

**A COMPARATIVE STUDY ON THE EPIDEMIOLOGY OF
UNDER-NUTRITION BASED ON ANTHROPOMETRIC AND
CLINICAL PARAMETERS AMONG THE TRIBAL UNDER-FIVE
CHILDREN IN HILLS AND PLAINS OF THIRUVANNAMALAI
DISTRICT, TAMIL NADU**

THESIS

*Submitted to the Tamil Nadu Dr. M.G.R. Medical University in partial
fulfilment of the requirement for the award of the degree of*



DOCTOR OF PHILOSOPHY IN MEDICINE

By

Dr. P. Saravanakumar, M.D.

Government Kilpauk Medical College

Chennai

JUNE 2017

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Signature of the Co-guide

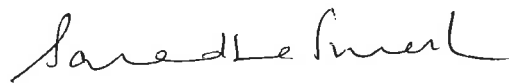
Prof. Dr. A.K. Rajendran M.D.
Professor and HOD
Department of Community Medicine,
Sri Muthukumaran Medical College & RI,
Mangadu, Chennai, Tamil Nadu.

Signature of the Guide

Prof. Dr. Saradha Suresh MD, PhD, FRCP (Glas)
Former Director and Superintendent,
Inst. of Child Health & Hospital for Children,
Former HOD and Professor of Pediatrics,
Madras Medical College, Chennai.

CERTIFICATE

This is to certify that this study entitled:-“A COMPARATIVE STUDY ON THE EPIDEMIOLOGY OF UNDER-NUTRITION BASED ON ANTHROPOMETRIC AND CLINICAL PARAMETERS AMONG THE TRIBAL UNDER-FIVE CHILDREN IN HILLS AND PLAINS OF THIRUVANNAMALAI DISTRICT, TAMIL NADU” is the original research work done by Dr. P.SARAVANAKUMAR, under my guidance and supervision for the degree of Doctor of Philosophy and represents independent and original work on the part of the candidate.



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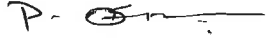
Prof. Dr.A.K.Rajendran, MD,DPH,
Professor & Head
Department of Community Medicine,
Sri Muthukumaran Medical College
& Research Institute,
Mangadu, Chennai.

DECLARATION

I hereby declare that thesis entitled “A COMPARATIVE STUDY ON THE EPIDEMIOLOGY OF UNDER-NUTRITION BASED ON ANTHROPOMETRIC AND CLINICAL PARAMETERS AMONG THE TRIBAL UNDER-FIVE CHILDREN IN HILLS AND PLAINS OF THIRUVANNAMALAI DISTRICT, TAMIL NADU” is a research work done by me and not used previously either partially or fully for the award of any Degree/ Diploma/ Associateship/Fellowship or any other similar title.

Place: Chennai

Date: 29.6.17


Dr.P.Saravanakumar

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ABBREVIATIONS

NFHS	-	National Family Health Survey
DLHS	-	District Level Household and Facility Survey
PHC	-	Primary Health Centre
HSC	-	Health Sub-Centre
ICDS	-	Integrated Child Development Services
CI	-	Confidence Interval
IFA	-	Iron and Folic acid Tablet
LBW	-	Low birth weight
IMR	-	Infant Mortality Rate
WHO	-	World Health Organization
PPS-LSS	-	Probability Proportional to Size with linear Systematic sampling
S.D.	-	Standard Deviation
M	-	Median
MAM	-	Moderate Acute Malnutrition
SAM	-	Severe Acute Malnutrition
MUAC	-	Mid Upper Arm Circumference
Hb	-	Hemoglobin
DCF	-	Data collection Form
FGD	-	Focused Group Discussion
BMI	-	Body Mass Index
SKFT	-	Skin Fold Thickness
OPV	-	Oral Polio Vaccine
DPT	-	Diphtheria, Pertussis and Tetanus vaccine
Hep B	-	Hepatitis B
Hib	-	Hemophilus Influenza B vaccine
HFIAS	-	Household Food Insecurity Assess Scale
ASHA	-	Accredited Social Health Activist
MDG	-	Millennium Development Goals
Wt	-	Weight
Ht	-	Height
HC	-	Head Circumference
CC	-	Chest Circumference
RDA	-	Recommended Daily Allowance
ICMR	-	Indian Council of Medical Research
yrs	-	Years
gm	-	Grams
dl	-	Deciliter

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Dr.P.Saravanakumar

CHAPTER I

INTRODUCTION

Children's health is Tomorrow's wealth. Children are about one third of the population and are the future pillars of the nation. Indeed the child who has health has hope and he who has hope has everything. Nutritional status of a child is governed by food as well as health care, which is a basic human right of every child¹. But in reality, globally majority of the children are deprived of this basic right. Various factors like maternal health, infant and child feeding practices, support from the family as well as health care providers determine the overall growth and development of the child to its fullest potential. The most crucial time to meet the nutritional requirements of the child is during the first thousand (1,000) days, which begins from pregnancy and extends till the second birthday of the child¹. Under-nutrition during this vulnerable period leads to stunting of growth, which remains not only irreversible but also associated with impaired cognition, reduced school performance and low efficiency in work in future life¹.

Malnutrition is the underlying cause which leads to almost half of all deaths in children under the age of five years worldwide². This in turn indicates the loss of nearly 3 million lives every year². Undernutrition renders the children at a greater risk of acquiring recurrent infections which may be associated with delayed recovery and even death. In addition, the interaction between undernutrition and infection can create a vicious and potentially a lethal cycle which further adversely affect the nutritional status. Underweight, stunting and wasting are associated with synergistic

increase in morbidity due to diarrhea, recurrent respiratory infections and Measles. These undernourished children require urgent treatment and care to prevent death.

About 101 million children under the age of five years were suffering from under-weight in 2011, which represents nearly 16% of under-five children globally². In 2016, globally, nearly about 155 million children under five years of age suffered from stunting³. Wasting in under-five children is the life-threatening result of hunger and disease³. In 2016, globally about 52 million children under five were wasted and about 17 million were severely wasted³. In 2016, more than 50% of all stunted children under the age of five years lived in Asia and more than 33% lived in Africa⁴. More than two thirds of all wasted children under the age of five years lived in Asia and more than one fourth lived in Africa in 2016⁴. Every year, nearly 2.3 million deaths occurring in children of age from 6 to 60 months in the developing countries are attributable to malnutrition, i.e. 41% of the total deaths in the under-five age group⁵.

The aim of Millennium Development Goal 1 (MDG) is to eradicate extreme poverty as well as hunger with target 1 C which aims to reduce the proportion of people who are suffering from hunger by 50% which in turn is based on the prevalence of underweight in the children aged below 5 years⁵. Also the aim of MDG 4 is to reduce the child mortality rate by targeting the infant and under-five mortality⁵. The 2030 Agenda for the Sustainable Development and UN Decade of Action on Nutrition 2016- 2025 have revitalized the momentum for improving nutrition globally. Nutrition contributes directly to achieving of SDG2 (End hunger, to achieve food security and improved nutrition, promote sustainable agriculture)

and is a decisive enabler to achieve SDG3 (Ensure healthy lives as well as promote well-being for all at all ages)⁶.

In India, malnutrition during the first five years of age is indeed a major public health problem. Eighty percent of the undernourished children worldwide live in 20 countries, wherein India is the home to 40% of these children who suffer from underweight⁶. As per NFHS 3 (2005-06), the prevalence of underweight among the children under the age of five years nationwide was 42.5%^{7,8} and this has now dropped to 35.7% as per NFHS 4 conducted during 2015-16⁹ but still remains a major public health problem. The high prevalence of malnutrition in the under-five children is also observed among the underserved and vulnerable tribal population which is indeed a serious public health problem. India is home to almost half of the tribal population of the world. Tribes are social groups characterized by distinctive culture, traits, beliefs and territorial affiliation constituting 8.2% of total Indian population¹⁰. Factors like Illiteracy, geographical and cultural isolation and socio-economic backwardness render the tribal population to remain at the lowest stratum of the society. About 91 percent of tribal population still lives in rural area with 47.3% being below the poverty line¹¹. Although the scheduled tribes are accorded a special status under the fifth- sixth schedules of the Indian Constitution, their overall status particularly health still remains unsatisfactory¹².

Malnutrition is indeed the most common public health problem among the tribal community nationwide. Kshatriya GK et al had reported the widespread prevalence of under-nutrition among the tribal children in Himalayas, Coastal and Desert ecology particularly Dhodia, Kinnaura and Bhil tribes in India¹³. Also Dutta A et al¹⁴ reported a high prevalence of acute and chronic malnutrition among the

tribal children in Garhwal , Himalayas wherein Samiran Bisai et al reported the same among the Kora Mudi tribes settled in West Bengal¹⁵.

As per Census 2011, tribal population comprises of 7,94,697 people approximately 1% of the population in the state of Tamil Nadu¹⁶. About six of the tribal communities like Todas, Kota, Kurumba, Malaiyazhi, Kaattunaiken and Irular have been identified as primitive tribal groups in the state¹⁷. The main livelihood of these tribal people are wood cutting, selling honey, firewood, wax, agriculture and unskilled job of any kind¹⁸. For example, Irular tribes were traditionally snake and rat catchers which is no longer their means of living. Tribal people face a lot of economic hardships as they have no fixed means of livelihood and ignorant of all the benefits offered by the Govt. of India¹⁹. There is paucity of data on undernutrition among the tribal children in Tamil Nadu. Though the tribal population remains scattered all over the state, they live in large numbers in five districts among which one is the Thiruvannamalai district which was chosen randomly for the study. It was observed that in this district, the tribal population have been found residing in Javvadu hills as well as migrated to the plains in quite large numbers viz 46,440 and 22,486 respectively²⁰.

Though they are the same tribal groups, one striking feature of variation in the prevalence of under-nutrition among the children under the age of five years residing in hills and plains was observed as per the ICDS records maintained by the Government sector²¹. The prevalence of under-nutrition in under-five children among the tribal group residing in hills was observed to be 10% more than the tribal group residing in plains. There is no district level survey done specifically among the tribal population to assess the nutritional status of the under-five children. So this

study was designed to assess the prevalence and its determinants among these children residing in hills as well as in plains. Further compare the same to identify the key factors which play a role in the difference in under-nutrition, though they are belonging to the same tribal community. This study also aims to lay measures to rectify the under-nutrition so as to not only prevent morbidity but also mortality in the under-five.

Rationale

Under-nutrition remains an important cause of mortality among the children under the age of five years. Also it leads to recurrent infections and morbidity paving way to impairment in future productivity of life. There is a need to identify the under-nutrition and intervene at the earliest before the permanent damage occurs to the growth potential of the child. As per MDG goals, the aim to reduce hunger and under-five mortality should target the general population with special focus on the vulnerable and neglected tribal children. It is indeed essential to explore the prevalence of under-nutrition among this sector and to identify the determinants like socio-cultural beliefs, parental literacy, awareness on nutrition, accessibility to available health services even after the implementation of National Health Mission which aimed to improve the tribal health. Hence this study was designed to assess the prevalence of under-nutrition among the tribal under-five children as well as explore the reasons for the striking difference in the nutritional status of tribal children in hills and plains of Thiruvannamalai district though they are ethnically and culturally of same origin.

CHAPTER II

AIMS & OBJECTIVES

Objectives

- 1) To assess the prevalence of under-nutrition among the tribal children under the age of five years residing in the hills (Group 1) and plains (Group 2) of Thiruvannamalai District.
- 2) To identify the determinants of under-nutrition in both groups of tribal children
- 3) To compare the prevalence of under-nutrition and its determinants between these two groups

Hypothesis

- It is hypothesized that tribal children living in the plains are likely to have lower prevalence of under-nutrition than their hilly counterparts.
- Improved standard of living, awareness on nutrition, optimal infant and child feeding practices, access to health services and monitoring of health status are some of the possible determinants that lead to better nutritional status among the tribal children settled in plains than those residing in hills.

CHAPTER III

REVIEW OF LITERATURE

Adequate nutrition allows the children to grow, develop, play, learn, participate and contribute while malnutrition during the first five years of life robs the children of their future and leaves young lives hanging in the balance. The most crucial period to meet the nutritional requirement of the child is during the first 1000 days beginning from pregnancy to the second birthday¹. Poor nutrition during this period leads to stunting of growth which remains not only as irreversible but also associated with impaired cognition, poor scholastic performance and reduced productive life in future. An estimated 101 million children under the age of five years were underweight in 2011, which represents approximately 16% of world's under-5 children². In 2016, globally, approximately 155 million children under the age of five years suffer from stunting³. Wasting in children is the life-threatening result of hunger and disease³. In 2016, globally nearly 52 million children under the age of five years were wasted and 17 million were severely wasted³. Globally, there is an overall decline in stunting from 198.4 million to 154.8 million through 2000-2016⁴. In 2016, more than half of all stunted children under 5 lived in Asia and more than one third lived in Africa. Two out of five stunted children in the world live in Southern Asia. Also, more than two thirds of all wasted children under 5 lived in Asia and more than one quarter lived in Africa in 2016⁴. While less than half of all children under-5 live in lower-middle income countries, two-thirds of all stunted children and three-quarters of all wasted children live there⁴.

Children suffering from wasting have weakened immunity are susceptible to long term developmental delay and face an increased risk of death. Underweight, stunting and wasting are each associated with synergistic increase in morbidity with diarrhea, respiratory illness and infections like Measles. These undernourished children require urgent treatment and care to survive. Nearly half of all deaths in children under the age of five years are attributable to undernutrition³. This in turn translates into the loss of about 3 million young lives every year³. A stunted child may have increased risk of developing chronic diseases such as impaired glucose tolerance, obesity and Hypertension during adulthood. Thus the children under the age of five years contribute the most vulnerable segment of any community and their nutritional status is a sensitive indicator of community health and nutrition.

Millennium Development Goals⁵:

Millennium Development Goal 1 (MDG) aims to eradicate extreme poverty and hunger with Target 1 C as to half the proportion of people who suffer from hunger based on the prevalence of underweight among the children of age below five years⁵. Underweight which includes fetal growth restriction, stunting, wasting and deficiencies of Vitamin A, Zinc along with exclusive breastfeeding is the underlying cause of death in estimated 45% of all the deaths among the children under the age of five years. Also MDG 4 aims to reduce the child mortality rate by targeting infant and under-five mortality. Each year approximately 2.3 million deaths in children aged 6-60 months in developing countries are associated with malnutrition, which is about 41% of the total deaths in this age group⁵. Globally, the number of deaths of children under the age of five years fell from 12.7 million in 1993 to 6.3 million in 2013⁵. This rate of progress is close to the rate required to meet the MDG target,

however the improvements have been unevenly distributed between and within different regions.

Sustainable Development Goals⁶:

The 2030 Agenda for Sustainable Development and the UN Decade of Action on Nutrition 2016- 2025 have revitalized momentum for improving nutrition and have affirmed a clear leadership role for WHO⁶. Nutrition contributes directly to achieving SDG2 (End hunger, achieve food security and improved nutrition, and promote sustainable agriculture) and is a decisive enabler of SDG3 (Ensure healthy lives and promote well-being for all at all ages)⁶. WHO's Ambition and Action in Nutrition 2016-2025 is rooted in the six global targets for improving maternal, infant and young child nutrition set in 2012⁶.

Global targets 2025 to improve maternal, infant and young child nutrition⁶:

- 40% reduction in the number of children under the age of five years who are stunted.
- 30% reduction in low birth weight
- Reduce and maintain the childhood wasting to less than 5%
- Increase the rate of exclusive breastfeeding up to 6 months to at least 50%.

Under-nutrition in India:

In India, Malnutrition during the first five years of age is indeed a major public health problem. Eighty percent of the undernourished children worldwide live in 20 countries, wherein India is the home to 40% of these children who suffer from underweight⁶. As per National Family Health Survey, NFHS-3 (2005-06), the

prevalence of underweight among the children under the age of five years nationwide was 42.5%⁷. Ashima Gupta reported that the rural India had high incidence of underweight, stunted and wasted children as compared to urban states of India⁸. In India the total percentage of children underweight, stunted, wasted and underweight are 42.5, 48.2 and 20.1 per cent respectively⁸. Though this prevalence has now dropped to 35.7% as per NFHS 4 conducted during 2015-16⁹ but still remains a major public health problem. The high prevalence of malnutrition in the under-five children is not only among the general population but also among the underserved, vulnerable tribal population which is indeed a serious public health problem.

Tribal Health in India¹⁰:

India is home to almost half of the tribal population of the world. Tribal communities of India cannot be clubbed together as one homogeneous group. They belong to different ethno-lingual groups, having diverse faith and are at varied levels of development - economically, educationally and culturally.

“An endogamous group with an ethnic identity; who have retained their traditional & cultural identity; who have distinctive language or dialect of their own; they are economically backward and live in seclusion governed by their own social norm and largely having a self-contained economy”.

The essential characteristics of these communities are:-

- Primitive Traits
- Geographical isolation
- Distinct culture

- Shy of contact with community at large.
- Economically backward

In India, there are 84.33 million tribal groups which accounts to 8.2% of population. 9 states (A.P. Assam, Jharkhand, Gujarat, Chhattisgarh, Maharashtra, Orissa, Rajasthan and West Bengal) where majority of Schedules Tribes (ST) population lives.

Classification of Tribes¹⁰:

- Food gatherers and hunters. Eg: Jenukurubas of Karnataka, Rajis of Uttar Pradesh, Chenchus of Hyderabad, Kadars of Cochi, Jarwa and the Andamanese of Andaman islands.
- Shifting cultivators. Eg: Nagas of Assam, Khasis of Meghalaya, Korwa of Bihar, Saora of Orissa.
- Settled agriculturists. Eg: Mundas, Irulars
- Artisans. Eg: Kota of Nilgiri hills
- Pastoralists and cattle herders. Eg: Todas of Nilgiris, Bakerwal and Gaddi in Himachal Pradesh.
- Wood cutters and laborers: Malaiyali of Tamil Nadu
- Folk artists. Eg : Pradhans of Madhya Pradesh
- Wage laborers. Eg: Santhals of Bihar
- Acculturated layer: They have travelled farthest from their original habitat (civilized). Eg : Minas
- Settled schedule tribe agriculturists: They have come quite some way from their original habitat. Eg: Santal

- Third category: Those who have hardly shifted from their original habitat.
Eg: Khasis
- Fourth category: Those encysted in their original habitat. Eg: Kadars.

Tribal Health Culture¹⁰:

The culture of community determines the health behavior of the community in general and individual members in particular. The health behavior of the individual is closely linked to the way he or she perceives various health problems; what they actually mean to him or her, on the one hand, and on the other his or her access to various relevant institutions. Since the beginning of the civilization, mankind has always been able to find some medicines in the nature. The early healing treatments were derived from the surrounding environment of the human, who were forest dwellers. They made use of plants, animals and other substances naturally available to them to treat illness. Complex health care system of the simple societies evolved based on deep observation of the nature and environment. The medical system in simple societies is structured on the lines of herbal and psychometric treatment. The healing practices include a touch of mysticism, supernatural and magic, resulting specific magic-religious rites etc. Faith healing has always been a part of the traditional treatment in the Tribal Health Care System, which can be equated with rapport or confidence building in the modern treatment procedure.

In most of tribal communities, there is folklore associated with health beliefs. The health culture of a community does not change so easily with changes in the access to various health services. Hence, it is required to change the health services to conform to health culture of tribal communities for optimal utilization of health

services. Studies by anthropologists indicate that traditional medicines do exist and persist even though the health consumer has now access to western medicine. Tribals are characterized by a distinctive cultural practices, primitive traits, and extreme socio economic backwardness. The tribals of India, constituting 8.2% of the total population (84 million) belong to around 698 communities or clans¹¹. Around 75% of the tribals are called primitive tribal groups due to pre-agricultural level of knowledge, low level of literacy and extreme backwardness. Though the Indian tribals are a heterogeneous group, most of them remain at the lowest stratum of the society due to various factors like geographical and cultural isolation, low levels of literacy, primitive occupations and extreme levels of poverty. Although scheduled tribes are accorded special status under the fifth/sixth schedules of the Indian Constitution, their status on the whole, especially their health still remains unsatisfactory. Around 91% of the tribal population still lives in rural area as against 72% for the whole nation. The percentage of tribes living below poverty line is 47.3% in rural and 33.3% in urban areas, which is higher than the corresponding national figures of 28.3% and 25.7%, respectively among the general population. The average tribal household size is 5.2 and is comparable to the national average of 5.3. 1.6% of the total ST workers, both rural and urban, are engaged in the primary sector, essentially agriculture. Almost 65% women are illiterate against the national figure of 46%¹¹.

Magnitude of health problems in the tribal population¹¹:

The following are the health problems in the tribal population:

- Decadal Growth rate is higher than that of the total population.
- Girls marrying below 18 years are up to 60%.

- 43% of tribal pregnant women do not receive any antenatal checkup, 38% do not receive any Tetanus toxoid injections and only 51% do not receive Iron and Folic acid tablets.
- About 81% tribal pregnant women deliver at home, 44% of all deliveries are attended by TBA and 32% by other untrained persons. Only 5% are attended by health care professionals.
- unmet need for family planning 15.4%
- 42% of currently married women have any reproductive health problem
- Only 26% of children receive all vaccines.

The health problems of the tribals¹² arise from

- a. Socio-cultural (The widely prevalent ancient health practices, use of indigenous herbal medicines, taboos & superstition).
- b. Genetic attributes.
- c. Environmental conditions (Forest indwelling) - Vector borne diseases.
- d. Poor maternal & child health services.
- e. Other factors: In accessibility to safe drinking water & sanitation - Gastrointestinal disorders.
- f. *Poor nutrition/ Malnutrition - Nutritional problems*

Malnutrition among tribal children in India:

Malnutrition is indeed the most common public health problem among the tribal community nationwide.

- Kshatriya GK et al had reported the widespread prevalence of under-nutrition among the tribal children in Himalayas, Coastal and Desert ecology particularly Dhodia, Kinnaura and Bhil tribes in India¹³.
- Dutta A et al¹⁴ reported a high prevalence of acute and chronic malnutrition among the tribal children in Garhwal , Himalayas
- Samiran Bisai et al reported the same among the Kora Mudi tribes settled in West Bengal¹⁵.

Tribal health in Tamil Nadu

As per Census 2011, tribal population comprises of 7, 94,697 people approximately 1% of the population in the state of Tamil Nadu¹⁶. In Tamil Nadu, six of the tribal communities like Toda, Kota, Kurumba, Irular, Malaiyali and Kattunaiken have been identified as the Primitive Tribal groups¹⁷. For an example, the origin of the word "Irula" is not clear. One surmise is that it could have been derived from Tamil word, Irula either implying the dark complexion of the Irulas or their being constantly spotted by villagers in the ancient past as distant silhouettes in the forests. Anthropological literature says that Irulars belong to the Negrito (or Negroid) race, which is one of the six main ethnic groups that add to the racial mosaic of India. Negroids from Africa were the oldest people to have come to India¹⁸. There are twenty districts in Tamil Nadu with tribal population scattered over who are socio-culturally distinct and secluded from the general population. There are five major districts like Vellore, Tiruvallur, Thiruvannamalai, Salem and Nilgiris wherein the tribal population are found in large numbers settled in tribal colonies.

Tribal health in Thiruvannamalai District:

In Thiruvannamalai District, the tribal population are distributed in Javvadu hills at an altitude of 1150 mts and in plains wherein they had migrated many years ago for livelihood¹⁹. They are the same tribal group from common ethnic origin. The Thiruvannamalai District has a total population of 24, 64,875 with tribal population of 68,926. There are 10 blocks in the District of which Jammunamarathur block is located in the Javvadu hills with tribal settlement comprising of 46,440 population. Out of the other 9 blocks, Thandrapet, Chengam and Polur are the blocks in the plains, in which the tribal people who had already migrated from the hills have settled for their livelihood. The tribal population in the plains is about 22,486 people who have settled in colonies in the villages along with the general population¹⁹.

There are 73 PHCs with 410 HSCs, 18 Community Health centers, six Taluk Hospitals and one Government Medical College. Based on 2016 data, the following are the Health indicators of the district as a whole Crude Birth rate was 17.6 as against 15.6 state level value, IMR was 16.1 per 1000 live births and MMR was 0.69 (state level value = 0.97). Though there was a district level survey for the general population, there was no data on the health status of the tribal population specifically. The ICDS Office in the district headquarters maintained the data on the nutritional status of all the children and mothers attending the ICDS centers. This data reflected the nutritional status of the tribal children under the age of five attending the ICDS centers which showed a striking difference in the prevalence of under-weight among the tribal children residing in the Javvadu hills and those in plains of the district²⁰. This difference had been existing since 5 years when the data

was analyzed and the report was submitted to the Government annually. The ICDS records maintained in the hills reported that the prevalence of under-weight was 47% among the tribal children under the age of five as a whole during the year 2012 and the same among the plains was 37% with a difference of 10%^{20,21}. There is a paucity of data on the nutritional status of the tribal children and the determinants of the same in the district level. So there is a need to assess the nutritional status in detail to throw more light on the severity and difference of under-nutrition among the groups of tribal population.

Methods to assess the Nutritional status of the children^{22,23}:

There are many methods to assess the nutritional status which are as follows:

Assessment of the nutritional status can be done by evaluating the ‘**ABCDEF**’

- Anthropometric assessment
- Biochemical indicators
- Clinical assessment
- Dietary assessment
- Epidemiological assessment
- Functional evaluation

a. Anthropometric Assessment of Nutritional status²⁴:

Anthropometry is a simple valuable tool and the gold standard for evaluating the nutritional status. Adequate precautions are to be taken during the measurement and the procedures utilized are to be standardized and checked frequently for accuracy. WHO Z score charts for the age and sex are used to interpret the nutritional status from the recorded value.

- Weight for age
- Length for age < 2 years of age and then onwards Height for age.
- Weight for height
- Mid arm upper circumference using shakir's tape, bangle test
- Quac stick method
- Head circumference and chest circumference
- Skinfold thickness (Triceps and subscapular)
- Body mass Index / Quetlet index, Dughadale ratio Kanawati & Ponderal index

Under-nutrition is defined as per standards based on WHO Z score charts for the age and sex which are as follows^{25,26}:

Underweight

Weight for age < M – 2 standard deviations (SD) of WHO Child Growth Standards Z score charts with Median for age and sex which reflects acute malnutrition.

Stunting

Height for age < M –2 S.D. of WHO Child Growth Standards Median for age and sex which reflects the chronic state of malnutrition

Wasting

Weight for height <M –2 SD of WHO Child Growth Standards Median for age and sex representing the acute on chronic malnutrition

Severe under-nutrition

Cut off	Weight for age	Length/Height for age	Weight for Height
Below M < -3.S.D.	Severe Underweight	Severe stunting	Severe Wasting

Moderate and Severe Acute Malnutrition (MAM & SAM)

Parameters	Moderate Acute Malnutrition (MAM)	Severe Acute Malnutrition (SAM)
Weight for height (Wasting)	M < - 2. S.D. Z score	M < - 3S.D. Z score
Mid arm Circumference (MUAC) 6-60 months	11.5 cm to 13.5cm	< 11.5 cm
Oedema	No	Yes

Weight for height is more reliable indicator for acute on chronic malnutrition. MUAC is an age independent criteria to assess the nutritional status of the child.

WHO Classification of Acute and Chronic Malnutrition

Weight for age	Height for age	Weight for height	Interpretation
M > - 2.S.D.	M > - 2 S.D.	M > -2S.D.	Normal
-2 S.D. to -3S.D	M > - 2 S.D.	- 2 S.D to -3.S.D.	Acute malnutrition
M < - 3 S.D.	M < -3.S.D.	M > -2S.D.	Chronic malnutrition
M < - 3 S.D.	M < -3.S.D.	- 2 S.D to -3.S.D.	Acute on chronic malnutrition

Mid upper arm circumference²⁷

Mid upper arm circumference is an age independent criteria to assess the nutritional status of children of age one year to five years. A plastic, flexible and non-stretchable tape is used for measuring mid-arm circumference. The

measurement is taken at the midpoint of the upper left arm, between the acromion process and the tip of the olecranon. After locating the midpoint, the left arm was extended so that it is placed loosely by the side, with the palm facing inwards. The tape is wrapped gently but firmly around the arm at the midpoint and MUAC is measured. MUAC can also be measured using Shakir's tape with red, yellow and green colors showing the grade of severity and Bangle test with inner diameter of 4 cm. If the bangle crosses the elbow, the child is malnourished. MUAC > 13.5cm is defined as normal while < 11.5cm is termed as severe under-nutrition (SAM) requiring immediate intervention. Values in between represent moderate malnutrition in children with age ranging from 1 to 5 years²⁸. In Quac stick, there is a rod with two markings, one indicating the height and the other MAC for the corresponding height. The arm circumference is measured and the stick is placed behind the standing child. If the height is more than the expected height for the measured MUAC, the child is considered malnourished. The modified Quac stick utilizes a rod that is colored green, yellow and red to indicate the severity.

Skinfold Thickness Measurement (Triceps)

Skinfold Thickness Measurement is measure of body fat (adiposity) wherein loss of body fat represents the negative energy balance thereby a marker of under-nutrition. Triceps skinfold thickness is measured using skin calipers WHO Z score charts for age and sex were used to interpret Triceps SKFT with under-nutrition below < M- 1. S.D to >M-2S.D (Mild), M-2S.D to M-3S.D (Moderate) and <M-3S.D. (severe).

Head circumference

Head circumference is measured by placing the flexible and non-stretchable tape firmly over the most prominent region of the occiput and frontal crests accurately to nearest 0.1cm and was plotted in WHO Z score for age and sex. Value $< M - 3.S.D$ is defined as microcephaly.

Chest Circumference

Chest circumference was measured at the nipple and is related to Head Circumference. In infancy, HC is more than CC while both are equal by 1 year of age and thereafter the CC is more than HC. In Severe malnutrition, Chest circumference continues to be less than HC with $HC: CC > 1$.

Kanawati index (Ratio of MAC to Head circumference):

A ratio of 0.28 - 0.314 indicates mild malnutrition, 0.25 – 0.279 indicates moderate malnutrition and less than 0.249 indicates severe malnutrition.

Body Mass Index for age and sex

BMI is expressed as weight in Kg/ height² in meter. BMI is plotted with the weight and height in Z score chart wherein the measurement $< M - 2S.D.$ was defined as wasted and $< M - 3S.D.$ as severely wasted.

Dughadale ratio (weight/height^{1.6}):

A ratio of above 0.79 indicates normal and below 0.79 indicates malnutrition.

Ponderal index

The ratio of weight/height³ where 2.5 is normal, 2-2.5 indicates symmetric IUGR and less than 2 indicates asymmetric IUGR.

b. Biochemical indicators:

The striking biochemical changes include lowering of serum proteins especially Albumin, enzymes like esterase, amylase, lipase, cholinesterase, alkaline phosphatase and Lactic dehydrogenase, carrier proteins like transferrin, ceruloplasmin, essential amino acids, essential fatty acids, serum calcium, phosphorus, Sodium, Potassium, Iron and Magnesium etc. Urinary creatinine gives an indirect evidence of muscle mass. Reduction in carrier protein is an early indicator of malnutrition. Low serum Albumin is well known to predict mortality. Acute Phase reactants and gamma globulin which represent the antibodies are found to be raised against infection.

c. Clinical Signs Indicative or Suggestive of Malnutrition

- Hair Shiny; firm; Lack of natural shine; hair dull and dry; thin and sparse; hair color changes (flag sign); can be easily plucked
- Face : Skin color loss (depigmentation); skin dark over cheeks and appearance; not swollen under eyes (malar and supra-orbital pigmentation); lumpiness or flakiness of skin of nose and mouth; swollen face; enlarged parotid glands; scaling of skin around nostrils (nasolabial seborrhea)
- Eyes: Eye membranes are pale (pale conjunctivae); redness of eyelids; membranes (conjunctival injection); Bitot's spots; redness and fissure and angular palpebritis; dryness of eye vessels or mound of tissue on sclera (conjunctival xerosis); cornea has dull appearance (corneal xerosis);

comea is soft (keratomalacia); scar on cornea; ring of fine blood vessels around corner (circumcorneal injection)

- Lips : Smooth, not chapped or swollen Redness and swelling of mouth or lips (cheilosis); especially at corners of mouth (angular fissures and scars)
- Tongue: Deep red in appearance; not swollen or Swelling; scarlet and raw tongue; magenta (purplish color) of smooth tongue; smooth tongue; swollen sores; hyperemic and hypertrophic papillae; and atrophic papillae.
- Teeth cavities; no pain; bright May be missing or erupting abnormally; gray or black spots (fluorosis); cavities (caries)
- Gums Healthy; red; do not bleed; not swollen "Spongy" and bleed easily; recession of gums Glands Face not swollen
- Thyroid enlargement (front of neck); parotid enlargement
- Skin No signs of rashes, swellings, dark or Dryness of skin (xerosis); sandpaper feel of skin (follicular light spots hyperkeratosis); flakiness of skin; skin swollen and dark; red swollen pigmentation of exposed areas (pellagrous dermatosis); excessive lightness or darkness of skin (dyspigmentation); black and blue marks due to skin bleeding (petechiae); lack of fat under skin
- Nails Firm, pink Nails are spoon-shape (koilonychia); brittle, ridged nails
- Muscular and Good muscle tone; some fat under skin; Muscles have "wasted" appearance; baby's skull bones are skeletal systems can walk or run without pain thin and soft (craniotabes); round swelling of front and side of head (frontal and parietal bossing); swelling of ends of bones (epiphyseal enlargement); small bumps on both sides of chest wall (on ribs)-beading of

ribs; baby's soft spot on head does not harden at proper time (persistently open anterior fontanelle); knock-knees or bow-legs; bleeding into muscle (musculoskeletal hemorrhages); person cannot get up or walk properly

Internal Systems

- Cardiovascular Normal heart rate and rhythm; no murmur- Rapid heart rate (above 100 tachycardia); enlarged heart; murmurs or abnormal rhythms; normal blood abnormal rhythm; elevated blood pressure for age.
- Gastrointestinal No palpable organs or masses (in Liver enlargement; enlargement of spleen (usually indicates children, however, liver edge may be other associated diseases palpable)
- Nervous Psychological stability; normal reflexes Mental irritability and confusion; burning and tingling of hands and feet (paresthesia); loss of position and vibratory sense; weakness and tenderness of muscles (may result in inability to walk); decrease and loss of ankle and knee reflexes.

d. Dietary assessment:

- Overall assessment of breastfeeding, complementary feeding, dietary pattern and diet during illness by a 24 hour recall method is sufficient to assess the dietary intake which determines the nutritional status. The food frequency table to record the frequency of intake of each food item is also desirable. The calculated intake should be finally compared with the Recommended Dietary Allowances (RDA).

e. Epidemiological/ Ecological assessment

Vital statistics like Neonatal mortality, Infant mortality, under-five mortality rates are the usual indicators selected to evaluate the nutritional status of the community. Assessment of ecological factors like illiteracy, poverty, ignorance are also important.

f. Functional Evaluation

This denotes evaluation of developmental milestones, vision, hearing, bone age, micronutrient deficiency that leads to changes in the eyes, mucosa and learning disability and future poor scholastic performance.

Ecology and Spectrum of Protein Energy Malnutrition³⁰:

WHO- defined Protein Energy Malnutrition as “a range of pathological conditions arising from coincident lack, in varying proportions of protein and calories occurring most frequently in infants and young children and commonly associated with infections.

- **Kwashiokar** : Kwashiokar in Ghana means Red boy disease of the first child. A classic case will be apathetic, miserable, stunted in growth and edema, hepatomegaly, anemia, hair and skin changes. The triad is Mental changes, edema and growth retardation.
- **Marasmus**: Marasmus means wasting with Old man appearance with just skin and bones. Grade I – wasting in the axilla and groin, Grade II – thigh and buttocks, followed by chest and abdomen (Grade III) and lastly the buccal pad of fat (Grade IV). These children are alert with good appetite.
- **Marasmic Kwashiokar** : Marasmus with edema

- **Prekwashiokar:** Children have poor nutritional status and certain features of kwashiokar like hair changes, moon facies, hepatomegaly.
- **Nutritional dwarfism:** Prolonged protein starting fairly early in life and going over a number of years without developing marasmus or kwashiokar.
- **Under-weight:** The weight for age $< M - 2 \text{ S.D.}$ for age and sex.
- **Invisible Protein Energy Malnutrition:** Toddlers who show breast addiction must be suspected to have invisible malnutrition. Use of growth charts will help to diagnose this at the earliest
- **SAM** – Severe Acute Malnutrition with Wasting $< M - 3 \text{ S.D.}$, $\text{MAC} < 11.5$ cm and SAM with edema is termed as E-SAM.

DETERMINANTS OF NUTRITIONAL STATUS OF CHILDREN³⁰

Nutritional status of a child is governed by food as well as health care, which is a basic human right of every child. Various factors like maternal health, Infant and child feeding practices, support from the family as well as health care providers determine the overall growth and development of the child to its fullest potential.

Under-nutrition among the children has been mostly associated with higher family food insecurity, low quality of complementary foods and high burden of intestinal parasitic and other infections despite improvement in economic conditions over recent years.

Ecology of under-nutrition (PEM)

The following are the major factors determining the ecology of PEM:

- Conditioning influences like Low birthweight

- Cultural practices and food fads
- Feeding practices : Exclusive breastfeeding and complementary feeding
- Socio-economic factors
- Food security and intake
- Availability of health services
- Utilization of health services.

Infant and young child feeding practices³¹

Optimal Infant and Young Child Feeding practices - especially early initiation within the first hour of life and exclusive breastfeeding for the first six months of life help ensure young infants, the best possible start to healthy life. “Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with important implications for the health of mothers. As a global public health recommendation, infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age.” – WHO, 2012³¹.

Early Initiation of Breastfeeding

Early initiation of breastfeeding is extremely important for providing Colostrum’ (mother’s first milk) to the neonate and establishing the successful lactation. Ideally, the baby should receive the first breastfeed as soon as possible and preferably within one hour of birth. The new born baby is very active during the first

half an hour and if the baby is kept with the mother and effort is made to breastfeed, the infant learns sucking very fast. This early suckling by the infant starts the process of milk formation in the mother and helps in early secretion of breast milk. Newborn babies should be kept close to their mothers to provide warmth and ensure frequent feeding. This also helps in early secretion of breast milk and better milk flow.

Colostrum and its Nutritive importance

The milk secreted after the child birth for the first few days is called 'Colostrum'. It is yellowish in colour and sticky. It is highly nutritious and contains anti-infective substances. It is very rich in vitamin A. Colostrum has more protein, sometimes up to 10%. It has less fat and the carbohydrate lactose than the mature milk. Feeding colostrum to the baby helps to get the nutrients and anti-infective substances (antibodies). The anti-infective substances protect the baby from infectious diseases such as Diarrhoea, Pneumonia. Colostrum is basically the first immunization a child receives from the mother. Some mothers consider this first milk as something dirty and indigestible. Difference in colour and consistency could be possible reasons for such beliefs.

Effects of Delayed Initiation of breastfeeding³¹

- Delayed initiation of breastfeeding is a common practice that deprives the newborns from the concentrated source of anti-infective properties, vitamin A and protein available in colostrum.
- In some communities breastfeeding is started as late as the fifth day for various superstitions and ignorance. In India only 25% of the newborns are

started with breastfeeding within one hour of birth and only 37.1% within a day of birth.

- Late initiation of breastfeeding not only deprives the child of the valuable colostrum, but becomes a reason for introduction of pre-lacteal feeds like glucose water, honey, ghutti, animal or formula milk which are potentially harmful and invariably contribute to diarrhoea in the new born.
- Late initiation of breastfeeding also causes engorgement of breasts which further hampers establishment of successful lactation. Educating the mothers and the community about the value of colostrum would help in ensuring that colostrum is not wasted but fed to the child. Colostrum is followed by the mature milk in few days. The foremilk will be watery which will satisfy the thirst of the baby while the hind milk with high fat content and nutritive value should be fed to the baby on demand.

Exclusive breastfeeding – Definition³¹

Exclusive breastfeeding means that babies are given only breast milk and nothing else – no other milk, food, drinks and not even water for first six months

- Breast milk provides best and complete nourishment to the baby during the first six months. The babies who are exclusively breastfed do not require anything else namely additional food or fluid, herbal water, glucose water, fruit drinks or even plain water during the first six months.

Benefits of Exclusive Breastfeeding:

- a) Exclusive breastfeeding provides babies with higher intelligence and helps in optimal brain development.

b) Exclusive breastfeeding is extremely important to prevent infections like diarrhea and acute respiratory infections in early infancy and thus reduce infant mortality.

c) Recent WHO studies estimate that death rate in babies can go down four times if they are exclusively breastfed for the first six months

Counseling for breastfeeding during pregnancy

- All the expectant mothers, particularly primi and those who have experienced difficulties with lactation management should be motivated and prepared for early initiation of breastfeeding and exclusive breastfeeding.
- This should be achieved by educating them, through a personal approach, about the benefits and management of breastfeeding.
- In the last trimester of pregnancy, breasts and nipples should be examined and relevant advice given.
- Antenatal checkups and tetanus toxoid immunization are the precious opportunities which should be utilized for promoting early initiation of breastfeeding, feeding of colostrum, exclusive breastfeeding and discouraging prelacteal feeds.

GLOBAL STRATEGY FOR INFANT AND YOUNG CHILD FEEDING³¹

Millennium Development Goal⁵- MDG 4 aims to reduce the death in under-five children by two thirds by 2015 which cannot be achieved without reducing the neonatal deaths comprising of 40% of under-five deaths. It is estimated that out of 136 million babies born every year, 4 million neonatal deaths are due to preventable causes like sepsis, meningitis, pneumonia. Majority of these are the important causes of neonatal and infant mortality in developing countries. The Promotion of early

initiation and exclusive breastfeeding contributes in a large extent to reduce both neonatal and infant mortality to achieve the MDG. WHO and UNICEF state that two-thirds of the under-five deaths are due to sub-optimal infant feeding practices and recommends exclusive breastfeeding for first six months of life and then to continue breastfeeding with adequate complementary feeding up to two years of life. If breastfeeding alone is universalized, it could reduce under-five mortality by 13% globally as reported in Lancet's child survival series in 2003 and 2004³². Globally as many as 1.45 million lives are lost due to sub-optimal infant feeding in developing countries³³. Early initiation of breastfeeding is the single most intervention to save newborn and reduce the neonatal mortality³⁴. Infections like Diarrhea and Lower respiratory tract infections contribute to 55% and 53% respectively to infant deaths during the first six months and 20% and 18% respectively for second six months of infancy with 20% of the causes of deaths in the second year of life as reported by Lauer JA et al³⁵.

National Guidelines for breastfeeding practices in India³⁶

National Guidelines on Infant and Young child feeding from Ministry of women and child development, Government of India-2016 recommends the exclusive breastfeeding practices among the Indian mothers. They are like

- Intensify the nutrition and health education to improve the infant and child feeding and caring practices.
- To bring down the prevalence of underweight in children less than three years of age from the current level of 47 % to 40%.

- Enhance the early initiation of breastfeeding from the current 15.8% to 50 %.
- Enhance the Exclusive breastfeeding rate for the first six months from the current rate of 55.2 % to 80 %.

Reasons for this included the inadequate knowledge of caregivers regarding the correct infant and young child feeding, low social and nutritional status of girls and women. So the technical guidelines for Breastfeeding and complementary feeding, feeding in specific situations were emphasized by Breastfeeding Promotion Network of India and Operational guidelines like recommendations for the Government, NGOs and International agencies, recommendations for the media were initiated to promote breastfeeding National programs like RCH, Breastfeeding Promotion program also target the exclusive breastfeeding and create awareness through the World breastfeeding promotion week, during the first week of August every year. Breastfeeding Promotion Network of India is the National agency for Breastfeeding promotion.

Current breastfeeding practices in India

In spite of various recommendations and guidelines which are implemented nation-wide, the following are the evidence for the current status of breastfeeding practices among the Indian mothers.

- NFHS3 survey done by IIPS Mumbai 2006 reports the exclusive breastfeeding practices to be 46.4%, nation-wide⁷.
- NFHS 4 survey done by IIPS Mumbai 2015 reports the exclusive breastfeeding practices to be 54.9%, nation-wide⁹.

- Kishore MS et al reported suboptimal knowledge and practices of Exclusive breastfeeding among the mothers in rural areas of North India. 39% of mothers were reported to have satisfactory knowledge on breastfeeding and 42% of mothers practiced the correct attachment and positioning of the baby respectively during the exclusive breastfeeding. The correct technique of breastfeeding is very vital for the mothers to practice exclusive breastfeeding for their children³⁷.
- K Madhu et al reported that 19% of mothers in rural areas used to give prelacteal feeds and many social, cultural and economic factors play a role in exclusive breastfeeding practices³⁸.
- S.K.Rasania et al reported that the maternal literacy status was significantly related to the breastfeeding practice. The exclusive breastfeeding was 73.7% among the mothers in the maternal and child care centre in Delhi. Bottle feeding was a common practice and the problems related to breastfeeding were reported mainly from the illiterate mothers³⁹.
- Paliwal S et al reported the high prevalence of practice of prelacteal feed particularly plain jaggery water and the commonest reason for top feed in addition to breastmilk was the fear of insufficient milk in the rural part of India⁴⁰.
- Mridula Bandyopadhyay reported the impact of ritual pollution like discarding colostrums and delayed initiation of breast milk on the infant feeding practices adopted by the mothers in rural West Bengal⁴¹

Breastfeeding practices among the Tribals in India

- Dakshayani B, Gangadhar MR reported the median exclusive breastfeeding months in Hakkipikkis tribes in Mysore to be 3 months and 52% had practiced the discarding the colostrums and giving the prelacteal feeds⁴².
- Kshatriya GK et al reported high prevalence of under-nutrition among the tribal children in India particularly in Coastal areas and Himalayan tribes particularly Dhodia, Kinnaura and Bhil tribes due to poor infant feeding techniques¹³.
- Dutta A, Pant K, Puthia R et al reported high prevalence of acute and chronic malnutrition among the children in the Garhwal Himalayas among both the sexes secondary to poor infant feeding practices¹⁴.
- Chhotray GP reported the high prevalence of malnutrition in women of primitive tribes of Orissa which in turn affects the infant feeding practices and then the health status of tribal children⁴³
- Basu SK also reported the poor health status of tribal women in India thereby affecting the nutritional status of their children⁴⁴.
- Samiran Bisai et al reported the high prevalence of under-nutrition among the Kora-Mudi children in West Bengal due to poor breast feeding practices¹⁵
- Behl L et al reported the sub-optimal infant feeding practices among the tribal inhabitants of Himachal Pradesh and the cultural beliefs behind the practices⁴⁵.

- Dash et al reported the low prevalence of exclusive breastfeeding practices among the Santals of Orissa with discarding of colostrum and early weaning practices. Practice of giving pre-lacteal feeds like Sugar water, Honey, milk with sugar is highly prevalent in this tribal community. 53.3% of Santal tribal mothers did not give colostrums after the birth of their babies⁴⁶.
- Vimala V et al reported that though 55% of the tribal mothers in Andhra Pradesh had breastfed their babies even without supplementation till one of year, they were not aware of importance of maternal nutrition during the lactating period which needed to be focused during the health education⁴⁷.
- Despande SG et al in their study on the infant feeding practices among the tribes in Melghat region of Maharashtra reported the high prevalence (91.2%) of introduction of prelacteal feeds and 36% infants were breastfed after 24 hours of life. Honey, jaggery and sugar water were the prelacteal feeds given and early weaning practices were adopted by the mothers in that community⁴⁸
- Patel A et al and Vinod Mishra et al reported the importance of maternal awareness in the optimal infant feeding practices^{49,50}.
- Sharma M et al reported the influence of Grandmother in infant care and their involvement in the successful exclusive breastfeeding practices⁵¹.
- Tiwari R et al reported the influence of family members in successful breastfeeding in urban slum area⁵².

- Rasheed et al and Hoyer et al stressed the importance of Nurses and Health education providers in the successful lactation through health education to the mothers^{53,54}
- Arun Gupta et al reported the importance of timely complementary feeding by 6-8 months of age⁵⁵.

Under-nutrition and the determinants among tribal under-five children in India

- Meshram II et al reported that maternal illiteracy, household wealth index, food security, socio-economic status, personal hygiene and infant feeding practices were important determinants of under-nutrition among the tribal children⁵⁶.
- Lower socio-economic status, poor hygiene, non-utilization of health services and poor access to health facilities are major determinants as reported by Mitra et al⁵⁷,
- Laxmaiah et al reported that the prevalence of Underweight among the tribal children in Khammam district of Andhra Pradesh was 65.4%. Maternal illiteracy was observed to be 88% while 72% of men were illiterates. Major determinants of under-nutrition were like lower socio-economic status, poor environmental sanitation, personal hygiene, low intake of micronutrients in diet and household food insecurity⁵⁸.
- Jerath et al reported that underweight, stunting and wasting among under-five Sahariya tribal children in Madhya Pradesh were 59.1%, 57.3% and

27.7% respectively. Low food security was found in 90% of HHs and the odds of children being underweight and stunted when belonging to HHs with low and very low food security was found to be significant. Calorie, fat, vitamin A, Riboflavin, Vitamin C and Folic acid intake among the children was lower than recommended dietary allowance. Infant and young child feeding practices were suboptimal. Awareness on nutritional disorders and utilization of nutrition and health services was poor. Jerath et al concluded that system strengthening, community empowerment and nutrition education may play a pivotal role in addressing this undernutrition⁵⁹

- Barkha Sharma reported that the importance of environmental factors and feeding practices in the web of causation of under-nutrition among the under-five children and the need for implementation of nutritional intervention programs to overcome this problem.⁶⁰
- Chakrabarty et al reported the high prevalence of under-nutrition among the tribal children in Orissa due to inappropriate complementary feeding practices⁶¹
- Poor awareness among the caregivers on the optimal feeding practices pave way for the under-nutrition in the under-five children as reported by Khandare et al.⁶²
- Rao VG reported that more than 60 per cent of tribal children were suffering from underweight. Micronutrient deficiency disorders such as anemia and vitamin A deficiency were common among them. Unhygienic personal habits, adverse cultural practices relating to child rearing, breast-feeding and

weaning were important determinants. Appropriate nutritional programs should be designed to meet the requirements. A comprehensive child survival program with supplementary feeding, growth and development monitoring and early prompt treatment during illness needs to be devised and implemented ensuring community participation to combat under-nutrition⁶³.

- Rao KM et al reported the prevalence of under-nutrition among the Saharia tribal children in Rajasthan reduced due to majority of the households were participating in supplementary feeding programs such as ICDS. Nevertheless, the observations highlighted the need for further strengthening of health and nutrition programs, especially RCH program in this area⁶⁴.
- Dolla CK et al reported that high prevalence of underweight (59.8%) was observed among the under-five children of Kodaku tribe in Madhya Pradesh and very low weight (< M- 2 S.D.) was observed to be 26.2%. Clinical PEM like Kwashiorkor was not seen. Higher prevalence Vitamin A deficiency such as Bitot spot and night blindness was recorded in 2.6% of children mostly aged about 3- 5 years. Vitamin B complex deficiencies predominantly angular stomatitis, goiter and dental caries were observed in the tribal children Preventive measures are needed to improve food security, Strengthen the supplementary feeding programs and also need to encourage the mother for introduction in complementary feeding and supplementary foods made from locally available⁶⁵.
- Reddy DC et al reported the prevalence of underweight among the tribal children in Banda district in Uttar Pradesh to be 75% among children of low socio-economic status while only 24% among children of better socio-

economic status. Awareness through health education campaigns, regarding infant and young child feeding practices needs to be generated among the local grass root level health personnel and mothers to address the problem of undernutrition in the community⁶⁶.

- Vijayaraghavan.K et al reported the importance of ICDS services to prevent the under-nutrition among the tribal under-five children in Andhra Pradesh⁶⁷.
- Inadequate health care facilities, illiteracy and socio-economic disadvantage among tribal populations perpetuate the vicious cycle of undernutrition. Therefore, there is a need to evolve comprehensive programs for the overall development of tribal population with special focus on nutritional programs as reported by Rao KM⁶⁸.
- T.V.R.K.Rao et al reported that 78.1% of tribal children in Bihar had anemia⁶⁹.
- Sreedhar et al reported prevalence of anemia in tribal children to be 66.1% while 80.31% had microcytic hypochromic anemia, 10% had sickle cell anemia and the rest were normochromic normocytic anemia requiring nutritional interventions⁷⁰.
- Prakash v et al reported the high prevalence of Iron deficiency anemia among the under-five children and the Nutritional program recommended by Govt. of India for the children from six to sixty months to be given one milliliter of IFA syrup for 100 days in a year. One milliliter of syrup will contain 20 mg elemental iron and 100 micrograms of folic acid. They also added that In India, where the program was in place, but was not being

implemented at any significant level. In a regular monitoring of the program, anemia control for children was not achieved. There is a need to emphasize, train, support, and effectively monitor the program's implementation, systematically and realistically plan out logistics, supply, monitoring, and implementation of the program at the regional, national, state, and district levels to reduce anemia among the children⁷¹.

- Sahu et al reported that 94% of under-five children in tribal villages of Mohana block in Orissa were anemic with 8.8% with severe anemia. Anemia is a major health problem in tribal children. Poor coverage of IFA prophylaxis in children is a matter of concern. They recommended the Reorientation of primary health care functionaries to cover the children under National Anemia Prophylaxis Program with the help of ICDS workers and early presumptive antimalarial prophylaxis in all fever cases can prevent anemia in tribal children⁷².
- Rekha Rachel Philip et al reported that prevalence of underweight among the tribal preschool children in Wayanad district of Kerala to be 39% with high prevalence of anemia (95%). They reported that the important risk factors of under-nutrition were maternal educational status, low birth weight, recurrent diarrhoea and poor utilization of health services particularly nutritional interventions. They recommended urgent need to improve health care services for health education on feeding practices, treatment of morbidity like diarrhoea and implementation of nutritional interventional programs⁷³.
- Sathya P et al reported the high prevalence of anemia (81%) among the under-five children in Andaman & Nicobar islands and they reported that

micronutrient deficiencies with Food insecurity in the family played an important role in high prevalence of anemia in childhood. They also recommended qualitative research on the socio-cultural factors and beliefs which determined the high prevalence of nutritional deficiencies particularly childhood anemia⁷⁴.

- Sreeramreddy CT et al reported the association between the nutritional status and household food access as well as insecurity which is as follows: Prevalence of moderate and severe household food insecurity was 23.2% and 19.0%, respectively, for children aged 0-60 months. Weighted prevalence rates for stunting (height-for-age Z-score <-2), wasting (weight-for-height Z-score <-2) and underweight (weight-for-age Z-score <-2) were 41.6% (95% CI 38.9, 44.3%), 11.5% (95% CI 9.8, 13.2%) and 30.1% (95% CI 27.5, 32.8%), respectively. Prevalence of stunting, severe stunting (HAZ<-3) and underweight by level of household food insecurity were statistically significant. They recommended the need for Community nutrition interventions to reduce household food insecurity and thereby reduce the prevalence of growth faltering in under-five children⁷⁵.
- Coates et al designed the Indicator Guide to measure the Household food access and insecurity scale to be applied in community level survey to screen food insecurity among the families⁷⁶.
- Rao VG et al reported that the high prevalence of undernutrition and micronutrient deficiency disorders were the important risk factors contributing to the high childhood mortality observed among the Onge tribe

of Andaman and Nicobar islands requiring immediate community based interventions⁷⁷.

- Rao VG, Sugunan et al reported the under-nutrition was observed high (66.6%) among the Shompens- the primitive Mongoloid tribe of Great Nicobar island⁷⁸.
- Rao VG et al reported that about 85% of tribal children under the age of 6 years were undernourished with high prevalence of Anemia and Vitamin A deficiencies which led to high mortality observed among the Great Andamanese tribe. They also reported the higher incidence of diarrhea among this vulnerable group of children leading to high under-five mortality⁷⁹.
- Sehgal SC, Rao VG et al reported that intake of vegetables and milk products by the tribes in Andaman and Nicobar islands were observed to be less than recommended RDA with high intake of millets and tubers as staple food. The tribes remained secluded from the general population with poor awareness on nutritious food for the growth and development of children⁸⁰.
- Pasricha SR et al reported that maternal anemia, family wealth and food insecurity were important determinants of anemia and malnutrition among the under-five children⁸¹.
- N.V. Kumbhare et al reported that 59 % of households had low food security and 20% had very low food security in Vidarbha region of Maharashtra in India which inturn reflects on the nutritional status of the family as a whole⁸².

- Md. Israt Rayhan et al reported that the main contributing factors for under five malnutrition were found to be birth interval, birth weight, mother`s body mass index at birth and parent`s education⁸³.
- Robert E et al reported that suboptimum breastfeeding, especially non-exclusive breastfeeding in the first 6 months of life, results in 1.4 million deaths and 10% of disease burden in children younger than 5 years. Delayed complementary feeding practices, recurrent infections like Respiratory illness, Diarrhoea and Malaria lead to increased prevalence of wasting and stunting in under-five children and also to increased mortality⁸⁴.
- Siddharth Agarwal et al reported that unemployment along with food insecurity played a major role in under-nutrition among the under-five children and recommended the Public distribution services with involvement of ICDS and NGOs for nutritional interventional programs to reduce the problem of food insecurity which inturn leads to under-nutrition⁸⁵.
- Basit Aet al reported that recurrent childhood illness, short birth interval and consumption of diluted milk were some of the significant contributory factors leading to under-nutrition among the under-five in Udupi taluk of Karnataka, India. Information, Education, Communication (IEC) campaigns alleviating food fads and promoting birth spacing are needed to reduce the under-nutrition⁸⁶.
- Park SE et al recommended the community based nutritional interventions like ready to use therapeutic food, cost-effective management, Supplementation of Vitamin A, nutritional supplements from ICDS, Oral

rehydration solution for diarrhoea and antibiotics for respiratory illness to reduce the burden on malnutrition among the vulnerable under-five children⁸⁷.

- Severe acute malnutrition remains a major killer of children under five years of age. Until recently, treatment has been restricted to facility-based approaches, greatly limiting its coverage and impact. New evidence suggests, however, that large numbers of children with severe acute malnutrition can be treated in their communities without being admitted to a health facility or a therapeutic feeding centre. Community-based approach involves timely detection of severe acute malnutrition in the community and provision of treatment for those without medical complications with ready-to-use therapeutic foods or other nutrient-dense foods at home. If properly combined with a facility-based approach for those malnourished children with medical complications and implemented on a large scale, community-based management of severe acute malnutrition could prevent the deaths of hundreds of thousands of children⁸⁸
- Children with SAM are treated with special therapeutic foods, most commonly Ready-to-Use Therapeutic Food(F75 and F100 milk-based diets)⁸⁹.
- Severe acute malnutrition (SAM) is a major cause of child mortality under 5years of age. Severe acute malnourished children are nine times more likely to die than healthy children. The mother's age at birth, birth interval, socioeconomic status, father's educational level and initiation of complementary feeding at the age of 6 months were important determinants

of SAM among children. A multi-sector approach is essential to address SAM⁹⁰.

- End hunger, achieve food security and improve nutrition and promote sustainable agriculture to combat under-nutrition among the under-five children⁹¹
- Maternal under-nutrition co-exists with stunting and wasting of under-five children requiring combined approach of nutritional intervention⁹².
- Under-nutrition accounts for increased mortality in the under-five children. Improvement in the maternal nutritional status reflects in the improvement of nutritional status of the children under the age of five years in the family^{93,94}.
- Yisak H et al reported that maternal health, household and environmental factors played an important role in the nutritional status of the under-five children and also stressed the need to intervene at the earliest for better outcome⁹⁵.
- Hien NN concluded that mother's occupation, household size, mother's BMI, number of children in family, weight at birth, time of initiation of breast-feeding and duration of exclusive breast-feeding were found to be significantly related to malnutrition. Socio-economic, environmental factors and feeding practices are significant risk factors for malnutrition among under-three⁹⁶.
- Sharghi A recommended that the health education to the family as a whole regarding the importance of nutrition and growth for girls, obtaining more nutritious and inexpensive foods and appropriate distribution of food among

family members is needed to prevent severe form of under-nutrition. Also they stressed the need for periodic monitoring of child growth and early detection and treatment of children affected by malnutrition⁹⁷.

- Jamro B et al reported that maternal illiteracy, large household, poverty, non-exclusive breastfeeding, feeding practices and recurrent infections are the important factors leading to severe acute malnutrition among the under-five children and they recommended health education to parents is the most important preventive step in child care⁹⁸.
- Dejere N⁹⁹, Nandy S et al recommended the alleviation of hunger, poverty, health education on feeding practices and health seeking with regular monitoring of health status of the children to prevent malnutrition and reduce the under-five mortality¹⁰⁰.

CHAPTER IV

MATERIALS AND METHODS

Study Methodology

Study Design

This is a Community based **Observational study** using a **Mixed methods approach** with quantitative and qualitative components.

- A Cross-sectional survey method was used for the **quantitative component** to interview the mothers with a questionnaire to gather information on demographic profile, antenatal services, details of delivery, infant & child feeding practices, child health, utilization of health services, details of illness health seeking behavior, maternal health and food security in the family.. Anthropometric and clinical assessment of nutritional status of the tribal children were done using a case study format.
- Focus Group Discussions and In-depth interviews were conducted for the **qualitative component** to obtain the information on socio-cultural beliefs governing infant and child feeding as well as child rearing practices and health seeking behavior.

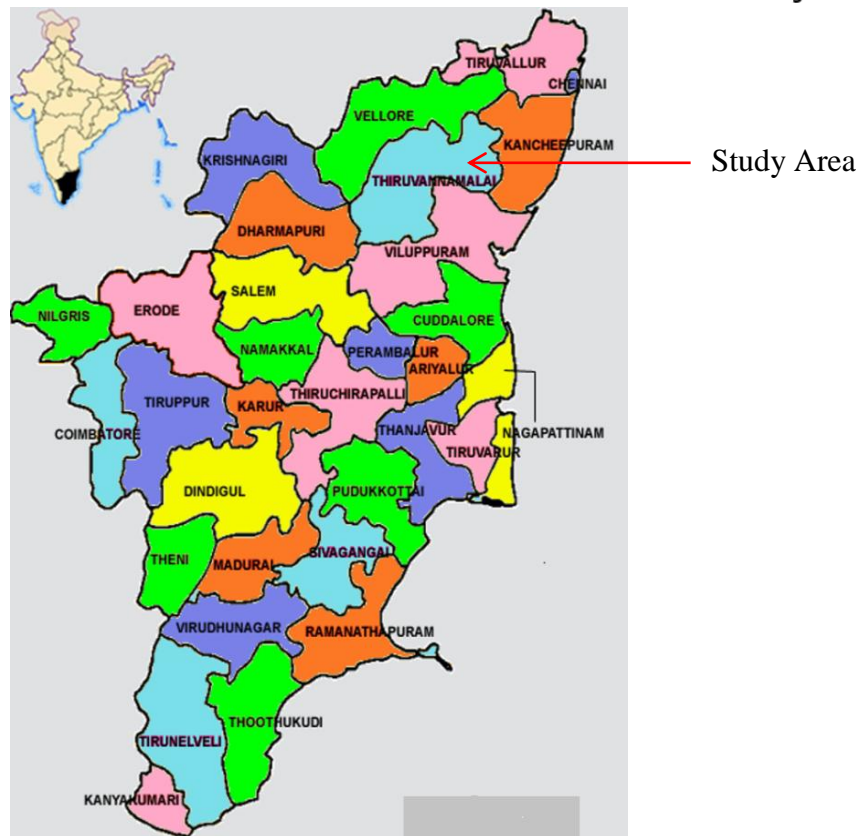
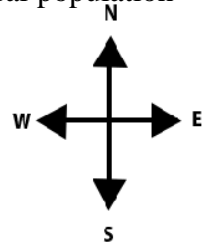
Study setting

This study was conducted in the tribal villages in Javvadu hills and plains of Thiruvannamalai District in Tamil Nadu, India chosen at random.

Thiruvannamalai District has a total population of 24,64,875 with tribal population of 68,926. There are 10 blocks in the District of which Jammunamarathur block is located in the Javvadu hills with tribal settlement comprising of 46,440 population.

Out of the other 9 blocks in the plains, Thandrampet, Chengam and Polur are the blocks in which the tribal people are found. In these blocks, the tribal people who had already migrated from the Javvadu hills about 10 to 15 years ago had settled for their livelihood. The total tribal population in the plains is about 22,486 people who have settled in colonies in the villages along with the general population in the above mentioned blocks.

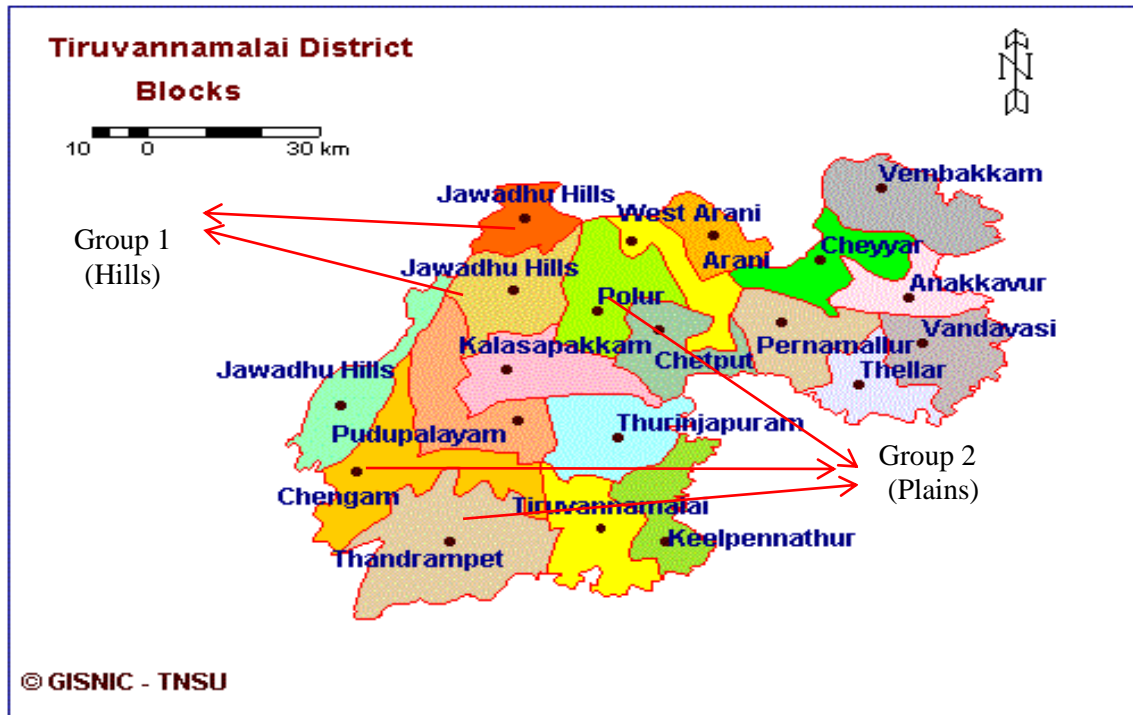
Fig1:Tamil Nadu Map with Thiruvannamalai District



source: www.TNmaps.com

The Thiruvannamalai District in Tamil Nadu has the total tribal population of 68,926 with 46,440 in hills and 22,486 people in plains.

Fig 2:Map showing the blocks in the hills and plains of Thiruvannamalai District



The map shows the Javvadu hills which is the hilly tribal settlement (Group1) and the Polur, Chengam and Thandrapet blocks (Group 2) which are the blocks with tribal settlement in plains (out of 9 blocks in the plains with general population).

Study period: July 2014- Jan 2017

Study Population

Tribal children under the age of five years and their mothers. Two groups of children and their mothers participated in this study.

Group 1 (tribal population living in hilly areas)

Children residing in tribal villages in Jammunamarathur block in Javvadu hills in the Thiruvannamalai District in Tamil Nadu.

Group 2 (tribal population living in plains)

Tribal children residing in non-hilly area (plains) in Thandrampet, Chengam and Polur blocks of Thiruvannamalai District. This tribal population had migrated from hills to the plains for their livelihood and settled among the general population.

Inclusion Criteria

Tribal Children below the age of 5 years and their mothers residing in the hilly area (Javvadu hills) and plains who consent to participate in this study.

Exclusion criteria

Tribal Children with documented chronic systemic illness, developmental delay and metabolic disorders on special diet and those mothers who are not willing to participate.

Sample size

There is no district level survey on nutritional status in the tribal population specifically in this district. So the prevalence of under-nutrition in the form of underweight as reported in 2012 by ICDS project in Thiruvannamalai District was obtained from ICDS Project office²¹. The prevalence reported among the Group 1 (hilly) was 47% and the prevalence of underweight among the Group 2 (plains) was 37.1%. The sample size was calculated using Open Epi version 3, open source calculator – SS Prop with the following,

Formula: Sample size $n = [DEFF * Np(1-p)] / [(d^2 / Z^2_{1-\alpha/2} * (N-1) + p*(1-p)]$

- Population size (for finite population correction factor or fpc)(N)
- Hypothesized frequency of outcome factor in the population (p)
- Confidence limits as % of 100 (absolute +/- %) = d

Table 1: Sample size calculation

Parameters	Group 1 (Hills)	Group 2(Plains)
Population size (for finite population correction factor or fpc)(N)	4814	2166
Hypothesized % frequency of outcome factor in the population (p Prevalence)	47%	37%
Design effect (Cluster sampling)	2	2
Absolute precision +/- % (d)	7%	6%
Confidence Limits (CI)		
90%	- 268	- 325
95%	- 376	- 447
99%	- 457	- 718
Sample size for 95% CI	376	447

The sample size calculated is 376 for the hills (Group 1) and 447 for the plains (Group2).

The **sample size for the purpose of comparative study** among these **two groups** was finalized to be **450** in each group. It was decided to use cluster sampling method using PPS probability proportional to size (PPS) to obtain the necessary sample size for this study. The final sample was decided as follows:

30 clusters in each group with 15 children in each cluster to reach the sample size of 450.

Sampling Method for quantitative data collection

This study used the Cluster Sampling with PPS-LSS method to include the eligible children with their mothers to obtain the necessary data for quantitative component.

Group 1

Group 1 comprises of the tribal population residing in Jawadhu hills in Jamanamarathur block of Thiruvannamalai district where there are two Primary Health centres (Jamanamarathur and Namiyampattu) and 13 HSCs (Health sub-centres) with a total of 162 tribal villages. The hilly tribal settlement has a population of 46,440 of which 4814 are children under the age of five years. 30 villages (clusters) from the list of tribal villages were identified by Probability Proportional to size with linear systematic sampling (PPS-LSS). In each cluster, 15 children under the age of 5 years were included in the study.

Group 2

Group 2 comprises of the tribal population migrated and settled in the plains of Thiruvannamalai district along with the general population. Under the three Primary Health centres (Thandrampet, Chengam and Polur) are eight HSCs with 38 tribal villages where the tribal population have settled with a population of 22,486 of which 2,166 are under the age of five years. From these villages, 30 clusters with 15 children in each cluster under the age of 5 years were identified using PPS LSS for this study.

Enrollment of children

After discussing the process of enrollment of children in this study in the Advisory committee, it was finalized to have proportional representation of the various age groups in each cluster. The age groups were < 1 year, 1-3 years and 3-5 years. The number of children enrolled in each of the age groups were determined by the statistician based on the population proportion in the district.

Detailed Methodology

- a) Methodology for quantitative data collection
- b) Methodology for qualitative component

a) Methodology for data collection for quantitative component:

This study used the Cluster Sampling with PPS-LSS method for the quantitative component. The clusters identified by PPS-LSS method were enlisted in the Annexure III. Prior written permission were obtained from the Public Health authorities (Appendix II), Panchayat members and Local Tribal leaders to conduct the study in the selected villages with the co-operation of the tribal people. In the selected cluster (village) in the Group 1, the eligible children were enlisted with the help of the under-five register maintained by the female Health workers.

After obtaining informed written consent (Appendix IV) in the presence of the Female Health worker, the house to house visit was done in the selected cluster to include 15 children representing below 1year, 1-3 years and 3-5 years. The mothers were interviewed in Tamil with the DCF and children were examined for anthropometric and clinical parameters of nutritional status in order to obtain the data for quantitative component. The details of the procedure for examination of the

child have been given in the Operational definitions. After an informed consent, under aseptic precautions, venous blood was drawn from the children for the estimation of Hemoglobin which were transported to the Laboratory in the PHC the same day for analysis. Once the data collection from the 15 children in the chosen cluster were completed, the next cluster was sought for until all 30 clusters with 15 children in each amounting for 450 were arrived at. The same was repeated in the Group 2 to reach the required sample.

Instrument Development for Data Collection (Appendix V)

There are three forms of instruments used for this study which are as follows:

- 1) Data collection form (DCF) for quantitative component
- 2) Guide for Focus group Discussion and
- 3) Guide for In-depth Interviews for qualitative component

Data Collection Form (DCF) for quantitative component:

For the quantitative data collection, a semi-structured questionnaire (DCF) in Tamil was used which was pretested in the Institute of Child Health and Hospital for children, Madras Medical college, Chennai.

A pilot study was conducted in hills and plains to check whether this DCF could obtain the data needed for this study from the interviewees (tribal mothers).

The DCF has the following two components

- 1) **Questionnaire for interviewing the mothers which contains**^{22,23}
 - Socio-demographic characteristics of the family
 - AN services availed by the mother

- Details of delivery
- Infant feeding practices (Breastfeeding and Complementary feeding)
- 24hrs dietary history of the index child
- Utilization of health services
- Health seeking behavior during illness
- Family Food security and maternal health

2) **Case Record of the index child**

- Clinical examination of the child (Head to foot & systemic examination)
- Anthropometric details
- Hemoglobin estimation

The first component was filled in by interviewing the mothers and the second component was filled by examining the child by the researcher.

Pilot study

A pilot study was conducted among 50 children and their mothers in Athipetu tribal village in Javvadu hills (Group 1) and 50 subjects in Keelmuthanur in Plains (Group 2) in Thiruvannamalai District which were not included in the detailed study. This piloting was done to check whether the DCF (Data Collection Form) could obtain the data needed for the study from the mothers and their children.

The results of the Pilot study are as follows

The age and sex distribution of the children of both groups are given in the table

Table 2: Age and gender distribution in pilot study

Parameters	Group 1		Group 2	
	Male	Female	Male	Female
< 1 year	6	5	6	4
1-3 years	9	8	8	7
>3 -5 years	12	10	12	13
Total	27	23	26	24

Socio-demographic details

In Group 1, 67% of mothers were non-literates while 44% only were illiterate in Group 2. Majority (55%) of fathers were daily laborers by occupation belonging to class IV socio-economic status in Group 1, while only 21% were coolie and rest were semi-skilled worker belonging to class III socio-economic status in Group 2. About 19 were Nuclear families and rest were joint type in Group 1, while 33 were Nuclear families in Group 2.

In Group 1, 91% of houses were katcha type and only 13% were katcha houses in Group 2. Almost all had safe water in both groups but majority in Group 1 had open defecation practices with bare-foot walking unlike in Group 2.

Prevalence of under-nutrition among the tribal children in the pilot study

- Over all prevalence of under-nutrition based on underweight (weight for age < M-2S.D.) among the Group 1 was 42% (21 out of 50) while the prevalence among the Group 2 was observed to be 30%. The difference between the prevalence in Group 1 and Group 2 was 12.
- Prevalence of SAM (weight for height < M- 3 S.D. and MUAC < 11.5cm) was about 8% in the group 1 as against only 4% in group 2 with regard to weight for height and mid upper arm circumference.

- The severity of under-nutrition increased with increasing age and female children in all age groups suffered from under-nutrition more than the male counterparts.
- The prevalence of Anemia was higher (74%) in the group 1 while only 54% were anemic in group 2. Severe Anemia (Hb < 7 gm/dl) was observed to be in 5 children in Group1 and 3 children in Group 2.

Prevalence of Anemia and its severity

Table 3: Prevalence of Anemia

Anemia Hb Parameter	Group 1 (n=50)		Group2(n=50)	
	Male	Female	Male	Female
>11 gm/dl (Normal)	9	4	12	10
9-11 gm/dl (Mild Anemia)	12	11	8	9
7-9 gm/dl (Moderate)	4	5	4	4
<7 gm/dl (severe)	2	3	2	1
Total	27	23	26	24
Prevalence of Anemia	37 (74%)		28 (54%)	

Determinants of under-nutrition in both groups

The factors like age of the mothers, educational status, sex of the child, low birth weight, exclusive breastfeeding with timely introduction of complementary feeding, awareness on nutrition, utilization of ICDS, Health seeking behavior, monitoring and support by the health personnel and food security were statistically significant in Group 2 for the observed difference in under-nutrition when compared with Group 1. Factors like Type of family, antenatal care, delivery details,

Immunization coverage were observed to be similar with no statistical significance for the difference in under-nutrition among the two groups.

Application of the pilot study

- c) The observed difference in the prevalence of under-nutrition in this pilot study was statistically significant between the two groups as reported in the 2012 data in ICDS project office of the district. Therefore the sample size calculated with reference to ICDS data in the district was approved by the advisory committee.

Final Instrument for Data collection after the Pilot study (Appendix V)

- d) After the pilot study, the DCF was finalized with no modifications and was approved by the members of the Advisory committee for the purpose of quantitative data collection.
- e) No piloting was done for the guides for Focus group Discussion and In-depth Interview. The same were approved by the Advisory committee to be applied for the qualitative research component.

Ethical Committee Approval:

The Ethical Committee Approval was obtained from the Madras Medical College in Chennai. A copy of this is enclosed in the Appendix I. The mothers were enrolled in this study after informed written consent in Tamil. A copy is enclosed in the Appendix IV.

b) Methodology for data collection for the Qualitative component

Focus Group Discussion

Two Focus Group Discussions were conducted in each group with 8 to 10 tribal mothers with children under the age of five years chosen with representation of all parameters like age, educational status and parity following an informed consent. These mothers were not included in the quantitative data collection. Using the approved guide for FGD, the discussion was conducted which was recorded along with note taking. The purpose of the FGD is to gather information about the cultural beliefs on child feeding and child rearing in the community as a whole.

In-depth Interviews

After obtaining informed consent, five in-depth interviews based on the guide were conducted among the mothers in each group to collect qualitative data on socio-cultural beliefs in Infant and child feeding as well as child rearing practices which were recorded with note taking. The purpose of the in-depth interview was to gather information on the variation in the individual practice of cultural beliefs on the child feeding and rearing practices in the tribal community.

Operational Definitions^{24, 25}

Under-nutrition was defined as per standards based on WHO Z score charts for the age and sex which are as follows (Appendix VI):

Underweight

Weight for age < -2 standard deviations (SD) of WHO Child Growth Standards Z score charts with Median for age and sex which reflects acute malnutrition.

Stunting

Height for age < -2 S.D. of WHO Child Growth Standards Median for age and sex which reflects the chronic state of malnutrition

Wasting

Weight for height < -2 SD of WHO Child Growth Standards Median for age and sex representing the acute on chronic malnutrition

Severity of Under-nutrition

Severe Under-nutrition is defined as follows:

Cut off	Weight for age	Length/Height for age	Weight for Height
Below < -3 .S.D.	Severe Underweight	Severe stunting	Severe Wasting

Moderate and Severe Acute Malnutrition (MAM & SAM)

Parameters	Moderate Acute Malnutrition (MAM)	Severe Acute Malnutrition (SAM)
Weight for height/ Length (Wasting)	$< - 2$. S.D. Z score	$< - 3$ S.D. Z score
Mid Upper arm Circumference (MUAC) 6-60 months	11.5 cm to 13.5cm	< 11.5 cm
Edema	No	Yes

Weight for height is more reliable indicator for acute on chronic malnutrition. Weight for height /Length and MUAC are age independent criteria to assess the nutritional status of the child.

WHO Classification of Acute and Chronic Malnutrition²⁶

Weight for age	Height for age	Weight for height	Interpretation
M > - 2.S.D.	M > - 2 S.D.	M > -2S.D.	Normal
-2 S.D. to -3S.D	M > - 2 S.D.	- 2 S.D to -3.S.D.	Acute malnutrition
< - 3 S.D.	< -3.S.D.	M > -2S.D.	Chronic malnutrition
< - 3 S.D.	< -3.S.D.	- 2 S.D to -3.S.D.	Acute on chronic malnutrition

Measurement of weight and Height/length

- Weight of the infant was weighed using Infant weighing electronic scale. Children more than one year were weighed using standing electronic platform (Avery India Limited, model no. L111A) with a precision of 10 g. The balance was checked regularly for accuracy using standard weights.
- Length was measured up to 2 years of age using Infantometer MT-1155. Acrylic base structure. Foldable design. Height 90 cm (collapsed to 45 cm).
- Height was measured in children more than 2 years with stadiometer made of heavy duty plastic material measuring in inches, millimeters and cm with maximum of 210cm.

Mid upper arm circumference^{27,28}

- Mid upper arm circumference is an age independent criteria to assess the nutritional status of children of age one year to five years. A plastic, flexible and non-stretchable tape was used for measuring mid-arm circumference. The measurement was taken at the midpoint of the upper

left arm, between the acromion process and the tip of the olecranon. After locating the midpoint, the left arm was extended so that it was placed loosely by the side, with the palm facing inwards. The tape was wrapped gently but firmly around the arm at the midpoint. Measurements were taken to the nearest 0.1cm. MUAC > 13.5cm is defined as normal while < 11.5cm is termed as severe under-nutrition (SAM) requiring immediate intervention. Values in between represent moderate malnutrition in children with age ranging from 1 to 5 years.

Skinfold Thickness Measurement (Triceps)

- Skinfold Thickness Measurement is measure of body fat (adiposity) wherein loss of body fat represents the negative energy balance thereby a marker of under-nutrition. Triceps skinfold thickness was measured using ICS Dial type Indian with dial graduation of 0.20mm measuring range from 0 to 80 mm, pressure of 10gm/mm² with 99 % accuracy and repeatability of 0.2mm.
- WHO Z score charts for age and sex were used to interpret Triceps SKFT²⁹.
- Under-nutrition is defined as value below < M- 1. S.D to >M-2S.D is Mild degree, M-2S.D to M-3S.D. is Moderate and <M-3S.D. is severe.

BMI for age and sex

- BMI was calculated by plotting the weight and height in Z score chart with value < M-2S.D. was defined as wasted and < M-3S.D. as severely wasted

Head circumference

- Head circumference was measured by placing the flexible and non-stretchable tape firmly over the most prominent region of the occiput and frontal crests accurately to nearest 0.1cm and was plotted in WHO Z score for age and sex. Value $< M - 3.S.D$ was defined as microcephaly.

Chest Circumference

- Chest circumference was measured at the nipple and is related to Head Circumference. In infancy, HC is more than CC while both are equal by 1 year of age and thereafter the CC is more than HC. In Severe malnutrition, Chest circumference continues to be less than HC with HC: CC > 1 .

Hemoglobin Estimation

- For estimation of Hemoglobin, 20 microliter of venous blood was drawn from the child with safe aseptic precautions adding Drabkin's solution which was transported to Laboratory in PHCs that very day. Hemoglobin was estimated using Spectrophotometric method with the semi-auto Analyzer in the PHC. Anemia was defined as Hemoglobin value < 11 gm/dl (WHO definition) with Mild (9-11gm/dl), moderate (7-9 gm/dl) and severe < 7 gm/dl.

Early Initiation of Breastfeeding

- Early initiation of breastfeeding is defined as the proportion of children born in the past 24 months who were put to the breast within 1 hour of birth.

Exclusive Breastfeeding

- Breastfeeding up to the age of first six months of life with not feeding any form of milk and giving not even water except medications

Supplementary feeding

- Feeding infants below 6 months of age with other milk in addition to breastfeeding in order to meet the nutritional demands

Complementary feeding

- Complementary feeding is defined as introduction of semi-solid food at the age 6 to 8 months along with continuation of breastfeeding.

Fully Immunized

- The fully immunized child must have completed BCG 1, DPT 1, DPT 2, DPT 3, OPV 1, OPV 2, OPV 3, Hep B 1, Hep B 2, Hep B 3, Hib 1, Hib 2 , Hib3 and Measles vaccines before the child is 12 months of age.

Partially Immunized

A child who was not yet fully immunized. Of which Partially Immunized but 'up to date' is a child who had received all the vaccines for which he/she was eligible by age while 'not up to date' is one who had not completed the doses for his/her age as per the schedule.

Unimmunized

- A child who had not yet received any vaccine for age though eligible

24 hours Dietary recall

24 hours dietary recall by the mothers for the enrolled children was carried out. Calorie and Protein intake were quantified in 24 hours dietary recall method and adequacy was defined as per ICMR - RDA requirements for the age and sex which is added in the Annexure VII.

Food security questionnaire

Household Food Insecurity Access Scale - USAID (HFIAS) Measurement Tool was used to assess the food security in the household with 4 weeks recall method. The categories of Food insecurity are classified as food secure, mildly food insecure, moderately food insecure and severely food insecure (Annexure VIII)

Table 4: Updated B.G. Prasad classification for the month of May 2016²⁹.

Social class	Per capita monthly income limits (Base 2001 = 100)	Per capita monthly income limits, May 2016
	Linking Factor: 4.63 (1960 Value x 4.93 x 4.63)	Multiplication Factor: 2.75 (1960 Value x 4.93 x 4.63 x 2.75)
Class I	2283 And Above	6277 And Above
Class II	1142-2282	3139-6276
Class III	685-1141	1883-3138
Class IV	343-684	942-1882
Class V	Below 343	Less Than 942

Outcome Measures:

- 1) Single assessment of Under-nutrition in the form of clinical and anthropometric parameters in both the Groups.

- 2) Assessment of Anemia based on Hemoglobin estimation per WHO standards.

Data Analysis

The quantitative data collected was entered in MS Excel and analyzed using SPSS version 21. Chi Square test, Fischer Exact and Multivariate analysis by logistic regression were used for inferential statistical analysis.

The qualitative data recorded was transcribed, translated and theme extraction was done using Frame Work Analysis method.

CHAPTER V

RESULTS AND ANALYSIS

This study was conducted among 450 tribal children under the age of five years and their mothers residing in the hills (Group 1) and 450 tribal children and their mothers who had settled in plains (Group2) of Thiruvannamalai District of Tamil Nadu. There are two types of tribes residing in the Thiruvannamalai District namely Malayali and Irulars. Among the tribal population, 70% of people belonged to Malayali type of tribe and the rest were Irulars. This distribution was observed to be similar in both hills and plains. The Group1 remained secluded in the hilly area in an altitude of 1100 meters while the Group 2 who had migrated about 10 to 15 years ago for livelihood had settled in plains in colonies along with the general population

This study aims to assess and compare the nutritional status of the children and its determinants in both the groups. A mixed methodology approach with a quantitative component, supported by a qualitative component to identify the socio-cultural beliefs and practices among the tribal population was used. The results of the analysis are given as follows:

Plan of Analysis

A. Analysis of Quantitative data

1. Socio-demographic characteristics of the children

- 1.1. Descriptive Statistics of the children like age, gender distribution & birth order of the children
- 1.2. Details of the respondent (Mothers)

- f) Age of the mothers
 - g) Educational status
 - h) Occupation of the mother
- 1.3. Details of the fathers – Education, occupation, income
 - 1.4. Type of tribe and Religion
 - 1.5. Type of Family
 - 1.6. Environmental characteristics like Housing type, safe drinking water and sanitation practices

2. Outcome Measures

- 2.1. Clinical Features of Nutritional deficiencies in the children
- 2.2. Anthropometric assessment of Nutritional status of the children
- 2.3. Hemoglobin estimation for Anemia

3. Determinants of Under-nutrition (Under-weight) within Group

- 3.1. Socio-demographic determinants
- 3.2. Antenatal services and delivery details
- 3.3. Feeding practices (breastfeeding practices, Complementary feeding, Supplementary feeding, current dietary pattern)
- 3.4. Utilization of Health services (Immunization, Vitamin A supplements ICDS supplements, regular deworming), monitoring of nutritional status in health facility and health seeking behavior
- 3.5. Family Food security and Maternal Health.

4. **Comparison of Outcome Measures between the Groups**
 5. **Comparison of Determinants of Under-nutrition between the Groups**
- B) Analysis of Qualitative data**

1) Focus group discussion

To explore the socio-cultural beliefs of child feeding and rearing practices among the tribal population as a whole to support the quantitative component.

2) In-depth interview

To analyze the individual variation in the socio-cultural beliefs and practices of infant and child feeding practices among the tribal mothers in both groups.

Results of the Quantitative component

The results of the quantitative data are as follows:

1) Socio-demographic characteristics of the two Groups

1.1) Age and gender distribution

The distribution of the age and gender in the two groups of children is as follows. Majority of children in both the Groups were of age group 3- 5 years. In Group 1, 55.1% were males and the rest were females. In Group 2, 53.1% were males and the rest were females.

The distribution of age and gender in the two groups of children were observed to be similar and comparable for the purpose of the study.

Table 5: Mean and S.D. of age group in both groups

Group		N	Mean age	Std. Deviation
Group 1	< 1year	93	9.0645	1.65376
	1-3yrs	147	23.8163	8.55444
	3-5yrs	210	47.1286	7.47997
	Total	450	31.6467	16.97652
Group 2	< 1year	91	9.0165	1.53741
	1-3yrs	159	23.0943	7.83436
	3-5yrs	200	46.9250	7.36073
	Total	450	30.8389	16.70636

Table 6: Age and gender distribution of the under-five children in the two Groups

Age of the baby	Group 1 (N=450)					Group 2 (N=450)				
	Male		Female		Total	Male		Female		Total
	N=248	%	N=202	%		N=239	%	N=211	%	
< 1 years	51	53.1	45	46.9	96	39	40.6	57	59.4	96
1-3 years	79	49.7	80	50.3	159	91	53.8	78	46.2	169
3-5 years	118	60.5	77	39.5	195	109	58.9	76	41.1	185

$\chi^2 = 0.568$

$p = 0.753$

Fig 3: Age distribution of the under-five children in the two Groups

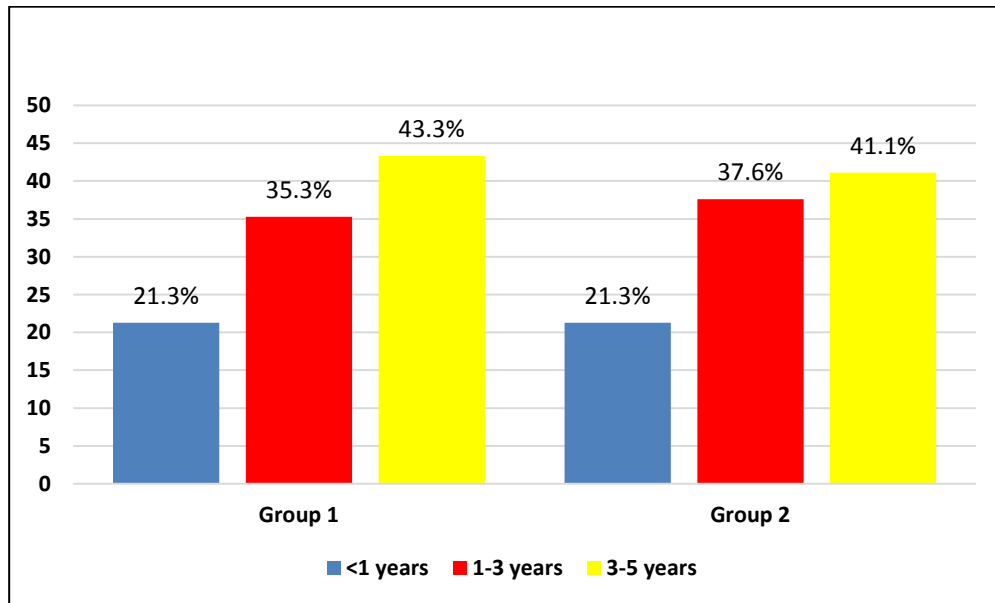
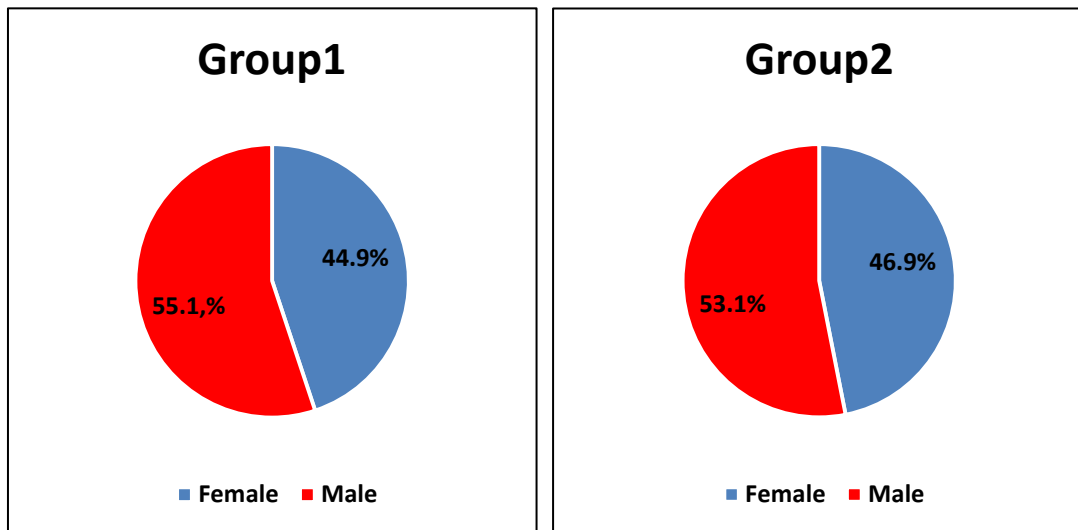


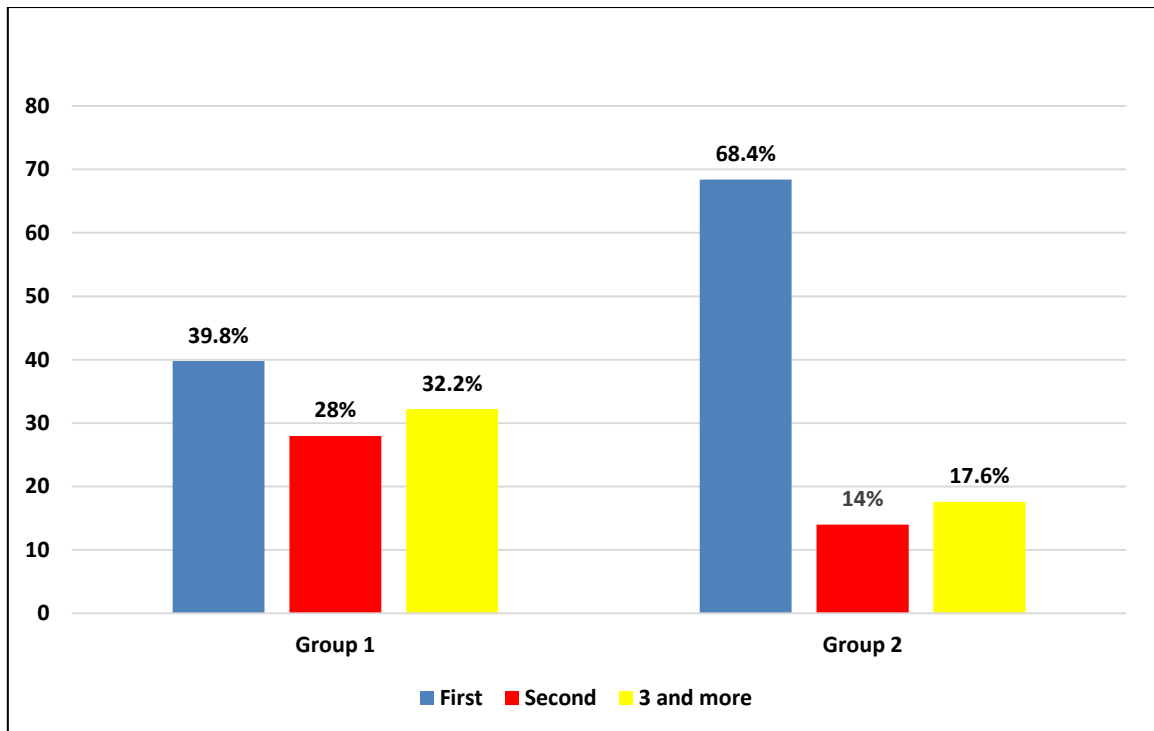
Fig 4: Gender distribution among the two Groups



1.2) Birth order in the two Groups

In the Group1, the higher order birth (3 children and above) was observed to be (32.2%) which was higher than in the Group 2 (17.6%)

Fig.5: Birth order



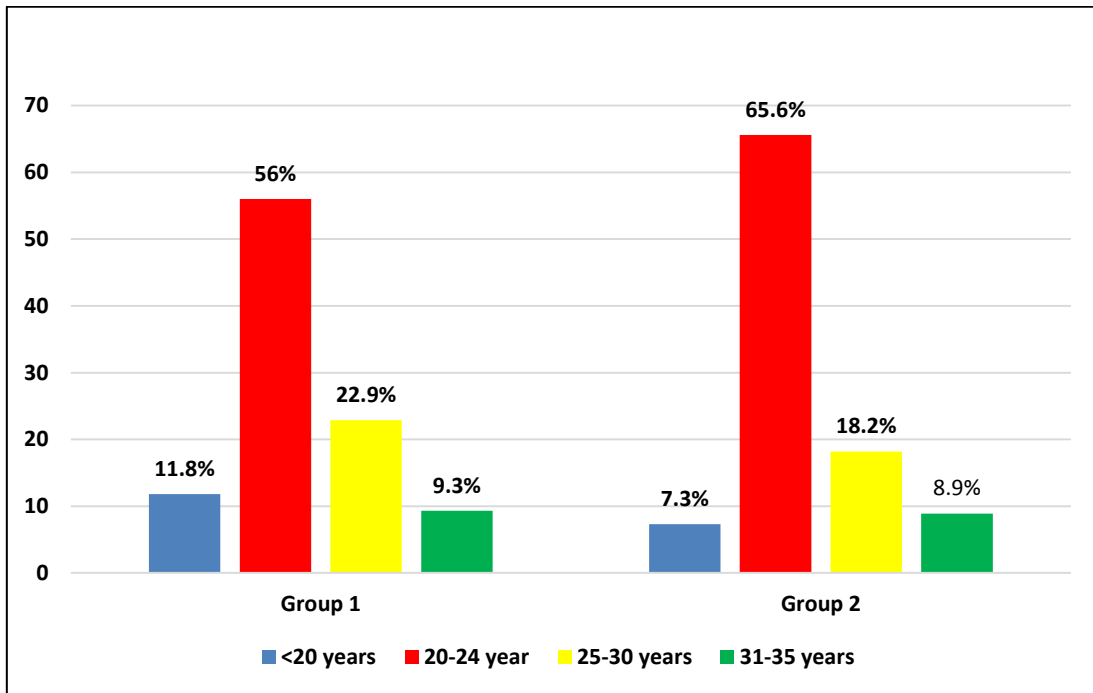
1.3) Details of the respondent (mothers)

a) Age of the mothers

In the Group 1, 11.8% of the mothers were of adolescent age (<20years) as against 7.3% in the Group 2 which might adversely influence in the maternal health and the health of their children. In both the Groups, majority of the mothers belonged to the 20-24 years of age.

Mean age of mothers in Group 1 was 22.74(S.D= 4.72) and the mean age of mothers in Group 2 was 23.99(4.41)

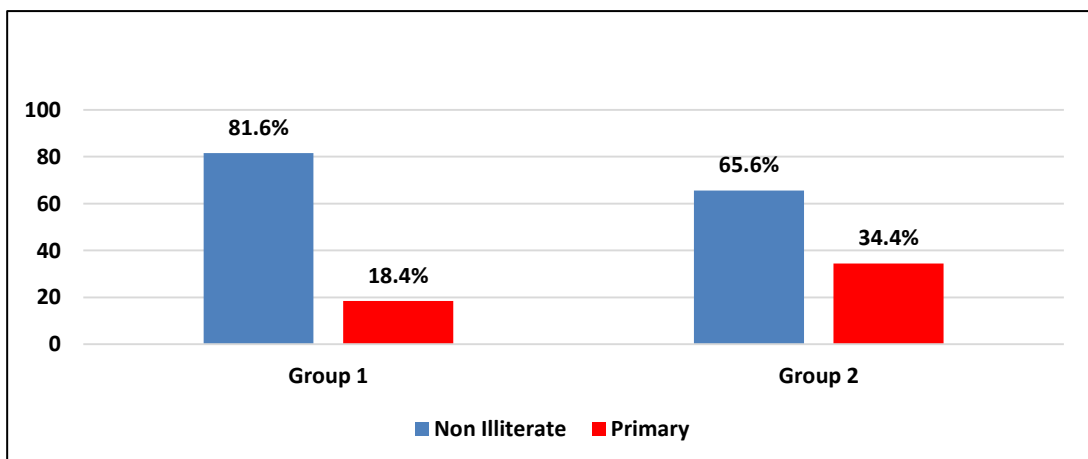
Fig 6: Age of the mothers



b) Educational status of the mothers

In the Group 1, majority of the mothers (81.6%) were non-literates. In Group 2, 34.4% of the mothers had primary education while only 18.4% in Group1, which might influence their child rearing practices.

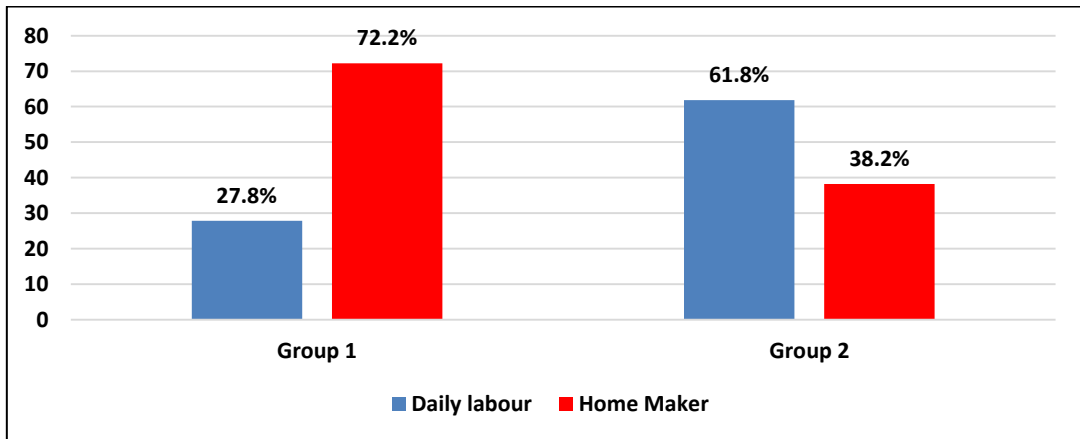
Fig 7: Educational status of the mothers



a. Occupation of the mothers

In Group 1, Majority (72.2%) of the mothers was home makers and the rest were engaged in daily labor. In Group 2, about 61.8% of mothers had engaged in daily labor contributing to the household income which in turn might influence the family health.

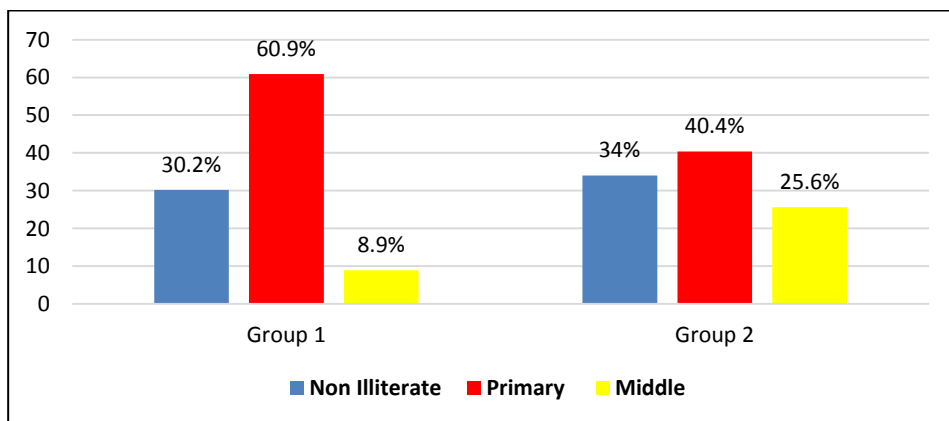
Fig 8: Occupation of the mothers



1.4. Educational status of the Father

In Group 2, 25.6% of fathers had middle school education which was observed to be higher than Group 1. Overall educational status was observed to be better in Group 2.

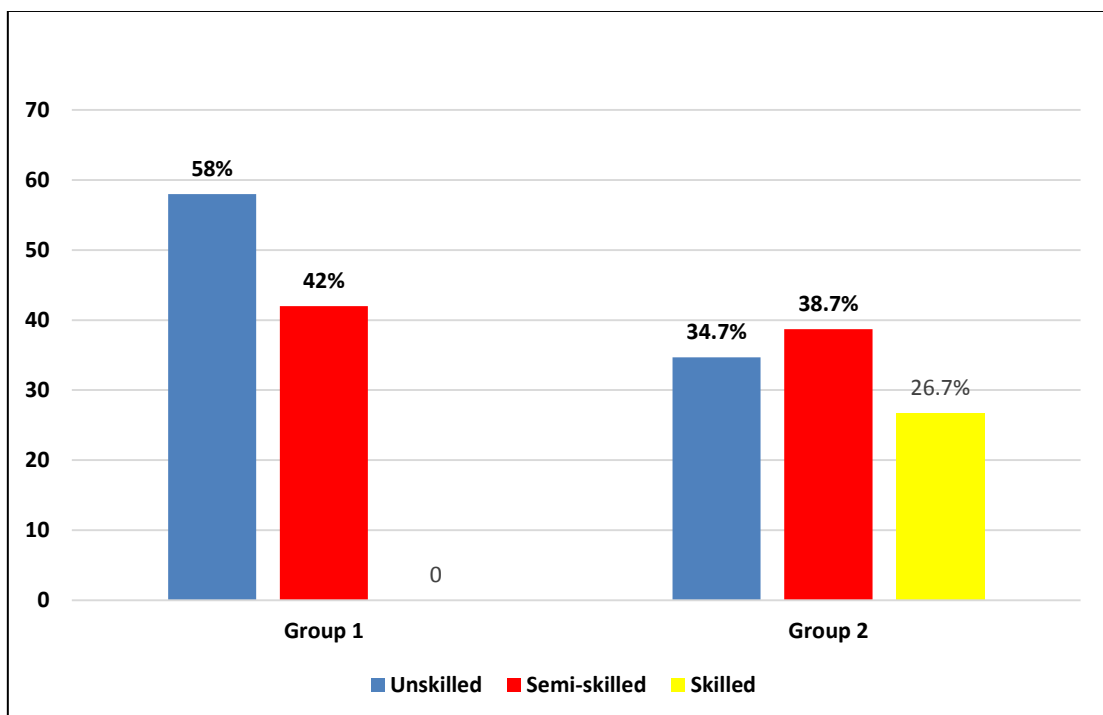
Fig -9: Educational status of the father



c) Occupation of the father

In Group 1, majority of the fathers were of unskilled type of occupation like wood cutting, daily labor who have to leave the native village in search of job to different parts of the state and even out of the state. In Group2, it was observed that only 34.7% of the fathers had daily labor while 26.7% had skilled type of job which had contributed to the better per capita income of the family which is discussed subsequently. This might have an influence on the health status of the family as a whole in Group 2.

Fig 10: Occupation of the father



1.5 Environmental characteristics

a. Years of settlement

All the subjects and their families included in the Group 1 had been living in the hills for generations while in Group 2 have migrated and settled in the plains about 10 to 20 years. They are of the same type of tribal origin and ethnic race.

b. Religion

In the Group 1, 76.4% were Hindus and 23.6% were Christians while 82.4% were Hindus & 17.6 % were Christians in the Group 2 with no other religious group.

c. Type of family

In Group 1, 72.2% were of nuclear type and the rest were non-nuclear type while 81.6% were of nuclear type of family in Group 2.

d. Type of Housing

In Group 1, 90.4 % houses were katcha type and the rest was semi-pucca. On the contrary, 55.8% only were katcha type with the rest as semi-pucca in the Group 2. With regard to source of drinking water, both the groups had easy access to safe drinking water. In group 1, water from the hand pump served to be the predominant source of drinking water while it was safe water supplied through pipe by the local Panchayat bodies served to be the major source of drinking water in the group 2.

e. Sanitation practices

In Group 1, open defecation practice was highly prevalent (81.6%) with no toilet facility and bare foot walking was noticed to be almost 80% in this community. But in Group 2, only 30% had the practice of open defecation with only bare foot walking was observed in 56.4%.

Table 7: Environmental characteristics

S.No	Parameters	Hilly tribe		Plain tribe	
		N=450	%	N=450	%
1	Type of house				
	Katcha	407	90.4	251	55.8
	Semi-pucca	43	9.6	199	44.2
2	Type of family				
	Nuclear	325	72.2	367	81.6
3	Source of water				
	Well	-	-	120	26.7
	Pump	410	91.1	100	56.7
	Pipe water	40	8.9	230	30.0
4	Sanitation practices				
	Open defecation	367	81.6	135	30.0
5	Toilet facility in the house				
	yes	83	18.4	295	65.6
6	Bare foot				
	Yes	364	80.9	255	56.7

2) Outcome Measures in both the Groups

The following are the outcome measures in this study:

2.1) Clinical Features of Nutritional deficiencies in the children

Table 8: Clinical Features of Nutritional deficiencies in the Subjects

S.No	Clinical Parameters	Group 1		Group 2	
		N=450	%	N=450	%
1	Hair colour				
	Depigmented	145	32.2	122	27.1
2	EYES				
	Pallor of Conjunctiva	311	69.1	275	61.1
	Bitot's spot	33	7.3	9	2
3	EAR				
	Wax	228	50.7	237	52.7
	Pus	95	21.1	96	21.3

4	ORAL CAVITY				
	Presence of Cheilitis	198	44.0	155	34.4
	Presence of Glossitis	135	30.0	96	21.3
	Presence of Dental Caries	281	62.4	155	34.4
	Hygiene practices				
5	Skin for Impetigo	82	18.2	63	14.0
6	Good Hygiene in nails	60	13.3	89	19.1
7	Palmar pallor +	85	18.9	43	9.6

None of the children had corneal opacity or Ulcer, Goitre and clinical features of Rickets. The examination of others systems like CVS, RS , Abdomen and CNS revealed that in Group 1, 18.2% of children had systolic murmur in the heart probably Hemic murmur due to anemia and 9.6% in Group 2 had such murmur which will require further evaluation.

Also there were hepatomegaly observed among 9.3% of children in Group 1 and 4% in Group 2. There was no Splenomegaly and no abnormalities were detected in Respiratory, Central nervous system and other systems observed clinically in these children.

Overall clinical features of nutritional deficiencies by head to foot clinical examination revealed better nutritional status in Group 2 than Group 1.

2.2) Anthropometric assessment of Nutritional status:

Age dependent parameters for Nutritional assessment

a) Weight for age

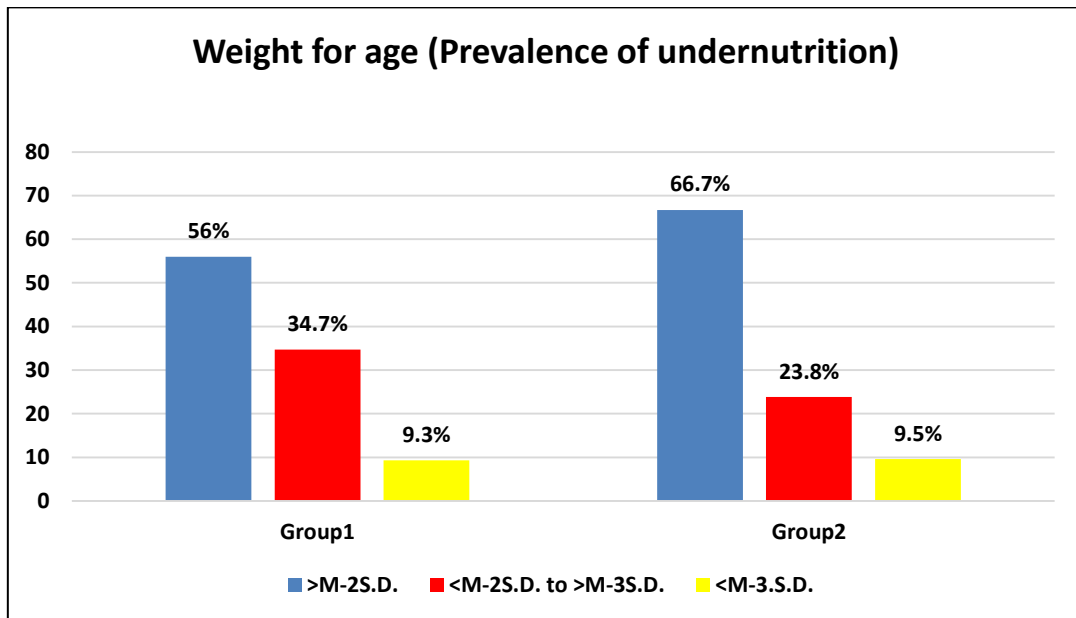
- i) In Group 1, 56% of children had normal nutritional status and 44% (n=198) were found to be under-weight (weight < M-2S.D.). So the

prevalence of under-nutrition which is defined as weight < M-2S.D. was observed to be 44% in this group. Out of 198 children, 35.9% (71) were males and 64.1% (127) were females with female preponderance.

j) In Group 2, 66.7% were normal with 33.3% (n=150) suffering from under-weight. The prevalence of under-nutrition in Group 2 was observed to be 33.3%. Out of 150 children, 38.6% (58) were males and 61.3% (92) were females with female preponderance.

k) The severe form of under-nutrition (severe under-weight) as defined as weight for age < M-3S.D. was observed to be similar in both the Groups as 9.3% and 9.5% respectively.

Fig.11: Distribution of Weight for age



b) Height/Length for age

In both groups, the distribution of height for age was observed to be almost similar with prevalence of mild stunting in Group 1 was 20.2% and that in Group 2 was 19.1%. Also the severe stunting (< M-3.S.D.) was observed to be similar in two Groups.

Fig 12: Distribution of Height for age among the two groups

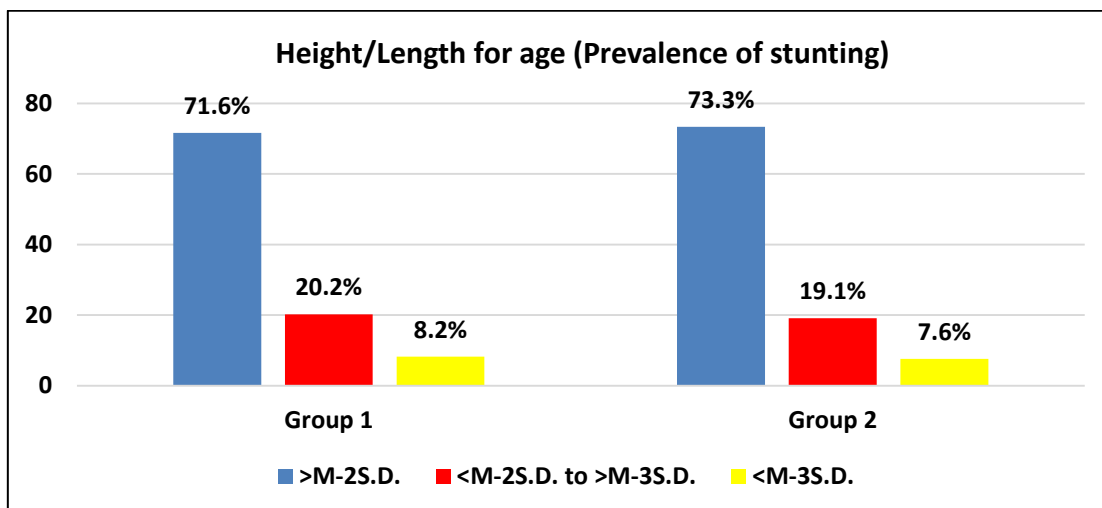


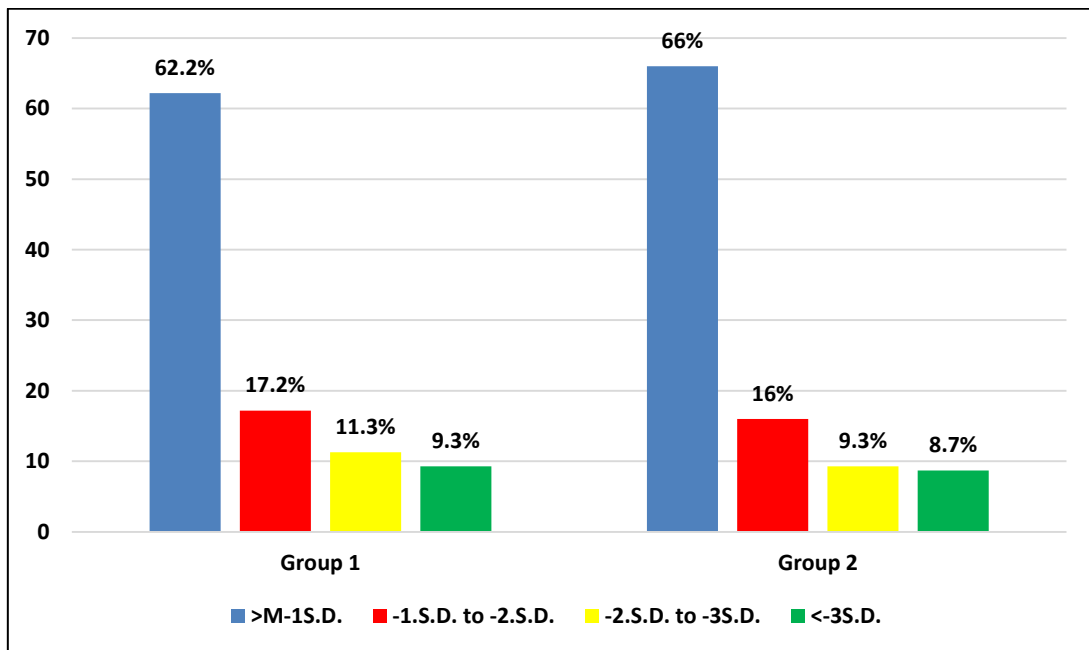
Table 9: Agewise Mean and SD of weight and height / Length of two groups

Groups	< 1 year		1- 3 years		3-5 years	
	Weight	Length/ Ht	Weight	Length/ Ht	Weight	Length/ Ht
Hilly	7.2226	69.2258	9.6592	81.3061	12.9571	95.3143
Group 1	1.36566	3.27251	1.86437	6.59453	1.70890	5.06690
Plains	7.4846	68.6429	9.8792	81.1950	12.7870	96.4450
Group 2	.89777	2.53014	1.39125	5.68334	1.91233	5.01650

c) Weight for height

In Group 1, 62.2% of children were of normal weight for height and in Group 2, 66% were of normal weight for height. It was observed that wasting (< M-2 S.D to M-3S.D.) was slightly higher in Group 1 (11.3%) when compared to Group 2 (9.3%) representing the severity of under-nutrition. Severe wasting (< M-3.S.D) was observed to be almost similar, 9.3% and 8.7% respectively.

Fig 13: Distribution of weight for height/length



d) Head circumference and chest circumference

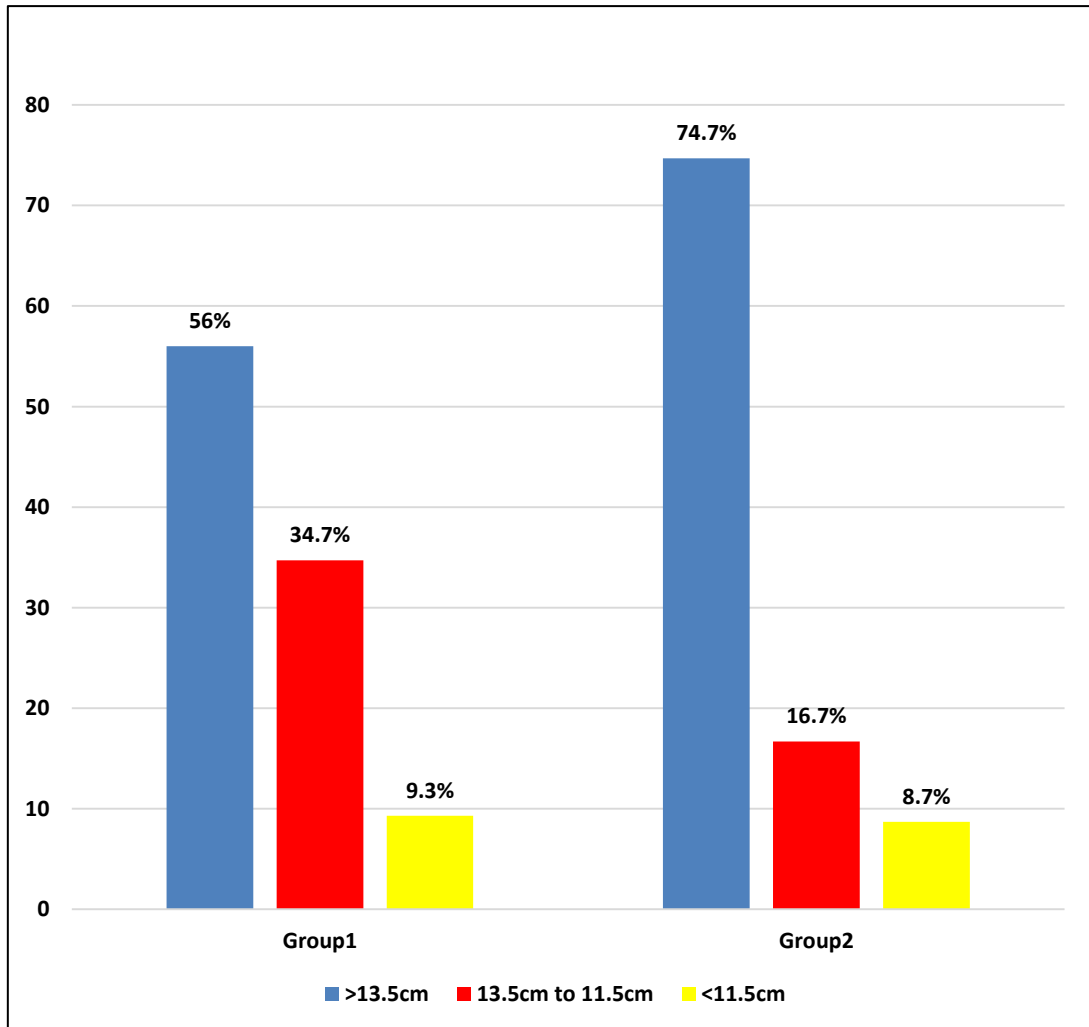
None of the children were observed to have microcephaly or macrocephaly with reference to their head circumference. Also up to the infancy the HC and CC proportion was maintained normal in all the subjects. After the age of one year, the Chest circumference exceeded the head circumference which was observed as normal in all children except in children with severe wasting in Group 1(9.3%) and Group 2(8.7%). In these severely wasted children the CC remained to be lesser than HC reflecting the severe form of under-nutrition.

e) Age independent parameters –Mid Arm Circumference (MAC)

Mid arm circumference which is an age independent criteria reflects the severity of under-nutrition depending on muscle, fat and bone mass in the growing child. 56% of children in Group 1 had normal MAC with 34.7% with mild to

moderate under-nutrition while 74.7% of children had normal MAC with only 16.7% suffering from mild to moderate under-nutrition. Severe form of Under-nutrition with MAC < 11.5 cm was observed to be similar in both the Groups.

Fig. 14: Distribution of Mid arm circumference

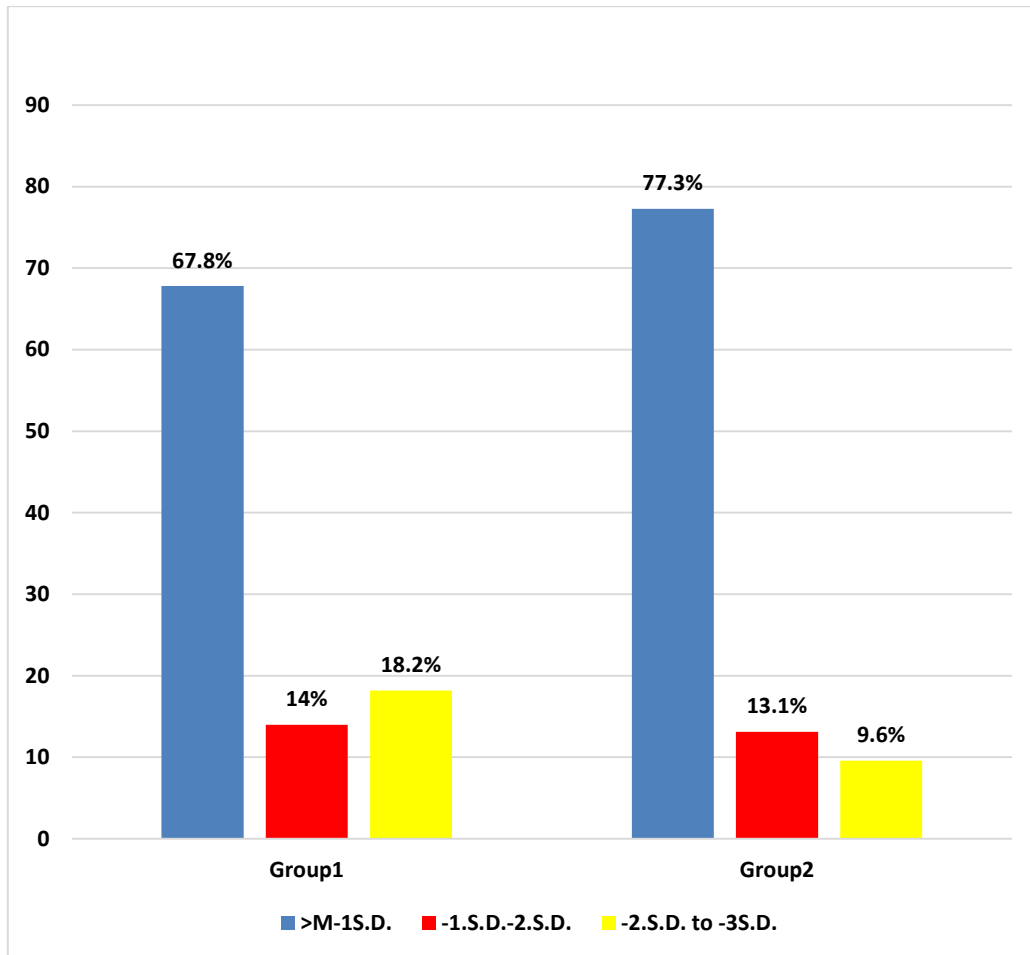


f) Body Mass Index (BMI)

Body Mass Index is a derived parameter from weight and height measurements.

In Group 1, 67.8% of children had normal BMI while 77.3% were normal in Group2. The severe form of under-nutrition based on BMI was observed higher in Group1 than 2.

Fig 15: BMI pattern among the two groups

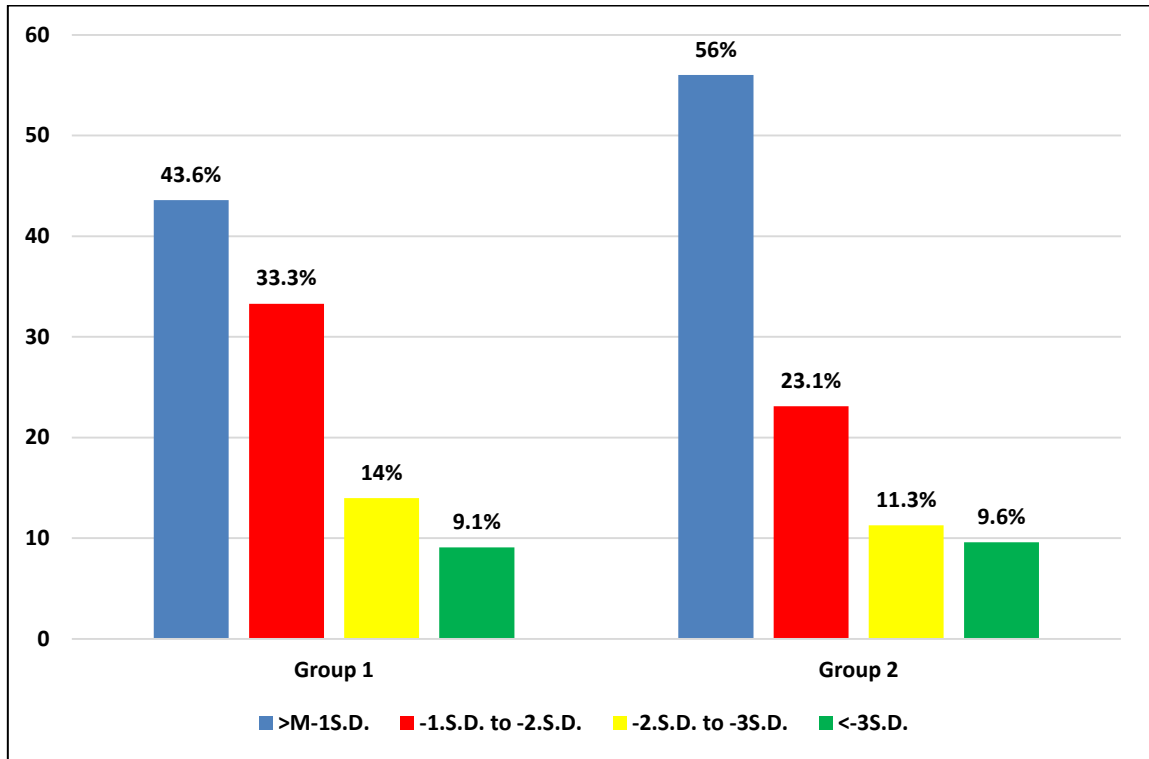


g) Triceps skin fold thickness

With regard to the measurement of Fat distribution in the subcutaneous tissue using Triceps skinfold thickness which reflects the overall nutritional status of the child, better nutritional status with normal skinfold thickness was observed in Group 2(56%) than Group 1(43.6%). The mild and moderate under-nutrition based on skinfold thickness was observed to be high in Group1 although the severe form was similar in both the Groups. Children with underweight were observed to have

reduced skinfold thickness in both the groups while children with SAM had very low skinfold thickness reflecting low cutaneous fat reserve in these children.

Fig 16: Pattern of nutritional status based on Triceps skinfold thickness



2.3) Hemoglobin estimation

Hemoglobin estimation was done to assess Micronutrient deficiency (Iron), Anemia was assessed with Hemoglobin estimation. In Group 1, the prevalence of Nutritional Anemia was very high (81.9%) in Group 1 than Group 2 wherein the prevalence was 61.1%. Majority of the children suffered from mild form of anemia in both Groups wherein the Group 2 was better than Group 1. The distribution of severe anemia was observed to be similar in both groups 9.3% and 9.6% respectively.

In Group 1, mean hemoglobin was 9.82 (SD=5.58) and in Group 2 mean Hb 10.21 (SD=2.11)

Fig 17: Anemia and its severity among the two groups

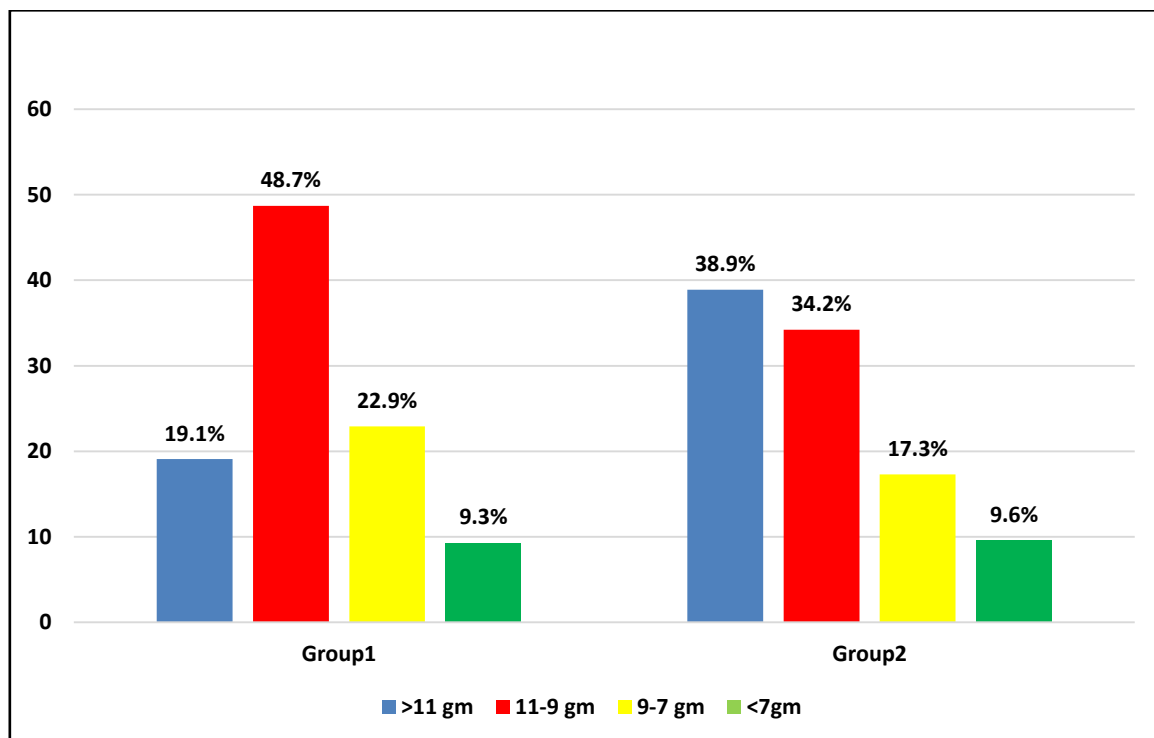


Table 10: Hemoglobin level Sexwise

		Normal	Anemic
Group 1	Male (248)	69 (27.8)	179 (72.2)
	Female (202)	12 (6)	190 (94)
Group 2	Male (239)	116 (48.5)	123 (51.5)
	Female (211)	59 (27.9)	152 (72.1)

2. Determinants of under-nutrition (Under-weight) within the Group 1

The determinants of under-nutrition within the Group 1 are discussed as follows:

3.1) Socio-demographic determinants

The following are the socio demographic determinants of under-nutrition among the children in Group 1 (p value < 0.05 is statistically significant).

Table 11: Socio demographic determinants of Undernutrition in Group 1

S.No	Socio –demographic characteristics	Underweight (n=198)	COR (95% OR)	P value
1	Increasing age of the child	69(35.4)	0.53(0.36-0.78)	0.001
2	Female Gender	122(61.6)	3.45(2.33-5.09)	0.000
3	Birth order - 3 and above	115(58)	2.60(1.67-4.04)	0.000
4.	Type of tribes	90(45.7)	1.12(0.76-1.61)	0.482
5	Religion	88(44.3)	1.13(0.72-1.74)	0.282
6	Non-literate mothers	177(89.3)	92.70(49.09-175.07)	0.000
7	Unemployed mothers	156(78.7)	1.82(1.18-2.80)	0.006
8	Non-literate fathers	93(68.4)	3.46(1.86-6.41)	0.000
9.	Unskilled type – father occupation	135(51.7)	2.14(1.45-3.15)	0.002
10.	Low family income	86(63.7)	3.18(2.09-4.84)	0.001
11	Nuclear family	116(35.7)	0.29(0.18-0.44)	0.01
12	Katcha type	175(88.3)	75.75(41.13-139.49)	0.002
13	unsafe drinking water	158(79.7)	20.92(12.89-33.96)	0.000
14	Open defecation practices	177(89.3)	92.70(49.09-175.07)	0.000
15	Barefoot walking practices	179(90.4)	115.51 (59.40-224.63)	0.000

The factors like increasing age of the child, female gender, higher order birth, non-literate mothers, low socio-economic status, poor environmental sanitation were statistically significant while the type of tribes and religion had no statistical significance.

3.2 Antenatal services and details of delivery

The following the determinants of under-nutrition with regard to antenatal services availed by the mother and the details of delivery.

Table 12: Antenatal services and details of delivery

S.No	Antenatal services and delivery details	Underweight (n=198)	Unadjusted OR (95%OR)	p value
1	Place of AN checkup HSC	90(45.4)	1.11(0.76-1.61)	0.582
2	Advice during checkup-VHN	90 (45.4)	1.111(0.70-1.74)	0.647
3	No intake of IFA	135 (68.18)	6.42(4.25-9.71)	0.000
4.	Maternal Anemia	144(72.7)	9.77(6.33-15.09)	0.000
5	Weight gain <7kg	112(56.5)	2.514(1.714-3.687)	0.000
6.	Mode of delivery-LSCS	78(39.3)	0.715(0.490-1.043)	0.081
7.	Place of delivery-Home	16 (66.7)	3.084(1.280-7.434)	0.012
8.	Birth weight<2.5kg	93(69.9)	4.694(3.029-7.276)	0.000
9.	Gestation-Pre term	98 (54.4)	2.14(1.45-3.15)	0.02
10.	Colostrum not given	105 (53.1)	1.930(1.322-2.819)	0.001

All the mothers have utilized the antenatal services like at least five antenatal checkups with two doses of Tetanus Toxoid given during the pregnancy. All the mothers have attended the session conducted by the VHN with the help of ASHAs where in the advice regarding good nutrition during the antenatal period was given. Antenatal check up and advice were not statistically significant. There occurred few home deliveries in spite of good motivation by the VHN to avail the institutional care for deliveries. These home deliveries were conducted by the trained dais and then the mother with the baby visited the PHC for a checkup during the immediate

postnatal period. Factor like maternal anemia, weight gain in mother, birth weight, preterm delivery, not feeding colostrum were statistically significant. Still the practice of giving prelacteal feeds like honey, water with sugar was observed in this group which was attributed to the belief of fear of inadequate milk.

3.3. Feeding practices (Breastfeeding and Complementary feeding, dietary pattern)

The following are the determinants for the under-nutrition with regard to infant and child feeding practices in the Group1.

Table 13: Infant and child feeding practices

S.No	Feeding practices	Underweight (n = 198)	COR (95% OR)	p value
1	Lack of awareness on EBF	138(69.6)	7.360 (4.839-11.195)	0.000
2	Non-Exclusive Breastfeeding	158(79.7)	20.929 (12.896-33.967)	0.000
3	Delayed complementary feeding (after 8 months of age)	83(41.9)	0.587 (0.365-0.943)	0.028
4.	Inadequate Calorie intake	156(78.7)	18.568 (11.545-29.864)	0.000
5	Inadequate Protein intake	169(85.3)	44.812 (25.798-77.839)	0.000
6.	No Nutritional supplements	147(74.2)	11.360 (7.297-17.684)	0.000
7.	Feeding practices in previous child	112(56.5)	2.514 (1.714-3.687)	0.000

In Group 1, 42% of the mothers had discontinued exclusive breastfeeding due to the following factors like fear of insufficient milk, job and insisted by the family members. Among those who had exclusively breastfed, 33% of the mothers had continued it beyond six months and started the complementary feeding only after 9-12 months which in turn affects the nutritional status failing to meet the

nutritional demands. The only nutritional supplement given was the supplements from the ICDS and only 43% of the mothers had utilized the ICDS facility and the others had no access due to distance from their village.

3.4: Utilization of health services and Health seeking behavior during illness

The following are the determinants of under-nutrition in terms of utilization of health services provided in the health facility and also the health seeking behavior of the mothers during the illness in their children.

Table 14: Utilization of health services and health seeking behavior.

S.No	Utilization of health services and health seeking behavior	Underweight (n = 198)	COR (95%OR)	P value
1	Partially immunized	102(64.4)	11.360 (7.297-17.684)	0.001
2	No Vitamin A supplementation	45(22.7)	0.064(0.040-0.102)	0.000
3	Recurrent diarrheal episodes >3	132 (67.1)	7.260 (4.839-11.195)	0.000
4.	Recurrent respiratory illness >3	83(41.9)	0.587 (0.365-0.943)	0.01
5	Home available treatment for illness	48(24.4)	11.360 (7.297-17.684)	0.001
6.	No Monitoring of nutritional status	165(83.3)	9.481(6.015-14.945)	0.000
7.	Non-utilization of ICDS	115(58)	2.821(1.918-4.148)	0.000

Majority of the mothers (72%) had sought the VHN for Immunization. Factors like Partial Immunization, Lack of Vitamin A supplementation, recurrent infections, poor utilization of health services were statistically significant factors for underweight. Still the practice of seeking home-made remedies were followed for respiratory infections and diarrhea existed in the community. No one had sought for native treatment practiced by the traditional healers in the community. Also no child had suffered from Exanthematous illness during the past 3 months. The mothers were referred to PHC for further treatment after the initial treatment by the VHN. No one had sought the private sector for health care need as it is costly and located far off from their residence. There was no monitoring of nutritional status of the child during the visit to the health facility.

3.5 Family Food security and Maternal Health

The family food security was assessed by the questionnaire to quantify the severity of hunger in the family and also maternal health was assessed with body mass index which reflects the overall health status of the family and economic status.

Table15: Food security in the family and maternal health

S.No	Family Health	Underweight (n = 198)	COR (95% OR)	p value
1	Food insecurity in the family	155(78.2)	2.821 (1.918-4.148)	0.000
2	Low Maternal BMI	116(58.5)	2.932 (1.992-4.316)	0.000

Food insecurity in the family and maternal Thinness in the form of low BMI were statistically significant with under-nutrition.

Table 16:Multivariate Analysis for Group I:

S.No	Determinants	Adjusted OR(95%OR)	p value
1.	Increasing age of the child > 3 years	0.33(0.26-0.58)	0.001
2.	Female Gender	2.45(1.33-4.09)	0.000
3.	Birth order - 3 and above	2.20(1.47-3.74)	0.000
4.	Non-literate mothers	82.70 (39.09-125.07)	0.000
5.	Poor sanitation	18.92(10.89-31.96)	0.000
6.	Place of delivery (Home)	2.784(1.180-4.434)	0.03
7.	Non-Exclusive breastfeeding	17.929 (10.896-24.967)	0.000
8.	Delayed complementary feeding	0.387 (0.165-0.643)	0.02
9.	Dietary pattern – inadequate calorie and protein	16.568 (10.545- 24.864)	0.000
10.	Health seeking behaviour	0.496(0.278-0.814)	0.02
11.	Monitoring of Nutritional status	7.481(4.015-11.945)	0.000
12	Lack of Nutritional supplements	2.121(1.418-3.548)	0.01
13.	Family Food insecurity	6.481(3.015-9.945)	0.000

The factors like increasing age, female gender, higher order birth, maternal illiteracy, poor sanitation, Home delivery, non- exclusive breastfeeding, delayed complementary feeding, inadequate calorie and protein, poor health seeking behavior, lack of monitoring of health status and family food insecurity were the statistically significant factors for under-nutrition among the group 1.

Determinants of Under-nutrition(Underweight) among the Group 2

The determinants of under-nutrition within the Group 2 are discussed as follows:

a. Socio-demographic determinants

The following are the socio demographic determinants of under-nutrition among the children in Group 2 (p value < 0.05 is statistically significant).

Table 17: Socio-demographic determinants

S.No	Socio –demographic characteristics	Underweight (n=150)	COR (95% OR)	p value
1	Increasing age of the child	60(34.4)	0.53(0.36-0.78)	0.001
2	Female Gender	112(57.6)	3.35(2.03-4.79)	0.000
3	Birth order - 3 and above	96(56)	2.47(1.57-4.04)	0.000
4.	Type of tribes	88(44.7)	1.02(0.74-1.61)	0.462
5	Religion	82(43.3)	1.11(0.70-1.73)	0.262
6	Non-literate mothers	172(86.3)	91.70(49.09-175.07)	0.000
7	Unemployed mothers	152(78.7)	1.77(1.14-2.80)	0.006
8	Non-literate fathers	29(19.0)	0.897 (0.507-1.585)	0.722
9.	Unskilled type – father occupation	131(51.7)	2.11(1.42-3.12)	0.002
10.	Low family income	84(61.7)	3.16(2.06-4.84)	0.001
11	Nuclear family	111(32.7)	0.28(0.18-0.44)	0.01
12	Katcha type	92(36.7)	1.407 (0.944-2.097)	0.09
13	unsafe drinking water	152(79.7)	19.52(11.89-30.96)	0.000
14	Open defecation practices	60(40.0)	0.643 (0.427-0.968)	0.034
15	Barefoot walking practices	119(79.3)	33.310 (19.361-57.308)	0.000

3.2 Antenatal services and details of delivery

The following the determinants of under-nutrition with regard to antenatal services availed by the mother and the details of delivery.

Table 18: Antenatal services and details of delivery

S.No	Antenatal services and delivery details	Underweight (n=150)	Unadjusted OR(95%OR)	p value
1	Place of AN checkup	88(44.4)	1.01(0.74-1.61)	0.972
2	Advice during checkup	65 (43.3)	0.765(0.453-1.292)	0.316
3	No intake of IFA	90(20.0)	0.643(0.427-0.968)	0.034
4.	Maternal Anemia	90(60.0)	6.000(3.895-9.243)	0.000
5	Weight gain <7kg	60(40.0)	0.643(0.427-0.968)	0.034
6.	Mode of delivery-LSCS	38(25.3)	0.570(0.368-0.881)	0.011
7.	Birth weight<2.5kg	83(69.9)	4.194(2.729-6.676)	0.000
8.	Gestation-Pre term	87 (44.4)	2.04(1.25-2.85)	0.01
9.	Colostrum – not given	30 (20.3)	0.402(0.244-0.629)	0.000

All the mothers have utilized the antenatal services like at least seven antenatal checkups with two doses of Tetanus Toxoid given during the pregnancy. All the mothers have attended the session conducted by the VHN where in the advice regarding good nutrition during the antenatal period was given. There were no home deliveries observed in this Group.

Very few still the practice of giving prelacteal feeds like honey, water with sugar in this Group which was attributed to the cultural belief although this practice has been discouraged to greater extent following the advice by the health professional.

3.3. Feeding practices (Breastfeeding and Complementary feeding, dietary pattern)

The following are the determinants for the under-nutrition with regard to infant and child feeding practices in the Group 2.

Table 19: Infant and child feeding practices

S.No	Feeding practices	Underweight (n = 150)	Unadjusted OR(95%OR)	p value
1	Lack of awareness on EBF	35(23.3)	0.490 (0.314-0.763)	0.002
2	Non-Exclusive Breastfeeding	92(67.6)	9.228 (5.834-14.59)	0.000
3	Delayed complementary feeding (after 8 months of age)	53(35.33)	1.660 (1.050-2.626)	0.030
4.	Inadequate Calorie intake	60(40.0)	1.556 (1.033-2.343)	0.034
5	Inadequate Protein intake	98(65.3)	8.987 (5.731-4.094)	0.000
7.	No Nutritional supplements	112(50.0)	4.947 (3.199-7.650)	0.000
8.	Feeding practices in previous child (Non-EBF)	77(51.3)	3.280 (2.166-4.966)	0.000

In Group 2, 70% of the mothers had practiced exclusive breastfeeding and the rest had the following factors like fear of insufficient milk, job and insisted by the family members. Among those who had exclusively breastfed, 33% of the mothers had continued it beyond six months and started the complementary feeding only after 9-12 months which in turn affects the nutritional status failing to meet the nutritional demands. The only nutritional supplement given was the supplements from the ICDS and only 43% of the mothers had utilized the ICDS facility and the others had no access due to distance from their village.

3.4: Utilization of health services and Health seeking behavior during illness

The following are the determinants of under-nutrition in terms of utilization of health services provided in the health facility and also the health seeking behavior of the mothers during the illness in their children.

Table 20: Utilization of health services and health seeking behavior.

S.No	Utilization of health services and health seeking behavior	Underweight (n = 150)	Unadjusted OR(95%OR)	p value
1	Partially immunized	35(23.3)	0.490 (0.314-0.763)	0.002
2	No Vitamin A supplementation	29(19.3)	0.355 (0.222-0.565)	0.000
3	Recurrent diarrheal episodes	68(45.3)	2.205 (1.464-3.321)	0.000
4.	Recurrent respiratory illness	90(30.0)	0.643 (0.427-0.968)	0.034
5.	No Monitoring of nutritional status	34(22.7)	0.465 (0.297-0.727)	0.001
6.	Non-utilization of ICDS	45(30)	0.796 (0.522-1.214)	0.289

Majority of the mothers (72%) had sought the VHN for Immunization, Vitamin A supplementation and minor ailments in their children although still the practice of seeking home-made remedies were followed for respiratory infections and diarrhea existed in the community. No one had sought for native treatment practiced by the traditional healers in the community. Also no child had suffered from Exanthematous illness during the past 3 months. The mothers were referred to PHC for further treatment after the initial treatment by the VHN. No one had sought the private sector for health care need as it is costly and located far off from their residence. There was no monitoring of nutritional status of the child during the visit to the health facility.

3.5 Family Food security and Maternal Health

The family food security was assessed by the questionnaire to quantify the severity of hunger in the family and also maternal health was assessed

Table 21: Food security in the family and maternal health

S.No	Family Health	Underweight (n = 198)	Unadjusted OR(95%OR)	p value
1	Food insecurity	88(58.6)	2.821 (1.918-4.148)	0.001
2	Low BMI in mothers	60(40.0)	1.556 (1.033-2.343)	0.034

Food insecurity in the family and maternal Thinness in the form of low BMI were statistically significant with under-nutrition.

Multivariate analysis in Group 2:

Table 22 : Multivariate analysis of Factors in Group 2:

S.No	Determinants	Adjusted OR(95%OR)	p value
1.	Increasing age of the child	0.43(0.26-0.68)	0.01
2.	Female Gender	3.05(2.33-5.09)	0.001
3.	Birth order - 3 and above	0.415 (0.238-0.718)	0.02
4.	Non-literate mothers	10.217 (8.048-21.080)	0.000
5.	Poor sanitation	7.994 (4.746-12.076)	0.000
6.	Non-Exclusive breastfeeding	5.000(3.095-8.443)	0.000
7.	Delayed complementary feeding	1.260 (1.010-2.426)	0.01
8.	Dietary pattern	3.847 (2.199-5.650)	0.001
9.	Monitoring of Nutritional status	2.880 (2.166-4.066)	0.000
10.	Family Food insecurity	1.8 (1.161-2.821)	0.002

The factors like increasing age, female gender, higher order birth, maternal illiteracy, poor sanitation, non- exclusive breastfeeding, delayed complementary feeding, inadequate calorie and protein, lack of monitoring of health status and family food insecurity were the statistically significant factors for under-nutrition among the group 2. There were no home deliveries and Health seeking behavior was observed better in Group 2.

Distribution of factors among SAM in both groups

Table 23 : Distribution of factors among SAM in both groups

S.No	Variables	Weight for height M<-3.S.D. Group 1 n=42(%)	Weight for height M<-3.S.D. Group 2 n=39(%)
1	Increasing age of the child > 3 years	29 (69)	22 (56)
2	Female Gender	30(71)	27(69)
3	Birth Order – 3 and above	36 (85)	22 (56)
4	Open defecation	40(95.2)	28(71.7)
5	Birth weight (>2.5kg)	28(66)	20(51)
6	No Exclusive breastfeeding	37(88)	30(76)
7	Complementary feeding		
	6-8 months	19(45.2)	12(30.7)
	>8months	23(54.8)	27(69.2)
8	No Vitamin A	33 (78.6)	26 (68.6)
9	No ICDS supplementation	42 (100)	29 (74.3)
10	Inadequate calorie	32(76.2)	30(76.2)
11	Inadequate Protein	37 (88.1)	32 (82.1)
12	Partial immunization	37(88.1)	29(74.3)
13	Respiratory infection (>3 episodes)	27(64)	19(48)
14	Diarrhea (>3 episodes)	33(78.2)	27(69.2)
15	No Monitoring by health personnel	33(78.2)	28(71.2)
16	Food insecurity in the family	37(88)	35(83)

The nutritional status of the children in both the groups was compared using the clinical parameters, anthropometric and level of Hemoglobin which are as follows:

- A. Clinical features of Under-nutrition between the two Groups
- B. Anthropometric outcomes between the groups
- C. Hemoglobin estimation between the two groups

Table 24: Comparison of clinical features of Under-nutrition between groups:

S.No	Clinical Parameters	Group 1		Group 2		p-value
		N=450	%	N=450	%	
1	Hair color					
	Depigmented	145	32.2	122	27.1	0.021
2	EYES					
	Conjunctival pallor	311	69.1	275	61.1	0.011
	Bitot spot	33	7.3	-	-	-
3	EAR					
	Wax	228	50.7	237	52.7	0.548
	Pus	95	21.1	96	21.3	0.941
4	ORAL CAVITY					
	Presence of Cheilitis	198	44.0	155	34.4	0.003
	Presence of Glossitis	135	30.0	96	21.3	0.002
	Presence of Dental Caries	281	62.4	155	34.4	0.000
	Hygiene practices					
5	Skin for impetigo	82	18.2	63	14.0	0.086
6	Hygiene in nails	86	19.1	60	13.3	0.018
7	Palmar pallor	85	18.9	43	9.6	0.000

Hence the Group 1 had significant clinical features of under-nutrition when compared to the Group 2 except Impetigo in skin and ear wax.

B. Anthropometric assessment of Under-nutrition among two Groups

Table 25: Prevalence of underweight (based on weight by age)

Weight	Group 1		Group 2	
	N=450	%	N=450	%
>M-2S.D.	252	56.0	300	66.7
<M-2S.D. to > M-3S.D.	156	34.7	107	23.8
<M-3S.D.	42	9.3	43	9.6
Total	450	100.0	450	100.0

$$\chi^2 = 13.315$$

$$p=0.001$$

About 44 % were undernourished with regard to weight for age among the group1 while 33.3% were suffering from under-nutrition among the group 2 with statistical significance.

Table 26: Prevalence of stunting (based on height by age)

Height	Group 1		Group 2	
	N=450	%	N=450	%
>M-2 S.D.	322	71.6	330	73.3
<M-2 S.D. to >M-3 S.D.	91	20.2	86	19.1
<M-3 S.D.	37	8.2	34	7.6
Total	450	100.0	450	100.0

$$\chi^2=0.3662$$

$$p=0.8327$$

With regard to stunting, the prevalence among the both the groups were observed to be similar but with regard to SAM (severe wasting) the prevalence was higher in group 1 than group 2.

Table: 27. Prevalence of wasting (based on weight by height/ length)

Height	Group 1		Group 2	
	N=450	%	N=450	%
>M-1 S.D.	280	62.2	297	66.0
-1 S.D. to -2 S.D.	77	17.1	72	16.0
-2 S.D. to -2 S.D.	51	11.3	42	9.3
<-3 S.D.	42	9.3	39	8.7
Total	450	100.0	450	100.0

$$\chi^2=1.6851$$

$$p=0.64$$

Table 28: Prevalence of severity of under-nutrition based on MAC

	Group 1		Group 2	
Mid-arm circumference	N=450	%	N=450	%
>13.5cm	252	56.0	336	74.7
13.5cm to 11.5cm	156	34.7	75	16.7
< 11.5cm	42	9.3	39	8.7
Total	450	100.0	450	100.0

$$\chi^2 = 40.514$$

$$p=0.000$$

In group 2, nutritional status based on Mid-arm circumference was observed to be better which was statistically significant.

Table 29: BMI pattern among the two groups

	Group 1		Group 2	
BMI	N=450	%	N=450	%
>M-1S.D.	305	67.8	348	77.3
-1.S.D. to -2.S.D.	63	14.0	59	13.1
-2S.D. to -3.S.D	82	18.2	43	9.6
Total	450	100.0	450	100.0

$$\chi^2 = 15.131$$

$$p=0.001$$

Table 30: Nutritional status based on the Triceps Skinfold Thickness

Triceps Skinfold Thickness	Group 1		Group 2	
Height	N=450	%	N=450	%
>M-1 S.D.	196	43.6	252	56.0
-1 S.D. to -2 S.D.	150	33.3	104	23.1
-2 S.D. to -2 S.D.	63	14.0	51	11.3
<-3 S.D.	41	9.1	43	9.6
Total	450	100.0	450	100.0

$$\chi^2=16.641$$

$$p=0.000$$

Based on BMI and Triceps skinfold Thickness, it was evident that the nutritional status of children in group2 was better than those counterparts in group1 with statistical significance.

B. Comparison of Anemia among the two Groups:

Table 31: Prevalence of Anemic and its severity

Hemoglobin	Group 1		Group 2	
	N=450	%	N=450	%
>11 gm	86	19.1	175	38.9
11-9 gm	219	48.7	154	34.2
9-7 gm	103	22.9	78	17.3
<7gm	42	9.3	43	9.6
Total	450	100.0	450	100.0

$$\chi^2 = 45.141$$

$$p=0.000$$

The prevalence of anemia was very high among the children in group 1 (80.9%) as against in the group 2 with 61.1% with majority in mild form of anemia (Hemoglobin 9 – 11 gm/dl) which was statistically significant. Regular deworming was observed among the group 2 as against the group 1

Thus the Group 2 was observed to be better in outcome measures of this study with statistical significance thereby depicting the better nutritional status in Group2 than Group1.

5. Comparison of determinants in both the groups:

The following are the determinants that determine the difference in the under-nutrition among the two groups of tribal children as follows:

- **Maternal education:**

Mothers in the Group 2 were better in educational status than Group1 with statistical significance which in turn determines the child feeding and rearing practices.

Table 32: Maternal educational status in between groups

Mother education	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
Illiterate	367	81.6	295	65.6
Primary	83	18.4	155	34.4
Middle	-	-	-	-
High	-	-	-	-
Secondary	-	-	-	-
Graduation	-	-	-	-
Total	450	100.0	450	100.0

$$\chi^2 = 29.612$$

$$p = 0.000$$

- **Socio-economic status :**

The Group 2 was observed to be in better socio-economic status than the Group 1 with statistical significance.

Table 33: Socio-economic status

Per capita	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
>Rs.6277	-	-	-	-
3139-6277	-	-	-	-
1883-3138	315	70.0	352	78.2
942-1882	135	30.0	98	21.8
<Rs.942	-	-	-	-
Total	450	100.0	450	100.0

$$\chi^2 = 7.928$$

$$p = 0.006$$

- **Birth order**

Group 1 had higher order birth more than the Group 2 which in turn determine the nutritional status of the child.

Table 34: Birth order

Birth order	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
First	179	39.8	308	68.4
Second	126	28.0	63	14.0
3 and >	145	32.2	79	17.6
Total	450	100.0	450	100.0

$$\chi^2 = 74.617$$

$$p = 0.000$$

- **Open defecation and Barefoot walking practices;**

Though the practice of open defecation and barefoot walking was observed in both the groups, it was statistically significantly higher in group 1 leading on to under-nutrition.

Table 35: Open defecation practices

Defecation	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
Open defecation	367	81.6	135	30.0
Safe toilet	83	18.4	315	70.0
Total	450	100.0	450	100.0

$$\chi^2 = 242.455$$

$$p = 0.000$$

Table 36 : Barefoot walking practices

Bare foot	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
Yes	364	80.9	255	56.7
No	86	19.1	195	43.3
Total	450	100.0	450	100.0

$$\chi^2 = 61.475$$

$$p = 0.000$$

- **Giving colostrum as first feed.**

Table 37: Colostrum as first feed

First feed	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
Colostrum	345	76.7	404	89.8
Other milk	105	23.3	46	10.2
Total	450	100.0	450	100.0

$$\chi^2 = 5.446$$

$$p = 0.024$$

Colostrum was given as first feed more in Group2 than Group 1 which determined the better nutritional status in children with statistical significance.

- **Awareness on Exclusive breastfeeding practices**

Mothers in Group 2 were better in awareness on exclusive breastfeeding practices than Group 1 which they had practiced and the nutritional status of their children were better than Group 1 with statistical significance.

Table 38: Awareness on Exclusive breastfeeding

Awareness	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
<2 months	-	-	-	-
2-3 months	40	8.9	23	5.1
4-5 months	95	21.1	45	10
up to 6 months	275	61.1	345	76.7
>6 months	40	8.9	37	8.2
Total	450	100.0	450	100.0

$$\chi^2=10.094$$

$$p=0.018$$

- Complementary feeding practices

Mothers in the Group 2 were better in the practice of giving timely complementary feeding at the end of 6 months in order to maintain the nutritional needs of the children which was statistically significant.

Table 39 : Timely introduction of Complementary feeding:

Time semisolid food	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
< 6 months	63	14.0	20	4.4
6-8 months	129	28.7	219	48.7
>8 months	258	57.3	211	46.9
Total	450	100.0	450	100.0

$$\chi^2=50.263$$

$$p=0.000$$

- Utilization of Health services (ICDS)

Mothers in the Group 2 had utilized the ICDS services and given the nutritional supplements to their children than those in Group1 which was statistically significant in determining under-nutrition among the groups. The reason given by the mothers in Group 2 was easy access to the ICDS centers from their villages.

Table 40: Utilization of ICDS services

Utilization of ICDS	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
Yes	166	36.9	275	61.1
No	284	63.1	175	38.9
Total	450	100.0	450	100.0

$$\chi^2 = 52.826$$

$$p=0.000$$

- **Monitoring of nutritional status of child by health personnel**

Regular monitoring of the nutritional status of the children in Group2 with the information passed on to the mothers played a significant role in better nutritional status in children than those in Group 1 with statistical significance.

Table 41: Monitoring of nutritional status of child during health visits

Health visit	Hilly tribe		Plain tribe	
	N=450	%	N=450	%
Yes	129	28.7	255	56.7
No	321	71.3	195	43.3
Total	450	100.0	450	100.0

$$\chi^2 = 72.111$$

$$p=0.000$$

- **Food insecurity in the family**

Table 42: Food insecurity in the family

		Food security		Total
		Secured	Insecure	
Group 1	Count	212	238	450
	% within Food secured	38.8%	67.2%	50.0%
Group 2	Count	334	116	450
	% within Food secured	61.2%	32.8%	50.0%
Total	Count	546	354	900
	% within Food secured	100.0%	100.0%	100.0%

$$\chi^2 = 69.3$$

$$p=0.000$$

Food insecurity was observed in both the groups leading on to under-nutrition but higher among the Group 1 than Group 2 with statistical significance.

Factors like increasing age, female gender, preterm and low birth weight, non-exclusive breastfeeding, inadequate calorie and protein intake in children were observed to be similar in both groups leading on to under-nutrition among both the groups.

Results of the analysis of Qualitative component

Focus Group Discussion

Two Focus Group Discussions were conducted as part of qualitative data collection in each Group for the purpose of exploring the cultural beliefs of the two tribal groups as a whole in infant and child feeding practices as well as health seeking behavior. Focus group discussion was conducted with 10 mothers who had children under the age of five with less than 1 year of age, 1-3 years and 3-5 years of age. These mothers were not included in the quantitative data collection.

Results of FGD in women in the Hills (Group 1)

The views of the mothers are as follows:

Maternal health during antenatal period and delivery

- With regard to pregnancy and maternal health care, all the mothers in two FGDs shared the importance of regular antenatal check up with advice of consumption of green leafy vegetables, milk and intake of Iron and Folate tablets for maternal and fetal well-being. Only few mothers could take the Iron Folate tablets regularly as others said that they had discontinued the course due to vomiting and abdominal cramps.
- All the mothers said that they avoid non-vegetarian food like chicken, pork during the pregnancy as they believe it might cause diarrhea and abdominal pain. They added that they do not consume extra food in addition to the usual practice during their pregnancy. The mothers said that they had preferred the Health Sub-center for antenatal visits where the VHN conducts the checkup but they utilize PHC only for deliveries. Few mothers shared the fact of occasional occurrence of home deliveries in their villages wherein trained dai conducts the delivery. They also expressed the utilization of medical college or Govt. Taluk hospitals located far off in the plains of the district when

referred for LSCS in view of complications during the delivery. The mothers said that they had not visited private clinics or private hospitals for the reasons like cost factor and far off from their residence.

Infant feeding practices

- Breastfeeding practices (Early initiation and Exclusive breastfeeding)

- All the mothers were given antenatal advice by VHN on the benefits of breastfeeding. But few mothers said that the practice of discarding the colostrum and giving prelacteal feeds like sugar, honey to the baby were practiced in their community as insisted by the elders in the family. Probable reason was fear of inadequate milk for the newborn.

To quote one mother – *my mother felt that breast milk will inadequate for the newborn and so she gave sugar mixed in water.*

Most of the children of these mothers were undernourished. Some mothers in the group said that they had given colostrum as the first feed for the baby, as insisted by the Nurse.

- As far as exclusive breastfeeding is considered, some mothers were aware of the fact that up to first six months the baby should be exclusively breastfed. Of whom, only few could successfully complete exclusive breastfeeding while others had the fear of insufficient breastmilk following which they had switched over to cow's milk.

To quote one mother –“*My 3months old baby cried incessantly from which I felt the milk is insufficient and gave cow’s milk in addition to my milk*”.

- Few mothers said that the babies on other feeds like cow’s milk were fed by bottle or paladai and no one preferred the formula milk due to its cost and non-availability. Mothers who were daily laborers expressed their difficulty in exclusive breastfeeding though they desired to. Out of the mothers who practiced the exclusive breastfeeding up to first 6 months, few of them said that they continued to exclusively breastfeed even after 9 months. Very few mothers had continued breastfeeding in their children even after the age of 2 years.

- **Complementary feeding practices**

- With regard to complementary feeding practices, in Group1, most of the mothers started the semi-solid food only after 8 months of age.

To quote one mother -” *In our village, we will give semi-solid food only when the infant sits without support*”

- The mothers preferred rice and millet as it was their staple food to be introduced in addition to breastmilk. Food groups like vegetable, pulses and oil were given only two or three days a week. Mothers said that they used to grow vegetables, rice in the field but the produce will be sold in market for livelihood. These food products were not used for consumption by the family members. In Group 1, mothers had a practice of giving only white of the egg and not the yolk after the age of 1 year.

To quote one mother, she said” *Yellow of the egg causes jaundice*”.

- Mothers had practiced giving non-vegetarian food after 18 months of age and they had a practice of giving chicken and pork. Pork was the staple non-vegetarian food during festivals and weddings. Mothers said that they used to feed Pork to children above the age of 3 years. Fish was given very occasionally. Most of the mothers said that their children refuse to eat any fruit when offered.

To quote few mothers – “*The elders in their families used to pressurize the feeding pattern as per our culture like giving millet as staple food in spite of the VHN giving us the advice to feed our children with rice, vegetables and fruits*”.

- Mothers said that they assist the child in feeding rice and other food items up to the age of 2 years and after that the children are allowed to feed themselves given in a plate. Some mothers said that they have a younger baby to take care by the time the older one was 2 years of age. Most of the mothers said that they feed their children only 3 times a day like the adults in their families. The children of these mothers were found to be suffering from under-nutrition. Only very few mothers who had children with normal nutritional status said that they feed their children with nutritious food 6 times a day.

Utilization of Health services

- In Group 1, mothers said that they approached the VHN for immunization services, Vitamin A supplements and nutritional advice for their children. Few mothers had the practice of utilizing the ICDS while the others felt it was located at quite a long distance. Mothers who were engaged in coolie work felt it to be difficult to receive their children in the middle of the day from the ICDS center when they had job at a far off place. So they preferred to get the egg and flour on the particular day of the week from ICDS center instead of sending their wards regularly. Mothers in the Group 1 did not visit any private sector health facility owing to cost factor and far off distance. It was observed that no other nutritional supplement other than ICDS source was given to the children in Group 1. Most of the mothers said that they brought up the children alone with no support from their families for their husbands stay away from home in other states like Kerala, Andhra Pradesh for months together for livelihood.
- Most of the mothers in the group said they are aware of the poor weight gain and poor growth of their children when compared with other wards and that they added that their children were normal at birth and till 1 year of age particularly till breastfed. These mothers said that only after 1-2 years of age, their children began to eat poorly and appeared to be undernourished.

To quote one mother, *“My baby was of good weight at birth and became thin after I stopped my milk at 1 year of age”*.

- They also added that the health care staff did not monitor the weight or height after the age of 18 months immunization and it was not recorded even during any visit to PHC for minor illnesses in their children.
- Mothers were not aware of the reasons why their children fail to gain weight and height in spite of being aware of the undernourished state of their children.

Health seeking behavior

- In Group 1, the mothers said that they had the practice of seeking the VHN or the PHC for any illness in their children. One mother said that they try giving available home remedies for respiratory illness and seek the health facility only if the child is not improving. Mothers said that they did not approach anyone who practiced native treatment in their community. As far as diarrheal diseases were concerned, the mothers sought for the VHN for treatment as early as possible and then only utilize the PHC for health services like ORS. No mothers were aware of Zinc supplementation for diarrhea. Few mothers said that they had easy access to VHN and they said that the PHC was located quite far which required travel by Government bus. As far as ICDS services, many mothers did not utilize the services like nutritional supplements, egg and flour etc for their children as the ICDS center was located at a far off distance from their residence.

To quote one mother, *“I am alone at home and I feel difficulty in taking my child to Balwadi located far off from my village”*.

- Also the mothers were very happy that they had ASHAs in their villages trained in the PHCs who used to contact the VHN at any time representing their health needs.
- The mothers expressed their desire that their children should be checked thoroughly in the PHC whenever taken for any illness.

To quote one mother, “*we need separate attention to be given to children if taken to the PHC for any illness and not to mix with the queue for adults*”.

Results of FGD in Group 2

The views of the mothers are as follows:

Maternal health during antenatal period and delivery

- With regard to pregnancy and maternal health care, all the mothers in two FGDs in the Group 2 shared the importance of regular antenatal check up with advice of consumption of green leafy vegetables, milk and intake of Iron and Folate tablets for maternal and fetal well-being. The VHN used to visit them at their village to advise them regarding the care of the mother during pregnancy. Few mothers could take the Iron Folate tablets regularly as others said that they had discontinued the course due to vomiting and abdominal discomfort.
- The mothers said that they avoid non-vegetarian food like chicken, fish during the pregnancy as they believe that it might cause harm to the baby.

To quote one mother, *“My body becomes hot if I take non-vegetarian food during my pregnancy which is bad for the baby”*.

- Three mothers had practiced the intake of additional meal and egg in addition to the usual practice they followed. The mothers said that they had discontinued the consumption of Pork which was practiced long ago in their community during wedding occasions and festivals.
- The mothers said that they go to PHCs and Government Taluk hospitals nearby their village for antenatal checkup. The mothers also stated that pregnant women in their tribal colonies used to attend the OPD in Government Medical College in the district for investigations and for delivery in case of emergency referral. Also they have observed that few mothers attended private clinics located nearby, for their antenatal checkup which were located nearby. The mothers said that there were no deliveries conducted in the home environment in their villages for the past few years.

Infant feeding practices

- Breastfeeding practices (Early initiation and Exclusive breastfeeding)

- In Group 2, the mothers said that they were given antenatal advice by VHN and staff nurse regarding the benefits of breastfeeding. Most of the mothers in the FGD expressed that they had given the colostrum as the first feed as early as possible to their babies. They admitted the fact that the practice of discarding the colostrum and giving prelacteal feeds like sugar, honey to the

neonate were still practiced in their community as insisted by the elders but now discouraged to a large extent.

- As far as exclusive breastfeeding is considered, many mothers were aware of the fact that up to first six months the baby should be exclusively breastfed. Of whom, most of them could successfully complete exclusive breastfeeding while few had the fear of insufficient breastmilk following which they had switched over to cow's milk.

To quote one mother who had switched over to other milk for her baby” *My baby cried always after I feed with my milk and so my mother-in-law insisted to introduce cow’s milk as the baby was thought to be still hungry”.*

- Mothers said that the babies on other feeds like cow's milk were fed by bottle or paladai. One mother said that she had also used formula milk which was available in the nearby medical shop as she had been guided by her neighbors but she discontinued after two months due to the cost factor.
- Mothers who were daily laborers expressed their difficulty in exclusive breastfeeding though they desired to. Most of the mothers had continued breastfeeding in their children up to the age of 2 years in addition to other food.

- **Complementary feeding practices**

- With regard to complementary feeding practices, in Group 2, most of the mothers started the semi-solid food by 6- 8 months of age. The preferred

food was rice with dhal and slowly started on smashed vegetables for the young infant.

- In Group 2, very few mothers had a practice of giving only white of the egg and not the yolk as they felt it causes jaundice which was advised as incorrect to them.

. To quote one mother, she said " *Yellow of the egg causes jaundice*".

- Mothers had practiced giving non-vegetarian food after one year of age and they had a practice of giving chicken. Food groups like vegetable, pulses and oil were given twice or thrice a week.
- Mothers said that they assist the child in feeding rice and other food items up to the age of 3-4 years and after that the children are allowed to feed themselves given in a plate. Most of the mothers said that they feed their children every 3 hours with food advised by the VHN.

Utilization of Health services

- In Group 2, most of the mothers said that they used to approach the VHN for immunization services, Vitamin A supplements and nutritional advice for their children. Many mothers had the practice of utilizing the ICDS as it was located nearby their house. Most of the mothers said that they used to approach the Medical college hospital for any illness in their children as they have bus facility to go there and they also added that the care was good in the hospital.

- Few mothers in the Group 2 sought even the private sector health facility for minor ailments in their children who had advised multivitamin supplements for their children.

To quote one mother, *“Doctor is available nearby my village and there is no big queue to see him. So I prefer to visit the private clinic”*.

- Few mothers in the group said they were aware of the poor weight gain and poor growth of their children when compared with other wards and that they added that their children were normal at birth and till 1 year of age particularly till breastfed.
- Many mothers said that the health professional monitored the weight or height during the Immunization and it was recorded during any visit to Government Medical College for minor illnesses in their children and they were always informed about the nutritional status of their children.

Health seeking behavior

- In Group 2, most of the mothers said that they had a practice of seeking the VHN as well as the PHC for any illness in their children. No mother had practiced any native medicine for any illness in their children.

To quote one mother, *“there was a practice of giving native medicine seeking the advice of elders few years ago but now we take the children to Government hospital if they are not well and give the medicine prescribed by the doctor”*.

- As far as diarrheal diseases or respiratory illnesses, the mothers had approached the Government Medical College for treatment as it was located nearby their residence. Few mothers were aware of Zinc supplementation for diarrhea which was given in the Medical College.
- All the mothers said that they were happy with the care given in the Primary Health center and also they were satisfied with the care given when referred to the Government Medical College for any illness.

Results of In-depth Interview in Group 1(Hilly)

Five mothers were interviewed individually and that they were not included in quantitative data collection. The views of these mothers are as follows:

- All the mothers said that they were residing in the hills for many years, generation after generation. They all had practiced agriculture, daily labor as profession with male members involved in wood cutting and spent many months in other state like Andhra Pradesh, Kerala for job leaving behind the family in Javvadu hills.
- Millet and rice were the staple food in their village. The mothers said that they grow vegetable, fruits but that were sold for their livelihood. The mothers shared the shortage of food in their families where they used to have only rice with water without any vegetables for few days a month.

Maternal health during the antenatal period and details of delivery:

- All the mothers had approached the VHN and PHC for their antenatal checkups and added that they were advised to consume green leafy vegetables, milk, non-vegetarian diet, Iron and Folate tablets for both their and fetal well-being. But only few mothers could take the Iron and Folate tablets as they had vomiting. They also avoided eating papaya and pork during the pregnancy as they believe it is harmful to the baby.

To quote one mother, *“I could not take the Iron tablets as advised by the VHN sister as I had vomiting and my mother-in-law also insisted upon stopping the tablets”*.

- All of them utilized the PHC for delivery but one mother shared the fact that few home deliveries occurred now also but not as many as that occurred few years ago.

Infant feeding practices (Breastfeeding and Complementary feeding):

- The mothers said that colostrum was the first feed given as soon as the birth of the baby but two mothers had been asked to give honey and sugar water by the family members as it was a cultural practice. One of the mother said that their mother-in-law had discarded the colostrum as it was believed to be not good to the baby.

To quote one mother, *“My mother-in-law expressed the first coming breast milk and discarded it saying that it was dirty milk and that the following fresh milk only should be given to my baby”*.

- Mothers felt that exclusively breastfeeding up to first 6 months of age is good as advised by the VHN but two mothers started on cow's milk as they felt that the baby is not gaining weight as usual.
- The mothers expressed the difficulty in exclusively breastfeeding when they go to job like daily labor. The grandmother used to give cow's milk when the mother had gone long distance for 100 days job scheme in the village.
- Mothers introduced semi-solid food only after 9 months of age and few still continued to feed only breastmilk till 1 year of age. The mothers said that they gave millet and rice as complementary feed and vegetables were introduced only after one year of age.

Child Feeding practices:

- All the mothers said that their children do not consume vegetables, fruits or milk regularly in their diet. They also added that the children refused to eat many times in a week. The children were fed with pork during the festivals and wedding occasion, chicken was given very rarely as they felt it not good to health of the baby.
- The children were fed by the mothers up to 2 years and then onwards the children feed themselves three or four times a day. Many times the elders in the family prepare the plan of meal though the VHNs advised to give nutritious food and the mothers used to follow the elders at home.

- Mothers shared that male children were taken care more than female children as a cultural practice in their community.

To quote one mother, *“In our community, we believe that male children are the one who will take care of our family even in old age and will conduct the rituals as per our religious beliefs. So they have to be given extra care”*

Utilization of health services and Health seeking behavior:

- The mothers did not give any nutritional supplements regularly to their children. Rarely the mothers used to give nutritional supplements and egg supplied in the ICDS center. The mothers shared that the ICDS centers were located far off from their homes and there was no one to help them to reach the centers daily when their husbands were engaged in daily work. They also added that they had to travel long distance for the bus facility to reach the centers.

To quote one mother, *“I find it difficult to leave my child in Balwadi when I have to go for coolie work during the day as the center is located far off from my village and that there is no one to bring my child back to home”*

- Most of the mothers preferred the VHN for any health care need and used to utilize PHC for any illness in their children. One mother said that they used to give home based native treatment for cough and cold in her child and used to seek the VHN only if no improvement was observed.
- The mothers were not aware of the nutritional status of their children but they felt that their children are growing as compared with other wards.

- The mothers said that VHN or any health personnel did not record the weight or height of their children whenever taken for any illness to the PHCs while the weight was recorded regularly during the first one year of age during the immunization session.

Results of Indepth Interview in Group 2 (Plains)

Five mothers were interviewed as a part of Indepth interview and they were not included in the quantitative data collection. The views of these mothers are as follows:

- All the tribal mothers who were residing in the plains had migrated here 10-15 years ago from the Javvadu hills. The tribal people in the plains had practiced agriculture as well as daily labor as profession with male members involved in daily labor, electrical work and construction of building. Few men used to go out of the state for livelihood leaving their families in the villages.
- Rice was the staple food followed in their village and they used to consume millet occasionally. Occasionally they face food shortage in the family wherein they used to take some food available to tide over the crisis.

Maternal health during the antenatal period and details of delivery:

- Most of the mothers had approached the VHN and PHC for their antenatal checkups and one mother had utilized the Government Medical College for her checkups.

- The mothers said that they were advised to consume green leafy vegetables, milk, extra diet, Iron and Folate tablets for both their and fetal well-being which almost all the mothers had adopted. Two mothers could not take the Iron and Folate tablets as they had vomiting. They also avoided eating papaya and pork during the pregnancy.
- The mothers had utilized the PHC for their deliveries and one mother had utilized the Government Medical College for delivery of her baby as it was easy to access the college by Government bus from her village. She also added that she was aware of all the facilities available for delivery in the Medical College.

Infant feeding practices (Breastfeeding and Complementary feeding):

- The mothers said that colostrum was the first feed given as soon as the birth of the baby but one mother shared that still occasionally the practice of giving honey and sugar water to the newborn before the breastmilk was followed in their community although had been discouraged to larger extent than that practiced few years ago.

To quote one mother, *“Our VHN sister had advised my family members to help me in giving the breastmilk soon after the birth of my baby as it is healthy for the baby”.*

- Most of the mothers felt that exclusively breastfeeding up to first 6 months of age is good as advised by the VHN but one mother said that she had started to give cow’s milk to be baby by 3 months as she felt that the baby

was not gaining weight as usual. The mothers expressed the difficulty in exclusively breastfeeding when they go to job like daily labor.

- Most of the mothers introduced semi-solid food after 6 months of age and few still continued to feed breastmilk till 2 years of age. The mothers said that they gave rice as complementary feed and vegetables were introduced after 8 months of age. Chicken, egg and fish were given sometimes in a week to their children. The children were fed by the mothers up to 3 -4 years and then onwards the children feed themselves. Two mothers had practiced giving frequent feeds every 3 to 4 hours once a day as advised by the doctor in the Government Medical College.
- Mothers were advised by the VHN regarding the appropriate nutritious food to be given daily to their children. Male children were taken care more than female children as it was practiced so in their community.

Utilization of health services and Health seeking behavior

- The mothers said that they used to give supplements given in Balwadi ICDS food to their children regularly and even gave egg given in the ICDS center. They said that the ICDS center is not very far from their village and they will leave their children during the morning and receive them by afternoon.
- The mothers preferred the VHN for any health care need and utilize PHC for any illness in their children. The mothers utilized the Government Medical College when the illness persisted more than 3-4 days. The

mothers also added they the practice of native treatment no longer existed in their community.

- The mothers said that they were informed about the weight and height status of their children as it was regularly monitored in ICDS center and Government Medical College during the visits for any illness.

To quote one mother, *“The doctor in the Medical College informed that my baby was 3 kg less weight than the normal and advised me to give healthy food for my baby”*.

CHAPTER VI

DISCUSSION

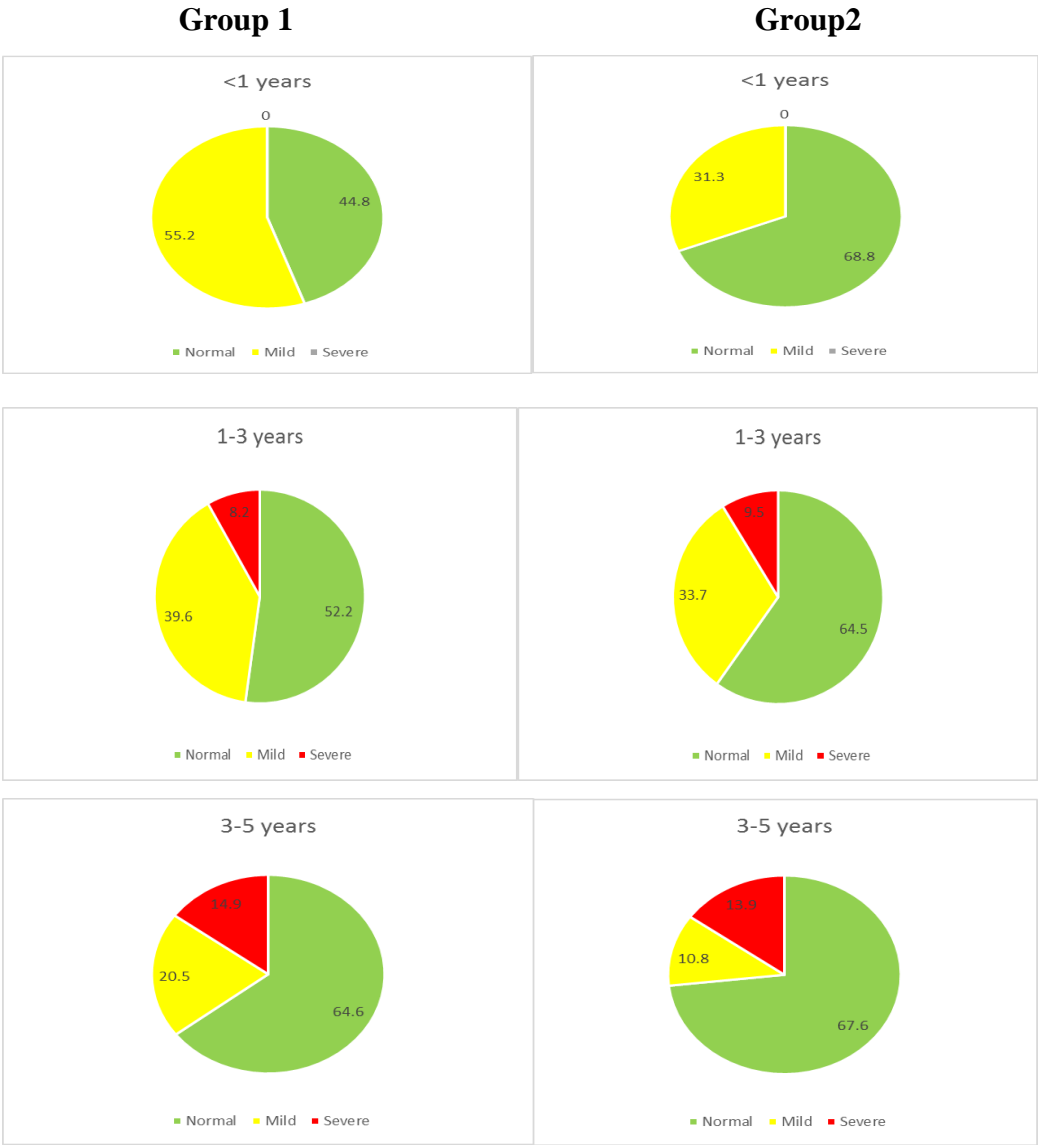
This study aims to examine the hypothesis that the tribal children under the age of five years who had migrated and settled in the plains of Thiruvannamalai District of Tamil Nadu have lower prevalence of under-nutrition when compared to those tribal children residing in the Javvadu hills in the District although though they are of same tribal origin and ethnic group. The results of the study revealed that the prevalence of under-nutrition among the Group1(hills) was 44%, CI = (39.5 - 48.6) while that in the plains was 33.3% CI = (29.1 - 37.8) depicting a difference of 10.7 % with statistical significance ($p = 0.001$). Thus the tribal children in the plains had a better nutritional status than their counterparts in the Javvadu hills in spite of similar ethnic origin and cultural beliefs supporting the Hypothesis. But the prevalence of Severe Acute Malnutrition (SAM) as per MAC in both the groups were almost similar i.e. 9.3% and 8.7 % in Group 1 and 2 respectively.

The overall prevalence of under-nutrition in both the groups (hills and plains) remains as an important public health problem in the vulnerable sector as reported by Laxmaiah et al among the tribal under-five children in Andhra Pradesh to be 65.4%⁵⁸ and Jerath et al among the Sahariya tribal children in Madhya Pradesh to be 59.1%⁵⁹. VG Rao et al also reported a similar prevalence of 60% with underweight and 25% with SAM in Gond tribe of Madhya Pradesh⁶³ while Dolla C K et al reported that 59.8% were underweight and 26.2% with SAM in Kodaku Tribe in same state of Madhya Pradesh⁶⁵. This study was designed to identify and compare the determinants for the under-nourished state of these tribal children in both the groups.

Distribution of under-nutrition among the different age groups in two Groups

The following illustration depicts the difference in the distribution of under-nutrition based on the underweight among the different strata of age groups in between the two Groups. This also depicts that mild to moderate under-nutrition was more in younger age group while no severe form of under-weight during the infancy. In contrast, the severe form was observed to be higher as age of the child advanced.

Fig 18: Distribution of under-nutrition among the different age groups



So the severity of under-nutrition increased with increasing age probably due to lack of nutritional support during the increasing demands in later age group and also due to failure of intervention during the milder stage of under-nutrition. No child in this study had Kwashiokar but SAM was observed to be 8-9% in both the groups which is still higher when compared to the National figures of severe under-nutrition 7.4% as per NFHS-4⁹. The results of the study clearly depicted that as the age of the child advanced, the severity of under-nutrition increased which reflects that during the first 2 years of age, the breastfeeding support prevented the child from slipping into malnutrition. Once the breastfeeding was stopped and no appropriate nutritional support was given there arose a mismatch in demand in the growing child leading on to an increase in severity of under-nutrition. This was supported by the qualitative data, where the mothers in Group 1 said that their babies were of normal weight at birth and thriving well up to infancy and then onwards they did not gain weight or height for many months.

Also, the female children were more under-nourished in both the groups, 64.1% in Group 1 and 61.3% in Group 2 when compared to male counterparts probably due to female child neglect as supported by the view of mothers during the in-depth interview. Vinod Mishra et al also reported the role of sex differentials in childhood feeding and its impact on the nutritional status of children⁵⁰. The determinants of under-nutrition like age of the children and gender were observed to be almost similar in both groups. Various determinants like maternal illiteracy, higher order birth, lower socio-economic status, poor environmental sanitation, family food insecurity, lack of awareness on nutrition, non-exclusive breastfeeding practices, inappropriate complementary feeding as well as inadequate nutritive food, lack of

nutritional supplements, recurrent infections and poor utilization of health services had played an important role in web of causation of under-nutrition among the two groups individually. However the determinants which were the underlying factors for the difference in the under-nutrition between the two groups are discussed below.

Determinants of difference of under-nutrition between the two Groups

The following are the determinants with statistical significance which influenced the difference in under-nutrition among the two groups.

Birth order

Higher order birth (3 and above) was observed to be highly prevalent in the Group 1 (32.7%) when compared to those in Group 2 (17.6%) which determined the higher prevalence of under-nutrition among the Group 1 as reported by Md Israt Rayhan et al wherein higher order birth was an important risk factor for under-nutrition among the under-five children⁸³. This has an influence in the sharing of the family food and the child being subjected to reduced intake of nutritious food added to the existing food insecurity. This was also supported by the qualitative data wherein the mothers in Group 1 during the FGDs said that once they had another baby, the care they had given in feeding the older child got diluted and the child had to feed themselves which in turn leads to poor intake of nutritious food. In Group 2, the mothers are exposed to general population and have access to health services which had probably influenced them in adopting the small family norm which in turn reflected on the better nutritional status in their children.

Maternal Literacy status

The mothers who have better educational status in the Group 2 (34.4%) than Group 1 (18.7%) appeared to be more aware of the nutritional status of their children and were able to seek for health care at the earliest during illness and to adopt the nutritional advice given by the health professional. This was not observed in the Group 1 where the mothers were not aware of appropriate nutritive food as reported by Madhu k et al that maternal literacy was an important determinant in exclusive breastfeeding, timely as well as appropriate complementary feeding practices and providing adequate nutrition in older children³⁸.

Breastfeeding practices

In Group 1, still the practice of prelacteal feed which is a part of their culture to give honey or water with sugar existed in spite of the nutritional advice given by the VHN during her visits. The mothers in the Group 1 who participated in the FGD also said that the elders of the community insisted on prelacteal feeds and also they had a fear of insufficient breastmilk soon after delivery. This practice had been discouraged by the tribal people in the plains probably because they have easy access to the general population as well as the health facility which had brought about a change in their cultural beliefs as evidenced by the FGD. Mridula Bandyopadhyay reported the practices of discarding colostrum and giving prelacteal feeds that existed in West Bengal⁴¹ and also Dash et al reported the practice of prelacteal feeds among the Santal tribes of Orissa⁴⁶.

Also, about 60 % of the mothers practiced exclusive breastfeeding in their children in Group 1 but they continued the exclusive breastfeeding even after 8-9 months. The mothers in the Group 1 during the FGD said that only after the child sits without support, they used to feed with semisolid food which is again faulty

technique where the nutritional demands were not met. On the contrary, the prevalence of under-nutrition among those who were not exclusively breastfed was high due to the introduction of diluted cow's milk which was not the right nutritional support for the young infant as reported by B Dakshayani et al⁴².

In Group 2, the mothers had better awareness on the benefits of exclusive breastfeeding and 70% had succeeded in exclusively breastfeeding till first 6 months. Mothers who had discontinued the exclusive breastfeeding had the fear of inadequate milk secretion and some who had engaged in daily labor shared the difficulty in breastfeeding due to job reasons in the FGD session. Failure of exclusive breastfeeding as well as prolonged breastfeeding is a risk factor for the young infant to slip into the pit of malnutrition.

Complementary feeding practices

The next important determinant of under-nutrition is the inappropriate and delayed introduction of complementary feeding which were observed to be practiced in the Group1. The transition from breastfeeding to family food should be done appropriately and with care to meet the nutritional demands else the child falls into the pit of malnutrition. Food which is semisolid, culturally acceptable with appropriate nutritive value and timely introduction between 6- 8 months of age in addition to breastmilk meets the nutritional demand during the next half of the infancy.

In Group 1, the staple food is millet which is introduced by the mothers to their infants as complementary feeding while few give rice but lesser extent as mentioned in the FGDs. These babies are predominantly breastfed even after 9-12

months which leads to calorie and protein deficiency and slowly these children progress from under-weight to stunting of growth. Arun Gupta et al⁵⁵ and Meshram II⁵⁶ reported that timely complementary feeding at the end of 6 months of life and appropriate feeding is an important step in prevention of under-nutrition among the under-five children. SAM was observed more in the age group 3-5 years as there was definite mismatch of nutritional demand and supplementation. Also the food groups like vegetables, fruits and egg were not added in the regular dietary pattern in their children. In Group I, there existed a cultural practice of consuming pork particularly during festivals and marriage where the children above the age of 3 years were offered pork. Other non-vegetarian food groups like chicken, fish are very rarely given to the children. The FGD revealed that egg yolk was avoided in diet of the child due to food fads like the belief “ yellow yolk of the egg causes jaundice”. The food groups like rice, vegetables grown in their own land also were reserved for sale and were not used for the consumption by the children and other family members.

In Group 2, the mothers practiced the right complementary feeding like semisolid rice based food stuff and slow introduction of vegetables in addition to breastfeeding from 6-8 months. The different food groups like fruits, non-vegetarian food like chicken, fish, and egg were given in frequent intervals in a week. The FGD in Group 2 revealed that there is a change in the cultural dietary pattern in the children like rice being fed by 6 to 8 months, encouraging the intake of vegetables, fruits, discouraging the intake of pork and timely introduction of adequate and appropriate complementary feeds. This awareness and the inclusion of the food with

high nutritive value had influenced the better nutritional status of the children in the Group 2.

Dietary pattern in feeding the under-five children and maternal role

The qualitative research done in the feeding pattern of the children in Group 1 revealed that the mothers had practiced giving food only three times a day for their children like adult dietary pattern and they attributed that to their cultural practice. Some mothers said that the child refused to eat whenever offered. Also it was observed in this study that the child was not assisted in feeding by the mothers after the age of two years where the child is offered food to be taken by itself and the other reason for the same is the need to take care of the next younger baby. But in Group 2, the mothers learnt to give frequent feeds probably every 3 to 4 hours and they assisted the child when feeding from the plate. This change in the cultural and child rearing practice among the Group 2 had influenced to a larger extent the better nutritional status of the children. In group 2, 70% of children received adequate calories and 56.7% received adequate protein in their diet than Group 1 (adequate calorie 56%, adequate protein 46.4%) Meshram II et al reported that the inadequate intake of calorie, protein and micronutrients is an important predictor of under-nutrition among the tribal children⁵⁶.

Utilization of Health services

The antenatal services, intra-natal care and postnatal care remains almost similar in both the groups wherein this change in their health seeking behavior is a welcoming step in reduction of maternal and neonatal mortality although few domiciliary deliveries occur in the Group 1. The utilization of immunization services, Vitamin A supplementation was observed to be better in both groups over the years as mentioned by the mothers in FGDs. Health seeking behavior during

illness in their children in Group 1 was restricted to the Village Health Nurse a larger extent. The FGD revealed that the mothers had sought the VHN for almost all the health needs of their children and that VHN visits their villages once in a month. The Primary Health center is the next level of health which is not in easy access to all in the hilly terrain. The mothers utilized the Government transport facility for reaching the PHCs which again was difficult for those residing in deep forest away from the road facility.

The mothers in Group 1 rarely utilized the tertiary care given in the Government Medical College located in the plains of the District which they felt as, located at far off distance from the hills. Also the ICDS centers were located in main villages which were difficult to access by the smaller villages and hamlets located in the hilly terrain. The FGD revealed that though the practice of native medicine is to a larger extent discouraged among the tribal people in the hills still the accessibility, availability and affordability for Primary Health care itself remains unsolved. In Group 2, it was observed that they had easy access to the health services in the plains apart from the regular visit by the VHNs. The facilities like Medical College, Government Taluk hospitals are easily accessible for health care by the mothers in the Group 2 in addition to the Primary health center. Also few mothers had sought the private sector for health care and supplementation of multivitamins which was noticed only in Group 2. These factors led to better health care for the children during the illness and better monitoring of health status. Vijayaraghavan K et al reported the importance of ICDS services to prevent the under-nutrition among the tribal under-five children in Andhra Pradesh⁶⁷.

Monitoring of health status of children by health professional

The monitoring of health status of the children in general and particularly during any visit to health facility for minor ailments is very important to detect the under-nutrition at the earliest and intervene as early as possible. In Group 1, it was observed that the anthropometric measurements and recording in the growth in the growth chart and sharing the information about the health of the children were not done regularly which was reported by the mothers, during the FGD. But in Group 2, the health of the child was monitored better during a visit to PHCs, Government Medical College and ICDS centers and the information about the health of the child was informed to the mothers. So this preventive measure is indeed essential to detect the malnutrition at the earliest and intervene to prevent morbidity and mortality.

Food security in the Family

This study revealed that there was a significant food insecurity existing in the Group1 wherein the overall nutritional status of the family was affected as evidenced by low BMI in the mothers in Group1. This in turn reflects on the nutritional status of the child. In Group 2 also there existed food insecurity (32.8%) but the severity was observed less than that in Group1(67.2%) . Sathya P et al reported that Food insecurity played an important role in anemia and under-nutrition among the under-five children⁷⁴.

Also Sreeramreddy CT et al reported the strong association of childhood under-nutrition and food insecurity in the family and recommended community based nutritional interventional programs to reduce the growth faltering in children⁷⁵.

Distribution of SAM and Anemia among the two groups

Though there existed a significant difference in the under-nutrition between the two groups of tribal children, the prevalence of SAM in this community was observed to be similar in distribution in both the groups. The prevalence of anemia was significantly higher in Group 1(80.9%) than Group2(61.1%) .Factors which played a significant role in SAM in both the groups were similar and are as follows. As age advanced there occurred a mismatch in nutritional demand in both groups with female children more affected than the male counterparts. The maternal illiteracy, lower socio-economic status, barefoot walking, higher order birth, unsafe drinking water, poor sanitation, preterm delivery, low birth weight, lack of awareness in mothers regarding nutrition, discarding colostrum, non-exclusive breastfeeding, delayed complementary feeding, inadequate nutrition, lack of nutritional supplementation particularly Iron supplements, absence of regular deworming, lack of monitoring of health status, poor utilization of health services was observed in both group of tribal people in this district which led to SAM in higher prevalence than the general population. These factors have to be rectified and implementation of community based nutritive programs is needed for the prevention of SAM and the reduction in under-five mortality as recommended by Sharghi⁹⁷ et al and Jamro et al⁹⁸ .

This study has shown that though the tribal groups were similar in origin and ethnicity, the nutritional status of the children under the age of five years which is an important indicator of health status of the community differs between the two groups significantly governed by various determinants. The preventive measures to combat the malnutrition in both the groups aim at rectifying those factors which adversely

influenced the nutritional status of the children. An inter-sectoral approach like improving the educational status, socio-economic status like job opportunities, facilities for easy access to health care, food security measures and health care etc is needed to rectify this public health problem.

Modifications in the health sector like providing more manpower to benefit small population who remain secluded in hilly terrain, train the health personnel to provide primary health care easily available, accessible and affordable, provision of more ICDS center, Training the health personnel on providing health education and Behavior Change Communication on healthy practices of personal hygiene, avoiding open defecation and use of foot wear, optimal feeding practices like exclusive breastfeeding and complementary feeding, discouraging harmful cultural practices, regular health monitoring using growth charts and create awareness in mothers regarding the nutritional status of their children are needed to reduce the morbidity and mortality due to under-nutrition.

CHAPTER VII

SUMMARY AND CONCLUSIONS

This study was designed to assess the prevalence of under-nutrition and identify the determinants among the tribal children under the age of five years residing in Javvadu hills and plains of Thiruvannamalai District in Tamil Nadu and thereby compare to identify the factors determining the difference in under-nutrition between these two groups although they are of same tribal origin and ethnic race.

This is a Community based **Observational study** using a **Mixed methods approach** with quantitative and qualitative components.

- A Cross-sectional survey method was used for the **quantitative component** to interview the mothers with a questionnaire to gather information on demographic profile, antenatal services, details of delivery, maternal health, infant & child feeding practices, child health, utilization of health services, details of illness health seeking behavior, maternal health and food security in the family.. Anthropometric and clinical assessment of nutritional status of the under-five children were done using a case study format.
- Focus Group Discussions and In-depth interviews were conducted for the **qualitative component** to obtain the information on socio-cultural beliefs governing infant and child feeding as well as child rearing practices and health seeking behavior.

Summary and conclusions:

There were 450 tribal children and their mothers in each group who had participated in this study.

- 1) The prevalence of Under-nutrition among the Group 1 was 44% CI = (39.5 - 48.6) and that in the Group 2 was observed to be 33.3% CI = (29.1 - 37.8)
- 2) The prevalence of under-nutrition is higher by 10.7% among the hilly group in comparison with the group2 in the plains with statistical significance (p=0.001).
- 3) Determinants like lack of maternal education, higher birth order with poor environmental sanitation were the major socio-demographic determinants leading on to the difference in under-nutrition among the two groups
- 4) Factors like Antenatal checkup, antenatal advice, and mode of delivery were similar between the Groups. While cultural practices like prelacteal feeds, non-exclusive breastfeeding, delayed and inappropriate complementary feeding, non- supplementation of any form of nutritional supplements, Food insecurity in the family in addition to lack of awareness on nutritional demand of the growing child, difficult access to health services were the major determinants of under-nutrition among the tribal children residing in the hills than those in the plains.

- 5) Hence the overall nutritional status of tribal children is better in the plains than their counterparts in hills although SAM is almost similar in both the groups.

Impact of the study

- Antenatal care and institutional deliveries have improved well among the tribal people in the Thiruvannamalai District, but still majority of mothers did not consume nutritive food and Iron folate tablets during pregnancy which in turn lead to low birth weight or preterm delivery. This also renders the children at risk of under-nutrition in future life. If these children born underweight were not monitored and nutritionally intervened, they slip into the pit of malnutrition particularly SAM as they grow older which in turn leads to recurrent infections and even death. So a special focus is needed to track these at risk children right from birth.
- In spite of improved facilities in the Primary Health care, there is a need to increase the man power like a VHN for every 3000 tribal population, particularly in hilly terrain to deliver health education, adopt small family norm, regular monitoring of health status of the tribal family as a whole, re-enforcing exclusive breastfeeding and complementary feeding, motivation to use the health services which is observed in the plains of the district.
- Improvement in overall environmental sanitation, provision of toilets, safe drinking water, health education to avoid barefoot walking have to be achieved in both the groups particularly in Hilly group.

- Health education on optimal infant and child feeding practices like frequent supervised feeds with nutritive value through repeated monitoring and follow up is needed to detect the malnutrition at the earliest.

Limitations

- This cross-sectional study was designed to assess the prevalence of under-nutrition among the tribal children under the age of five which assess the single time outcome of nutritional status and its determinants. More information on the trends of under-nutrition would be assessed if a longitudinal study was designed to follow these children over a period of time which could not be done for the time constraints.
- Cluster sampling method with PPS-LSS has brought out the prevalence in this study groups but still further studies with larger sample will throw more light on the facts governing the nutritional status in the inaccessible hilly terrain
- Qualitative research on wider spectrum will bring more information on the socio-cultural beliefs practiced in the tribal groups which influences the overall health of this community.
- Anemia was highly prevalent among the children in this community. Further studies to classify the anemia and to screen for Hemoglobinopathies etc will be needed in future.
- Investigations for other Micronutrient deficiencies like Iodine have not been included in this study

- The possibility of Recall bias exists during the interview of mothers with children of age > 2 years regarding their breastfeeding and Complementary feeding practices.
- Longitudinal follow up of nutritional status of the children with growth charts is to be implemented at primary health care level

CHAPTER VIII

RECOMMENDATIONS

- There is a strong need for improvement in the environmental sanitation, provision of safe drinking water, food security and betterment of socio-economic status through increasing women literacy and empowerment in this vulnerable sector in both the Groups.
- Health education and Behavior Change Communication on exclusive breastfeeding, timely and appropriate complementary feeding, Nutritional supplementation and regular follow up are needed to prevent under-nutrition.
- Creating health awareness against the faulty traditional beliefs of discarding colostrum, prelacteal feeds, inappropriate feeding practices is inevitable in the long run prevention of under-nutrition, in this under-served tribal community to prevent morbidity and reduce under-five mortality.
- Role of health personnel in monitoring the health status of the children regularly with growth charts and also during visit to health facility plays a vital role in early detection and intervention of malnutrition.
- Availability, easy accessibility to Primary Health care in the health sector at an affordable cost is the need of the hour for this vulnerable group.
- Provision of more ICDS centers for the hilly terrain and increase the manpower to focus on the family as a whole in this neglected sector of population will serve to solve the problem of under-nutrition.

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INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To

Dr. P. Saravana Kumar, M.D.,
Assistant Professor,
Stanley Medical College,
Chennai - 600001.

Dear **Dr. P. Saravana Kumar,**

The Institutional Ethics Committee has considered your request and approved for change in the title and proposal titled "Epidemiology of under-nutrition based on the anthropometric and clinical parameters among the tribal children aged 9 to 36 months in Jawadu Hills in Tiruvannamalai District, Tamilnadu" No.27072013 as **"A comparative study on the Epidemiology of under-nutrition based on the anthropometric and clinical parameters among the tribal under-5 children in Hills and plains of Tiruvannamalai District, Tamilnadu"**.

The following members of Ethics Committee were present in the meeting held on 03.06.2014 conducted at Madras Medical College, Chennai-3.

- | | |
|---|------------------------|
| 1. Dr. C. Rajendran, M.D. | -- Chairperson |
| 2. Dr. R. Vimala, M.D., Dean, MMC, Ch-3. | -- Deputy Chair Person |
| 3. Prof. Kalaiselvi, MD., Vice-Principal, MMC, Ch-3 | -- Member |
| 4. Prof. Nandhini, M.D. Inst. of Pharmacology, MMC, Ch-3. | -- Member |
| 5. Dr. G. Muralidharan, Director Incharge , Inst. of Surgery | -- Member |
| 6. Prof. Md Ali, MD., DM., Prof & HOD of MGE, MMC, Ch-3. | -- Member |
| 7. Prof. Ramadevi, Director i/c, Biochemistry, MMC,Ch-3. | -- Member |
| 8. Prof. Saraswathy, MD., Director, Pathology, MMC, Ch-3. | -- Member |
| 9. Prof. Tito, Director, i/c. Inst. of Internal Medicine, MMC | -- Member |
| 10. Thiru. Rameshkumar, Administrative Officer | -- Lay Person |
| 11. Thiru. S. Govindasamy, BABL, High Court, Chennai-1. | -- Lawyer |
| 12. Tmt. Arnold Saulina, MA MSW | -- Social Scientist |

We approve the proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee


VICE PRINCIPAL
MADRAS MEDICAL COLLEGE
CHENNAI-3.

R. No.3672 /A7 /2014

Office of the Deputy Director of
Health Services, Thiruvannamalai.

Date: 02.06.2014.

Sub: Public Health - SBHI Thiruvannamalai Health Unit District-
Prevalence of Under-nutrition based on the
Anthropometric and Clinical parameters among the tribal
Children aged 12 to 59 months in - permission to Collect
data requested - Regarding.

Ref: R.No.043662/SBHI-II/S3/2013 Dated:27.06.2013 Office
of the Director of Public Health and Preventive Medicine,
Chennai-6

03 000 03

In response to the reference cited above the following Block
Medical Officers are instructed that Dr. P. Saravanakumar, Research Scholar
Assistant professor, Government Stanley Medical College, Chennai is taking up
the "Prevalence of Under nutrition based on the Anthropometric and Clinical
parameters among the tribal Children aged 12 to 59 months" in this Health Unit
District and requested to provide permission to use the staff for guidance to
collect above data without interfering with the routine duty.

Jay-This
Deputy Director of Health Services,
Thiruvannamalai

To:

UB
2.6.14
The Block Medical Officers, Jammunamarathur, Thandrampattu, Chengam and
Polur

✓ Dr. P. Saravanakumar, Research Scholar Assistant professor, Government Stanley
Medical College, Chennai-1

Copy Submitted to:

Director of Public Health and Preventive Medicine, Chennai-6

S.No	Name of Tribal villages – Hills Group 1 (JAMANAMARATHUR- PHC)	Total <1yr	Total 1-3yr	Total 3-5yrs	Male	Female	Total under- five
1	Pakkamudayanaur HSC - Pakkamudayanur	3	14	11	19	9	28
2	komatur	15	14	15	24	20	44
3	Melur	3	3	4	6	4	10
4	Jamanamarathur	23	67	56	74	72	146
5	vallikottai	7	28	22	31	26	57
6	Nadur	1	5	8	4	7	10
7	Palamkottai	9	18	23	20	30	50
8	Kanaganeri	8	10	7	10	15	25
9	Marganur	13	23	19	26	29	55
10	Earimamarathur	3	5	7	6	9	15
11	Guniganthur	5	10	10	9	16	25
12	Kuriyanur	1	2	4	3	4	7
13	ATHIPET HSC - Athipet village	13	17	23	27	26	53
14	Mottulapattu	7	11	12	17	13	30
15	Mattukanur	8	11	14	18	15	33
16	Thanjankollai	6	10	11	17	10	27
17	Kovilmamarathur	8	15	12	21	14	35
18	Aattiyatur	5	13	14	17	15	32
19	Kumbalamarathur	6	15	15	19	17	36
20	Muttipattu	1	9	15	13	12	25
21	Jeemarathur	6	14	14	18	16	34
22	Aalanjanur	8	13	16	23	14	37
23	Sinthaloor	7	14	15	19	17	36
24	Palawadi	1	5	7	7	6	13
25	Palvari	3	6	5	9	5	14
26	Erunaiyanur	1	5	8	8	6	14
27	PERUNGATHUR HSC - Perungattur village	7	18	17	19	23	42
28	Thambareddy	6	14	17	11	26	37
29	kovilur	3	8	10	14	7	21
30	Vedathoppu	7	19	26	27	25	52
31	Melnellimarathur	4	14	14	18	14	32
32	Bornellimarathur	6	11	12	7	22	29
33	Erinellimarathur	5	14	17	14	22	36
34	Sevamarathur	3	9	8	12	8	20
35	Jambadi	5	12	15	20	12	32
36	Kundalathur	3	9	15	11	16	27

37	Thakkamarathur	6	14	18	30	8	38
38	Kovilanur	3	7	10	12	8	20
39	Kilur	1	4	5	4	6	10
40	THOPPUR HSC- Thoppur	6	11	14	13	18	31
41	Thimrinathur	7	13	16	17	19	36
42	Manthakattukollai	0	2	4	4	2	6
43	Thomkalur	1	3	7	6	5	11
44	Gunpenadi	3	7	12	12	10	22
45	Palamarathur	3	9	17	14	15	29
46	Valakavoor	0	3	6	5	4	9
47	Reddikottai	1	4	6	6	5	11
48	Narthamerathur	3	7	9	9	10	19
49	Chinnakuttai	2	9	13	11	13	24
50	Kuriyanoor	3	10	13	16	10	26
51	Orikuriyanur	0	1	6	4	3	7
52	Nallapattu	9	20	31	26	34	60
53	KALYANAMANTHAI HSC- Kalyanamantjai	9	17	26	27	25	52
54	Kuttathur	4	12	17	18	15	33
55	Velachanoor	8	15	22	24	21	45
56	Vannakottai	1	7	12	11	9	20
57	Melchalambadi	4	13	23	21	19	40
58	Melurpatti	2	9	11	10	12	22
59	Palakanoor	5	14	21	19	21	40
60	Padapancharathur	3	12	15	16	14	30
61	PULIYUR HSC- Puliur	1	9	12	12	10	22
62	Thallur	0	4	10	9	5	14
63	Erukkampattu	3	15	19	17	20	37
64	Mottur	0	3	8	4	7	11
65	Velamarathur	1	5	9	7	8	15
66	Kelvellamuchi	0	3	8	7	4	11
67	Melvellamuchi	3	11	14	14	14	28
68	Athukanoor	4	11	15	20	10	30
69	Valaikadu	0	4	7	5	6	11
70	Pullichakottai	0	1	4	1	4	5
71	Seramanthy	0	1	2	1	2	3
72	Nachamalai	1	5	10	9	7	16
73	Kuthaneerai	3	13	18	17	17	34
74	PERUMUTTAM HSC -Perumuttam	1	6	10	7	10	17
75	Melpattu	1	7	14	9	13	22

76	Cinnakilpattu	3	12	15	16	14	30
77	Thenmalai Athipattu	1	6	9	6	10	16
78	Periyakilpattu	5	16	22	20	23	43
79	Nellivasal	3	13	17	17	16	33
80	Melthattaiyapattu	1	7	16	16	8	24
81	Kelthattaiyapattu	1	5	11	12	5	17
82	Kotturkolai	0	3	10	6	7	13
83	Mottukolai	2	7	14	10	13	23
84	Mellayanoor	0	2	9	6	5	11
85	Pothiri	0	3	7	6	4	10
86	NAMMIYAMPATTU PHC - Pallathur	4	15	20	21	18	39
87	Avaravalasai	2	5	12	9	10	19
88	Mallimedu	1	5	12	9	9	18
89	Nagalur	1	5	14	10	10	20
90	Kilkanavayur	3	12	15	17	13	30
91	kavampattu	2	7	11	10	11	21
92	Puliyangkuppam	4	12	18	16	20	30
93	Murugamanthai	3	10	15	14	14	28
94	VEERAPPANUR HSC -Veerappanur	23	39	53	65	50	115
95	Bargur	5	10	14	13	16	29
96	Ettimarathur	2	9	14	10	15	25
97	Thithanur	3	11	21	18	17	35
98	Arasavalli	2	11	17	14	16	30
99	Mandapurai	4	15	19	19	19	38
100	Kalliparai	1	4	10	6	9	15
101	Malaikollai	1	5	11	7	10	17
102	valathambai	2	7	13	11	11	22
103	Melmarathur	1	3	7	5	6	11
104	Sadaiyanur	0	4	12	9	7	16
105	Pudhipattu	11	24	33	37	31	68
106	villangkuppam	7	22	31	32	28	60
107	Vallithathankatur	1	4	10	7	8	15
108	Odamangalam	1	10	14	15	10	25
109	Thumbakollai	0	3	7	4	6	10
110	Perumalai	2	5	11	10	8	18
111	SARANGAKUPPAM HSC- Sarangakuppam	5	21	31	30	27	57
112	Panaimarathur	0	2	6	3	5	8
113	Thathankuppam	8	18	23	19	30	49
114	Mutnattur	9	20	28	37	20	57

115	Nadanoor	10	20	28	35	23	58
116	Eriyur	2	5	11	8	10	18
117	Seramarathur	1	4	11	10	6	16
118	Pulikandranvalli	1	7	13	11	10	21
119	Machur	2	6	12	13	7	20
120	Kupsanur	13	26	39	43	35	78
121	Muthalaimadu	4	14	25	24	19	43
122	Nadupattu	4	13	26	26	17	43
123	PALLAMPATTU	4	17	24	31	14	45
124	Chittampattu	2	9	15	12	14	26
125	Amirthi	4	13	20	18	19	37
126	Neesampattu	7	23	35	35	30	65
127	Kanamalai	4	18	25	21	26	47
128	Lenthampattu	1	9	16	15	11	26
129	Neerthumbai	0	9	13	12	10	22
130	NAMMIYAMPATTU HSC-Namiyampattu	19	36	48	54	49	103
131	Keelkoovur	7	22	31	28	32	60
132	Thanneepudur	2	14	20	23	13	36
133	kollannalur	8	22	30	33	27	63
134	Pudur	1	7	14	14	8	22
135	Koramaduvu	0	3	9	6	6	12
136	Jonnaru	0	2	3	2	3	5
137	Pittanur	1	11	15	15	12	27
138	Kumbanur	4	13	22	18	21	39
139	Pidanoor	0	4	9	6	7	13
140	veerapattu	5	17	23	23	22	45
141	vittaiyankudisai	1	9	13	13	10	23
142	kattaiyankudisai	0	4	9	7	6	13
143	Kalerikudisai	0	3	7	4	6	10
144	Koonerikudisai	0	3	8	4	7	11
145	vanniyur	5	16	21	22	20	42
146	PATTARAIKADU HSC- Pattaraikadu	1	8	15	11	13	24
147	Pudur kudisai	0	5	11	8	8	16
148	AaraKollai	1	5	14	10	10	20
149	Sepnee	3	11	16	16	14	30
150	Kondikanoor	0	3	12	7	8	15
151	Kooleri	0	1	7	5	3	8
152	kuttakarai	4	16	23	21	22	43
153	Padiri	1	10	13	13	11	24

154	Manjatthu	0	8	15	12	11	26
155	Leguvelli	3	13	21	18	19	37
156	Pattankovinoor	0	3	8	4	7	11
157	Kallathur	5	15	22	19	23	42
158	Ponganoor	0	7	14	10	11	21
159	Nellaimanthai	0	2	7	5	4	9
160	Seengadu	4	12	17	17	16	33
161	Padimalai	4	15	22	21	20	41
162	Pallamadi	1	9	14	10	14	24
		585	1720	2490	2477	2318	4794

List of tribal villages in the Plains

S.No	Name of Tribal village – Plains Group 2	Total <1yr	Total 1-3yrs	Total 3-5yrs	Male	Female	Total under-five
1	CHENGAM PHC - kilayur	23	35	20	30	48	78
2	Kallathur	4	20	24	25	23	48
3	Thurunjikuppam	5	30	9	24	20	44
4	Mettur	2	24	4	16	14	30
5	Oorkandanoor	11	40	19	32	38	70
6	Pambathur	2	12	2	8	8	16
7	Endripattu	6	9	8	11	12	23
8	Kalpinaindur	3	6	2	6	5	11
9	Mittangakalur	6	9	9	12	12	24
10	Arasanur	8	9	9	14	12	26
11	Pudur	3	7	6	9	7	16
12	Kuttur	2	7	4	8	5	13
13	Pinarale	5	13	12	13	17	30
14	Koil Kollai	7	11	11	12	17	29
15	REDDIARPALAYAM PHC - Melmuthanur	3	5	16	12	12	24
16	Kuberapattinam	35	47	43	60	65	125
17	Irular kudisai	2	7	13	12	10	22
18	Erisandai	5	11	25	21	20	41
19	Kurukelambur	3	4	25	15	17	32
20	Beemarapatti	21	32	37	44	46	90
21	Ulchathudi	5	16	29	26	24	50
22	Melvalasai	7	13	13	17	16	33

23	Kelvalasai	8	15	21	23	21	44
24	Akkaraipatti	14	19	17	26	24	50
25	Asipadi	19	47	54	67	53	120
26	Navakollai (PERUNGALATHUR HSC)	17	42	60	65	54	119
27	Nerungipadi	11	19	22	27	25	52
28	Puliyampatti(Kalnathur HSC)	21	34	50	52	53	105
29	Udayarkuppam	13	18	19	24	26	50
30	Kalnathurpudur	19	38	28	44	41	85
31	Aruvangadu	21	30	25	37	39	76
32	Kalnathur	13	17	22	24	28	52
33	Jambodai	15	16	19	29	21	50
34	Neerkummi	19	25	19	34	29	63
35	KALASAMUDRAM PHC - Shenbagathoopu	34	42	51	68	59	127
36	Irular parai	23	31	30	44	40	84
37	KELUR PHC - vadiyankottai	16	29	30	40	35	75
38	Thumbakkadu	22	52	65	72	67	139
		453	841	872	1103	1063	2166

30 Clusters in Group 1:

Cluster.No.	Name of Tribal village - Hills (JAMANAMARATHUR- PHC)	Male	Female	Total	No.of TribaHH	RandomHH
1	Melur	6	4	10	23	11
2	vallikottai	31	26	57	59	20
3	Marganur	26	29	55	112	70
4	Mattukanur	18	15	33	98	17
5	Kumbalamarathur	19	17	36	111	9
6	Palvari	9	5	14	49	11
7	Vedathoppu	27	25	52	132	7
8	Jambadi	20	12	32	92	9
9	Thimrinathur	17	19	36	95	94
10	Kuriyanoor	16	10	26	67	57
11	Velachanoor	24	21	45	103	103
12	Palakanoor	19	21	40	99	23
13	Melvellamuchi	14	14	28	66	14
14	Cinnakilpattu	16	14	30	88	88
15	Kotturkolai	6	7	13	41	41
16	Kilkanavayur	17	13	30	52	19
17	VEERAPPANUR HSC -Veerappanur	65	50	115	221	102
18	Arasavalli	14	16	30	82	11
19	Pudhipattu	37	31	68	140	107
20	Perumalai	10	8	18	44	18
21	Mutnattur	37	20	57	120	108
22	Kupsanur	43	35	78	141	132
23	Nadupattu	26	17	43	112	35
24	Neesampattu	35	30	65	142	125
25	NAMMIYAMPATTU HSC-Namiyampattu	54	49	103	226	2
26	kollannalur	33	27	63	129	96
27	Kumbanur	18	21	39	98	60
28	PATTARAIKADU HSC- Pattaraikadu	11	13	24	70	57
29	Padiri	13	11	24	72	24
30	Nellaimanthai	5	4	9	26	2

30 Clusters in Group 2:

Cluster.No.	Name of Tribal village - Plains	Male	Female	Total	No.of TribaHH	1st_RandomHH	2nd_RandomHH
1	CHENGAM PHC - kilayur	30	48	78	239	87	
2	Thurunjikuppam	24	20	44	150	126	
3	Oorkandanoor	32	38	70	196	148	
4	Pambathur	8	8	16	28	5	
5	Arasanur	14	12	26	42	20	
6	Pinarale	13	17	30	61	5	
7,8	Kuberapattinam	60	65	125	220	172	88
9	Erisandai	21	20	41	100	100	
10,11	Beemarapatti	44	46	90	186	152	117
12	Melvalasai	17	16	33	49	24	
13	Akkaraipatti	26	24	50	99	63	
14,15	Asipadi	67	53	120	156	136	109
16	Navakollai (PERUNGALATHUR HSC)	65	54	119	262	96	
17	Nerungipadi	27	25	52	96	50	
18,19	Puliyampatti(Kalnathur HSC)	52	53	105	245	162	82
20,21	Kalnathurpudur	44	41	85	112	49	42
22	Aruvangadu	37	39	76	153	37	
23	Jambodai	29	21	50	109	15	
24	Neerkummi	34	29	63	94	94	
25,26	KALASAMUDRAM PHC - Shenbagathoopu	68	59	127	156	86	7
27	Irular parai	44	40	84	123	57	
28	KELUR PHC - vadiyankottai	40	35	75	99	66	
29,30	Thumbakkadu	72	67	139	183	62	38

INFORMATION SHEET

A comparative study on the Epidemiology of under-nutrition based on anthropometric and clinical parameters among the tribal under-five children in hills and plains of Thiruvannamalai District, Tamil Nadu

Introduction

Nutrition given to the growing children during the first five years of life particularly, exclusively breast feeding, timely introduction of appropriate and adequate complementary feeds is indeed very vital for the health and development of the child to its fullest potential. But Under-nutrition contributes to both morbidity and mortality in many children globally and also in India.

Malnutrition during the first five years of life affects the mental development, future academic performance and work efficiency in later life. Many studies done in our country have shown high prevalence of malnutrition among the children both in the Urban and rural setting. Further, it is still higher among the tribal under-five children. This study is conducted to diagnose the malnutrition in your children so that it can be prevented at the earliest.

Objectives of the study

- To assess the prevalence of under-nutrition among the under-five tribal children living in the Javvadu hills and plains of Thiruvannamalai
- To identify the risk factors associated malnutrition among the children living in the plains and Javvadu hills of Thiruvannamalai

Methodology

Your participation in this study is purely voluntary and you can withdraw at any time from this study. I will explain regarding the background of this study, methodology, risks and benefits. I will also provide the details of your rights as the study participant and details of communication regarding enquiries or complaints. You can ask as many questions as you want before deciding to participate in this study. Once you decide to participate, kindly sign or provide your thumb impression in this form along with the date in the form which I will give you.

The methodology of the study is given below.

Some questions will be asked to find out whether your child has normal nutritional status. I request you to kindly co-operate with me and provide details regarding your antenatal, intra natal history, breastfeeding & complementary feeding practices. I will also enquire regarding your child's dietary pattern, immunization & food insecurity in the household. And kindly co-operate and provide details regarding treatment seeking behavior and customs regarding management of Acute respiratory illness, and Diarrheal disorders in your child. Kindly permit to examine the child clinically and perform a blood investigation to estimate the Hemoglobin level. Interviews and discussions will be conducted among mothers individually and as groups to gather information on the child rearing practices.

Risks and inconveniences

There are no risks involved in this study. 1 mL of blood will under strict aseptic precautions. Medication will be given to minimize pain and discomfort. All services are done free of cost.

Confidentiality

We inform you that we will not reveal your identity and information during the study and while publishing the study details and results.

Benefits and Medical treatment

Your child will be examined to find out whether he or she is malnourished. If your child is found to be suffering from malnutrition, treatment and advice will be given. All will be done free of cost. You need not pay anything for this participation.

Rights and complaints

Participation in this study is dependent purely on your willingness. Further you can withdraw from the study any time you want.

We also inform you that will communicate the results to you during or after the study.

In case of any doubts or enquiries during the study you can contact Dr. Saravanakumar on 9840286841 and the chief Dr. Saradha Suresh on 044-24987490.

After receiving this information if you decide to participate in this study whole heartedly, kindly sign or provide thumb impression.

Thank you.

ஒப்புதல் கடிதம்

தமிழ்நாட்டில் திருவண்ணாமலை மாவட்டத்தைச் சார்ந்த மற்றும் மலைப்பகுதியில் மற்றும் சமவெளி பகுதியில் வாழும் ஐந்து வயதுக்குட்பட்ட மலைஜாதி குழந்தைகளின் ஊட்டச்சத்து குறைபாட்டின் காரணங்களைப் பரிசோதிக்கும் ஆய்வு

பெயர்:

வயது /பாலினம்

சேர்க்கை எண்:

தேதி:

இந்த ஆராய்ச்சியில் விவரங்களைக் கொண்ட, தகவல் தாளைப் பெற்றுக் கொண்டேன்.

இந்த ஆராய்ச்சியின் விவரங்களும், அதன் நோக்கமும் முழுமையாக எனக்கு தெளிவாக விளக்கப்பட்டது.

எனக்கு விளக்கப்பட்ட விஷயங்களை, நான் புரிந்து கொண்டு எனது சம்மதத்தைத் தெரிவிக்கிறேன்.

இந்த ஆராய்ச்சியில் பிறரின் நிர்பந்தமின்றி, என் சொந்த விருப்பத்தின் பேரில் தான் பங்கு பெறுகிறேன். மற்றும் இந்த ஆராய்ச்சியில் இருந்து எந்நேரமும் பின் வாங்கலாம் என்பதையும், அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கொண்டேன்.

நான் என்னுடைய சுயநினைவுடனும் மற்றும் முழு சுதந்திரத்துடனும் இந்த மருத்துவ ஆராய்ச்சியில் என்னை சேர்த்துக் கொள்ள சம்மதிக்கிறேன்.

ஆராய்ச்சியாளர் மற்றும் அவரைச் சார்ந்தவர்களோ, நெறிமுறைக்குழு உறுப்பினர்களோ நான் இந்த ஆராய்ச்சியில் இருந்து விலகினாலும், என்னுடைய அனுமதியின்றி, எனது தகவல்களை, இந்த ஆராய்ச்சிக்கோ இது தொடர்பான வேறு ஆராய்ச்சிகளுக்கோ, பயன்படுத்திக்கொள்ளமுடியும் என்று புரிந்து கொண்டு சம்மதம் அளிக்கிறேன். ஆனாலும், என்னுடைய அடையாளம் வெளியிடப்படமாட்டாது என்று புரிந்து கொள்கிறேன்.

இந்த ஆராய்ச்சியின் தகவல்களையும், முடிவுகளையும் அறிவியல் நோக்கத்திற்காக பயன்படுத்துவதற்கு நான் அனுமதிக்கிறேன். நான் இந்த ஆராய்ச்சியில் பங்கு பெற சம்மதிக்கிறேன்.

பங்கேற்பவரின் பெயர்

பங்கேற்பவரின் கையொப்பம்
(அல்லது) கட்டைவிரல் ரேகை

ஆய்வாளர் பெயர்

ஆய்வாளரின் கையொப்பம்

சாட்சியின் பெயர்

சாட்சியின் கையொப்பம்

இடம் :

தேதி:

தகவல் தாள்

தமிழ்நாட்டில் திருவண்ணாமலை மாவட்டத்தைச் சார்ந்த மலைப்பகுதியில் மற்றும் சமவெளி பகுதியில் வாழும் ஐந்து வயதுக்குட்பட்ட மலைஜாதி குழந்தைகளின் ஊட்டச்சத்து குறைபாட்டின் காரணங்களைப் பரிசோதிக்கும் ஆய்வு

அறிமுகம்

முதல் ஐந்து வயது வரை கொடுக்கப்படும் ஊட்டச்சத்து அதாவது ஆறுமாதம் வரை பிரத்தியேகமாக தாய்ப்பால் மட்டும் கொடுத்து பிறகு தகுந்த நேரத்தில் திடமான உணவு அளிப்பது ஆகியன குழந்தையின் ஆரோக்கியத்துக்கும், வளர்ச்சிக்கும் முக்கியமானது. உலக அளவிலும் நம் இந்தியாவிலும் அநேக குழந்தைகள் ஊட்டச் சத்து குறைவால் வியாதிப்பட்டு மரணமும் அடைகின்றன.

முதல் ஐந்து வரை ஊட்டச்சத்து குறைபாடு இருந்தால் பின் நாட்களில் வளர்ச்சி மற்றும் படிப்பு, தொழில் எல்லாவற்றிலும் மிகுந்த பாதிப்பு ஏற்படும். இந்தியாவில் நகர்புற மற்றும் கிராமப்புற ஐந்து வயதுக்குட்பட்ட குழந்தைகள் மத்தியில் மிகுந்த அளவில் ஊட்டச்சத்து குறைபாடு உள்ளதாக பல ஆய்வுகள் தெரிவிக்கின்றன. மேலும் மலைஜாதி குழந்தைகள் மத்தியிலும் இந்த குறைபாடு அதிகமாக உள்ளது. இதைக் கண்டறிந்து, ஏற்ற வேளையில் சீர் செய்து, ஐந்து வயதுக்குட்பட்ட குழந்தைகள் நலனைப் பேணுவது மிகவும் முக்கியம்.

இந்த ஆய்வின் நோக்கம்

திருவண்ணாமலை, ஜவ்வாது மலைப்பகுதியில் மற்றும் சமவெளி பகுதிகளில் உள்ள ஐந்து வயதுக்குட்பட்ட மலைஜாதி குழந்தைகளின் ஊட்டச்சத்து குறைபாட்டினை கண்டறிவதே இந்த ஆய்வின் நோக்கம்.

ஊட்டச்சத்து குறைபாட்டின் அளவு, மலைவாழ் மற்றும் சமவெளிப்பகுதிகளில் வாழும் மலைஜாதி குழந்தைகள் மத்தியில் எவ்வளவு உள்ளது என்றும் அதற்குரிய காரணங்களைக் கேட்டறிவதும் இந்த ஆய்வின் நோக்கம்.

நடைமுறையின் விவரங்கள்

இந்த ஆய்வில் பங்கேற்பது முற்றிலும் தனியின்சையான முடிவாகும். இந்த ஆய்வின் பின்புலம், நோக்கம், நடைமுறை, அபாயங்கள் மற்றும் நன்மைகள் நான் உங்களுக்கு விளக்குவேன். ஒரு ஆய்வுப் பங்கேற்பாளராக உங்களது உரிமை குறித்தும், புகார் அல்லது ஆலோசனைக்கு நீங்கள் யாரைத் தொடர்புகொள்ள வேண்டும் என்பதற்கான எங்களது தொடர்புத் தகவல்களையும் உங்களுக்கு வழங்குவேன். இந்த ஆய்வில் பங்கேற்கத் தீர்மானிக்கும் முன் நீங்கள் எத்தனை கேள்விகள் வேண்டுமானாலும் கேட்கலாம். நீங்கள் பங்கேற்கத் தீர்மானித்தவுடன், இந்தப் படிவத்தில் தேதியுடன் கையொப்பமிடுமாறு அல்லது கைரேகை வைக்குமாறு நான் வேண்டுகிறேன். எதிர்காலத்தில் நீங்கள் பார்ப்பதற்காக இந்தப் படிவத்தின் பிரதி ஒன்று உங்களுக்கு தரப்படக்கூடும். இந்தச் செயல்முறை முழுவதும் அறிந்தளிக்கப்பட்ட ஒப்புதல் எனப்படுகிறது. இந்த ஆய்வின் நடைமுறை பின்வருமாறு இருக்கும்.

உங்கள் குழந்தைக்கு ஊட்டச்சத்து குறைபாடு உள்ளதா என்பதை அறிய சில கேள்விகள் கேட்கப்படும். உங்கள் கர்ப்பகால பரிசோதனை விவரம், பிரசவ மற்றும் தாய்ப்பால் கொடுத்தது பற்றிய விவரம் மேலும் திடமான ஆகாரம் வழங்கிய விவரங்களைக் கேட்டறிய ஒத்துழைக்க வேண்டுகிறேன். உங்கள் குழந்தைக்கு தினமும் கொடுக்கும் உணவு வகைகள், தடுப்பூசி போட்ட விவரம் மற்றும் வீட்டில் உணவு பற்றாக்குறை ஆகியவற்றை கேட்டறிவோம். மேலும் குழந்தைக்கு சளி, இருமல், வயிற்றுப்போக்கு போன்ற உடல்நலக்குறைவு ஏற்பட்டால் வைத்தியம் செய்யும் முறை மற்றும் பழக்க வழக்கங்களை கேட்டறிய உதவ வேண்டுகிறேன். குழந்தையைப் பரிசோதிக்கவும், இரத்தத்தில் இரும்பு சத்துக்காக Hemoglobin (ஹிமோகுலோபின்) அளவு பார்க்க இரத்தப் பரிசோதனை செய்யவும் அனுமதிக்க வேண்டுகிறேன். தாய்மார்களைத் தனியாகவும், குழுவாகவும் வைத்து குழந்தை பராமரிப்பு பற்றி கேள்விகளும், கலந்தாய்வும் செய்யப்படும்.

அபாயங்கள் மற்றும் அசௌகரியங்கள்

இந்த ஆய்வில் ஆபத்தான காரியம் எதுவுமில்லை. இரத்த பரிசோதனை மிகவும் கவனமாக சுகாதாரமாக மட்டுமே 1ml எடுக்கப்படும். வலியோ வேதனையோ இல்லாமல் இருக்க மருந்து வழங்கப்படும். எல்லாம் இலவசமாகச் செய்யப்படும்.

இரகசியத்தன்மை

நாங்கள் இந்த ஆராய்ச்சியின் முடிவுகளை மற்றும் கருத்துக்களை வெளியிடும் போதோ அல்லது ஆராய்ச்சியின் போதோ, தங்களது பெயரையோ அல்லது அடையாளங்களையோ வெளியிட மாட்டோம் என்பதை தெரிவித்துக் கொள்கிறோம்.

நன்மைகள் மற்றும் மருத்துவ சிகிச்சை

உங்கள் குழந்தையை பரிசோதனை செய்து ஊட்டச்சத்து குறைபாடு உள்ளதா என்று கண்டறியப்படும். ஒருவேளை குறைபாடு இருந்தால் உடனே மருத்துவ சிகிச்சை மற்றும் குறைபாடு நீக்க அறிவுரை வழங்கப்படும். எல்லாம் இலவசமாக செய்யப்படும்.

உரிமைகள் மற்றும் புகார்கள்

இந்த ஆராய்ச்சியில் பங்கேற்பது, தங்களுடைய விருப்பத்தின் பேரில் தான் இருக்கிறது. மேலும் நீங்கள் எந்நேரமும் இந்த ஆராய்ச்சியிலிருந்து, பின் வாங்கலாம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த ஆராய்ச்சியின் முடிவுகளை, ஆராய்ச்சியின் போதோ அல்லது ஆராய்ச்சியின் முடிவின் போதோ தங்களுக்கு அறிவிக்கப்படும் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த ஆய்வின் போது உங்களுக்கு ஏதாவது சந்தேகங்கள் அல்லது கேள்விகள் ஏற்பட்டால், நீங்கள் மருத்துவர் ப.சரவணகுமார் அவர்களை 9840286841 என்ற எண்ணிலும் தலைவர் Dr.சாரதா சுரேஷ் அவர்களை 044-24987490 என்ற எண்ணிலும் தொடர்பு கொள்ளவும். இந்த தகவலைப் பெற்ற தாங்கள் முழுமனதோடு பங்கேற்க விரும்பினால் கையொப்பம் அல்லது பெருவிரல் ரேகை வைக்கலாம்.

INFORMED CONSENT FORM

Title:

A comparative study on the Epidemiology of Under-nutrition based on anthropometric and clinical parameters among the tribal under-five children in hills and plains of Thiruvannamalai District, Tamil Nadu

Name of the Participant:

Age/Sex:

Participant ID :

Date:

- (1) I have been explained in detail about the study and its procedure. I confirm that I had completely understood the study and have had the opportunity to ask questions.
- (2) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without their medical care or legal rights being affected.
- (3) I understand that the principal investigator, others working on the investigator's behalf, the Ethics Committee and the regulatory authorities will not need my permission to utilize my details in respect of the current study and any further research that may be conducted in relation to it, even if they withdraw from the trial.
- (4) I agree to this access. However I understand that my identity will not be revealed in any information released to third parties or published.
- (5) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).
- (6) I agree to take part in the above study.

Name of the Participant

Signature or thumb impression of
Participant

Name of the investigator

Signature of the investigator

Name of the witness

Signature of the witness

DATA COLLECTION FORM

Hilly tribe (Group 1)/Plain tribe (Group 2) ID no _____

Name of the village: _____ Name of the PHC: _____

Name of the Index child _____ Male / Female D.O.B: _____

Age of the child in months _____ Date of Survey _____

Name of the mother(Respondent): _____

Address: _____

Tribal name: 1. Malaiyali 2. Irular 3. Others _____

Religion: 1. Hindu 2. Christian 3. Muslim 4. Others _____

How long are you living in this area? _____ in yrs

Section I: Socio-demographic characteristics of the respondent:

No.	Name	Age	Gender	Education	Occupation	Income

- 1) Type of family: 1. Nuclear 2. Non-Nuclear
- 2) Total no. of family members _____
- 3) Type of House 1. Katcha 2. semi-pucca 3. Pucca.
- 4) Drinking water source: 1. well 2. bore 3. pump 4. pipe water 5. others _____
- 5) Open defecation: 1. yes 2. No
- 6) Toilet facility in the house 1. yes 2. No
- 7) Practice of bare foot walking in children 1. yes 2. No
- 8) Birth Order 1. First 2. Second 3. 3and >

Section II: Antenatal history of the index child

9) Did you attend antenatal checkup (for Index child)? Yes / No

10) If yes, where did you attend the antenatal checkup?

- 1) Health Sub centre
- 2) Primary Health centre
- 3) Government hospital
- 4) Private sector
- 5) Government Medical college

11) If not attended AN checkup, why? 1. Distance 2. Unaware 3. Other reasons

12) How many AN checkups did you have in the health facility?

1. <3
2. 3-5
3. >5

13) Advice given during AN visits? 1. Yes 2.No.

- To consume green leafy vegetables_____
- To consume more milk and egg_____
- To consume additional meal/food_____

14) Who gave the advice during the check-up?

- 1) Doctor
- 2) Nurse
- 3) ANM
- 4) VHN
- 5) No one

15) Did you take IFA tablets during pregnancy? 1. Yes 2. No

16) If yes, how many did you take _____? (Out of 100 tablets)

- 1) <30
- 2) 30-60
- 3) 60-100

17) Details from the Antenatal record of the mother:

a. Did you have any antenatal complications? 1Yes 2. No

b. Maternal Hemoglobin%_____

c. Weight gain of the mother during the AN period_____in Kg

18) Did anyone discuss the benefits of breastfeeding during the antenatal period? Yes/ No

- a) If so who _____
1. Doctor
 2. Nurse
 3. ANM
 4. VHN
 5. Family members
 6. Neighbors

Section III: Details of delivery of the index child:

19) Mode of delivery: 1. Normal 2. LSCS 3. Instrumental

20) Place of Delivery:

1. Home
2. HSC
3. PHC
4. Government Hospital
5. Medical college
6. private clinic

21) Who conducted the delivery? 1. Doctor 2. Nurse 3. ANM 4. VHN 5. Trained dai

6. Untrained dai

22) Term/ Preterm _____ weeks.

23) Birth weight _____ gms

24) Any maternal complications? _____ 1. Yes 2. No

25) Any Neonatal complications? _____ 1. Yes 2. No

Section IV: Breastfeeding Practices

26) What was the first feed given to the baby after the birth?

1. Colostrum
2. others

27) When did you first breastfeed (colostrum) your baby after delivery?

1. within first hour
2. > first hour to 6 hrs
3. 6-24hrs
4. >24hrs

28) Who helped you in breastfeeding after delivery?

1. Doctor
2. Nurse
3. ANM
4. VHN
5. family members
6. Others

- 29) If breastfeeding was not initiated within first one hour, what was the reason?
1. Unaware
 2. prelacteal feed / artificial feed was given
 3. Fear of insufficient milk
 4. Baby did not suck well
 5. Any breast problems
 6. maternal problems
 7. neonatal problems
 8. Delay in handing over the baby
 9. Others
- 30) How many months should the baby be breastfeed exclusively?
1. < 2months
 2. 2-3 months
 3. 4 – 5months
 4. up to 6 months
 5. > 6 months
- 31) Who gave you this information on exclusive breastfeeding?
1. Doctor
 2. Nurse
 3. VHN
 4. ANM
 5. family members
 6. neighbors
 7. others
- 32) Did anyone talk to you about the benefits of exclusive breastfeeding? Yes /no.
- a) If yes, who? -1. Doctor 2. Nurse 3. ANM 4. VHN 5. family members 6. friends
- 33) Did anyone check exclusive breastfeeding during visits for immunization? Yes /No
- If yes, who? 1) Doctor 2) Nurse 3) VHN 4) ANM
- 34) When did you start giving milk other than breast milk? _____ in months.
1. < 6months
 2. 6-8months
 3. 8-12 months
 4. >12 months
- 35) How was it given? _____ 1. bottle 2. tumbler with spoon 3. Paladai
- 36) If not given exclusive breastfeeding upto 6 months, the reasons are
1. unaware
 2. Fear of inadequate breastmilk
 3. Difficulty in breastfeeding
 4. Decided on own to start other milk
 5. Family members insisted on artificial feeds
 6. Due to job outside the house
 7. No support from health professional
 8. Contraindications for breastfeeding due to medical reasons
 9. Others

Section V: Complementary feeding practices

- 37) When did you start giving semisolid food _____months?
1. < 6 months 2. 6 – 8 months 3. > 8 months
- 38) What was given_____?
- 39) When did you start solid food to your child? _____months?
1. < 9months 2. 9-12 months 3. >12 months
- 40) What type of food was given_____?
- 41) At what age did you completely stop breastfeeding your child? _____
1. < 6 months 2. 6-12 months 3. 12-18 months 4. 18 -24 months 5. > 2yrs
6. still continuing
- 42) When did your child start eating food cooked for the family _____months?
1.< 1yr 2. 12-18 months 3. 18-24 months 4. >24 months

Section VI : Current Dietary Pattern in this child

- 43) What are the food groups given as diet to your child generally during a day?

24 Hours dietary recall history of the child was collected from the mothers and the approximate calorie and protein intake per day were calculated and compared with ICMR – RDA guidelines for age and sex for adequacy.

Section VII: Utilization of Health services (as per records)

- 44) Have your child immunized up to age? Yes / no.
a. If not why? _____
1. Not aware
2. Illness
3. Distance
4. Health Professional not available
5. Not willing
6. Others
- 45) Received vitamin A doses recommended up to age. Yes / No
- 46) Nutritional supplements given
Yes / No

47) If yes what is the supplement given

1. Iron preparation
2. Multivitamin
3. Formula feeds
4. ICDS food
5. others

48) Period of nutritional supplementation_____

1. 1month
2. 1-3 months
3. 3-6 months
4. > 6 months

49) Source of supplement

1. VHN
2. PHC
3. Private clinic
4. Family members
5. Neighbors
6. ICDS

50) Reasons for Non-supplementation:

1. Unaware
2. No guidance from health facility
3. Not available
4. Discontinued
5. Not willing

51) Optional vaccines given Yes / No.

52) Reasons for not giving optional vaccines;

- 1 unaware
2. Expensive
3. Not available
4. Not willing

53) Does your child have perianal itching? Yes / No

- Have you noticed worms in the stool passed by your child? Yes/ No
- Is your child dewormed every 6 months? Yes / No

Section VIII: Breastfeeding practices in the immediate previous child

(not applicable for primi mothers)

54) Previous baby Exclusive breastfeeding Period

- 1) < 2months
- 2) 2-4 months
- 3) 4-5 months
- 4) 6 months
- 5) 6-8
- 6) >8 months

55) Reasons for non-exclusive breastfeeding up to 6 months for previous baby.

1. Fear of inadequate breastmilk
2. Difficulty in breastfeeding
3. Family members insisted on artificial feeds
4. Due to work or job outside the house
5. Support from health professional
6. Contraindications for breastfeeding due to medical reasons
7. Decided on own
8. Unaware

Section IX: Health seeking behavior during illness

56) During the past 3 months did your child had any illness? ____ Yes/No

If yes answer the following

S.No	Type of Illness	No of episodes during past 3 months	Treatment availed
1	Diarrhoea		1.OPD 2.Hospitalized 3.Home treatment, 4.Native treatment
2	Respiratory Illness		Same
3	Fever with Exanthematous rash		Same

57) In case of **Diarrhoea**, Did you give ORS during the diarrhoea? Yes / No

a. If yes who advised you _____?

1. Doctor 2. Nurse 3. ANM 4. VHN 5. family members 6. neighbours

b. Was Zinc supplemented during the Diarrhoeal episode? Yes/ No

58) In case of **Respiratory illness**, where did you seek for treatment?

1. Govt .Doctor 2. VHN 3. Private health care 4. native treatment

59) In case of **Fever with Exan. Rashes** what was done _____?

60) Did anyone health professional assess the weight and height of your child

during your visit to the health facility? Yes /No b) If yes who?

1. Doctor 2. Nurse 3. ANM 4. VHN 5. private health care

61) What was the information about the health of your child was shared with you like

1. Normal for age 2. under nourished 3. overweight

62) Are you utilizing ICDS for supplementary food and minor ailment services ____?

Yes / No. If no why? 1. Distance 2. Unaware 3. Not willing 4. Others

Section X : Clinical Examination of the Child

Head to foot examination for features of Nutritional deficiencies

- Hair changes 1. Normal 2. Depigmented
- Eyes (Pallor, Bitot's spots, Corneal ulcer) Yes / No
- Ears (wax, Pus) Yes / No
- Mouth (Cheilitis, Glossitis, Oral Hygiene, Dental Caries)_ Yes/ No
- Skin for Impetigo Yes/ No
- Hygiene in nails 1. Normal 2. Poor
- Personal Hygiene 1. Normal 2. Poor
- Systemic examination. 1. Normal 2. Abnormal
 - CVS -
 - RS -
 - ABDOMEN -
 - CNS -

Section XI : Anthropometric Measurements of the child

- Weight for age : _____ kg
- Height / Length for age: _____ cms
- Mid-arm circumference: _____ cms
- Weight for Height/Length _____
- Body Mass Index _____
- Head circumference _____ cms
- Chest circumference _____ cms
- Triceps skin fold thickness _____

Section XII : Hemoglobin estimation

Hemoglobin Estimation _____ gm/dl

Section XIII : Nutritional status of the mother

Details of the Nutritional status of the Mother: Weight _____ Height _____ BMI _____

Section XIV : Food security in the family

Food security Questionnaire: Household Food Insecurity Access Scale (HFIAS):

No	QUESTION	RESPONSE OPTIONS	CODE
1.	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes _
1.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) _
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes _
2.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) _
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1 = Yes _
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) _
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to	0 = No (skip to Q5) 1 = Yes _

	obtain other types of food?		
4.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) <input type="text"/>
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1 = Yes <input type="text"/>
5.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) <input type="text"/>
6.	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1 = Yes <input type="text"/>
6.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) <input type="text"/>
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1 = Yes <input type="text"/>
7.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) <input type="text"/>

8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes ___
8.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) ___
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1 = Yes ___
9.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) ___

THANK YOU

தகவல் சேகரிப்புப் படிவம்

மலைவாழ் /சமவெளி வாழ் மலை ஜாதி கு.எண்

கிராமத்தின் பெயர்..... ஆரம்ப சுகாதார நிலையம்

குழந்தையின் பெயர் ஆண்/பெண்- வயது

பிறந்த தேதி ஆய்வு தேதி

தாயின் பெயர்

முகவரி

.....

மலை ஜாதியின் பெயர் மதம்

எத்தனை ஆண்டுகளாக இங்கு வசிக்கிறீர்கள்?

பிரிவு- I -பதில் அளிப்பவரின் விவரம்

எண்	பெயர்	வயது	ஆண்/பெண்	படிப்பு	வேலை விவரம்	வருமானம்

1. தனிக்குடித்தனம் /கூட்டு குடும்பம்?
2. மொத்த குடும்பத்தின் நபர்கள்
3. வீடு : குடிசை /ஓட்டு வீடு/மச்சு கல் வீடு (கட்டிடம்)
4. குடிநீர் : குழாய் நீர் /கிணற்று நீர் /அடி பம்பு நீர்
5. கழிவறை உள்ளதா?
6. திறந்தவெளி மலங்கழித்தல் உண்டா?
7. குழந்தைகள் காலில் செருப்பில்லாமல் நடக்கும் பழக்கம் உண்டா?
8. குழந்தையின் பிறப்பு வரிசை 1) முதல் 2)இரண்டாவது 3) மூன்றாம் மூன்றுக்கு மேல்

பிரிவு- II -கர்ப்ப கால விவரங்கள்

9. தாங்கள் இக்குழந்தையை கர்ப்பம் தரித்த காலத்தில் பரிசோதனைகள் செய்து கொண்டீர்களா? ஆம்/இல்லை
10. ஆம் என்றால் எங்கு சென்றீர்கள்?
 அ. துணை சுகாதார நிலையம்
 ஆ. ஆரம்ப சுகாதார நிலையம்
 இ. அரசு மருத்துவமனை
 ஈ. அரசு மருத்துவக் கல்லூரி
 உ. தனியார் மருத்துவமனை
11. எங்கும் செல்லவில்லை என்றால் ஏன்?
12. எத்தனை கர்ப்ப கால பரிசோதனைகள் மேற்கொண்டீர்கள்?

13. கர்ப்ப காலத்தில் ஆலோசனைகள் வழங்கப்பட்டது குறித்து
 கீரை வகைகளை உட்கொள்ள ஆலோசனை ஆம்/இல்லை
 பால் மற்றும் முட்டை சாப்பிட ஆம்/இல்லை
 கூடுதல் உணவு உட்கொள்ள ஆம்/இல்லை
14. யார் இந்த ஆலோசனையை வழங்கினார்கள்?
 அ.மருத்துவர்
 ஆ.செவிலியர்
 இ.துணை செவிலியர்
 ஈ. கிராம சுகாதார செவிலியர்
15. கர்ப்பகாலத்தில் இரும்பு சத்து மாத்திரைகள் சாப்பிட்டீர்களா? ஆம்/இல்லை
16. எத்தனை மாத்திரைகள்?
17. தாயின் இரத்த அளவு
 a)Hemoglobin
 b)கர்ப்ப காலத்தில் ஏதாவது சிக்கல்/உபாதைகள் இருந்ததா?
 c)கர்ப்ப காலத்தில் எவ்வளவு எடை கூடினீர்கள்?
18. கர்ப்ப காலத்தின் பரிசோதனையின் போது தங்களிடம் தாய்ப்பாலின் முக்கியத்துவத்தினை பற்றி பேசினார்களா? ஆம்/ இல்லை யார்பேசினார்கள்?
 அ. மருத்துவர் ஆ. செவிலியர்
 இ.துணை செவிலியர் ஈ. கிராம சுகாதார செவிலியர் உ.
 குடும்பத்தினர்

பிரிவு- III பிரசவத்தின் விவரம்

19. பிரசவ முறை : சுகப்பிரசவம் / அறுவை சிகிக்கை / ஆயுதத்தின் உதவியுடன்
20. பிரசவம் எங்கு நடந்தது

அ. வீடு
இ. ஆரம்ப சுகாதார நிலையம்
உ. அரசு மருத்துவக் கல்லூரி

ஆ. துணை சுகாதார நிலையம்
ஈ. அரசு மருத்துவமனை
ஊ. தனியார் மருத்துவமனை

21. யார் பிரசவம் பார்த்தார்கள்
அ. மருத்துவம்
இ. துணை செவிலியர்
உ. பயிற்சி பெற்ற தாதியர்
- ஆ. செவிலியர்
ஈ. கிராம சுகாதார செவிலியர்
ஊ. பயிற்சி பெறாத தாதியர்
22. நிறை மாத பிரசவம் / குறைமாத பிரசவம்
23. பிறந்த எடை
24. தாயிற்கு உபாதைகள் அல்லது உடல்நலக்கேடு இருந்ததா?
25. குழந்தைக்கு உபாதைகள் அல்லது உடல்நலக்கேடு இருந்ததா?

பிரிவு- IV தாய்ப்பால் கொடுத்த முறை பற்றி விவரம்

26. பிறந்தவுடன் முதலில் குழந்தைக்கு என்ன கொடுத்தீர்கள்?
27. குழந்தைக்கு முதல் முறையாக எப்போது தாய்ப்பால் கொடுத்தீர்கள்?
அ. ஒரு மணி நேரத்திற்குள்
ஆ. ஒரு மணி நேரம் முதல் இருபத்தினான்கு மணி நேரம் வரை
இ. இருபத்தினான்கு மணி நேரத்திற்கு பின்
28. குழந்தை பிறந்தவுடன் தாய்ப்பால் கொடுக்க யார் உதவினார்கள்?
அ. மருத்துவர் ஆ. செவிலியர் இ. துணை செவிலியர்
ஈ. கிராம சுகாதார செவிலியர் உ. குடும்பத்தினர்
29. குழந்தை பிறந்த ஒரு மணி நேரத்திற்குள் தாய்ப்பால் கொடுக்காததற்கான காரணம்?
அ. அறியாமை
ஆ. தாய்ப்பால் தவிர மற்ற உணவு கொடுக்கப்பட்டது
இ. போதுமான பால் சுரக்காது என்ற பயம்
ஈ. குழந்தை சரியாக குடிக்காத காரணத்தால்
உ. மார்பில் பிரச்சனை
ஊ. தாயின்/குழந்தையின் உடல் நலக்குறைவு
எ. குழந்தையை தாயிடம் தருவதில் தாமதம்
ஏ. தேன் அல்லது சர்க்கரை தண்ணீர் கொடுக்கும் பழக்கம்
30. குழந்தைக்கு தாய்ப்பில் மட்டுமே எத்தனை மாதங்கள் தரவேண்டும்?
1. இரண்டு மாதம் 2. முதல் ன்று மாதங்கள் 3. நான்கு முதல் ஐந்து மாதங்கள் 4. முதல் ஆறு மாதங்கள் வரை 5. ஆறுமாதங்களுக்கு மேல்
31. இந்த விவரத்தை யார் உங்களுக்கு தெரிவித்தார்கள்?
32. தாய்ப்பால் மட்டுமே கொடுப்பதினால் வரும் நன்மைகளை உங்களுக்கு யாரேனும் தெரிவித்தார்களா? ஆம்/இல்லை. ஆம் என்றால் யார்?
33. தடுப்பூசி போடும் போது யாரேனும் தாய்ப்பால் மட்டுமே கொடுப்பதை பற்றி மீண்டும் உற்சாகப்படுத்தினார்களா?

49. துணை சத்துணவு பெற்ற இடம்
 1. துணை செவிலிர் 2. ஆரம்ப சுகாதார நிலையம்
 3. தனியார் மருத்துவமனை 4. குடும்பத்தினர்
 5. அயலகத்தர் 6. பால்பாடி நிலையம்
50. துணை சத்துணவு வழங்காததற்கு காரணம்?.....
51. விருப்பத்தின் பெயரில் போடப்படும் தடுப்பூசி போடப்பட்டதா?.....
52. கல்லையென்றால் காரணம்?.....
53. குழந்தைக்கு ஆசன வாயில் அறிப்பு உண்டா? புழுக்கள் மலத்தில் வந்ததுண்டா? ஆறுமாதம் ஒரு முறை புழுக்களுக்கான மருந்து கொடுத்தார்களா?

பிரிவு- VIII முந்தைய குழந்தைக்குத் தாய்ப்பால் கொடுக்கப்பட்ட முறை

54. முந்தைய குழந்தைக்கு எத்தனை மாதங்கள் பிரத்தியேகமாக தாய்ப்பால் மட்டுமே கொடுத்தீர்கள்?.....
55. முதல் ஆறு மாதங்கள் தாய்ப்பால் மட்டுமே கொடுக்கப்படாவிட்டால்

பிரிவு- IX குழந்தையின் நோயற்ற தன்மை மற்றும் சுகாதார பயன்பாடு பற்றிய

விவரம்

56. கடந்த 3 மாதங்களாக குழந்தைக்கு (ஏற்பட்ட நோய்கள்) ஏதேனும் நோய் ஏற்பட்டதா? ----- ஆம் என்றால் கீழ்க்கண்டவற்றிற்கு பதில் அளிக்கவும்.

எண்	நோய்வகை	கடந்த 3 மாதங்களாக எத்தனை முறை	வைத்தியம் செய்யப்பட்ட / புறநோயாளி / மருத்துவமனையில் சேர்க்கப்பட்டு / வீட்டில் / நாட்டு வைத்தியம்
1)	பேதி		
2)	நுரையீரல், சுவாசம் சம்பந்தப்பட்ட நோய்கள்		
3)	ஜீரம் மற்றும் தட்டம்மை		

57. பேதியின் போது உப்பு சர்க்கரை நீர் (ORS) கொடுத்தீர்களா? ஆம் என்றால், யார் அறிவுரைத்தது?

பேதியின் போது குழந்தைக்கு zinc கொடுக்கப்பட்டதா?

58. சுவாசம் சம்பந்தப்பட்ட நோய்கள் ஏற்பட்டால் (இருமல், சளி, க்கடைப்பு) யாரை அணுகுவீர்கள்?
அ) அரசு மருத்துவர் ஆ) கிராம சுகாதார செவிலியர் இ) தனியார் மருத்துவமனை ஈ) நாட்டு வைத்தியம்
59. காய்ச்சலுடன் கூடிய (Exanthematous rash) தட்டம்மை வந்ததுண்டா? அப்படியென்றால் எங்கு சிகிச்சை செய்தீர்கள்?
60. ஏதேனும் ஒரு சுகாதார ஊழியர், சிகிச்சையின் போது உங்கள் குழந்தையின் எடை உயரம் பரிசோதனை செய்ததுண்டா? ஆம் / இல்லை, யார் செய்தார்கள்?
அ) மருத்துவர் ஆ) செவிலியர்
இ) துணை செவிலியர் ஈ) கிராம சுகாதார செவிலியர்
உ) தனியார் மருத்துவமனை
61. குழந்தையின் உடல் எடை, மற்றும் உயரம் உடல் நலன் பற்றி என்ன தகவல் அளித்தனர்? அ) நன்றாக உள்ளது ஆ) குறைபாடு உள்ளது
இ) மிகையாக உள்ளது
62. பால்வாடி (ICDS) யில் வழங்கும் மாவு மற்றும் முட்டை போன்ற உணவு வகைகளை குழந்தைக்கு கொடுப்பீர்களா? ஆம்/இல்லை.
அங்குள்ள சேவைகளை பயன்படுத்துவீர்களா?
இல்லையென்றால் ஏன்?

பிரிவு X

பரிசோதனை விவரங்கள்

தலை முதல் கால் வரை பரிசோதனை

- தலை முடி (நிறம், தன்மை, பலம்)
- கண் (இரத்த சோகை, பைடாட் புள்ளி, கருவிழி புண்)
- காது (கீழ், அழுக்கு)
- வாய் (புண், நாக்குப்புண், வாய் சுத்தம், பல் சொத்தை)
- தோல் புண்
- நிகங்கள் சுத்தம்
- சரீர் சுத்தம்
- இருதய பரிசோதனை
- நுரையீரல்
- வயிறு
- நரம்பு மண்டலம்

பிரிவு XI

குழந்தையின் எடை : ----- கிலோ
 உயரம் / நீளம் : ----- cm
 நடு-கை சுற்றளவு : ----- cm
 தலை சுற்றளவு : ----- cm
 நெஞ்சு சுற்றளவு : ----- cm
 Triceps தோல் தடிமானம்

பிரிவு XII

குழந்தையின் Hemoglobin (ஹிமோ குலோபின்) அளவு: -----

பிரிவு XIII

தாயின் : எடை -----
 உயரம் -----
 BMI -----

வீட்டில் உணவு பாதுகாப்பு பற்றிய வினாத்தாள்

வ.எண்.	கேள்வி	பதிலளிக்கும் விருப்பம்	
1.	கடந்த நான்கு வாரங்களில் உங்கள் வீட்டில் போதுமான அளவு உணவு இல்லை என கவலைப்பட்டீர்களா?	02+ இல்லை (Q2க்கு செல்லவும்) 01+ஆம்	<input type="checkbox"/>
1a.	ஆம் என்றால் என்னை எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+ அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>
2	கடந்த நான்கு வாரங்களில் பற்றாக்குறையினால் நீங்களோ அல்லது உங்கள் வீட்டில் இருப்பவர்களோ விரும்பிய உணவு வகையை சாப்பிட முடியாமல் போனதா?	02+இல்லை(க்கு Q3செல்லவும்) 01+ஆம்	<input type="checkbox"/>
2a.	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது)	<input type="checkbox"/>
3	கடந்த நான்கு வாரங்களில் பற்றாக்குறையினால் நீங்களோ அல்லது உங்கள் வீட்டில் இருப்பவர்களோ குறிப்பிட்ட ஒரு சில உணவு வகைகளை மட்டுமே சாப்பிட்டீர்களா	02+இல்லை (Q4க்கு செல்லவும்) 01-ஆம்	<input type="checkbox"/>
3a	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>

4	கடந்த நான்கு வாரங்களில் பற்றாக்குறையினால் நீங்களோ அல்லது உங்கள் வீட்டில் இருப்பவர்களோ விரும்பிய உணவுக்கு பதிலாக விரும்பாத உணவை சாப்பிட நேர்ந்ததா?	02+இல்லை (Q5க்கு செல்லவும்) 01+ஆம்	<input type="checkbox"/>
4a	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>
5.	கடந்த நான்கு வாரங்களில் பற்றாக்குறையினால் நீங்களோ அல்லது உங்கள் வீட்டில் இருப்பவர்களோ தேவையான உணவுக்கு பதிலாக குறைந்தளவு உணவை சாப்பிட்டீர்களா?	02+ இல்லை(Q6க்கு செல்லவும்) 01+ஆம்	<input type="checkbox"/>
5a	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>
6	கடந்த நான்கு வாரங்களில் பற்றாக்குறையினால் நீங்களோ அல்லது உங்கள் வீட்டில் இருப்பவர்களோ ஒரு நாளையில் நீங்கள் விரும்பிய வேளையை விட குறைந்த வேளையே உணவை சாப்பிட்டீர்களா?	02+ இல்லை(Q7க்கு செல்லவும்) 01+ஆம்	<input type="checkbox"/>
6a.	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>

7	கடந்த நான்கு வாரங்களில் உணவு பொருட்கள் வாங்க முடியாத அளவு பற்றாக்குறையினால் உங்கள் வீட்டில் எப்பொழுதாவது உணவின்றி இருந்தீர்களா?	02+ இல்லை(Q8க்கு செல்லவும்) 01+ஆம்	<input type="checkbox"/>
7a	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>
8	கடந்த நான்குவாரங்களில் போதுமான அளவு உணவு இல்லாததால் நீங்களோ அல்லது உங்கள் குடும்பத்தில் உள்ளவர்களோ இரவில் பசியோடு தூங்கினீர்களா?	02+ இல்லை(Q9க்கு செல்லவும்) 01+ஆம்	<input type="checkbox"/>
8a	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>
9	கடந்த நான்குவாரங்களில் போதுமான அளவு உணவு இல்லாததால் நீங்களோ அல்லது உங்கள் குடும்பத்தில் உள்ளவர்களோ ஒரு நாள் முழுவதும் (பகல் மற்றும் இரவு) உணவு உண்ணாமல் இருந்தீர்களா?	02+ இல்லை 01+ஆம்	<input type="checkbox"/>
9a	ஆம் என்றால் எத்தனை தடவை இது போல் நடந்தது	01+எப்பொழுதாவது (கடந்த 30 நாட்களில் ஒன்று அல்லது இரண்டு முறை) 02+சில நேரத்தில் (கடந்த 30 நாட்களில் மூன்று முதல் பத்து முறையாவது) 03+அடிக்கடி (30 நாட்களில் பத்து முறைக்கு மேல்)	<input type="checkbox"/>

Focus Group Discussion Guide

Focus group discussion is planned to be conducted at least two per Group (Hills and plains) involving 8 to 10 mothers who have children under the age of five years. Care was taken to include women with different educational status, age and parity. The information on antenatal care, dietary pattern during pregnancy, breastfeeding pattern, complementary feeding pattern, health seeking behavior during illness in their children will be obtained. FGD session will be audio recorded and note taker will record all non-verbal communication.

The Focus Group Discussion (FGD) will be started as soon as the informed consent is obtained from the FGD participants.

(Note: the audio recording of the FGD will begin from the beginning of introduction)

Interviewer:

Good morning to all, let me introduce myself. I am a doctoral student at The Tamil Nadu Dr. MGR Medical University, working in Govt. Kilpauk Medical College, Chennai conducting this research as part of the work for my PhD programme.

My plan for the FGD with you is to obtain how you perceive and carry out the nutritional practices for the health and well-being of your children.

Our conversation will be digitally recorded and my assistant will also be taking notes. However, everything you say will be remaining strictly confidential. No references will be made to either your name or the name of your place in any of the work that is produced as a result of this research. Thank you for agreeing to participate in my study.

Interviewer starts with the probes:

A. Child Birth

1. How do you take care of yourself during pregnancy? (probe eating/drinking habits, food fads, intake of green leafy vegetables, additional food, rituals, health seeking behaviour, IFA intake, treatment adherence)
2. Please tell me where do people here go for delivery (e.g. hospital/home delivery)
3. Please explain what are the customs you follow as soon as an infant is born

B. Infant Feeding Practices

1. What do you feed your baby with soon after birth? (Probe colostrum, any other feed like sugar, honey, other milk)
2. How long do you exclusively breastfeed your baby? (months)
3. In your opinion, what are the benefits of exclusive breastfeeding?
4. Are there any problems which you face in exclusive breastfeeding?
5. In case of any problem, how do you think it can be solved?
6. In your opinion, when do you start of complementary feeding (semi-solid food in addition to breastfeeding? (probe time of introduction, types of food, good and poor practices, and related customs and norms)
7. How frequently do you feed your child and what type of food do you give in a day?
8. Who will normally feed the child at home? (mother, grandmother)

C. Awareness on the health of the infant /child

1. In your opinion, please explain why health of your infant /child is important?
2. In your opinion, do you feel that your child has normal weight and height?(probe regarding the source of awareness, monitoring by health professional)

3. If you feel that your child is not gaining weight or height, what are the possible reasons, you attribute to?

D. Health Seeking Behaviour

1. What would you do as soon as your child falls sick? (General belief and practices can be probed)
2. Who are the people you consult when your child falls sick? (probe the reasons)
3. What are the specific practices you carry out if your child has diarrhoea?(Probe – health facility approached, ORS, any harmful practices)
4. What do you do when your child has got Respiratory tract illness? (Probe – health seeking behaviour, treatment opted)

E. Support systems and Challenges

1. What are the health services available to you and your children in and around your household? (Please probe availability, accessibility, affordability, and accountability)
2. Do you get any support given by the government to address the health/nutritional needs of your children (probe who, where and what is given)
3. What are the difficulties you face in availing those services? Please explain in detail
4. Please give all your suggestions to address these difficulties.

..... Thank you.....

குவிப்பு குழு விவாதம் வழிகாட்டி

குவிப்பு குழு கலந்துரையாடல் குறைந்தது இரண்டு குழுக்களாக மலைப் பகுதி மற்றும் சமவெளியில் வாழும் 5 வயதிற்குட்பட்ட குழந்தைகளின் (8 முதல் 10) தாய்மார்களைக் கொண்டு நடத்த திட்டமிடப்பட்டுள்ளது. கலந்துரையாடலில் கலந்து கொள்ளும் தாய்மார்கள் மாறுபட்ட கல்வி தகுதி மாறுபட்ட வயது மாறுபட்ட சமநிலை உள்ளவர்களாக தேர்வு செய்யப்பட கவனம் செலுத்தப்படும்.

அவர்களிடமிருந்து கர்ப்பக்காலத்தின் போது பின்பற்றப்படும் உணவு முறை, பேறுகாலத்திற்கு பின் எடுத்துக் கொள்ளப்படும் உணவு பழக்கம், தாய்ப்பால் கொடுக்கும் முறை, நிரப்பு உணவு முறை, குழந்தைகள் நோய்வாய்ப்பட்டிருக்கும் போது பராமரிக்கும் முறை தொடர்பான தகவல்கள் பெறப்படும்.

குவிப்பு குழு கலந்துரையாடல் அமர்வு ஒலிப்பதிவு மற்றும் வாய் மொழி உரையாடல்களையும் குறிப்பேடுகளில் பதிவு செய்யப்படும்.

கு.கு.க. தகவல் பெறும் ஒப்புதல் பங்கேற்பாளர் களிடமிருந்து பெறப்பட்டவுடன் தொடங்கப்படும்.

குறிப்பு:- ஆடியோ பதிவு (ஒலிப்பதிவு) குறிப்பு குழு கலந்துரையாடல் அறிமுகவுரையிலிருந்தே பதிவு செய்யப்படும்.

அனைவருக்கும் என்னுடைய காலை வணக்கங்கள். என்னை நான் அறிமுகப்படுத்துகிறேன். தமிழ்நாடு எம்.ஜி.ஆர். மருத்துவ பல்கலைக்கழகத்தின் மருத்துவ மாணவனாகிய நான் சென்னை கீழ்பாக்கம், அரசு மருத்துவக் கல்லூரியில் சமூகத்துறையில் உதவி பேராசிரியராக வேலை செய்து கொண்டே பணியின் ஒரு பகுதியாக என்னுடைய டி.டி.டி. திட்டத்திற்கான ஆராய்ச்சிகளை மேற்கொண்டு வருகிறேன்.

உங்கள் குழந்தைகளின் ஆரோக்கியம் மற்றும் நல் வாழ்விற்கான ஊட்டச்சத்து நடைமுறைகளை அறிந்து செயல்படுத்தப்பட வேண்டும் என்பதே இந்த கு.கு.க. ன் திட்டம்.

நம் கலந்துரையாடல் ஒலிப்பதிவு செய்யப்படுவதோடு என்னுடைய உதவியாளரால் குறிப்பேடுகள் மூலமாகவும் பதிவு செய்யப்படும். உரையாடலில் தரப்படும் தங்களின் மேலான கருத்துக்கள் இரகசியமாக பாதுகாக்கப்படும். இந்த ஆராய்ச்சியின் விளைவாக ஏற்படும் முடிவுகளின் தொடர்பாக, உங்களின் பெயரையோ, வசிப்பிடமோ குறிப்பிடப்பட மாட்டாது.

என்னுடைய இந்த ஆராய்ச்சியில் கலந்து கொள்ள ஒப்புதலளித்தமைக்கு மிக்க நன்றி.

A. குழந்தை பிறப்பு:

1. கர்ப்ப காலத்தின் போது உங்களை நீங்கள் எவ்வாறு கவனித்துக் கொள்வீர்கள்?

(உணவு பழக்க வழக்கங்கள், பச்சை காய்கறிகள் எடுத்துக் கொள்வது, கூடுதல் உணவு, இரும்பு சத்து மாத்திரைகள் உட்கொள்வது)

2. இங்குள்ள மக்கள் பிரசவத்திற்கு எங்கே செல்வார்கள்? (மருத்துவமனை / வீட்டிலேயே பிரசவம்)

3. குழந்தை பிறந்தவுடன் மேற்கொள்ளப்படும் வழி முறைகள் பற்றி விவரிக்கவும் :

B. குழந்தைக்கு உணவூட்டும் பழக்க வழக்கங்கள்

1. குழந்தை பிறந்தவுடன் என்ன கொடுப்பீர்கள்?

சர்க்கரை போன்ற மற்ற உணவுகள், தேன், வேறு பால்.

2. தாய்ப்பால் மட்டுமே குழந்தைக்கு எத்தனை மாதங்கள் கொடுப்பீர்கள்?

3. உங்கள் கருத்துப்படி தாய்ப்பால் மட்டுமே கொடுப்பதன் நன்மைகள் என்ன?

4. தாய்ப்பால் மட்டுமே கொடுப்பதால் ஏதேனும் பிரச்சினைகளை சந்தித்ததுண்டா?

5. அப்படி பிரச்சினை ஏற்பட்டால் எவ்வாறு தடுக்க முடியும் என்று நினைக்கிறீர்கள்?

6. தங்கள் கருத்துப்படி தாய்ப்பாலுடன் பிற நிரப்பு (அரை திட) உணவுகளை எப்போது கொடுக்க ஆரம்பிக்கலாம்.

(நிரப்பு அரை திட உணவு அறிமுகப்படுத்தும் நேரம், உணவு வகைகள், சம்பிரதாயம் தொடர்பான பழக்க வழக்கங்கள்)

7. குழந்தைக்கு ஒரு நாளைக்கு எத்தனை முறை உணவளிப்பீர்கள்? என்ன வகை உணவுகள் கொடுப்பீர்கள்?

8. உங்கள் வீட்டில் பொதுவாக குழந்தைக்கு யார் உணவளிப்பார்கள்? (தாய், பாட்டி)

C. குழந்தையின் ஆரோக்கியம் குறித்த விழிப்புணர்வு:

1. உங்கள் கருத்துப்படி குழந்தையின் ஆரோக்கியம் ஏன் முக்கியம் என்று கூறவும்.

2. உங்கள் கருத்துப்படி, உங்கள் குழந்தைக்கு சரியான உயரம் மற்றும் எடை இருப்பதாக உணர்கிறீர்களா? (உடல் நல நிபுணத்துவத்தால் விழிப்புணர்வு. கண்காணிப்பின் மூலத்தை பற்றிய ஆய்வு)

3. உங்கள் குழந்தைக்கு சரியாக உயரம்/எடை ஏறவில்லை என்று நினைத்தால், அதற்கான காரணம் என்னவாக இருக்கலாம்?

D. உடல் நலம் தேரும் நடத்தைகள்

1. குழந்தைக்கு உடல்நலக் குறைவு ஏற்பட்டால் என்ன செய்வீர்கள்?

(பொதுவான நம்பிக்கை மற்றும் பழக்க வழக்கங்கள் தொடர்பாக)

2. குழந்தைக்கு உடல்நலக் குறைவு ஏற்பட்டால் யாரிடம் ஆலோசனை கேட்பீர்கள்? (காரணம் ஆராய்தல்)

3. குழந்தைக்கு வயிற்றுப்போக்கு ஏற்பட்டால் என்னென்ன குறிப்பிட்ட நடைமுறைகளை மேற்கொள்வீர்கள்? (ஆய்வு மையம் அணுகுதல், உப்பு சர்க்கரை திரவம், கேடு விளைவிக்கும் நடைமுறை)

4. உங்கள் குழந்தைக்கு மூச்சுகுழாய் சம்மந்தமான நோய் தாக்கினால் என்ன செய்வீர்கள்? (சுகாதாரம் தேடும் நடத்தைகள், சிகிச்சை அளிக்கப்பட்ட விபரம்)

ஆதரவு அமைப்புகள் மற்றும் சவால்கள்

1. உங்கள் வீட்டின் அருகே உங்களுக்கும் உங்கள் குழந்தைக்கும் உள்ள சுகாதார சேவை அமைப்புகள் (சேவை கிடைப்பதில் ஏற்படும் சிரமம், அணுகும் முறை, செலவிடும் தகுதி, பொறுப்புடைமை)

2. உங்கள் குழந்தையின் ஆரோக்கியம்/ஊட்டச்சத்து தேவைகளுக்கு அரசு வழங்கும் உதவிகள் ஏதேனும் உங்களுக்குக் கிடைக்கிறதா?

(யாரால், எங்கே, என்ன கொடுக்கப்படுகிறது என்பதன் ஆய்வு)

3. அந்த உதவிகள் உங்களுக்கு கிடைப்பதில் என்னென்ன கஷ்டம் ஏற்படுகிறது? (தயவு செய்து விரிவாக விளக்கவும்)

4. அந்த கஷ்டங்களை எதிர்கொள்ள உங்கள் கருத்துகள்?

In-depth Interview Guide

After introduction about the purpose of the interview by the principal investigator and obtaining the informed consent, the interview is conducted as follows:

- Please introduce yourself (Mother), and tell me about your family members (Age, Education, occupation and health status)
- How long do you live in this place and give me some information about this place? (What grows here, transport facilities, health care facilities, ICDS, schools)
- What is the occupation that most of the people living here are engaged in? What is the average income of your family and who earns? Type of job, approximate wages, income from family, continuous source of income....

Nutrition and cultural beliefs:

- What is the staple food taken in this place (why ? foods preferred by men/women)
- Has there been shortage of food in your family? If so how do you adjust?
- In your opinion, what type of food is to be consumed during the pregnancy? What is the food stuff you avoid? (**Probe** – regarding greens, egg, additional food)
- Who advised you about nutrition during the antenatal period? **Probe** – health facility, who
- What type of food were you provided during your postnatal period, Do they recommend any specific food and why?
- What is the first feed you gave to your baby soon after birth? **Probe** – cultural belief, giving colostrum
- In your opinion, what is exclusive breastfeeding and how long to give?
- Did you face any difficulty in continuing the exclusive breastfeeding in your baby?
- When did you start giving semi-solid food to your baby in addition to breastfeeding? When and what did you give and who gave you the information on the type of food? **Probe** --- cultural beliefs and practices

- If you are a mixed diet consumer, when do you start giving non-vegetarian food to your child and what do you prefer?
- How frequently do you feed your child in a day?
- Who will assist the child in feeding at home?
- Is there any specific food group, you avoid giving the child? **Probe** : influence of social group
- What are the difficulties you face when home members differ in advice given by health professional regarding the dietary pattern? **Probe**: Cultural beliefs
- Is there any difference in feeding between boy and girl child?
- Do you give any multivitamin supplements to your child?

Health seeking behavior

- Whom do you approach for treatment of ARTI and Diarrhea in your child? Why so?
- Are there any difficulties which you face in approaching the health services for minor ailments for your child? **Probe** – distance, availability, beliefs
- Do you wish to share any suggestions to address the difficulties you face in seeking health facility during any illness in your child?
- What is your knowledge regarding the growth and health of your child? **Probe** – who gave the information, awareness on adequate growth and frequency of visits to health facility?
- What do you think about the role of ICDS, health facility like PHC, private sector in influencing the nutritional status of your child? **Probe** - Facilities available, availed, awareness?

ஆழமான நேர் காணல் வழிகாட்டி

நேர்காணலின் நோக்கம் ஒப்புதல் பெறப்பட்ட பின் முதன்மை விசாரணையாளர் அவர்களால் நேர் காணலின் நோக்கம் அறிமுகப்படுத்தப்பட்ட பின், பின்வரும் நேர்காணல் நடைபெற்றது.

- உங்களை அறிமுகப்படுத்திக் கொள்ளுங்கள். உங்கள் குடும்ப உறுப்பினர்கள் பற்றி கூறுங்கள் (வயது, கல்வி தகுதி, வேலை, உடல் நிலை)
- இந்த இடத்தில் எத்தனை நாளாக வசிக்கிறீர்கள். இந்த இடத்தைப் பற்றிய விவரங்களைக் கூறவும். (விளையும் பயிர், போக்குவரத்து வசதி, உடல் நல வசதி (பாதுகாப்பு மையம், பால்வாடி, பள்ளி கூடம்)
- இந்த இடத்தில் பெரும்பாலானவர்கள் என்ன வேலை செய்கிறார்கள். உங்கள் குடும்பத்தின் சராசரி வருமானம் என்ன? வருவாய் ஈட்டுபவர் விபரம், எப்படிப்பட்ட வேலை, சராசரி வருமானம், தொழில் வருமானம், சொத்து வருமானம் போன்ற நிரந்தர வருமானம்.

ஊட்டச்சத்து மற்றும் கலாச்சார நம்பிக்கை

- இந்த இடத்தில் பொதுவாக உட்கொள்ளப்படும் உணவு (ஏன்? உணவு தயாரிப்பவர் ஆணா/பெண்ணா)
- உங்கள் குடும்பத்திற்கு எப்போதாவது உணவு பற்றாக்குறை ஏற்பட்டுள்ளதா? அப்படியானால் எப்படி சரி செய்வீர்கள்?

- உங்கள் கருத்துப்படி கர்ப்பக்காலத்தில் என்னென்ன உணவு உண்ண வேண்டும்? நீங்கள் தவிர்க்கும் உணவு வகைகள்? (கீரை வகைகள், முட்டை கூடுதல் உணவு)
- கர்ப்பக்காலத்தில் உங்கள் ஊட்டச்சத்து குறித்த அறிவுரைகள் யார் வழங்குவார்கள்? (ஆய்வு-சுகாதார வசதி எப்படி)
- குழந்தை பிறந்த பின்பு எந்த வகையான உணவு உங்களுக்கு வழங்கப்பட்டது? ஏதேனும் குறிப்பிட்ட உணவு அறிவுறுத்தப்பட்டதா? ஏன்?
- குழந்தை பிறந்தவுடன் குழந்தைக்கு முதன் முதலில் அளிக்கப்பட்ட உணவு என்ன? (கலாச்சார உணவு, சர்க்கரை நீர், சீம்பால்)
- தாய்ப்பால் மட்டுமே வழங்குவது பற்றிய உங்கள் கருத்து என்ன? எத்தனை நாட்கள் தாய்ப்பால் மட்டுமே வழங்க வேண்டும்?
- குழந்தைக்குத் தாய்ப்பால் மட்டுமே வழங்குவதின் மூலம் நீங்கள் சந்தித்த சிரமங்கள் என்னென்ன?
- தாய்ப்பாலுடன் சேர்த்து அரை திட உணவுகள் எப்போது கொடுக்க ஆரம்பித்தீர்கள்? எந்த மாதிரி உணவுகளைக் கொடுத்தீர்கள்? யார் உங்களுக்கு உணவு வகைகள் குறித்த விவரங்களைக் கூறியது? (கலாச்சார நம்பிக்கை மற்றும் பயிற்சி)

- நீங்கள் அசைவ உணவு உட்கொள்பவராக இருந்தால், உங்கள் குழந்தைக்கு அசைவ உணவு கொடுக்க எப்போது ஆரம்பித்தீர்கள்? என்ன உணவு கொடுக்கப்பட்டது?
- ஒரு நாளைக்கு எத்தனை முறை குழந்தைக்கு உணவளிப்பீர்கள்?
- குழந்தைக்கு உணவளிக்க உங்கள் வீட்டில் யார் உதவுவார்கள்?
- உங்கள் குழந்தைக்கு ஏதாவது உணவு வகைகள் கொடுப்பதைத் தவிர்க்கிறீர்களா? (உடன் வசிப்பவர்களின் வற்புறுத்தல்)
- சுகாதார தொழில் முறை உணவை தரவிடாமல் குடும்பத்தினர் அறிவுரையால் ஏற்படும் இன்னல்கள்
- ஆண் மற்றும் பெண் குழந்தைக்கு உணவளிப்பதில் வேறுபாடு உள்ளதா?
- குழந்தைக்கு ஊட்டச்சத்து மருந்துகள் ஏதாவது கொடுக்கிறீர்களா?

சுகாதாரம் தேடும் நடத்தைகள்

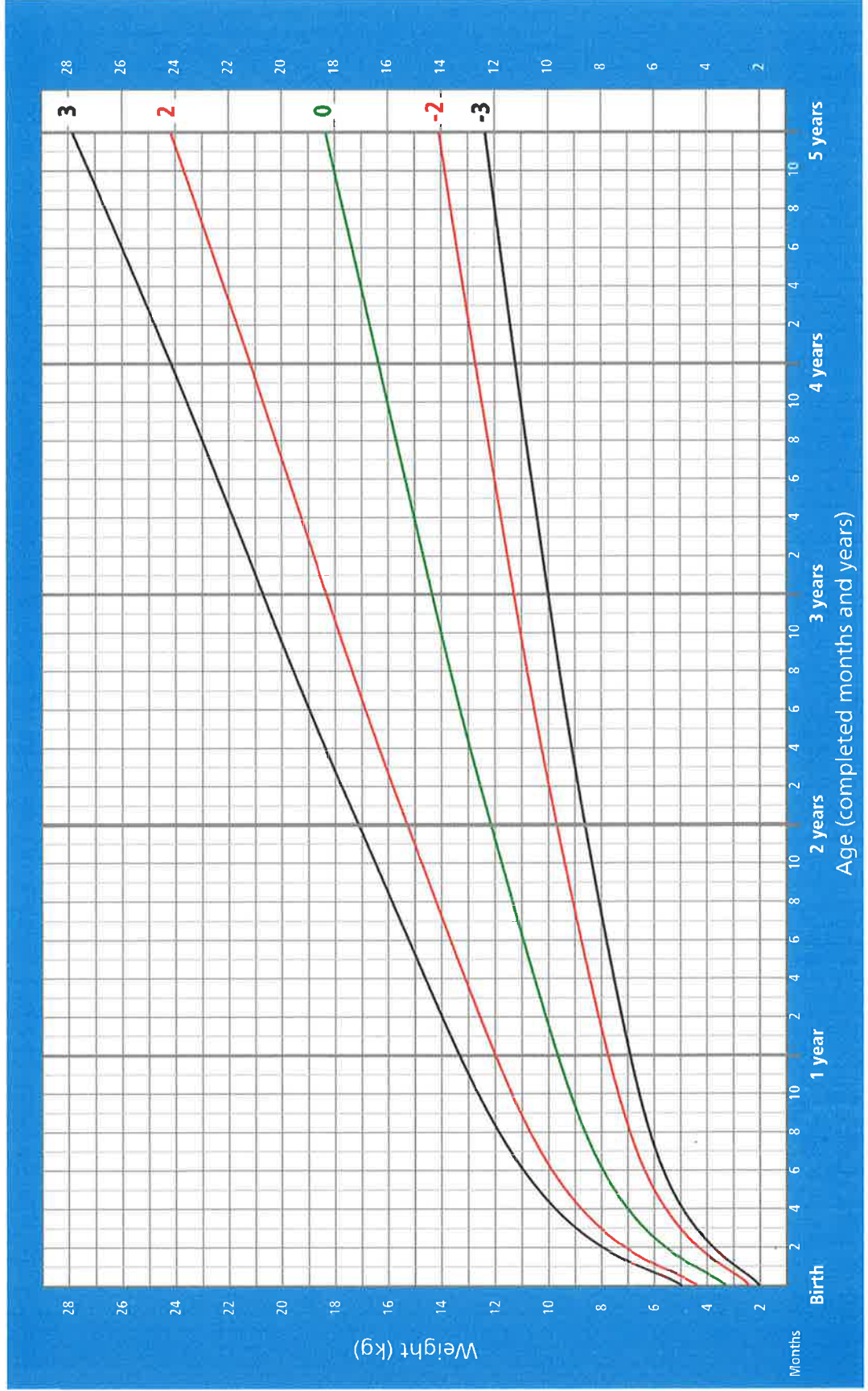
- வாந்தி மற்றும் வயிற்றுப்போக்கு ஏற்பட்டால் யாரை அணுகுவீர்கள்? எங்கு செல்வீர்கள்? ஏன்?
- சிறு உடல்நிலைப்பிரச்சினைக்கு மருத்துவ சேவையை அணுகுவதில் ஏதாவது சிரமம் உள்ளதா? (தூரம், நம்பிக்கை, சேவை கிடைப்பது)

- மருத்துவ சேவையை அணுகுவதில் ஏற்படும் சிரமங்களை எதிர்கொள்வதற்கு ஏதேனும் யோசனை கூற முடியுமா? சிரமங்களை பகிர்ந்து கொள்ள விரும்புகிறீர்களா?
- உங்கள் குழந்தையின் ஆரோக்கியம் மற்றும் வளர்ச்சியைப் பற்றிய உங்கள் புரிதல் என்ன? (தகவல் தருபவர் யார்? குழந்தையின் வளர்ச்சி மற்றும் சுகாதார மையத்தை அணுக விழிப்புணர்வு தருபவர் யார்?)
- பால்வாடி மையம், ஆரம்ப சுகாதார மையம், தனியார் மருத்துவ சேவை மையம், குழந்தைகளின் ஊட்டச்சத்து நிலைப்பாடு தொடர்பான உங்கள் கருத்து. (ஆய்வு:- வசதி, உள்ள நிலை, பெறப்பட்ட விவரம், விழிப்புணர்வு)

*** நன்றி ***

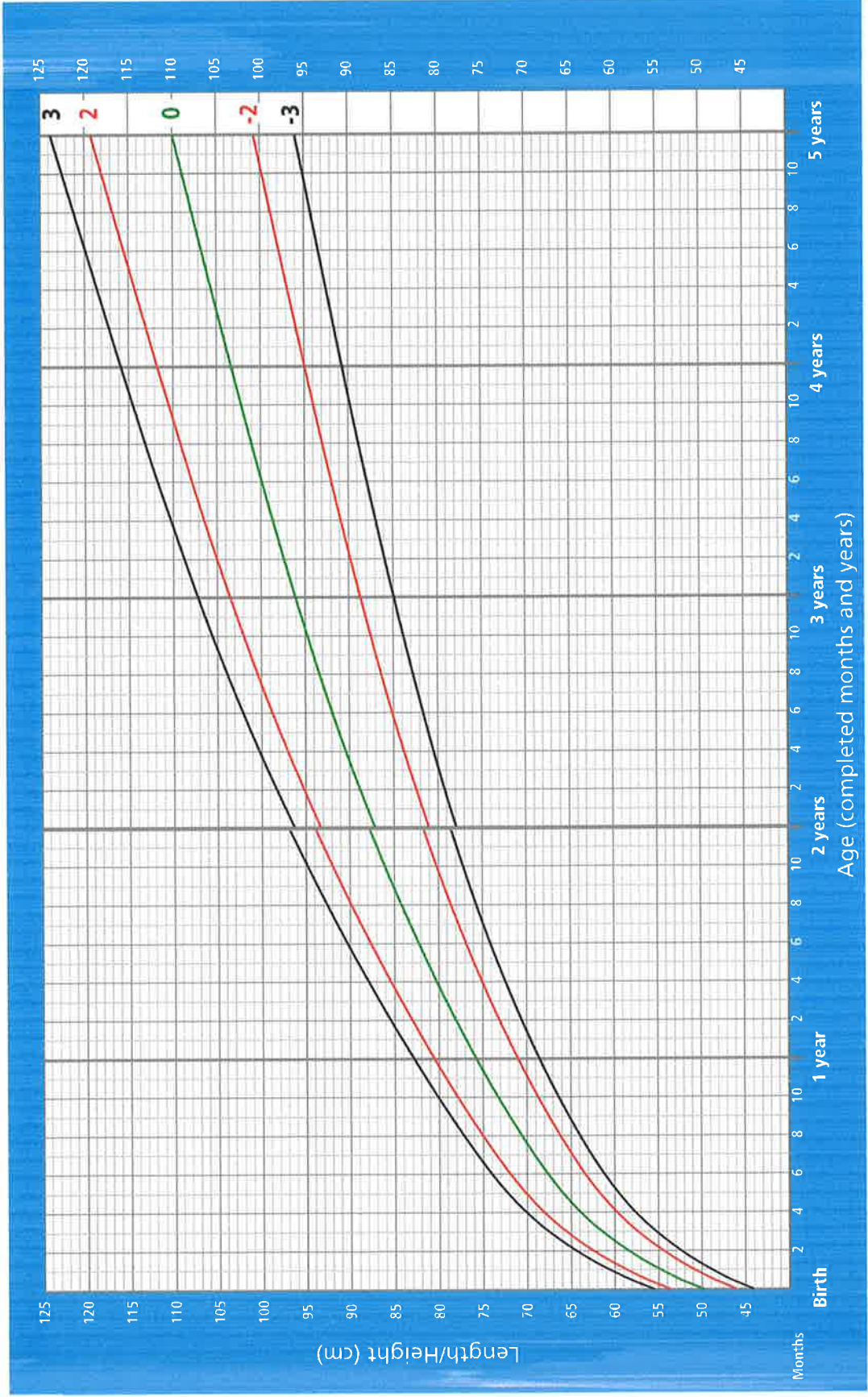
Weight-for-age BOYS

Birth to 5 years (z-scores)



Length/height-for-age BOYS

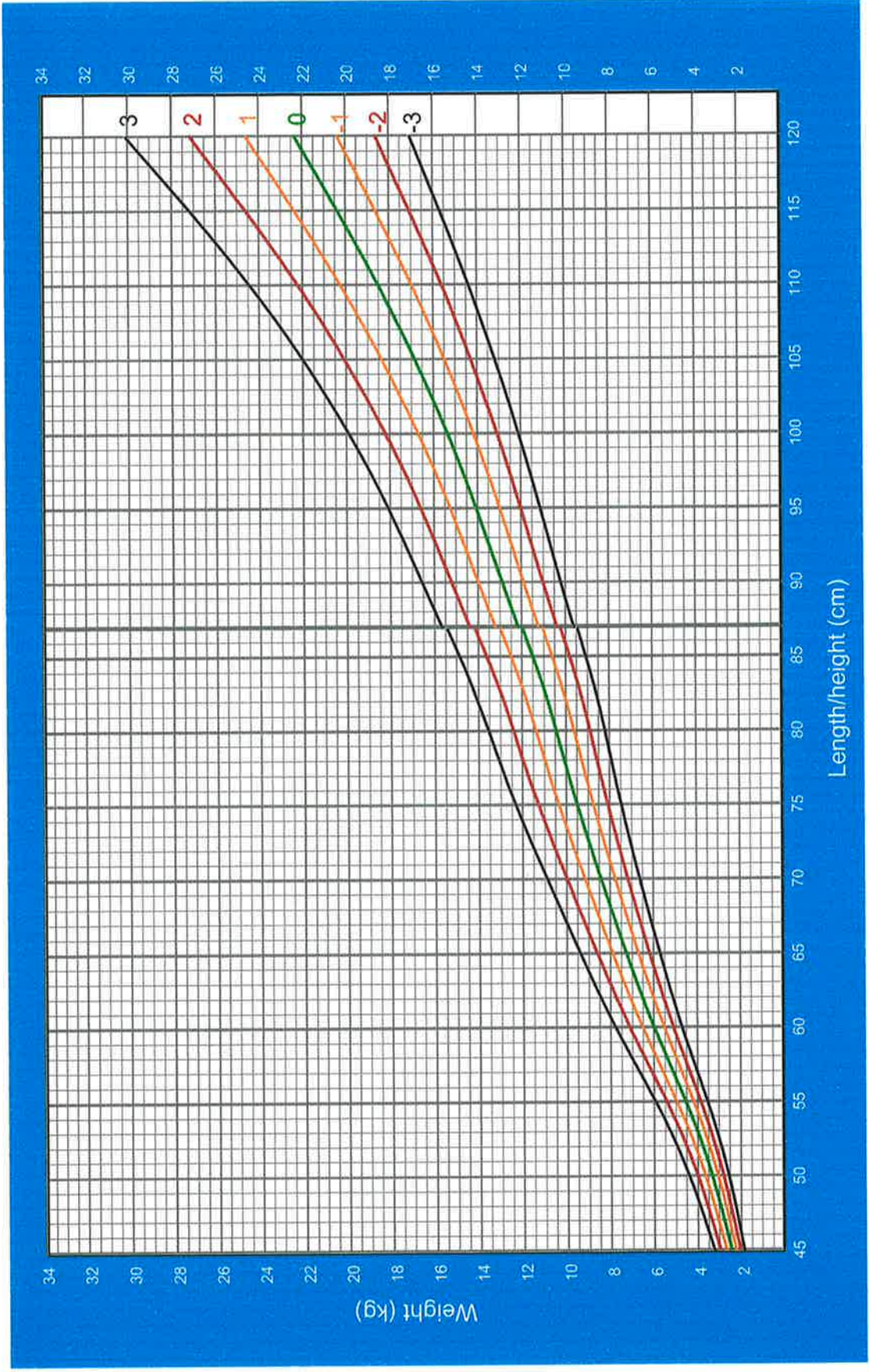
Birth to 5 years (z-scores)



Weight-for-length/height BOYS

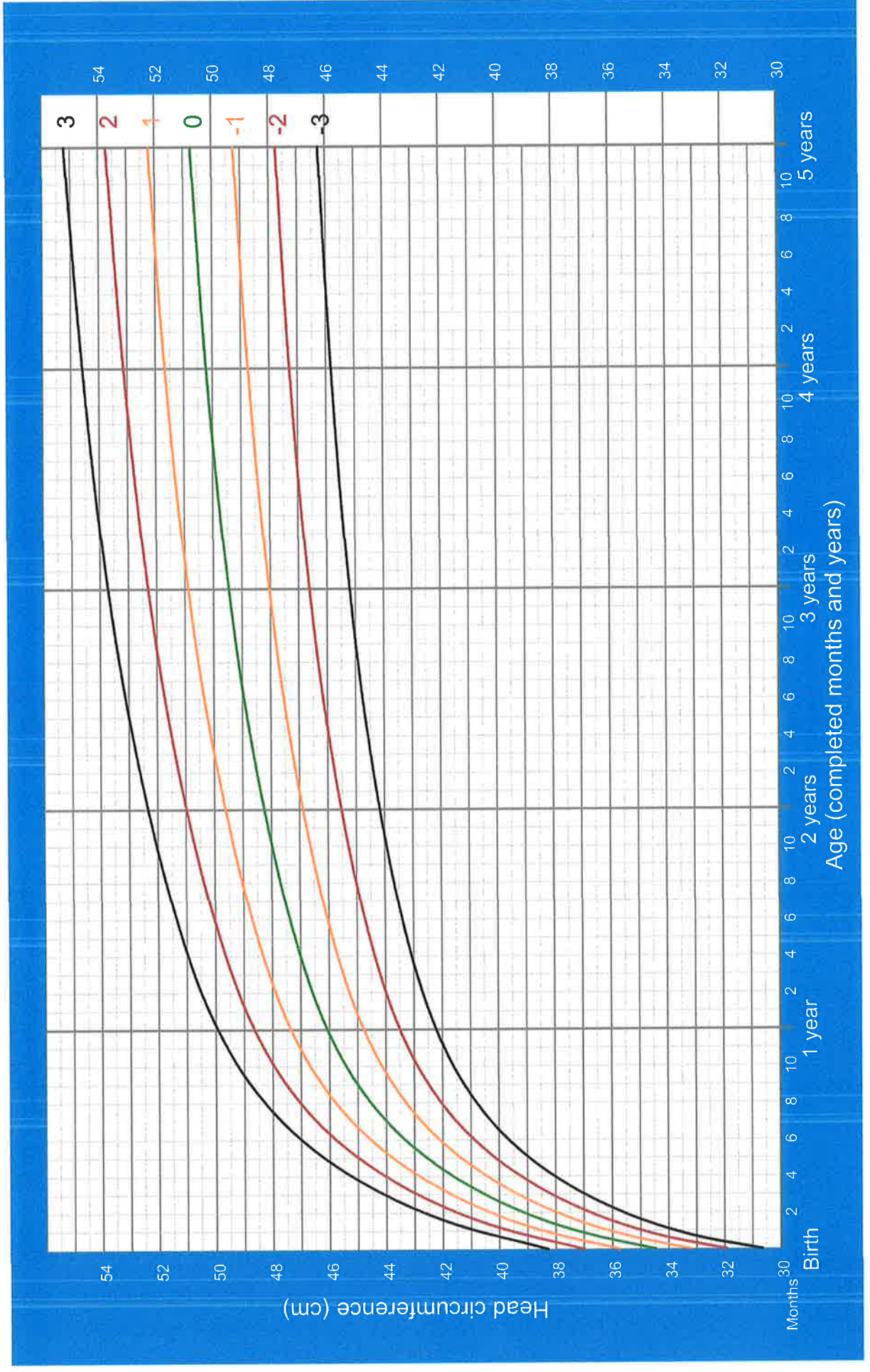


Birth to 5 years (z-scores)



Head circumference-for-age BOYS

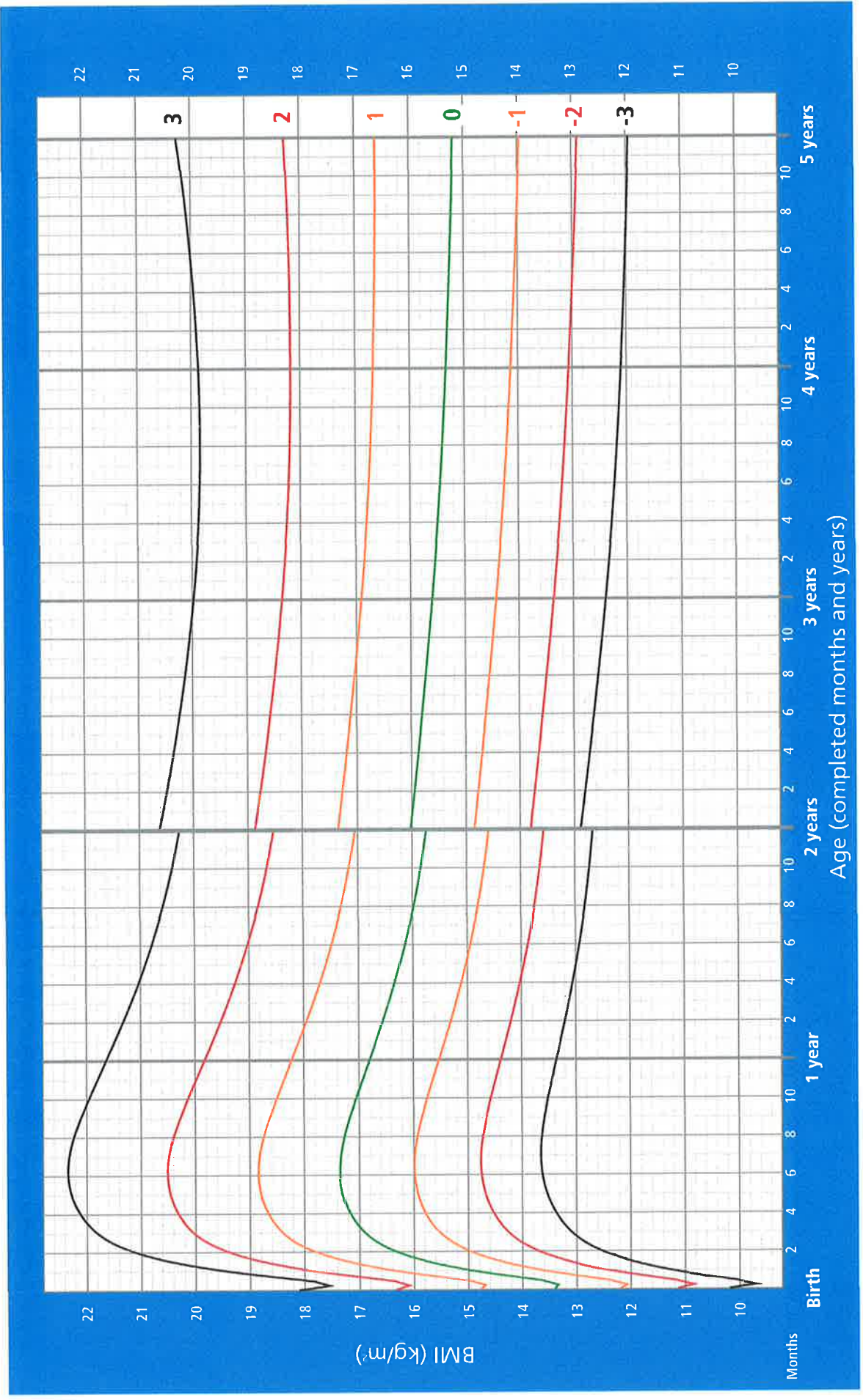
Birth to 5 years (z-scores)



53

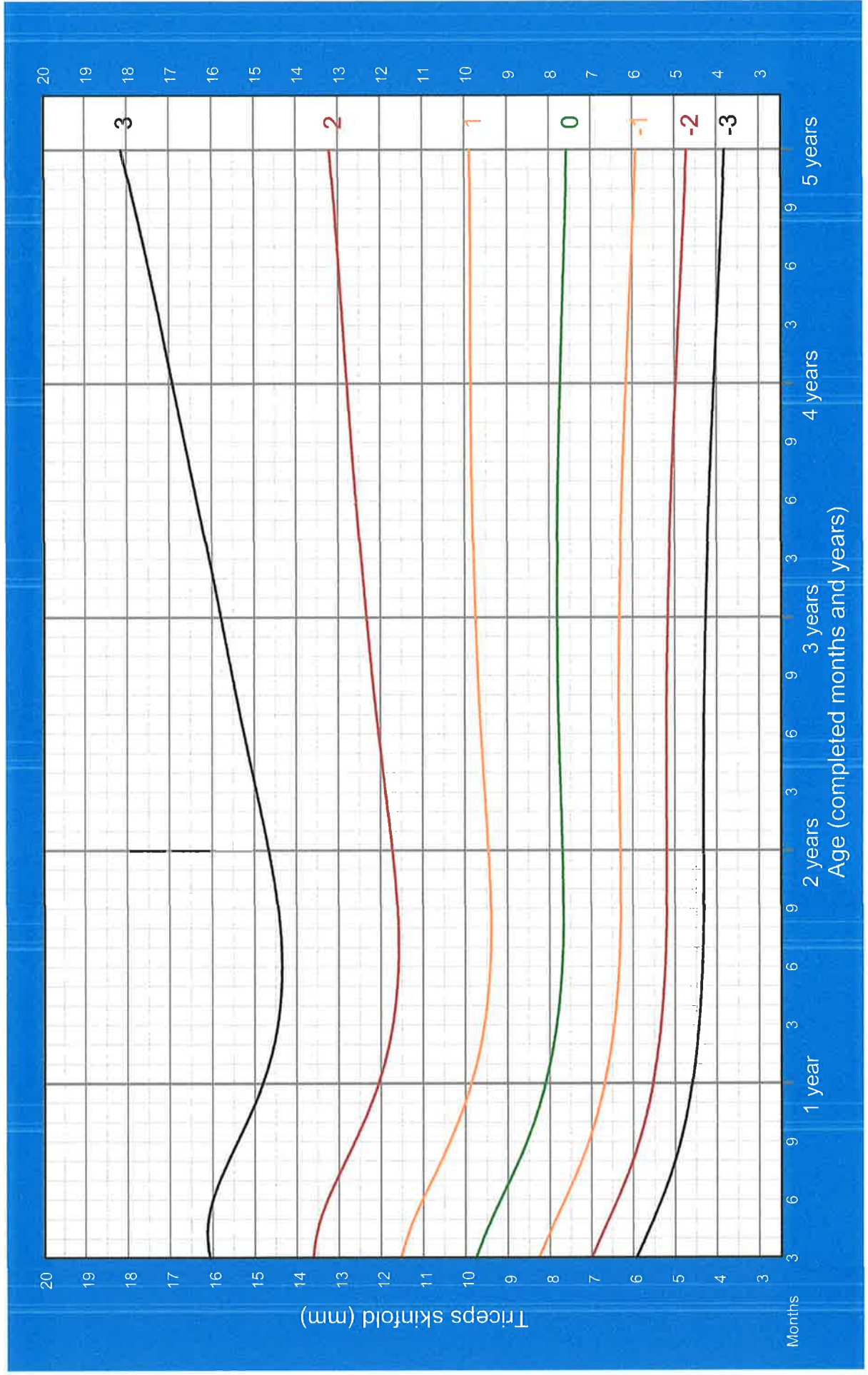
BMI-for-age BOYS

Birth to 5 years (z-scores)



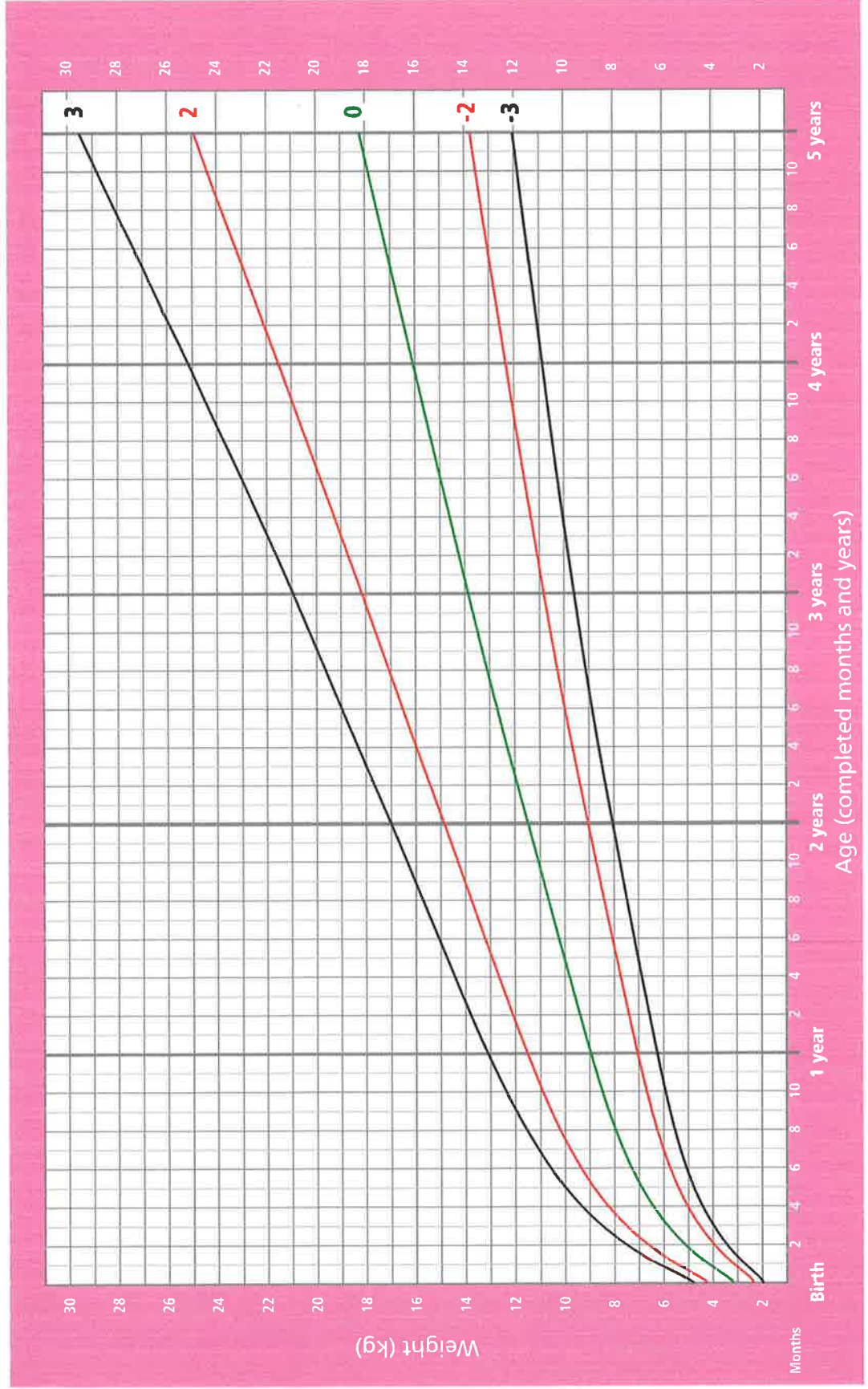
Triceps skinfold-for-age BOYS

3 months to 5 years (z-scores)



Weight-for-age GIRLS

Birth to 5 years (z-scores)



Length/height-for-age GIRLS

Birth to 5 years (z-scores)



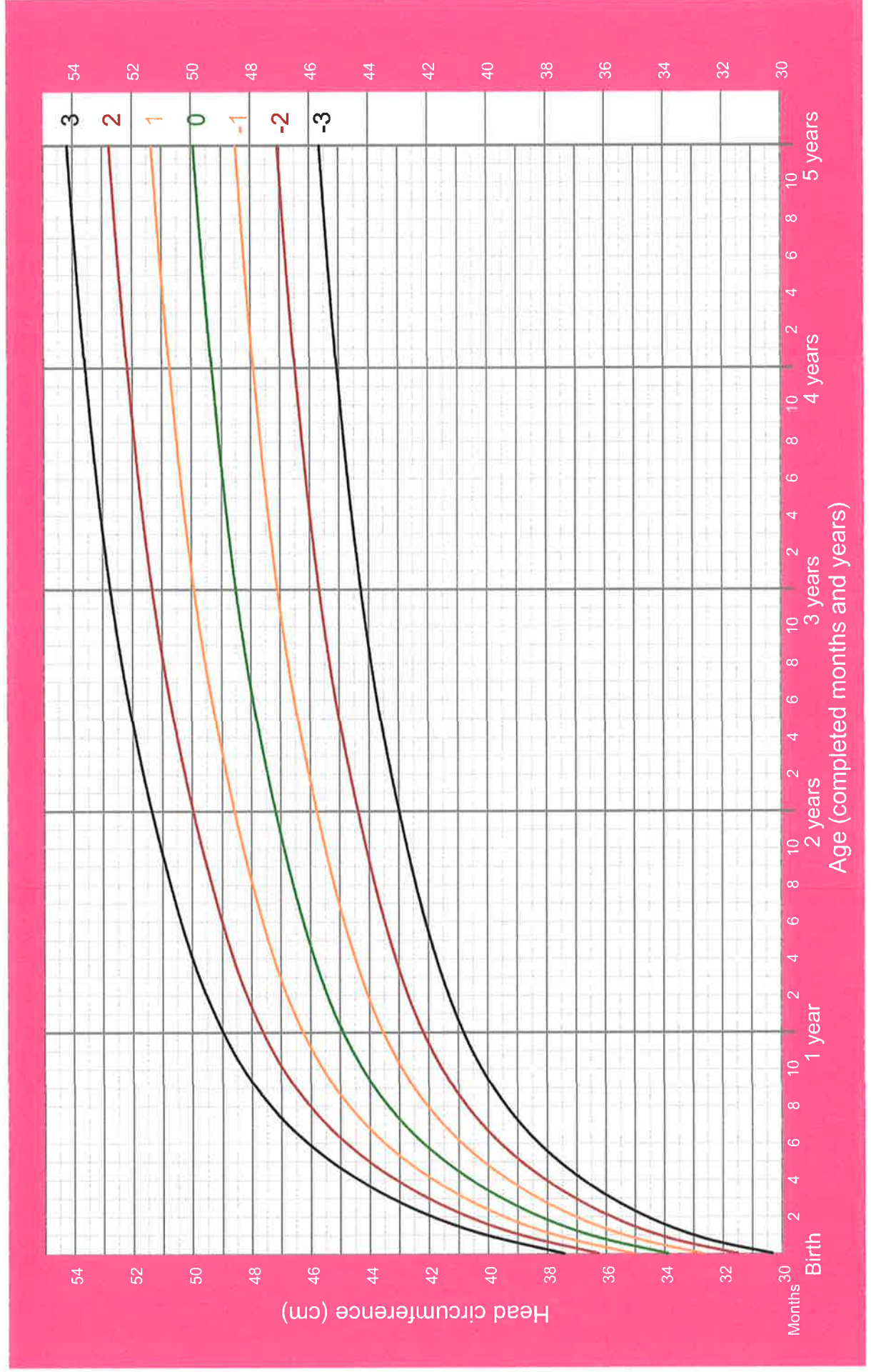
Weight-for-length/height GIRLS

Birth to 5 years (z-scores)



Head circumference-for-age GIRLS

Birth to 5 years (z-scores)



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BMI-for-age GIRLS



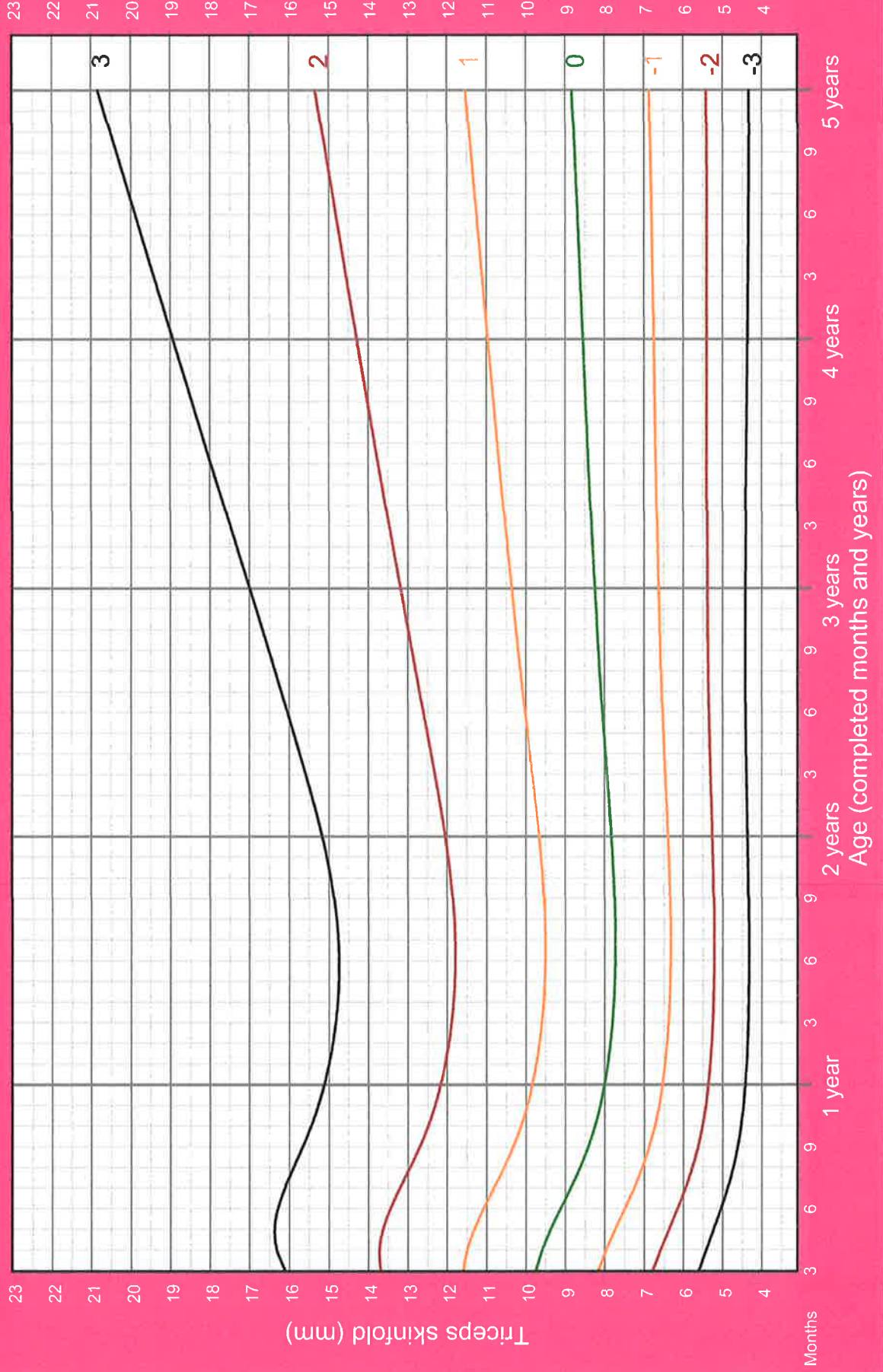
Birth to 5 years (z-scores)



190

Triceps skinfold-for-age GIRLS

3 months to 5 years (z-scores)



Appendix

Energy requirements of Indians at different ages

Age Group	Category	Body Weights	Requirement	
			(kcal/day) ^a	(kcal/kg/day)
Man	Sedentary work	60	2320	39
	Moderate work	60	2730	46
	Heavy work	60	3490	58
Woman	Sedentary work	55	1900	35
	Moderate work	55	2230	41
	Heavy work	55	2850	52
	Pregnant woman	55 + GWG ^b	+350	
	Lactation	55 + WG ^c	+600 +520	
Infants	0-6 m	5.4	500	92
	6-12 m	8.4	670	80
Children ^d	1-3y	12.9	1060	82
	4-6y	18.1	1350	75
	7-9 y	25.1	1690	67
Boys	10-12y	34.3	2190	64
Girls	10-12y	35.0	2010	57
Boys	13-15y	47.6	2750	58
Girls	13-15y	46.6	2330	50
Boys	16-17y	55.4	3020	55
Girls	16-17y	52.1	2440	47

^aRounded off to the nearest 10 kcal/d

^b GWG - Gestational Weight Gain. Energy need in pregnancy should be adjusted for actual bodyweight, observed weight gain and activity pattern for the population.

^cWG - Gestational Weight gain remaining after delivery

^dEnergy needs of children and adolescents have been computed for reference children and adolescents; these reference children were assumed to have a *moderate daily physical activity level*. The actual requirement in specific population groups should be adjusted for the actual weight and physical activity of that population especially when computing the gap between energy requirement and actual intake that needs to be filled by supplementation programs.

Appendix

Safe Level of Protein Intake for children over the age of 6 months up to 10 years (genders combined)*

Age(y)	Maintenance ^a	Growth ^b	Total	Safe level ^c 1.96xSD (1985 values)	Safe Level Indian Diet ^d
	g protein / kg Body weight / day				
0.5	0.66	0.46	1.12	1.31 (1.75)	1.69
1	0.66	0.29	0.95	1.14 (1.57)	1.47
1.5	0.66	0.19	0.85	1.03 (1.26)	1.33
2	0.66	0.13	0.79	0.97 (1.17)	1.25
3	0.66	0.07	0.73	0.90 (1.13)	1.16
4	0.66	0.03	0.69	0.86 (1.09)	1.11
5	0.66	0.06	0.69	0.85 (1.06)	1.09
6	0.66	0.04	0.72	0.89 (1.02)	1.15
7	0.66	0.08	0.74	0.91 (1.01)	1.17
8	0.66	0.09	0.75	0.92 (1.01)	1.18
9	0.66	0.09	0.75	0.92 (1.01)	1.18
10	0.66	0.09	0.75	0.92 (0.99)	1.18

Values in parentheses are based on 1985 FAO/WHO/UNU Consultations.

* For total daily protein requirement in each age band, values need to be multiplied by the normative attained weight in that age band. For example, the age band of 10 years represents the class interval from 9.1-10.0 years. The weight of a boy in this age band is 28.0 kg (taken from Table 4.6 in Energy Chapter). Then, the total protein requirement will be = 1.18 x 28 = 33.0 g/day. These calculations are presented for all ages and both genders in Table 5.15.

^aFrom N balance studies

^bFrom Table 5.5 adjusted for efficiency of utilization of 58% from N balance studies

^cSD calculated as in text

^dCorrected for protein from Indian cereal-pulse-milk based diet having PDCAAS of 77.4% for children up to 10 years,



**Household Food Insecurity
Access Scale (HFIAS) for
Measurement of Food Access:
Indicator Guide**

VERSION 3

Jennifer Coates
Anne Swindale
Paula Bilinsky

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Food and Nutrition Technical Assistance Project (FANTA)

Academy for Educational Development 1825 Connecticut Ave., NW Washington, DC 20009-5721
Tel: 202-884-8000 Fax: 202-884-8432 E-mail: fanta@aed.org Website: www.fantaproject.org

Table 1: Household Food Insecurity Access Scale (HFIAS) Generic Questions

Each of the questions in the following table is asked with a recall period of four weeks (30 days). The respondent is first asked an occurrence question – that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers “yes” to an occurrence question, a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks.

Example:

1. In the past four weeks, did you worry that your household would not have enough food?

0 = No (skip to Q2)

1 = Yes

1.a. How often did this happen?

1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

No.	Occurrence Questions
1.	In the past four weeks, did you worry that your household would not have enough food?
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
6.	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?

4. QUESTIONNAIRE FORMAT

Table 4: Household Food Insecurity Access Scale (HFIAS) Measurement Tool

No	QUESTION	RESPONSE OPTIONS	CODE
1.	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes _
1.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) _
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes _
2.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) _
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1 = Yes _
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) _
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to	0 = No (skip to Q5) 1 = Yes _

	obtain other types of food?		
4.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) __
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1 = Yes __
5.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) __
6.	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1 = Yes __
6.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) __
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1 = Yes __
7.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) __

8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes __
8.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) __
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1 = Yes __
9.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks) __

5. INDICATOR TABULATION PLAN

This section provides guidance on analyzing the data to create HFIAS indicators. It assumes that these questions will be part of a population-based survey instrument and will be applied to all the households in the sample.

The HFIAS module yields information on food insecurity (access) at the household level. Four types of indicators can be calculated to help understand the characteristics of and changes in household food insecurity (access) in the surveyed population. These indicators provide summary information on:

- Household Food Insecurity Access-related *Conditions*
- Household Food Insecurity Access-related *Domains*
- Household Food Insecurity Access *Scale Score*
- Household Food Insecurity Access *Prevalence*

The responses from the household food insecurity (access) measure should be entered into a database, spreadsheet, or statistical software like EpiInfo or SPSS. Computer tabulation is recommended for these indicators, though if necessary the data may also be tabulated by hand.

5.1 Household Food Insecurity Access-related Conditions

These indicators provide specific, disaggregated information about the behaviors and perceptions of the surveyed households. For example, if a program is providing assistance in growing staple crops and improved storage facilities, it might be useful to understand what percent of households had run out of food. The indicators present the percent of households that responded affirmatively to each question, regardless of the frequency of the experience. Thus they measure the percent of households experiencing the condition at any level of severity. Each indicator can be further disaggregated to examine the frequency of experience of the condition across the surveyed households.

<p>Household Food Insecurity Access-related Conditions</p> <p>Households experiencing condition at any time during the recall period.</p>	<p>Percent of households that responded, “yes” to a specific occurrence question. For example: “Percent of households that ran out of food.”</p> <p>Example:</p> $\frac{\text{Number of households with response = 1 to Q7}}{\text{Total number of households responding to Q7}} \times 100$
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Households experiencing condition at a given frequency	<p>Percent of households that responded “often” to a specific frequency-of-occurrence question. For example: “Percent of households that ran out of food often.”</p> <p>Example:</p> $\frac{\text{Number of households with response = 3 to Q7a}}{\text{Total number of households responding to Q7}} \times 100$
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5.2 Household Food Insecurity Access-related Domains

These indicators provide summary information on the prevalence of households experiencing one or more behaviors in each of the three domains reflected in the HFIAS - - Anxiety and uncertainty, Insufficient Quality, and Insufficient food intake and its physical consequences.

<p>Household Food Insecurity Access-related Domains</p> <p>Households experiencing any of the conditions at any level of severity in each domain</p>	<p>Percent of households that responded “yes” to any of the conditions in a specific domain. For example: “Percent of households with insufficient food quality.”</p> <p>Example:</p> $\frac{\text{Number of households with response = 1 to Q2 OR 1 to Q3 OR 1 to Q4}}{\text{Total number of households responding to Q2 OR Q3 OR Q4}} \times 100$
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5.3 Household Food Insecurity Access Scale Score

The HFIAS score is a continuous measure of the degree of food insecurity (access) in the household in the past four weeks (30 days). First, a HFIAS score *variable* is calculated for each household by summing the codes for each frequency-of-occurrence question. Before summing the frequency-of-occurrence codes, the data analyst should code frequency-of-occurrence as 0 for all cases where the answer to the corresponding occurrence question was “no” (i.e., if Q1=0 then Q1a=0, if Q2=0 then Q2a =0, etc.). The maximum score for a household is 27 (the household response to all nine frequency-of-occurrence questions was “often”, coded with response code of 3); the minimum score is 0 (the household responded “no” to all occurrence questions, frequency-of-occurrence questions were skipped by the interviewer, and subsequently coded as 0 by the data analyst.) The higher the score, the more food insecurity (access) the household experienced. The lower the score, the less food insecurity (access) a household experienced.^x

HFIAS Score (0-27)	Sum of the frequency-of-occurrence during the past four weeks for the 9 food insecurity-related conditions Sum frequency-of-occurrence question response code (Q1a + Q2a + Q3a + Q4a + Q5a + Q6a + Q7a + Q8a + Q9a)
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Next, the *indicator*, average Household Food Insecurity Access Scale Score, is calculated using the household scores calculated above.

Average HFIAS Score	Calculate the average of the Household Food Insecurity Access Scale Scores ^{xi} Sum of HFIAS Scores in the sample <hr/> Number of HFIAS Scores (i.e., households) in the sample
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5.4 Household Food Insecurity Access Prevalence

The final indicator is a categorical indicator of Food Insecurity Status.^{xii} The Household Food Insecurity Access Prevalence (HFIAP) Status indicator can be used to report household food insecurity (access) prevalence and make geographic targeting decisions. The change in HFIAP can also be tabulated. For instance, if 60 percent of households are severely food insecure (access) at baseline and only 30 percent are severely food insecure (access) at the end of the program, the prevalence of household food insecurity (access) would have decreased by 30 percentage points (or by 50 percent). Because the average HFIAS score is a continuous variable, it is more sensitive to capturing smaller increments of changes over time than the HFIAP indicator. Therefore, the HFIAP indicator should be reported in addition to, rather than instead of, the average HFIAS Score for program monitoring and evaluation.

The HFIAP indicator categorizes households into four levels of household food insecurity (access): food secure, and mild, moderately and severely food insecure. Households are categorized as increasingly food insecure as they respond affirmatively to more severe conditions and/or experience those conditions more frequently.

A food secure household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely. A mildly food insecure (access) household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. But it does not cut back on quantity nor experience any of three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating). A moderately food insecure household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the

size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions. A severely food insecure household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure.

Table 4 below illustrates this categorization. The categorization scheme is designed to ensure that a household's set of responses will place them in a single, unique category.

Table 4. Categories of food insecurity (access)

Question	Frequency		
	Rarely 1	Sometimes 2	Often 3
1a			
2a			
3a			
4a			
5a			
6a			
7a			
8a			
9a			



- food secure



- moderately food insecure



- mildly food insecure



- severely food insecure

Original article

Prevalence of Exclusive Breastfeeding Practices among the Irular tribes in Tamil Nadu

¹P.Saravanakumar , ²Dr. V. V. Anantharaman, ³Prof Dr.Saradha Suresh ,⁴ Prof.Dr. A.K. Rajendran

¹Assistant Professor, Department of Community Medicine, Govt. Stanley Medical College, Chennai-1, TamilNadu(T.N.).

²Associate Professor, Department of Community Medicine, SRM Medical College, Potheri, T.N.

³Pediatrician, IMNCI Nodal Officer, Institute of Child Health and Hospital for Children, Chennai.T.N.

⁴HOD, Department of Community Medicine, Sri Muthukumaran Medical College & RI, Mangadu, Chennai. T.N.

Corresponding author: P. Saravanakumar

ABSTRACT

Introduction: Exclusive breastfeeding is the ideal way for the healthy growth and development of the infant which also prevents future under-nutrition and recurrent infections. Globally only 35% of infants are exclusively breastfed for first six months. In India, the prevalence is not only low among the general population but also among the tribal population wherein malnutrition is highly prevalent. Hence this study aimed to assess the prevalence of exclusive breastfeeding and its determinants among the Irular tribes in Thiruvallur District of Tamil Nadu.

Methods: A community based cross-sectional study was conducted among the Irular mothers with children aged 6 to 24 months residing in the tribal villages in Thiruvallur District from August to December 2016. The sample size was 300 based on DLHS-4 2012-13. Data was collected by simple random sampling using the standardized Tamil questionnaire and analyzed using Chi Square test and multivariate analysis.

Observations and results: The prevalence of Exclusive breastfeeding among the Irular mothers was 52%. Only 60% of them gave colostrum while rest gave prelacteal feeds and discarded the colostrum. The important reasons for non-exclusive breastfeeding were the fear of inadequate milk and lack of support from family and health professional. Increasing maternal age, higher education, antenatal counseling, higher parity and support from the health workers were the significant factors favoring the exclusive breastfeeding

Conclusion: Health Education, antenatal counseling, discouraging prelacteal feeds, training the health workers to promote exclusive breastfeeding are the effective interventions for ideal infant nutrition, prevent morbidity and mortality.

Key words: Irulars, Exclusive breastfeeding, prelacteal feeds.

Introduction:

Exclusive Breastfeeding for the first six months after birth is a global public health recommendation not only to achieve optimal growth and development of infants but also to save them from diarrhoea, pneumonia and allergies¹. Globally, 35% of infants are exclusively breastfed during the first six months

of life². Improper Infant feeding practices not only results in under-nutrition but also leads to impaired cognitive development, poor school performance and reduced productivity in future³. Under-nutrition is the underlying cause of 53% of under-five deaths². In India, according to NFHS-3, the prevalence of the early initiation of breastfeeding is 25% and that of

exclusive breastfeeding is only 46.4%⁴. This low rate of exclusive breastfeeding is prevalent among both urban and rural areas. It is indeed a concern among the tribal population wherein the malnutrition is highly prevalent. Tribal population constituting 8.2% of total population are social group characterized by distinctive culture, traits, beliefs, and territorial affliction⁵. About 91% of the tribal population still lives in rural areas of our country and 47.3% are below the poverty line⁵. Kshatriya GK et al reported the widespread prevalence of under nutrition among the underserved tribal children in India⁶. Samiran Bisai et al reported the high prevalence of under-nutrition among the Kora-Mudi children in West Bengal due to poor breast feeding practices⁷. There is paucity of data on the exclusive breastfeeding practices and the infant nutrition among the tribal population particularly in Tamil Nadu. Irular tribes are one of the primitive tribes in Tamil Nadu with major public health problems like socio-economic backwardness, illiteracy, malnutrition and under-utilization of health services⁵. Irular tribes have settled in groups in rural area of Thiruvallur district of Tamil Nadu. This study was conducted to assess the exclusive breastfeeding practices and the associated factors among the Irular tribes of Thiruvallur district.

Aims and Objectives:

This study was designed to assess the prevalence of exclusive breastfeeding practices and its determinants among the Irular tribal mothers residing in Thiruvallur District in Tamil Nadu.

Materials and Methods:

A community based cross-sectional study was conducted among the Irular tribal mothers with children of age from 6 months to 24 months residing in the villages with Irular settlement in the

Thiruvallur District of Tamil Nadu in the rural field practice area of Govt. Stanley Medical College during the period September to December 2016. District Level Household Survey DLHS-4 RCH 2012-2013 reports that the prevalence of exclusive breastfeeding practices among the rural population including the tribal group in Thiruvallur District of Tamil Nadu is 60%⁸. With alpha at 5, relative precision of 10%, the sample size was calculated to be 300. The total Irular population in this district enumerated to be 44,569 with females about 21,388. The sampling frame included the 1052 mothers who had children of age 6 to 24 months as per the ICDS records in these tribal villages. The Irulars have settled in separate colonies in these villages. As per the inclusion criteria, the eligible Irular mothers were interviewed by house to house visit in the Tribal settlement in the selected villages by simple random sampling method using computer generated random numbers from the sampling frame.

A pretested, standardized structured questionnaire in Tamil was used to interview the mothers which included the socio-demographic details, antenatal period, delivery, postnatal period, details of breastfeeding. Data was analyzed using SPSS version 17, Chi Square Test and Fischer's Exact Test.

Observations and Results:

About 300 tribal mothers with children of age group 6 to 24 months had participated in this study. The age of the respondents ranged from 17 years to 40 years with mean age 29 years. Majority (45%) of the mothers belonged to 24 to 29 years with 10% below the age of 19 years. Table 1 depicts the various socio-demographic factors like educational status, type of family, religion, occupation, socio-

economic status, age of marriage and parity of the participants. Age of the mothers, type of family and parity were statistically significant for exclusive breastfeeding practices. Table 2 depicts the details of antenatal services availed by the mothers and the details of delivery. Of which the antenatal counseling, place of delivery and sex of the baby were statistically significant in successful exclusive breastfeeding. Only 60% of babies received colostrum as the first feed while others had sugar water and animal milk. Only 46.5% of mothers had practiced the early initiation of breastfeeding after delivery of which 80% had succeeded in exclusive breastfeeding till 6 months of age. Overall prevalence of exclusive breastfeeding practices among these tribal mothers was observed to be 52% (total 156 mothers). Table 3 depicts the duration of exclusive breastfeeding practiced by the tribal mothers. Table 4 shows the factors statistically significant in favoring Exclusive breastfeeding. Figure 1 shows the reasons for the failure of exclusive breastfeeding for first 6 months of age. Of which, majority 49% was due to fear on inadequate breastmilk, followed by influence of family members to start on supplementary feeding. Factors like awareness about exclusive breastfeeding, early initiation of breastfeeding and motivation from health care providers were statistically significant for successful exclusive breastfeeding by the tribal mothers.

Discussion:

The prevalence of exclusive breastfeeding practices among the Irular tribal mothers was 52% which is lower than the prevalence reported in DLHS-4 2012-13 for Thiruvallur District, Tamil Nadu. Vimala V et al reported that 55% of tribal mothers in Andhra Pradesh had exclusively

breastfed their infants till 6 months of age⁹ while Medhi et al reported the prevalence of exclusive breastfeeding among the tea garden workers in Assam to be 69.3%¹⁰. A similar study conducted by Banapurmath CR et al reported the prevalence of exclusive breastfeeding practices in Davanagere district of Karnataka to be 60% till 6 months of age¹¹. Chudasama RK et al reported that the prevalence of exclusive breastfeeding practice in Gujarat was only 37%¹². In our study, factors like maternal education, age and parity were significant factors governing exclusive breastfeeding practices. Mothers who were in adolescent age and who were primi had difficulty in exclusively breastfeeding due to lack of awareness and fear. K Madhu et al also reported that advanced maternal age, increasing parity and better educational status succeeded in early initiation and exclusive breastfeeding¹³. In our study, it was observed that antenatal education and awareness on exclusive breastfeeding helped in the tribal mothers to successfully exclusive breastfeeding as reported by Gunasekarariet al¹⁴. Feeding colostrum as the first feed for the infant is very important measure for future successful breastfeeding as reported by Sachdev HP et al¹⁵. In our study, 60% of the mothers had fed colostrum while others had the practice of discarding colostrum and giving prelacteal feeds as reported by Dakshayani et al among the Hakkipikkis tribes in Mysore¹⁶. Mothers who delivered in Primary Health centre had the support from the nursing staff in breastfeeding and it was also observed that male babies were exclusively breastfed more than the female infants. In our study, the factors like fear of inadequate breast milk, lack of support from family members played an important role in failure of

exclusive breastfeeding till 6 months. Parmar et al reported that factors like insufficient breastmilk and work stress were important reasons for initiation of bottle feeding before six months of age¹⁷. In our study it was observed that the motivation from the health care providers played a significant role in alleviation of fear of insufficient breastmilk and stress among the mothers thereby help in successful exclusive breastfeeding. Rasheed S et al also emphasized that intensive training programs for nurses on lactation management is needed for successful breastfeeding practices by the mothers attending the health facility¹⁸. The other public health issues like early marriage, gender bias in feeding and lack of support from family members need to be addressed to prevent faulty infant

feeding practices and to prevent malnutrition in the future generation of this vulnerable population.

Conclusion:

Exclusive breastfeeding is indeed an important public health measure for optimal growth and development of infants and preventive measure for under-nutrition and recurrent infections. Under-nutrition is highly prevalent among the tribal population. Qualitative research like Focus Group Discussion will throw more light on the socio-cultural beliefs in infant feeding of this under-served population. Health education and motivation of the tribal mothers by family members and health care professional remains the cornerstone in successful lactation management in order to prevent future under-nutrition and morbidity.

Acknowledgements:

We acknowledge the Public Health authorities, tribal village leaders and the participants of this study for their kind co-operation in the conduct of this study.

Table1: Socio-demographic details of the participants

S.No	Characteristics	Frequency(n=300)	Percent %
1	Educational status		
	- Illiterate	216	72
	- Primary (I- V std)	63	21
	- Middle school(VI-VIII std)	21	7
2	Type of family		
	- Nuclear	186	62
	- Joint	114	38
3	Religion		
	- Hindu	267	89
	- Christian	33	11
	- Muslim	-	-
	- Others	-	-
4	Occupation		

	<ul style="list-style-type: none"> - coolie - Agricultural work' - Unemployed - others 	<p>237</p> <p>33</p> <p>30</p>	<p>79</p> <p>11</p> <p>10</p>
5	Socio-economic status (Modified BG Prasad) <ul style="list-style-type: none"> - Class III - Class IV - Class V 	<p>207</p> <p>66</p> <p>27</p>	<p>69</p> <p>22</p> <p>9</p>
6	Age of first conception <ul style="list-style-type: none"> - <19 years - 20-24 yrs - 25- 30yrs - > 30 years 	<p>30</p> <p>135</p> <p>80</p> <p>55</p>	<p>10</p> <p>45</p> <p>26.7</p> <p>18.3</p>
7	Parity <ul style="list-style-type: none"> - Primi - 1 child - 2 and > 	<p>126</p> <p>102</p> <p>72</p>	<p>42</p> <p>34</p> <p>24</p>

Table 2: Details of Antenatal services availed by the participants

S.No	Characteristics	Frequency (n=300)	Percent%
1	Place of Antenatal visits <ul style="list-style-type: none"> - Health Subcentre (HSC) - Primary Health centre(PHC) - Govt. Hospital - Private clinic 	<p>72</p> <p>153</p> <p>75</p> <p>-</p>	<p>24</p> <p>51</p> <p>25</p> <p>-</p>
2	Place of Delivery <ul style="list-style-type: none"> - Home - HSC - PHC - Govt. Hospital - Private sector 	<p>12</p> <p>33</p> <p>171</p> <p>84</p> <p>-</p>	<p>4</p> <p>11</p> <p>57</p> <p>28</p> <p>-</p>
3	Mode of Delivery <ul style="list-style-type: none"> - Normal vaginal delivery - LSCS 	<p>81</p> <p>219</p>	<p>27</p> <p>73</p>

Table 4: Multiple logistic regression for the factors influencing exclusive breastfeeding practices

Factors	Odds ratio	95% CI	p value
Age of mothers	3.21	1.11 – 5.21	0.031
Educational status	3.91	1.99 – 5.89	0.046
Religion	2.21	0.98 – 3.12	0.146
Occupation	1.27	0.85 – 2.98	0.378
Socio-economic class	2.98	0.88 – 4.11	0.280
Age at conception (<19 and >19)	6.13	1.48 – 9.22	0.021
Type of family(Nuclear/Non-Nuclear)	3.18	1.39 – 6.23	0.048
Parity(<2, 2/>)	5.12	2.24 – 8.23	0.002
Place of antenatal visits	3.12	1.28 – 5.44	0.021
Antenatal counseling	4.33	2.28 – 5.13	0.003
Place of delivery	2.88	1.78 – 4.77	0.024
Sex of baby	3.16	1.65- 4.39	0.048
Awareness on breastfeeding practices	5.97	3.33- 8.33	0.001
Motivation by health professional	3.87	1.22 – 6.23	0.01

P < 0.05 indicates statistically significant association

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Original article

Prevalence of Exclusive Breastfeeding Practices among the Irular tribes in Tamil Nadu

¹P.Saravanakumar , ²Dr. V. V. Anantharaman, ³Prof Dr.Saradha Suresh ,⁴ Prof.Dr. A.K. Rajendran

¹Assistant Professor, Department of Community Medicine, Govt. Stanley Medical College, Chennai-1, TamilNadu(T.N.).

²Associate Professor, Department of Community Medicine, SRM Medical College, Potheri, T.N.

³Pediatrician, IMNCI Nodal Officer, Institute of Child Health and Hospital for Children, Chennai.T.N.

⁴HOD, Department of Community Medicine, Sri Muthukumaran Medical College & RI, Mangadu, Chennai. T.N.

Corresponding author: P. Saravanakumar

ABSTRACT

Introduction: Exclusive breastfeeding is the ideal way for the healthy growth and development of the infant which also prevents future under-nutrition and recurrent infections. Globally only 35% of infants are exclusively breastfed for first six months. In India, the prevalence is not only low among the general population but also among the tribal population wherein malnutrition is highly prevalent. Hence this study aimed to assess the prevalence of exclusive breastfeeding and its determinants among the Irular tribes in Thiruvallur District of Tamil Nadu.

Methods: A community based cross-sectional study was conducted among the Irular mothers with children aged 6 to 24 months residing in the tribal villages in Thiruvallur District from August to December 2016. The sample size was 300 based on DLHS-4 2012-13. Data was collected by simple random sampling using the standardized Tamil questionnaire and analyzed using Chi Square test and multivariate analysis.

Observations and results: The prevalence of Exclusive breastfeeding among the Irular mothers was 52%. Only 60% of them gave colostrum while rest gave prelacteal feeds and discarded the colostrum. The important reasons for non-exclusive breastfeeding were the fear of inadequate milk and lack of support from family and health professional. Increasing maternal age, higher education, antenatal counseling, higher parity and support from the health workers were the significant factors favoring the exclusive breastfeeding

Conclusion: Health Education, antenatal counseling, discouraging prelacteal feeds, training the health workers to promote exclusive breastfeeding are the effective interventions for ideal infant nutrition, prevent morbidity and mortality.

Key words: Irulars, Exclusive breastfeeding, prelacteal feeds.

Introduction:

Exclusive Breastfeeding for the first six months after birth is a global public health recommendation not only to achieve optimal growth and development of infants but also to save them from diarrhoea, pneumonia and allergies¹. Globally, 35% of infants are exclusively breastfed during the first six months

of life². Improper Infant feeding practices not only results in under-nutrition but also leads to impaired cognitive development, poor school performance and reduced productivity in future³. Under-nutrition is the underlying cause of 53% of under-five deaths². In India, according to NFHS-3, the prevalence of the early initiation of breastfeeding is 25% and that of

exclusive breastfeeding is only 46.4%⁴. This low rate of exclusive breastfeeding is prevalent among both urban and rural areas. It is indeed a concern among the tribal population wherein the malnutrition is highly prevalent. Tribal population constituting 8.2% of total population are social group characterized by distinctive culture, traits, beliefs, and territorial affliction⁵. About 91% of the tribal population still lives in rural areas of our country and 47.3% are below the poverty line⁵. Kshatriya GK et al reported the widespread prevalence of under nutrition among the underserved tribal children in India⁶. Samiran Bisai et al reported the high prevalence of under-nutrition among the Kora-Mudi children in West Bengal due to poor breast feeding practices⁷. There is paucity of data on the exclusive breastfeeding practices and the infant nutrition among the tribal population particularly in Tamil Nadu. Irular tribes are one of the primitive tribes in Tamil Nadu with major public health problems like socio-economic backwardness, illiteracy, malnutrition and under-utilization of health services⁵. Irular tribes have settled in groups in rural area of Thiruvallur district of Tamil Nadu. This study was conducted to assess the exclusive breastfeeding practices and the associated factors among the Irular tribes of Thiruvallur district.

Aims and Objectives:

This study was designed to assess the prevalence of exclusive breastfeeding practices and its determinants among the Irular tribal mothers residing in Thiruvallur District in Tamil Nadu.

Materials and Methods:

A community based cross-sectional study was conducted among the Irular tribal mothers with children of age from 6 months to 24 months residing in the villages with Irular settlement in the

Thiruvallur District of Tamil Nadu in the rural field practice area of Govt. Stanley Medical College during the period September to December 2016. District Level Household Survey DLHS-4 RCH 2012-2013 reports that the prevalence of exclusive breastfeeding practices among the rural population including the tribal group in Thiruvallur District of Tamil Nadu is 60%⁸. With alpha at 5, relative precision of 10%, the sample size was calculated to be 300. The total Irular population in this district enumerated to be 44,569 with females about 21,388. The sampling frame included the 1052 mothers who had children of age 6 to 24 months as per the ICDS records in these tribal villages. The Irulars have settled in separate colonies in these villages. As per the inclusion criteria, the eligible Irular mothers were interviewed by house to house visit in the Tribal settlement in the selected villages by simple random sampling method using computer generated random numbers from the sampling frame.

A pretested, standardized structured questionnaire in Tamil was used to interview the mothers which included the socio-demographic details, antenatal period, delivery, postnatal period, details of breastfeeding. Data was analyzed using SPSS version 17, Chi Square Test and Fischer's Exact Test.

Observations and Results:

About 300 tribal mothers with children of age group 6 to 24 months had participated in this study. The age of the respondents ranged from 17 years to 40 years with mean age 29 years. Majority (45%) of the mothers belonged to 24 to 29 years with 10% below the age of 19 years. Table 1 depicts the various socio-demographic factors like educational status, type of family, religion, occupation, socio-

economic status, age of marriage and parity of the participants. Age of the mothers, type of family and parity were statistically significant for exclusive breastfeeding practices. Table 2 depicts the details of antenatal services availed by the mothers and the details of delivery. Of which the antenatal counseling, place of delivery and sex of the baby were statistically significant in successful exclusive breastfeeding. Only 60% of babies received colostrum as the first feed while others had sugar water and animal milk. Only 46.5% of mothers had practiced the early initiation of breastfeeding after delivery of which 80% had succeeded in exclusive breastfeeding till 6 months of age. Overall prevalence of exclusive breastfeeding practices among these tribal mothers was observed to be 52% (total 156 mothers). Table 3 depicts the duration of exclusive breastfeeding practiced by the tribal mothers. Table 4 shows the factors statistically significant in favoring Exclusive breastfeeding. Figure 1 shows the reasons for the failure of exclusive breastfeeding for first 6 months of age. Of which, majority 49% was due to fear on inadequate breastmilk, followed by influence of family members to start on supplementary feeding. Factors like awareness about exclusive breastfeeding, early initiation of breastfeeding and motivation from health care providers were statistically significant for successful exclusive breastfeeding by the tribal mothers.

Discussion:

The prevalence of exclusive breastfeeding practices among the Irular tribal mothers was 52% which is lower than the prevalence reported in DLHS-4 2012-13 for Thiruvallur District, Tamil Nadu. Vimala V et al reported that 55% of tribal mothers in Andhra Pradesh had exclusively

breastfed their infants till 6 months of age⁹ while Medhi et al reported the prevalence of exclusive breastfeeding among the tea garden workers in Assam to be 69.3%¹⁰. A similar study conducted by Banapurmath CR et al reported the prevalence of exclusive breastfeeding practices in Davanagere district of Karnataka to be 60% till 6 months of age¹¹. Chudasama RK et al reported that the prevalence of exclusive breastfeeding practice in Gujarat was only 37%¹². In our study, factors like maternal education, age and parity were significant factors governing exclusive breastfeeding practices. Mothers who were in adolescent age and who were primi had difficulty in exclusively breastfeeding due to lack of awareness and fear. K Madhu et al also reported that advanced maternal age, increasing parity and better educational status succeeded in early initiation and exclusive breastfeeding¹³. In our study, it was observed that antenatal education and awareness on exclusive breastfeeding helped in the tribal mothers to successfully exclusive breastfeeding as reported by Gunasekarari et al¹⁴. Feeding colostrum as the first feed for the infant is very important measure for future successful breastfeeding as reported by Sachdev HP et al¹⁵. In our study, 60% of the mothers had fed colostrum while others had the practice of discarding colostrum and giving prelacteal feeds as reported by Dakshayani et al among the Hakkipikkis tribes in Mysore¹⁶. Mothers who delivered in Primary Health centre had the support from the nursing staff in breastfeeding and it was also observed that male babies were exclusively breastfed more than the female infants. In our study, the factors like fear of inadequate breast milk, lack of support from family members played an important role in failure of

exclusive breastfeeding till 6 months. Parmar et al reported that factors like insufficient breastmilk and work stress were important reasons for initiation of bottle feeding before six months of age¹⁷. In our study it was observed that the motivation from the health care providers played a significant role in alleviation of fear of insufficient breastmilk and stress among the mothers thereby help in successful exclusive breastfeeding. Rasheed S et al also emphasized that intensive training programs for nurses on lactation management is needed for successful breastfeeding practices by the mothers attending the health facility¹⁸. The other public health issues like early marriage, gender bias in feeding and lack of support from family members need to be addressed to prevent faulty infant

feeding practices and to prevent malnutrition in the future generation of this vulnerable population.

Conclusion:

Exclusive breastfeeding is indeed an important public health measure for optimal growth and development of infants and preventive measure for under-nutrition and recurrent infections. Under-nutrition is highly prevalent among the tribal population. Qualitative research like Focus Group Discussion will throw more light on the socio-cultural beliefs in infant feeding of this under-served population. Health education and motivation of the tribal mothers by family members and health care professional remains the cornerstone in successful lactation management in order to prevent future under-nutrition and morbidity.

Acknowledgements:

We acknowledge the Public Health authorities, tribal village leaders and the participants of this study for their kind co-operation in the conduct of this study.

Table1: Socio-demographic details of the participants

S.No	Characteristics	Frequency(n=300)	Percent %
1	Educational status		
	- Illiterate	216	72
	- Primary (I- V std)	63	21
	- Middle school(VI-VIII std)	21	7
2	Type of family		
	- Nuclear	186	62
	- Joint	114	38
3	Religion		
	- Hindu	267	89
	- Christian	33	11
	- Muslim	-	-
	- Others	-	-
4	Occupation		

	- coolie	237	79
	- Agricultural work	33	11
	- Unemployed	30	10
	- others		
5	Socio-economic status (Modified BG Prasad)		
	- Class III	207	69
	- Class IV	66	22
	- Class V	27	9
6	Age of first conception		
	- <19 years	30	10
	- 20-24 yrs	135	45
	- 25- 30yrs	80	26.7
	- > 30 years	55	18.3
7	Parity		
	- Primi	126	42
	- 1 child	102	34
	- 2 and >	72	24

Table 2: Details of Antenatal services availed by the participants

S.No	Characteristics	Frequency (n=300)	Percent%
1	Place of Antenatal visits		
	- Health Subcentre (HSC)	72	24
	- Primary Health centre(PHC)	153	51
	- Govt. Hospital	75	25
	- Private clinic	-	-
2	Place of Delivery		
	- Home	12	4
	- HSC	33	11
	- PHC	171	57
	- Govt. Hospital	84	28
	- Private sector	-	-
3	Mode of Delivery		
	- Normal vaginal delivery	81	27
	- LSCS	219	73

4	Sex of the Baby		
	- Male	158	52.7
	- Female	142	47.3

Table 3: Duration of Exclusive Breastfeeding among the tribal mothers

Duration in months	Frequency (n=300)	Percent %
< 2	18	6
2 - 3	27	9
3 - 4	36	12
4 - 5	63	21
6 months and >	156	52

Figure1: Reasons for failure of Exclusive breastfeeding up to first six months

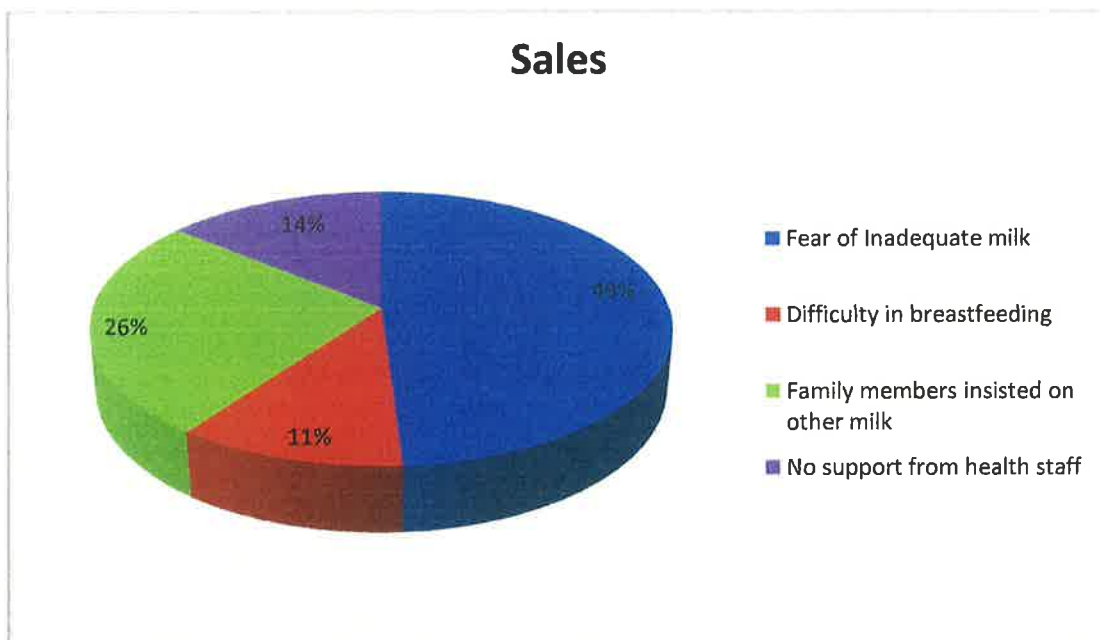


Table 4: Multiple logistic regression for the factors influencing exclusive breastfeeding practices

Factors	Odds ratio	95% CI	p value
Age of mothers	3.21	1.11 – 5.21	0.031
Educational status	3.91	1.99 – 5.89	0.046
Religion	2.21	0.98 – 3.12	0.146
Occupation	1.27	0.85 – 2.98	0.378
Socio-economic class	2.98	0.88 – 4.11	0.280
Age at conception (<19 and >19)	6.13	1.48 – 9.22	0.021
Type of family(Nuclear/Non-Nuclear)	3.18	1.39 – 6.23	0.048
Parity(<2, 2/>)	5.12	2.24 – 8.23	0.002
Place of antenatal visits	3.12	1.28 – 5.44	0.021
Antenatal counseling	4.33	2.28 – 5.13	0.003
Place of delivery	2.88	1.78 – 4.77	0.024
Sex of baby	3.16	1.65- 4.39	0.048
Awareness on breastfeeding practices	5.97	3.33- 8.33	0.001
Motivation by health professional	3.87	1.22 – 6.23	0.01

P < 0.05 indicates statistically significant association

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PREVALENCE OF ANEMIA AMONG THE TRIBAL ADOLESCENT GIRLS IN JAVVADU HILLS IN THIRUVANNAMALAI, TAMIL NADU

Pediatrics

P.Saravanakumar	Assistant Professor, Department of Community Medicine, Govt. Stanley Medical College, Chennai, Tamil Nadu.
Muthusundari.A	Resident, DMCH, Institute of Child Health and Hospital for Children, Chennai
Saradha Suresh	IMNCI Nodal Officer, Institute of Child Health & Hospital for Children, Chennai,
Chitra A	Associate Professor of Community Medicine, Madras Medical College, Chennai.

ABSTRACT

Background: Anemia during adolescence contributes to maternal, fetal morbidity and mortality in future. Tribal population is vulnerable and underserved wherein it is indeed essential to explore anemia among tribal adolescent girls to prevent future morbidity and maternal mortality.

Objectives: To assess the prevalence of anemia and risk factors among tribal adolescent girls in Javvadu hills in Thiruvannamalai, Tamil Nadu.

Materials and Methods: A cross-sectional study was conducted among 200 tribal adolescent girls in Jamanamarathur Block of Javvadu hills in Thiruvannamalai during January 2017. Socio-demographic and anthropometric details were obtained and Hemoglobin was estimated using Cyan method. Statistical analysis was done using IBM SPSS version 21.

Results: Overall prevalence of anemia was 76%. About 7% had severe anemia. Age, menstruation, barefoot walking, poor awareness and under-nutrition were the significant factors.

Conclusion: Health education, proper utilization of health services and timely intervention will alleviate this public health problem among tribal adolescent girls.

KEYWORDS:

Tribal adolescents, girls, anemia

Introduction:

Adolescence after the infancy is the second critical period of rapid physical growth and changes in body composition and physiology. It is of utmost importance to achieve optimum growth during this period for future healthy and productive life¹. Poor nutrition among the adolescent girls resulting in short stature and low lean body mass is associated with many adverse health problems particularly in future during motherhood¹. Under-nutrition among adolescents is a serious public health problem globally, especially in developing countries². Adolescents form an important vulnerable, neglected sector of population, which constitutes about 22 percent of Indian population¹. Choudhary et al reported the prevalence of under-nutrition among the adolescent girls in rural area in India to be 46.6%⁴.

During the adolescence, there is an increased demand for iron requirement in both boys and girls but more so in girls because of menstruation. Anemia not only affects the present health status of girls but also has deleterious effects in future pregnancy¹. Anemia accounts for about 40% maternal deaths, three times greater risk of delivering low birth weight and nine times higher risk of perinatal mortality thus contributing significantly for increased infant mortality⁵. In India, NFHS-4 estimates reveal the prevalence of anemia to be 53% in adolescent girls in rural area⁶. Early detection and effective intervention of anemia among the adolescent girls improves the future productive life in terms of maternal and child health.

Tribal population constitutes around 8% of total population in India⁷. The prevalence of malnutrition among the tribal children, adolescents and mothers is reported to be high in India. Soudarssanane et al reported the high prevalence of malnutrition and anemia among the tribal mothers and adolescents in south India and the need for intervention programs to overcome the health problems among the underserved community⁸. Basu et al recommended the need for intervention for anemia and under-nutrition during the childhood and adolescence for a safe and healthy motherhood⁹. There is paucity of data on anemia among the tribal population in Tamil Nadu. Irular tribes are one among the six primitive tribes in Tamil Nadu who have settled in Javvadu Hills in Thiruvannamalai district in Tamil Nadu⁷. This study aims to assess the prevalence of anemia and the associated risk factors among the adolescent girls belonging to the Irular tribes of Javvadu Hills in Tamil Nadu.

Materials and Methods:

A community based cross-sectional study was conducted among the Irular tribal adolescent girls of age 10 to 19 years in Athipet Health sub-

centre of Jamanamarathur block in Javvadu hills of Thiruvannamalai District in Tamil Nadu chosen by Multi-stage random sampling method during January 2017. NNMB 2013 report 23 reported the prevalence of anemia among the tribal adolescent girls to be 66.6% 10. With alpha at 5, precision of 10%, the sample size was calculated to be 200. The adolescent girls were recruited from the register maintained in ICDS in the sub-centre. After informed consent from mothers, the details of socio-demographic data, menstrual status, anthropometric details, awareness about anemia, utilization of health services were gathered with a semi-structured questionnaire. Hemoglobin was estimated by CyanmethHemoglobin method using a photoelectric Calorimeter with green filter (520 nm wavelength). Girls were examined for clinical signs of Nutritional deficiency. Anemia was defined as Hemoglobin level < 12 gm/dl for non-pregnant adolescent girls while Hb < 11 gm/dl for pregnant girls. Severe anemia was defined as Hb < 7 gm/dl. BMI was calculated with CDC 2000 charts with under-nutrition defined as BMI < 18.5. Statistical analysis was done using IBM SPSS package version²¹.

Results:

Out of 200 adolescent girls who had participated in this study, 54 were early adolescent age (10-13yrs), 61 were mid-adolescent age (14-16 years) and 85 belonged to late adolescent age (17-19yrs). Only 37% were literates and all belonged to lower socio-economic status. 78% of girls were menstruating and 33% of girls were married below the age of 18 years with 12 girls being pregnant during this study. Overall prevalence of anemia was 76%. Anemia was more common among the menstruating girls (72%). Out of 12 pregnant mothers, 10 were anemic of whom 2 were severely anemic. Fig1 depicts the severity of anemia among the tribal adolescent girls. About 7% were severely anemic with Hb < 7 gm/dl and severity of anemia was noticed to increase with increasing age with statistical significance ($\chi^2 = 17.3$, $p < 0.001$) Fig2. In late adolescents, it was noticed that 18% were severely anemic when compared to the early adolescent girls wherein only 3% had severe anemia. Also the severity of anemia was associated with menstrual status and pregnancy probably due to increasing demands. Based on BMI, the severity of thinness was observed to increase with advancing age (Table 1). Also Table 2 depicts the factors associated with anemia among the tribal adolescent girls. Of which, age, menstrual status, poor awareness on healthy food, under-utilization of health services like regular deworming, IFA intake and ICDS were the significant factors determining the high prevalence of anemia among the adolescent girls.

Discussion:

Adolescence is the crucial period of transition between childhood and

adulthood wherein the nutritional requirements if not met during this vulnerable period, results in under-nutrition and ill-health which in turn reflects on the future maternal and child nutrition¹. Anemia in the adolescent period if not detected and intervened during the adolescence leads to increased morbidity and mortality in future motherhood as well as underweight in offspring¹. In our study, 200 adolescent girls were recruited of whom 76% were anemic whereas the prevalence of anemia among the tribals in India is about 66.6% as per NNMB report 2013¹⁰. Soudarssanane et al also reported the high prevalence of anemia and malnutrition among the tribal population in India⁹.

In this study, there was no association between Anemia and educational status among the Irular tribal adolescent girls. But Meenal Vinay Kulkarni et al concluded the strong association between the educational status and anemia. In our study, poor awareness on anemia and its causes, preventive measures was noticed among the adolescent girls¹¹. In our study, anemia was noticed to be high in post-menarchal girls(72%) as against pre-menarchal group(28%) which was similar to study reported by Siddharam S M et al wherein 71% of post-menarchal girls had anemia when compared to pre-menarchal girls probably due to increased physiological demands but no nutritional support¹². But Rajaratnam et al¹³ and Agrwal¹⁴ et al had reported only minor difference in anemic status among pre and post-menarchal group of adolescent girls. Rekha Dutt et al reported a significant association between marital status, menstrual status and the severity of anemia¹⁵.

In this study, the severity of anemia increased with increase in age reflecting the increasing demand for Iron and micronutrients and mismatch of nutritional support. Also the awareness regarding the causes of anemia and the preventive measures is very low in this study population. There is also under-utilization of health services like IFA tablets, Nutritional Health education, regular deworming etc. Premalatha T et al reported the prevalence of decreased community awareness regarding the causes and prevention of anemia in their study⁵. This highlights the need for nutritional interventional programmes to create awareness regarding this public health problem at the primary health care level. Meenal Vinay Kulkarni et al stressed the need for nutritional education along with nutritional supplementation as well as Iron and Folate supplementation at primary health care level¹¹. Health services with regular follow-up in the remote and inaccessible areas of tribal settlement is needed to prevent morbidity due to malnutrition particularly anemia during the adolescence. Telake et al also recommended the need for focused health services to promote health among the adolescents in the rural area and underserved areas¹⁶. A comprehensive Adolescent Health Initiative at the primary health care level is the need of the hour as recommended by Patil et al to overcome this nutritional problem for a future healthy productive life¹⁷. The tribal population remain geographically isolated and scattered throughout the state and there is a need for larger sample to explore this public health problem in depth. Also a qualitative research will throw more light on customs, cultural beliefs and dietary pattern governing the nutritional status of tribal adolescent girls.

Acknowledgement:

We acknowledge the Public Health authorities, tribal village leaders and the participants of this study for their kind co-operation in the conduct of this study.

Fig1: Severity of Anemia

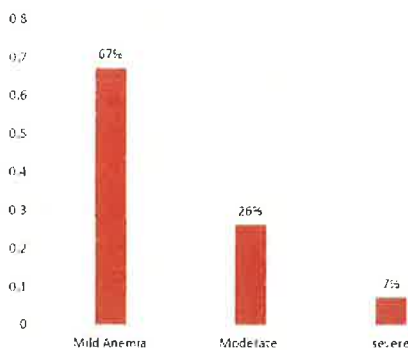


Fig 2: Severity of anemia with increasing age

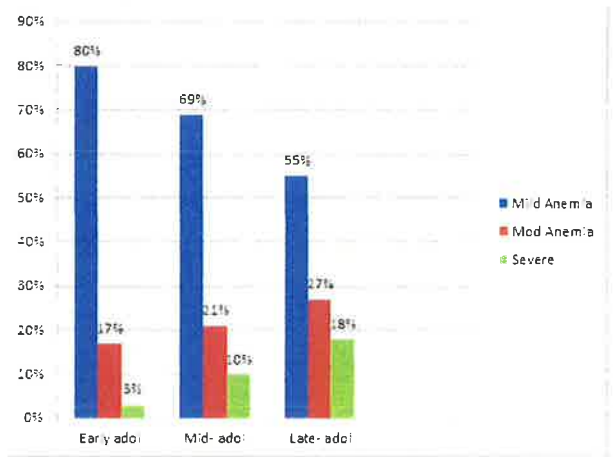


Table 1: Under-nutrition based on Body Mass Index among the tribal adolescent girls

Body Mass Index BMI (n= 200)	Early adolescence (10-13 years age)	Mid adolescence (14-16 years)	Late adolescence (17-19years)
Overall Thinness (BMI< 18.5) = 127	20	41	66
Mild Thinness (BMI 17 ~ 18.4)	6	11	13
Moderate Thinness (BMI 16 -16.99)	8	10	16
Severe Thinness (BMI < 16)	6	20	37

Table 2: Logistic regression for Factors associated with anemia among the adolescent girls

Factors	Odds ratio	95% Confidence Interval	p value
Age	3.21	1.12 - 5.22	0.031
Educational status of mothers	3.91	1.99 - 5.89	0.046
Socio-economic status	1.27	0.85 - 2.96	0.378
Awareness about nutrition	6.13	1.48 - 9.22	0.021
Menstrual status	5.12	2.23 - 8.24	0.002
Barefoot walking	3.12	1.28 - 5.44	0.021
IFA intake	5.97	3.33 - 8.32	0.001
Dietary pattern	3.86	1.23 - 6.22	0.012
Thinness based on BMI	4.35	2.28 - 5.15	0.003
Utilization of ICDS services	3.18	1.39 - 6.23	0.048

p value < 0.05 indicates statistically significant association

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Quantitative data collection

Group 1 in Jambadi village



Group 2 in Kuberapattinam



Anthropometric assessment in the subjects in Navakollai village



Blood collection in Kollanalur village



Focus group Discussion in Group 1 in Palamkottai village:



Focus group Discussion in Group 2 in Kallathur village



**Indepth interview in Mottulapattu villageIndepth interview in Kallathur(Group2)
(Group 1)**



Advisory committee meeting conducted on 28.12.2016



CERTIFICATE – II

This is to certify that this dissertation work titled –“A comparative study on the Epidemiology of Under-nutrition based on Anthropometric and Clinical parameters among the tribal under-five children in hills and plains of Thiruvannamalai District, Tamil Nadu” of the candidate **Dr.P.Saravanakumar** with registration number **141410506** for the award of PhD in the branch of Medical and Medical specialties – Community Medicine. I personally verified the urkund.com website for the purpose of Plagiarism check. I found that the uploaded thesis file contains from Introduction at conclusion pages and result shows 1% of plagiarism in the dissertation.



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Institute of Child Health and Hospital for Children,
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Madras Medical College, Chennai.

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