INTRODUCTION

Infant mortality has all along been recognised as an important index of socio-economic development of a country ever since the Physical Quality of Living Index (PQLI) was popularised by the economists. This realisation has enabled international organisations as well as national governments to intensify their efforts to lower infant mortality and raise the level of child survival. When we examine the gravity of this problem in the developing countries it can be seen that one out of ten new borns will die before the first birth day. Indeed, in 52 countries infant mortality even exceeds this figure and there are about 20 countries where every fifth or sixth new born dies in the first year of life. On the other hand in the developed countries the infant mortality rate reaches the lowest level (e.g., 10.1 in USA, 6.2 in Sweden, 6.0 in France, 5.3 in Japan during 1986-87; WHO, 1992).

Historically infant mortality has declined nearly everywhere, so that the distribution of individual countries according to their infant mortality rates has shifted quite favourably over a 25-year period. The overall decline from the developing world from 1960-65 to 1985-90 was a substantial 43 percent. However, the variation by region is rather wide, ranging from a 73 percent decline in East Asia, down to 34 percent decline in Sub-Saharan Africa. South and Southeast Asia fared only slightly better, with an overall decline of 37 percent, depressed by Bangladesh at a 21 percent decline and Pakistan at a 30 percent
decline. Infant mortality rate in India declined by 37 percent, during the same period (Ross et al., 1992). Among the countries of South Asia Regions, five countries have infant mortality rate above 100/1000 live births in 1989, three countries including India have a rate ranging from 50 to 100 and one country viz., Sri Lanka, has the lowest rate of 27. The infant mortality rate in India is about ten times higher than that of the Industrialised Western countries to remain high (91 in 1989) when compared to the neighbouring countries like Sri Lanka and China with an infant mortality rate of 27 and 31 respectively during the same period. Further the regional variation in infant mortality is significant which widely varied from 17 during 1990 in the State of Kerela to 1423 in the State of Orissa (India: RG, 1991).

In developing countries like India, reducing infant mortality to a level reached by the developed industrialised countries may take a longer time because of limited resources. But it is still possible to select some interventions (see Annexure-1) which when implemented together, will be able, through their synergistic effect to reduce the mortality to a reasonable level and lay a foundation towards better mental and social developments of the children.

India has good experience with nutrition intervention projects which could generally be termed 'Food Medicine'. During the past three decades a number of Applied Nutrition projects has
been tried out in our country with different approaches with reference to the beneficiaries, agents of delivery, receipts, frequency and so on (See Annexure-II) with the aim of reducing infant mortality, child morbidity and mortality and promoting child health. The Government of India have certain programme like the "Applied Nutrition Programme" and "Special Nutrition Programme". These are also implemented in Tamil Nadu (one State in India). Currently two such major programmes are in operation viz., The Chief Minister's Nutritious Noon Meal Scheme and Tamil Nadu Integrated Nutrition Project (TINP).

In the State of Tamil Nadu, the infant mortality declined by 38 percent from 108 in 1973 to 67 in 1990. The present level (1990) of infant mortality in Tamil Nadu is lower (67) than that of All India (80) level. It is more or less similar to the level in the neighbouring states like Karnataka (71) and Andhra Pradesh (70) but it is much higher than that of Kerala where it was 17 in 1990 (India : RG, 1991). Within each region of Tamil Nadu, there is a considerable diversity in the levels of infant mortality. The available information indicates that infant mortality in rural areas widely varied from 34 in Coimbatore district to 85 in Dharmapuri district by 1987 (Directorate of Family Welfare, 1989). Nevertheless, definite trend in decline in infant mortality is noticed in Tamil Nadu and more so in some areas within the State. One such area is Madurai district where the Tamil Nadu Integrated Nutrition Project (TINP) has been implemented since 1980.
The TIMP has four major components, viz., nutrition delivery services such as nutrition surveillance, supplementary feeding to children/pregnant and nursing women, prophylaxis against nutritional deficiencies, diarrhoea management and communications; rural health services, and communications and monitoring (See Annexure-III for details about TIMP). The main objective of the TIMP is to improve the health and nutritional status of preschool children under 36 months and to extend health and health related services to other high risk groups viz., pregnant and nursing women. One of the specific objectives of the TIMP is to reduce the infant and child morbidity and mortality. The Government of Tamil Nadu implemented it in Kottampatti block of Madurai district as a pilot project in October, 1980 and extended it to the remaining blocks of Madurai district in March 1982, and five other districts of Tamil Nadu with financial assistance from the World Bank. The infant mortality has declined by 29.1 percent in Kottampatti Community Development Block and 26.9 percent in other blocks of Madurai district after 5 to 6 years of implementation of the TIMP (Chidambaram, 1989). However, such decline has not been studied for comparison on experimental and control basis so far in any part of Tamil Nadu.

Recent research findings on infant mortality indicate the influence of socio-economic, demographic, ecological, health programmes on infant mortality (Mahadevan, 1989; Dyson and Moore,
1983; Batacharya et al., 1980; Simmons et al., 1979; Batacharya, 1979; Jain et al., 1988; Ramanujam, 1988; to mention a few). In fact low infant mortality rate observed in Kerala has been attributed largely to the relatively better environmental and hygienic conditions and the wider distribution of health care services besides the higher social development (Mahadevan, 1989; Nag, 1983). On this basis it is believed that the TINP (health, nutrition and communication services) might have changed the mother's attitude towards mother and child care (cultural factors), improved the housing and sanitation conditions (ecological factors), increased the utilisation of MCH services and improved the health of mother particularly during pregnancy period which ultimately contributed to the observed low infant mortality in Madurai district. Moreover the availability of nutrients is not only beneficial to the child but also to the mother. As the maternal diet and nutrition during pregnancy affects birth weight of baby and nutritive diet during lactation influences the quantity and nutrient quality of breast-milk, the nutrition intervention programme might have resulted in reducing infant mortality.

The health and nutrition intervention might have resulted in reducing infant mortality among general poor population of rural areas. But its impact is not yet established among the most socially and economically deprived population of Scheduled Castes. In fact about 35 percent of total infant deaths occurred among Scheduled Caste population. This is higher than the percentage of
Scheduled Caste population to the total population (Mahadevan, 1985; Ramanujam, 1991). For instance the state of Punjab has the highest proportion (27 percent in 1981) of Scheduled Caste population in the country and the extent of malnutrition is also comparatively much higher among the Scheduled Caste population even in this developed state. Out of total malnourished children, in Punjab, 63 percent belonged to Scheduled Caste families (Kakar, 1977). In such population under-weight babies generally born to malnourished mothers are susceptible to higher mortality risk. After seeing the flight of Scheduled Caste population on malnourishment in Punjab, it was considered appropriate to examine the changes of nutritional standard of this population in Tamil Nadu. Such high mortality and nutritional deficiency are extensively seen among Scheduled Caste population in other States as well. Under these considerations, for the present study also the same group of population was chosen to examine the overall influence of TINF on a sensitive basis. Therefore, it is proposed to study the specific socio-economic, biological, demographic, health and nutrition programme factors associated with infant mortality of this population consequent to the impact of TINF after controlling these factors.

The importance of this study stems out of several considerations. It is innovative and valuable because the population considered for the study, viz., Scheduled Castes are the most backward community who have not been studied sufficiently so far in India. In addition, no empirical study has been undertaken
in Tamil nadu to examine the benefits of TNP programme among the
target population. Since this study is based on Quasi-Experimental
design, the findings will have far reaching advantages to replicate
such programmes on a viable basis elsewhere in the country. On the
basis of these advantages this study has been undertaken. The
findings of this study have been conceptualised and presented in
several chapters on the following lines.

Chapterisation of the Thesis


In chapter-1, an extensive review of the available literature on factors influencing infant mortality has been made. Findings of studies conducted in different parts of India and elsewhere in the world have been discussed. Emphasis has been given
to studies pertaining to rural areas and Scheduled Castes in India and also to the variables considered in the present study. Subsections are devoted for the discussion of factors under each of the ten "life-affecting variables".

Chapter-II is devoted to the presentation of methodology of study. Specifically this chapter covers objectives of the study, hypotheses, theoretical basis of the study, study area, study population, sample size, sampling, method of data collection, list of variables: broad category of "life-affecting variables" and factors under each variable, construction of variable(s) and method of analysis. In the presentation of theoretical basis for the study, the important and recently developed conceptual models and selection of model for this study and analytical framework followed are discussed.

The chapters from III to XII are devoted for detailed analysis of the study findings. Separate chapters have been assigned for each "life-affecting variable". Under each chapter, the analysis of association between specific factor or variable and neonatal / post-neonatal / infant mortality for both the experimental and the control areas has been discussed. The mortality rate for each category of variable in the experimental area was compared with that of control area and the significance of difference between them has been discussed. Tables are numbered serially chapterwise and presented along with the chapters for which
they are meant. In each table, number of infant survivors (N), neonatal mortality rate (NMR), post-neonatal mortality rate (PNMR) and infant mortality rate (IMR) for both the experimental and control areas; and the statistical significance of difference in NMR, PNMR and IMR between the experimental and control area for each category of variable are presented.

To recapitulate the findings obtained for several factors have been summarised and presented at the end of each chapter. The detailed contents of the chapters from three to thirteen are discussed in the following pages.

In chapter III, ecological variables influencing infant mortality have been analysed. The specific ecological variables included are: housing condition-type of house, space in the house, ventilation of house, electrification of house; environmental sanitation - excreta disposal condition, refuse disposal, water stagnation, presence of cattle shed, storage of animal dung, rearing animals, fly nuisance inside the house, source of drinking water, habit of drinking boiled water, cleanliness of water storage, material used for cleaning water container, cleanliness of vessels used for cooking/eating; hygiene in cooking food/washing hand/eating fallen food on ground; and personal hygiene of mother-cutting nail and accumulation of dust behind nail. An attempt has also been made to construct sanitation index of the house, 'hygiene index for mother', 'index for natural call', and 'index for cleanliness of
vessels' by choosing appropriate variables and applying scoring procedures.

In Chapter IV, the influence of cultural variables on infant mortality has been examined. The specific cultural variables considered are: food practice - frequency of eating non-vegetarian food, special food taken and avoided during pregnancy; practice on treatment when baby fell ill; perception and fear of infant mortality and desire for additional children; and preference for son(s). An attempt has also been made to construct an index for preference to son(s) by choosing appropriate variables and applying scoring procedure.

In chapter V the relationship between familial variables and infant mortality has been examined. The specific familial variables included are type of family and economic status, viz., family income and expenditure, land holding size. Later the influence of marital variables on infant mortality has been studied. The specific marital variables included are: age at marriage, duration of marriage and relationship between bride and grooms.

In chapter VI, parental variables influencing infant mortality have been examined. The specific parental variables considered are: social - education and occupation of parents, and biological - age of mother at live birth, health condition of mother during pregnancy.
In chapter VII, the relationship between conception and pregnancy variables and infant mortality has been examined. The specific conception and pregnancy variables included are: bi-social - nature of delivery, bad obstetric history, result of previous conceptions; nutritional status of mother - intake of calories and protein, iron and vitamin 'B' and 'C' deficiency, haemoglobin level; and pregnancy care - use of medical care, morbidity experienced and treatment, and physical hard work outside home.

In chapter VIII, the relationship between perinatal variables and infant mortality has been examined. The specific perinatal variables included are: growth - mother's perceived birth weight of baby; delivery care - place of delivery, delivery attendant, type of bed used at delivery, instrument used to cut umbilical cord, and material applied for dressing the umbilical cord; post-delivery care - confinement after delivery, cleaning mouth/throat of baby, bathing the baby, colostrum, prelacteal feeds, mother resumed work and working outside home after delivery; and demographic factors - family size previous experience of infant loss, birth order, and birth interval.

In chapter IX, the influence of intervention programmes on infant mortality has been examined. The specific intervention programmes/services included are: medical care - availability and accessibility, use of services and satisfaction; MCH services -
antenatal care, tetanus toxoid/ferrous sulphate tablets for mother and Polio/BCG/DPT for child; and applied nutrition programme (TINP) - mother's participation during pregnancy and lactation, child's participation, sharing the food received, improvement in health of mother and child, mother's practice at home, nutritional status of mother/child, and opinion about TINP. An attempt has also been made to construct 'index for use of MCH services and satisfaction', 'index for use of antenatal services', and 'index for immunisation of children by choosing appropriate variables and applying scoring procedure."

In chapter X the relationship between norms on child care and socialization and infant mortality has been analysed. The specific norms on child care and socialization included are: infant feeding practices of breastfeeding - initiation, frequency, exclusive feeding, feeding during illness for baby, gap between stopping breastfeeding and death, position and frequency of feeding and duration of feeding; supplementation - initiation of liquid and solid food, type of feeder and its cleanliness, type of water and material used for cleaning the feeder, practices of keeping the feeder; and diarrhoeal management - experience of diarrhoea after initiation of liquid food and nature of treatment for diarrhoea."

In chapter XI, the relationship between morbidity pattern and infant mortality has been analysed. The specific variables considered are: nature of morbidity experienced and nature of treatment. The other variables considered are age at death of
infant, cause of death, nature of treatment to infant before death and mother's perceived size of infant for its age at death.

In chapter XII, the impact of nutrition supplementation through TINP on early neonatal mortality and post-neonatal mortality was analysed by comparing the mothers who participated in TINP with mothers who did not participate in TINP after controlling the effect of variables like age of mother, parity, ante-natal services used, tetanus toxoid received, initiation of breastfeeding, discarding colostrum, birth attendant, place of delivery and haemoglobin level for mother. The impact of TINP was also studied by examining nutritional status of surviving children by comparing (i) the mothers who participated in TINP with mothers who did not participate in TINP, (ii) experimental area with control area and (iii) at the time of joining TINP with at the time of leaving TINP. The impact of TINP on infant mortality was assessed by comparing the experimental area with the control area after controlling the effect of all the 'life-affecting variables' and the results were presented.

In chapter XIII, the overall major findings of the study have been summarised with discussion and policy related recommendations have been made to reduce infant mortality in the rural areas of the country in general and the Tamil Nadu State in particular.

At the end, a list of references and annexures quoted in the text are appended.