 49. The increment in heights after joining the school lunch were indicated by all the (110) parents in all the schools. An

average of 107 parents reported the increase in weight of their children. None of the parents reported the occurrence of any special disease after joining the school lunch.

The general opinions of the parents regarding the school lunch programme is tabulated in Table XII.

TABLE XII

OPINIONS OF THE PARENTS ABOUT THE SCHOOL LUNCH PROGRAMME

School	Satisfactory	Helps poor people	Nutritionally balanced diet	Sociability	Good and valuable programme	Nil
A	13	14	37	31	4	4
B	37	38	--	--	35	-
C	24	53	--	--	23	-
D	44	54	--	--	12	-

The parents of the children in school A pointed out their preferences in the following order: Getting nutritious food, learning sociability, helping the poor, satisfactory meals and as a valuable programme. Whereas in the other three schools the parents opined that the school lunch programme helped the poor and provided satisfactory meals therefore it was a valuable programme.

V. SUMMARY AND CONCLUSION

The school lunch programmes in four selected schools, A, B, C and D in Coimbatore city were evaluated. In school A all the desirable practices were followed. The other three schools B, C and D were compared with school A. The basis for the evaluation included hygienic practices followed during cooking and serving, amount of wastage, nutritive value of school lunch, heights and weights of children, nutritional knowledge of the children, attendance and class performance of children, children's attitudes and their likes and dislikes, and parents' opinions regarding the school lunch programme.

The results of the study indicate that:

1. School A was practising all the hygienic practices but in the other three schools while cooking was allright, practices like children washing plates and tumblers, using spoons for serving, keeping away the flies and mosquitoes were not practised.
2. The supply of iron and thiamine was higher than the amounts recommended by the ICMR. The lunch in all the schools served in school A provided Calories, Protein, Calcium, Retinal, Riboflavin and Ascorbic acid in quantities higher than the recommended allowances, when compared to other schools which provided a defficient supply of these nutrients.

3. The mean heights and weights of children in school A were greater than those in the other schools. In general, there was an increase in the heights and weights of children participating in the school lunch in all the schools.
4. The mean scores of children of school A were superior than to those obtained by pupils in schools B, C and D.
5. The class performance revealed that the scores received by children in school A were higher than those received by the children of other schools. This difference was statistically significant. The attendance performance was also greater than the other schools.
6. All hygienic practices were practised well by children of school A.
7. Regarding food likes and dislikes a majority liked all the preparations except uppuma.
8. In all the schools, parents expressed positive opinions regarding the school lunch programmes.

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APPENDICES

APPENDIX - I

ITEMS OF MEALS PROVIDED IN THE SCHOOLS

A, B, C and D

School A	Schools B, C and D
Dhal rice	
Dhal-green kootu	
CSM payasam	Sambar rice
Raw vegetable	

Tamarind rice	
Dhal-green kootu	
CSM payasam	Tamarind rice
Raw vegetable	

Lime rice	
Dhal-green kootu	
CSM payasam	Wheat rava uppama
Raw vegetable	

Wheat rava uppama	
Dhal-green kootu	
CSM payasam	
Raw vegetable	

APPENDIX - II

**SHI AVINASHILINGAM HOME SCIENCE COLLEGE FOR WOMEN
COIMBATORE-11**

OBSERVATION SCHEDULE

Date:

Name of the child:

Class:

1. Appearance

- a. Neat and tidy
- b. Fairly neat
- c. Shabby

2. Attitudes

- a. Happy
- b. Unhappy
- c. Indifferent

3. Health Status

- a. Healthy and active
- b. Moderately healthy
- c. Sick

4. Attitudes towards School Lunch

- a. Eager
- b. Not eager
- c. Indifferent

5. Cleanliness:

- a. Washes hands and feet before eating
- b. Washes hands and feet partially
- c. Washes hands and feet only when reminded
- d. Does not wash hands and feet

6. Acceptance of dishes served:

Acceptance	Cereal Preparations	Vegetable preparations	CSM preparation
------------	---------------------	------------------------	-----------------

- a) Eats Willingly
- b) Asks for more serving
- c) Eats indifferently
- d) Left Overs:
 - 1) Eats without leaving
 - 2) Eats less than normal
 - 3) Does not touch any food

7. Sociability while eating:

- a) Converses freely with others while eating
- b) Talks only to a selected few
- c) Feels shy to talk
- d) Never talks with others while eating

8. Consumption of foods:

Dish	Amount served	Amount left	Amount Consumed
------	---------------	-------------	-----------------

9. Remarks made about feed at meal times

10. After eating

- a) Washes the hands: Properly Improperly
- b) Washes the plates: Properly Improperly
- c) Puts back the plates: Properly Improperly
- d) Plays happily: Plays sometimes:
- Does not play at all:

11. Other remarks

Filled by:

Date:

APPENDIX - III

**SRI AVINASHILINGAM HOME SCIENCE COLLEGE FOR WOMEN
COIMBATORE-641011**

Parents' Opinions about the School Lunch Programmes

Name of the parents:

Income Rs./month:

Name of the child:

Class:

Since how long the child is taking lunch in school.

1. What are the reasons for admitting your child to the School lunch programme?

2. List the food preparations served in school Lunch and whether or not you like them.

Foods served in school lunch	Liked	Disliked	Reasons
.....

.....

3. What comments does your child make about the lunch in the school?

4. Mark the changes noticed in the eating habits of your child after joining the school lunch.

Habits	Before joining School Lunch	After joining School Lunch
a) Desire towards eating		
b) Time taken to complete eating a meal.		
c) Wasting food at meal		
d) Attitude towards new foods and food preparations (give examples)		
e) Foods liked		
f) Foods disliked		
g) Amount of particular foods consumed		

Habits	Before joining School Lunch	After joining School Lunch
--------	--------------------------------	-------------------------------

Coronals

Dhal

Vegetables

Milk

Curds

Others

5. Changes in the health status of the child after participating in the school lunch programme.

Height

Weight

Diseases

6. List your general opinions about the school lunch.

7. Other remarks

APPENDIX - IV



1. NUTRIENTS PROVIDED BY THE SCHOOL * * * LUNCH

Food Staff	Amount g.	Calor- ies	Protein g.	Calcium mg	Iron mg	Vit. A. Carotenk ug.	Thiamine mg	Ribo- flavin mg.	Vitamin C mg.
Rice (Parboiled milled)	100	346	6.4	9.0	4.0	—	0.21	0.05	—
(or)									
Bulgar wheat	100	356	9.2	57.0	4.9	—	0.74	0.11	—
Red gram dhal	10	34	2.3	7.5	0.6	13.2	0.45	0.02	—
Amaranth Tander	50	23	2.0	199.0	12.3	2760	0.02	0.15	49.5
CSM	30	112	5.5	153.9	5.55	349	0.02	0.16	12.0
Jaggery	10	33	0.04	8.0	1.14	17	0.002	0.004	—
Pappaya	20	6	0.12	3.4	0.10	133	0.008	0.05	11.4
Total		631	16.36	330.3	24.19	3272.4	0.495	0.434	72.9
		641	18.16	399.8	25.03	3272.4	1.015	0.494	72.9
Average		636	17.3	370.3	24.6	812	0.76	0.141	72.9
						Retinol ug.			

2. NUTRIENTS PROVIDED BY THE SCHOOLS B, C and D LUNCH

Food Stuff	Amount g.	Calo- ries	Pro- tein g.	Cal- cium mg.	Iron mg.	Caro- tene mg.	Thia- mine mg.	Ribo- flavin mg.	Vitamin C mg.
Rice (Parboiled, milled) (or)	72	249	4.5	6.5	2.9	--	0.15	0.03	--
Bulgar wheat	58	201	6.8	23.0	2.8	--	0.21	0.05	--
Red gram dhal	5	17	1.7	3.8	0.3	5.7	0.03	0.01	--
Oil	6	54	--	--	--	--	--	--	--
Bengal gram dhal	2	8	0.5	1.1	0.2	2.1	0.01	--	--
Pumpkin	10	3	0.2	1.4	0.2	6.5	0.01	0.01	0.3
Chillies (dry)	0.5	1	0	0.8	0.1	1.8	--	--	0.3
Chillies (Green)	0.2	--	0.1	0.5	0.3	--	--	--	0.2
CSM	10	37	1.8	51.3	1.8	115.4	0.08	0.06	4
Tamarind	2.5	12	0.2	0.3	2.5	--	0.13	0.03	--
Onion	1	0	0.02	0.01	0.01	0.01	0.3	--	--
Total		381	9.1	55.8	8.4	133.8	0.41	0.16	5.0
		333	10.3	82.3	8.3	133.8	0.47	0.15	5.0
Average		357	9.7	74.1	8.4	33.5 (reti- nol mcg)	0.44	0.15	5.0

APPENDIX - Y

HEIGHT

1. INITIAL

FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS

Class interval in cms.	Schools			
	A	B	C	D
95.1 - 95.0	2	2	4	4
95.1 - 100.0	5	16	17	13
100.1 - 105.0	13	37	39	37
105.1 - 110.0	12	44	53	49
110.1 - 115.0	19	54	49	49
115.1 - 120.0	23	37	53	54
120.1 - 125.0	26	40	33	36
125.1 - 130.0	10	15	18	23
130.1 - 135.0	8	5	3	10
135.1 - 140.0	0	3	2	1
140.1 - 145.0	0	2	1	1
Total	124	306	233	232

HEIGHT

2. FINAL

FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS

Class interval in cms.	Schools			
	A	B	C	D
90.1 - 95.0	0	1	1	1
95.1 - 100.0	1	6	12	5
100.1 - 105.0	8	26	18	26
105.1 - 110.0	12	33	53	49
110.1 - 115.0	16	43	44	47
115.1 - 120.0	25	81	54	51
120.1 - 125.0	23	72	57	40
125.1 - 130.0	21	25	33	33
130.1 - 135.0	9	12	12	20
135.1 - 140.0	8	4	3	5
140.1 - 145.0	1	3	1	0
Total	124	306	218	232

HEIGHT

3. DIFFERENCE

FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS

Class interval in cms.	Schools			
	A	B	C	D
0.6 - 1.0	0	2	2	0
1.1 - 1.5	1	25	10	5
1.6 - 2.0	0	55	15	21
2.1 - 2.5	6	57	29	43
2.6 - 3.0	13	61	62	72
3.1 - 3.5	19	39	50	40
3.6 - 4.0	16	35	43	40
4.1 - 4.5	18	14	22	20
4.6 - 5.0	15	11	34	22
5.1 - 5.5	15	3	10	1
5.6 - 6.0	9	1	4	8
6.1 - 6.5	8	3	2	5
6.6 - 7.0	2	0	0	0
7.1 - 7.5	2	0	0	0
Total	124	306	233	232

APPENDIX-VI

WEIGHT

1. INITIAL

FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS

Class interval in kg.	Schools			
	A	B	C	D
10.1 - 12.0	0	12	2	4
12.1 - 14.0	11	42	42	29
14.1 - 16.0	19	79	77	88
16.1 - 18.0	29	80	83	75
18.1 - 20.0	30	61	53	50
20.1 - 22.0	13	17	18	23
22.1 - 24.0	15	5	8	8
24.1 - 26.0	1	5	2	3
26.1 - 28.0	1	4	3	1
28.1 - 30.0	1	0	0	1
30.1 - 32.0	4	1	0	0
Total	124	306	238	232

WEIGHT

2. FINAL

FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS

Class interval	Schools			
	A	B	C	D
12.1 - 14.0	1	3	6	3
14.1 - 16.0	5	27	39	24
16.1 - 18.0	20	84	99	84
18.1 - 20.0	25	82	89	89
20.1 - 22.0	29	57	47	40
22.1 - 24.0	22	33	28	25
24.1 - 26.0	14	5	12	12
26.1 - 28.0	5	4	4	3
28.1 - 30.0	2	4	2	1
30.1 - 32.0	1	0	1	1
32.1 - 34.0	2	2	0	0
Total	124	306	238	232

WEIGHT

3. DIFFERENCE

FREQUENCY DISTRIBUTION FOR ALL THE SCHOOLS

Class interval in kg.	Schools			
	A	B	C	D
0.1 - 0.5	2	0	5	2
0.6 - 1.0	3	6	12	3
1.1 - 1.5	13	57	50	52
1.6 - 2.0	21	70	40	66
2.1 - 2.5	29	74	70	83
2.6 - 3.0	15	52	57	23
3.1 - 3.5	19	14	23	14
3.6 - 4.0	12	22	16	6
4.1 - 4.5	4	4	10	22
4.6 - 5.0	0	6	1	6
5.1 - 5.5	1	1	4	0
Total	124	306	298	282

APPENDIX - VII

**MARKS OBTAINED IN THE TEST CONDUCTED REGARDING NUTRITIONAL
KNOWLEDGE OF THE CHILDREN TAKING LUNCH AT SCHOOL**

ANALYSIS OF VARIANCE TABLE

Sources of variance	Degrees of freedom	Sum of squares	Mean sum of squares	Variance ratio	Infe- rence
<u>Between schools:</u>					
a. School A V _g Schools B, C and D.	1	727.00	727.00	76.6	**
b. Among Schools B, C and D	2	9	4.50	0.5	
<u>Between Classes:</u>	2	176.00	87.50	—	
Error	14	133.00	9.50	—	
Total	19	1039.00	—	—	

** Significant at 1% level

APPENDIX - VIII

CLASS PERFORMANCE OF THE CHILDREN TAKING LUNCH AT SCHOOL

ANALYSIS OF VARIANCE TABLE

Sources of Variance	Degrees of freedom	Sum of squares	Mean sum of squares	Variance ratio	Info-rence
Between Schools:					
a. School A V _s Schools B, C and D.	1	224.27	224.27	3.43	*
b. Among Schools B, C and D.	2	142.95	71.47	2.69	
Between Classes	4	196.70	49.19	—	
Error	12	323.30	27.03	—	
Total	19	887.2	—	—	

* Significant at 5% level

APPENDIX - IX

ATTENDANCE OF THE CHILDREN TAKING LUNCH AT SCHOOL

ANALYSIS OF VARIANCE TABLE

Sources of Variance	Degrees of freedom	Sum of squares	Mean sum of squares	Variance ratio	Inference
Between Schools:					
a. School A vs. Schools B, C and D.	1	64.10	64.10	9.8	**
b. Among schools B, C and D.	2	93.00	46.50	7.1	**
Between Classes	4	18.80	4.70	—	
Error	12	78.00	6.50	—	
Total	19	293.9	—	—	

** Significant at 1% level