STUDY OF MALNUTRITION AMONG UNDER FIVE CHILDREN IN RURAL FIELD PRACTICE AREA OF SHRI B.M. PATIL MEDICAL COLLEGE, BIJAPUR.

By

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Dissertation submitted to

BLDE UNIVERSITY,BIJAPUR.

KARNATAKA

In Partial fulfillment of the requirements for the degree of

M.D

in

COMMUNITY MEDICINE

Under the Guidance of

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ACKNOWLEDGEMENT

With proud privilege and deep sense of respect, I express my gratitude and indebtedness to my teacher and guide **Dr.M.M.Angadi**, Professor and Head Department of Community Medicine, BLDEU'S SHRI B. M. PATIL MEDICAL COLLEGE, for his constant inspiration, patience, encouragement and support, which he rendered in preparing this dissertation and in pursuit of my post graduate studies.

I am grateful to Dr. R.C.Bidri, Principal of B.L.D.U.A'S Shri.B.M.Patil Medical College Hospital and Research Centre, Bijapur, for permitting me to conduct this study.

I take this opportunity to express my deep sense of gratitude and sincere thanks to Dr.K.A.Masali and Dr.P.B.Jagirdar Professors for their supervision and timely advice.

My sincere thanks to Dr.M.C.Yadavannavar,Dr.Shailaja.S.Patil, Dr.Rekha.Udgiri, Dr. Vinod.S.Kamble Associate Professors and Dr.M.R.Gudadinni, Dr.Santosh.M.Biradar,Dr.Chandrashekar Assistant Professors for their valuable supervision and good wishes.

I am extremely thankful to Mrs.Vijaya Soraganvi,Statistician for her guidance in statistical analysis.

My thanks to Mr.G.V.Kulkarni, Mrs.Veena Algur Lectures and Miss Vidya Ugran Entomoligist for their support and good wishes.

I am very grateful to, Dr.Santosh.D.Patil, Dr.Bhavana and my all friends for their kind co-operation.

My thanks to Dr.Prakash.Biradar, Dr.Gangamma,Dr.Pallavi,Dr.Shwetha tutors for their support and good wishes. I thank all the non teaching staff of my department for their constant encouragement and moral support.

I also thank Mr.Kalyankumar.Awati, Preeti computer and internet browsing centre, Ashram road, Bijapur for their efforts during printing of this dissertation.

I am very thankful to my parents and grand parents for their constant encouragement and support.

Finally I acknowledge with gratitude to all participants and their parents for their co-operation during the study.

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LIST OF ABBERVATIONS USED

cm	-	Centimeters
EBF	-	Exclusive Breast Feeding
PEM	-	Protein Energy Malnutrition
p	-	Probability
PHC	-	Primary health centre
RHTC	-	Rural Health and Training Centre
Rs	-	Rupees
SEAR	-	South East Asian Region
SES	-	Socioeconomic status
UNICEF	-	United Nations Children's Emergency Fund
WHO	-	World Health Organization
X^2	-	Chi -square
Yrs	-	Years

ABSTRACT

Background:

Malnutrition is one of important cause of mortality and morbidity among underfive children. Globally each year, malnutrition is implicated in about 40% of the 11 million deaths of under five children in developing countries. By understanding about various risk factors, the morbidity and mortality due to malnutrition can be reduced and nutritional status of children can be improved.

Objectives:

1. To estimate the prevalence of malnutrition in under five children.

2. To study the role of socio demographic, and nutritional profile of the underfive children.

Method:

In this study 510 families having underfive children were studied for prevalence of malnutrition and their sociodemographic factors. The data was collected in pretested questionnaire.

Results:

52.5% of children were males. Literacy rate of mothers and fathers was 63.9% and 70.4% respectively. Moderate and severe degree of underweight, stunting and wasting was observed to be 30.80%, 26.86%, 15.68% and 7.64%, 6.47%, 5.49% respectively. Anemia, Vit'A' deficiency and Vit'B' complex deficiency was reported in 26.5%, 11.8% and 8.8% of children respectively.

Female gender, illiteracy of mothers, poor socioeconomic status, higher birth order, short birth interval, custom of giving prelacteal feeds, topfeeding, delayed initiation of weaning were significant risk factors for occurrence of malnutrition in underfive children.

Conclusion and Interpretation:

Most malnourished children were moderately undernourished. Female gender, illiteracy of mothers, poor SES, higher birth order, short birth interval, custom of giving prelacteal feeds, topfeeding, delayed initiation of weaning were significant risk factors for occurrence of malnutrition in underfive children.

Keywords:

malnutrition, underfive children, sociodemographic risk factors

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INTRODUCTION

"We are guilty of many errors and faults

But our worst crime is abandoning children,

Neglecting the fountain of life

Many of the things we need can wait;

The child cannot

Right now is the time his bones are being formed

His blood is being made and his

Senses are being developed

To him we cannot answer tomorrow

His name is today "

---Gabriel mistral, 1948

Children are nature's gift and the fountain of life. Their nurture and solicitude is our responsibility .The strength of nation lies in the health of its citizens. Children are future citizens and their health is nation's wealth. There is a meaningful truth in saying that "nation marches on tiny feet of young children and no nation without due love and attention paid to its children will lead to social and economic development. By promoting their good health we will be strengthening the development of the family, nation and world.

Realizing the importance of children, World Health organization (WHO) has declared the themes relating to children in the following years,

1951-Health for your child and world's children.

1979-A healthy child, a sure future.

1984-Children's health tomorrow's wealth.

2005-Make every mother and child count.

Nutrition in children is considered as one of the foundation not only for good health and freedom from disease but also for normal and development.. In the global campaign of Health for All, promotion of proper nutrition was one of the eight elements of primary health care. [1]

In the millennium declaration of September 2000, member states of the United Nations made a passionate commitment to address the crippling and multiplying problems in many developing areas of the world. Governments set a date of 2015 by which they would meet the Millennium Development Goals.

Among this, the first goal is to eradicate extreme poverty, which is measured by the prevalence of underweight among the children. The target is to halve the burden of undernutrition. The next important goal with regards to children is to achieve two thirds reductions in under five mortality and infant mortality by 2015.[2]

The term 'Nutrition' is derived from a Latin word nutritic, meaning nourishment. Mal means any deviation from normal phenomenon. Malnutrition is defined as any deviation from normal nutrition.

Deviation may be towards right side leading to overnutrition or to the left side of the mean leading to undernutrition. Since the problem of undernutrition is very high compared to overnutrition generally it is accepted that malnutrition means undernutrition in fact malnutrition and undernutriton are not synonymous word.

Malnutrition is called an "invisible" emergency because, much like an iceberg, its deadly menace lies mostly hidden from view .Globally each year, malnutrition is implicated in about 40% of the 11 million deaths of under five children in developing countries, and lack of exclusive breast feeding in infancy causes an additional 1.5 million deaths.

Geographically, more than 70% of malnourished children live in Asia, 26% in Africa and 4% in Latin America and the Caribbean.

Salient features of the problem:

- Poor nutrition contributes to 1 out of 2 deaths (53%) associated with infectious disease among children aged under five in developing countries.
- One out of two children in Africa with severe malnutrition dies during hospital treatment.
- One out of four preschool children suffers from under nutrition which can severely affect child's mental and physical development.
- Under nutrition among pregnant women in developing countries leads to 1 out of 6 infants born with low birth weight. This is not only a risk factor for neonatal deaths, but also causes learning disabilities, mental retardation, poor health, blindness and pre mature deaths.
- Inappropriate feeding of infants and young children are responsible for one third of the causes of malnutrition.
- One out of three people in developing countries are affected by vitamin and mineral deficiencies.
- Forty million people living with HIV/AIDS are exposed to an increased risk of food insecurity and malnutrition, especially in poor setting, which may further aggravate their situation.

  But on the other side of the problem:

- Two out of three overweight and obese people now live in developing countries, the vast majority in emerging markets and transition economies.

- By 2015, more obese people will live in developing countries than in the developed world and this in turn will lead to increase in incidence of diabetes cardiovascular manifestations. [3]

INDIAN SCENARIO:

Severe forms of PEM have diminished. According to the recently released NFHS-III data ,45.9% of India's under three years age children are underweight,39% are stunted , 20% severe malnourished, More than 6000 Indian children below five years die every day due to malnourishment .Overall, India hosts 57 million or more than a third of the world's 146 million undernourished children. More than 2 billion people worldwide suffer from Vitamin/mineral deficiencies of which 30% live in India.

- However there is wide variation in between the states, with Kerala (29%) on one end and the Hindi speaking belts (40-60%) on the other end. [4]
- A number of studies have shown that malnutrition is the result of a number of factors interplaying with each other and of them social determinants like Age of women at pregnancy, educational status, religion, socioeconomic status, child weaning and rearing practices, customs, beliefs and practices etc, play an important role. It is rightly said that it is foolishness to treat only the disease/health problem without looking at the circumstances responsible for the problem. Thus it is essential to implement measures to change the circumstances.

Hence this study was taken up to identify the various factors responsible for causing malnutrition in underfives in this socioeconomically backward district and to provide the data for the planners to implement preventive and control measures to tackle this problem more effectively.

OBJECTIVES

1. To estimate the prevalence of Malnutrition in under five children.

2. To study the role of socio demographic, and nutritional profile of the underfive children.

REVIEW OF LITERATURE

Since the very existence of mankind on the earth importance was given to nutrition. It is believed that Hippocrates, the Father of Medicine, paid strict attention to the diet of his patients as a feature of his therapeutic regimens. For instance, his dietetic prescriptions reveal a close relationship of effects of individual foods on both sick and the well. Pulses, he said, should be eaten with cereals. The obese should be advised to labour much, drink little.

Ancient Indian texts give adequate indication of the importance that diet and nutrition were accorded during ancient times. Aahara or the dietary philosophy has been central to the concept of ancient Indian system of medicine, Ayurveda. Prudent food with a strict dietary discipline was the hallmark of ancient Indian lifestyle and one of the secrets of a long and healthy life which the Indians enjoyed in the Vedic times. These dictums were ingrained in the lifestyle along with good and noble thoughts (vichara) and the discipline of life (Yoga) for a long lasting good health and the ultimate union with the supreme power.

The phrase 'science of nutrition' was first used probably by Count Rumond in an essay on feeding poor people in 1795. During the same period Lavoisier who was working on combustion and respiratory metabolism, is said to have established nutrition as a science . In 1753 James Lind published the first edition of A Treatise on the Scurvy which elaborated how 110 men were disabled by scurvy and were miraculously cured by an Indian remedy (the infusion of the needles of an evergreen tree). Lind was also the first one to study experimentally the value of different substances in the treatment of scurvy, and proved that dietary lemons and oranges cured scurvy.

In 1839, a Dutch physician Gerrit Mulder claimed that complex nitrogen compounds like egg albumin, serum albumin, fibrin and wheat gluten all contained a common radical, ‘protein’.

The science of nutrition bloomed during the 20th century. Vitamins and amino acids were discovered, human nutritional requirements were established and the relationship between diet, nutrition and the human body in health and disease were recognized.

- Lafayette B. Mender (USA) identified the nutritive value of proteins during 1909-1928.

- In 1912 Casimir Funk (Poland) propounded the theory that beriberi, scurvy, pellagra and possibly rickets were caused by deficiency of “special substances which are of the nature of organic bases” and coined the term ‘vitamine’.

- The dangerous disease Pellagra was earlier described in Northern Spain in 1735 by Casal. However, scientific world had to wait till Goldberger undertook a study in 1915. He studied the diets of patients and medical staff in State Asylums in South Carolina, Georgia and Mississipi. This study proved that the disease was caused by a deficiency rather than a poison or infection. The search for the pellagra preventing factor travelled through high proteins, yeast and liver and ended with the isolation of nicotinic acid from rice polishing by Funk in 1912.

- Verner McCollum (USA) discovered a fat soluble soluble factor that was essential for growth (Vitamin A) in l916 (6). Chick, Windaus and Hess worked on Vitamin D, Evans

and Bishop on Vitamin E, King and Gyorgy on Vitamin C, Dam on Vitamin K, Mitchell, Snell and Williams on folic acid and Hodjkin on Vitamin B.

- McCance, Mac Kay, Widdowson, McLaren and Woodruff did pioneering work on iron deficiency. Ciceley Williams (England) described Kwashiorkor in 1933. Kerpel Fronuis, Gomez and Cravioto also worked on protein calorie deficiency.[5]

RELATED STUDIES ON MALNUTRITION:

A large number of studies have been done and published in various National as well as International journals.

To mention a few studies which have been published across the globe and within the country in the recent decade are:

A) Prevalence of Malnutrition:

In a study done by Md.Israt Reyhan et al (2010) to assess malnutrition among 5419 under five children in Bangladesh, revealed that the prevalence of underweight, stunting and wasting was found to be 48%, 45% and 10.5% respectively.[6]

A study was done by Odunayo SI et al (2006) in rural Nigeria, to determine the nutritional status of under-five rural Nigerian children, From 344 households, 420 children were studied. The prevalence of underweight, wasting and stunting using the World Health Organization/ National Centre for Health Statistics (WHO/NCHS) standards were 23.1 percent, 9 percent and 26.7 percent respectively. Young age was significantly associated with a higher prevalence of underweight (P = 0.004). Overcrowding, low maternal income and the use of infant formula feeds in children who have attained the age of 6 months and above were associated with a higher prevalence of wasting (P = 0.029, P = 0.031 and P = 0.005 respectively).[7]

The study conducted by Regional Medical Research Center for Tribals (ICMR),Jabalpur(2005), India revealed that out of 1022 preschool children, 61.6% preschool were underweight ,51.6% were stunted and 32.9% were wasted .The study also reveled severe

degree (-3SD) of underweight , stunting and wasting 27.8%,30.3% and 6.5% children respectively.[8]

In a study conducted by Madhu B Singh et al (2005), to assess the nutritional status of under five children with a sample of 914 children, in western Rajasthan ,about 60% of the children were underweight (weight-for-age below -2SD from the reference median) while the prevalence of severe underweight (weight for age below -3SD from the reference median) was found to be about 31%.The overall prevalence of stunting (height-for-age below -2SD from the reference median) was about 53% with the extent of severe stunting (below -3SD from the reference median) being about 34% and the overall prevalence of wasting (weight-for-height below -2SD from the reference median), an indicator of short-duration malnutrition, was about 28% with the extent of severe wasting (below23SD from the reference median) being about 10%.Vitamin A and B complex deficiencies were found in 0.7 and 3.0% of children, respectively. Prevalence of marasmus (protein–energy malnutrition, PEM) was 1.7%.[9]

In a cross sectional study by Banerjee. B et al (2005) which was undertaken among 130 under five children in a slum area of Kolkata, prevalence of malnutrition was 55.38 % (females 77.6%, males 31.7%; $p<0.01$).More than half of female children were malnourished and this showed an increasing trend with increase of birth order in girls ($p<0.05$).But no such association was observed in boys.[10]

In a study by Kapur.D et al (2005) conducted to assess the assess the dietary intake and growth pattern of children, 9-36 months of age in an urban slum of Delhi, anthropometric analysis showed that out of 545 children, 75% were underweight (< -2SD) while 35% were severely underweight (< -3SD).Approximately 74% were having short stature with 39% severely stunted , 19% of children were wasted.[11]

In a study by Bloss Emily et al (2004), conducted in Kenya, Africa among 184 children of under five years of age, 30% of children were underweight, 47% were stunted and 7% were wasted.[12]

In another study by Joseph. B et al (2002), done in rural areas of Karnataka, in a sample of 256 under five children the prevalence of wasting, stunting and wasting and stunting was 31.2%, 9.4% and 29.2% respectively. Wasting was found to be more among younger age groups ($p<0.05\%$).[13]

In a study done by Ray S.K et al (2000) to asses of nutritional status of children and dietary pattern of families done in Siliguri, West Bengal with a sample size of 316 under five children, prevalence of malnutrition was observed to be 62.97%. Severe malnutrition was 6.65%, more so amongst 12-23 months of age and among females .64.7% males and 61.58% females were malnourished.[14]

In a study by Mahapatra.A et al (2000) conducted in a backward and drought affected district of Orissa where in 751 under five children belonging to 15 gram panchayats were studied for anthropometry and clinical signs of nutritional deficiencies.57.1% were underweight ,41.8%

were stunted and 27.9% were wasted. Clinical signs of all forms of PEM were recorded in 4.5% of 554 children aged 1-5 years. Prevalence of clinical PEM in the form of marasmus was found in 0.7% of children and kwashiorkor was not recorded.[15]

In a cross sectional study done by Garg S.K et al(1997),in the Ghaziabad city to determine the nutritional status of children in 1 to 6 years age group, out of 771 children, it was found that 41.8% were normal and of the rest 39.8%,16% and 2.4% were suffering from malnutrition of Grade 1,2 and 3 respectively,. None of the children were found to have Grade 4 malnutrition.[16]

In a study conducted in Delhi by Saxena N (1997), where in the Z score classification was used to assess the prevalence of malnutrition in 630 children less than 6 years of age, 57.6% were underweight, 53.0% were stunted and 22.5% were wasted. [17]

B) Prevalence of malnutrition according to Sociodemographic variables:

I) AGE:

Malnutrition's main victims are children under the age of 15, but the children under the age of 5 yrs are hit the hardest .This has been reported in many studies.

According to study conducted by Chakraborty S (2006), in a rural population of Jhansi district (U.P),the prevalence of PEM was found to be significantly higher in the age group of 1-3yrs (80.9%) as compared to other age groups (52.3% in 0-1 yr age and 59.4% in 3-6 yrs age).[18]

In a study by Bloss Emily et al (2004),conducted in Kenya, Africa both underweight and stunting was maximum in 12-24 months age group children at 46.2% and 60.5% and was statistically significant (OR=2.34,95% CI-1.01 to 5.95 for underweight children and for stunting OR=2.74,95% CI=1.10-6.88).[12]

In a study done by Harishankar et al (2004) in rural areas of Allahabad district among 0-6 age group with a sample size of 436 children, the maximum overall prevalence of malnutrition was recorded 33(32.03%) in age group 12-24 months followed by 43(28.09%) in the age group 37-72 months. Majority of children having grade II malnutrition were 13-24 months .while maximum grade III was recorded in 0-12 months. Maximum grade IV malnourished children were found to be 2(1.88%) in the age group 25-36 months followed by 1(0.65%) in age group 37-72 months.[19]

In a study by Mahapatra.A et al (2000) conducted in a backward and drought affected district of Orissa, the prevalence of underweight was found to be high in 12-24 months age group at 69%. The prevalence of stunting was found to be high in 37-48 months age group at 54.4% while wasting was seen commonly in 12-24 months age group.[15]

II) SEX:

Many studies have found the association of being a female child to be susceptible to malnutrition when compared to the prevalence in a male child. The difference may be due to negligence of girls, more morbidity and less health care facilities and overall lower social status of the girl child, preferential treatment given to the male children who receive better nutrition and attention than the female.

In a study by Banerjee B (2005), prevalence of malnutrition was 50.67%. Malnutrition was observed to be more common among females than male, though this difference was not found to be statistically significant ($p>0.05$). Grade I malnutrition was more common among males while grade II and grade III were more among females.[10]

In a study by Harishankar et al (2004), prevalence of malnutrition was found to be more in female children (53.01%) as compared to males (45.85%) .Severe grade of malnutrition was also prevalent in females (2.19%) as compared to their male counterparts. [19]

In a study by Bhalani K D (2002) more girls (68.2%) were malnourished than boys (58%) and the difference was statistically significant (.$p<0.000$ 1). Even in severity of malnutrition this difference persisted.[20]

III) PARENTAL EDUCATION:

Educated parents have better knowledge of diet and probably provide adequate nutrition to their children.

a) MATERNAL EDUCATION:

In a study by Mittal A (2007), prevalence was the highest where mothers were illiterate (60.9%) vs value of 21.2% where mother had education more than high school. Similarly, figures for stunting were 65.25% where mother was illiterate and 31.3% where education level was more than high school. [21]

In a study by Chakraborthy S (2006), the overall PEM prevalence was seen to be higher among the children of illiterate mothers whereas Grade II, III, IV PEM was higher amongst children of mothers having primary education. Significant difference (x^2=12.53, $p<0.05$)was found between the per cent of PEM in children of mother who were illiterate or having primary education in comparison to those of having education up to middle school and or above.[18]

In a study by Anoop I (1993), A highly significant inverse relationship was observed, with higher maternal education associated with lower prevalence of childhood malnutrition (p= 0.0006). The proportion of moderately malnourished children amongst those suffering from PEM has also been noticed to decrease with increasing maternal education.[22]

b) FATHER EDUCATION:

In a study by Sandip Kumar Ray (2000), substantial differences in the prevalence of malnutrition were observed among children belonging to illiterate fathers (74.76%) and literate fathers (57.28%) which was statistically significant ($p<0.05$).[14]

In a study conducted in rural area of Kenya, Africa by Bloss Emily et al (2004), neither underweight nor stunting was associated with father's literacy status(OR=0.91 and 0.88, 95% CI=0.53-1.56 and 0.51-1.52 for underweight and stunting prevalence respectively).[12]

IV) SOCIOECONOMIC STATUS:

A large part of our population particularly the poor suffer from serious deficiencies in their diet. Poor families with lack of purchasing power to meet the daily dietary requirements have a direct impact on nutritional status of their children. Many studies have demonstrated direct association between low socio-economic status and malnutrition.

In a study done by Harishankar et al (2004),the prevalence of malnutrition was found to be 52.2%,35.7% and 11.9% in children belong to low ,middle socioeconomic status group respectively In high socioeconomic status only grade I and grade II malnourished children were 5 (9.61%) and 2 (3.85%) respectively. No child of grade III and grade IV malnutrition was found in this socioeconomic group. Nutritional grade with economic status was found to be highly significant($X^2=18.91$, $p<0.001$).[19]

In a study by Anoop I (1993), Forty three point eight per cent of the children of the poorest families (with monthly income of under Rs.1000) were malnourished, while 32.6 percent of those with monthly family income of Rs.1000-1999, and 16.9 percent of those with monthly family income of Rs.2000 or more were suffering from PEM. However, Nutritional status with economic status was found to be statitistically not significant ($X^2 = 7.7$, DF = 2, p = 0.0213).[22]

V) FAMILY TYPE:

Type of family may also show its effect on the health of a child. It is usually better in children nurtured in joint & extended families compared to those brought up in nuclear families because one or other member in the family will be there to look after the child.

In a study by Bloss Emily et al (2004), conducted in Kenya, it was observed that children of larger families appeared to be protective against underweight [OR= 0.49,95% CI, 0.25-1.00].[12]

Contrasting findings were found in a study by Nanda S (1996), it was observed that the overall prevalence of PEM was significantly higher ($p<0.001$) in infants who were drawn from joint families than those drawn from nuclear families. The prevalence of PEM was 74.6 percent in large and only 21.96 percent in small families.[23]

VI) BIRTH ORDER:

Low prevalence of malnutrition in the children of first and second birth order brings home the fact that children born earlier get more attention and care and hence have better health.

In a study by Harishankar (2004), according to the birth order, the percentage of normal children decreased with increasing the birth order being 165(72.37%)in birth order one,110(72.37%) in birth order two and 44 (56.4%)in birth order three and above. The prevalence of all grades of malnutrition increases with birth order, 34(43.5%) in birth order three and above 41 (26.9%) in birth order two and 42(20.38%) in birth order one.[19]

In a study by Sandip Kumar Ray (2000), It was observed that 56.07% children with two or less member of siblings,' were malnourished. On the contrary 71.33% children were malnourished when number of siblings was 3 or more. The difference was statistically significant ($p<O.05$).[14]

In a study by Deoki Nandan (1981), the prevalence of grade II PEM was lowest (15.7%) in those families where there was only one child and was highest (21.4%) in the families having five or more children. The families in which there was only one child, the prevalence of PEM grade III was found to be zero and was 7.8 per cent where there were five or more children. This rising trend of the prevalence of PEM grade II and III in relation to total children was found highly significant ($X^2 = 78, 82$, d.f. - 12, p 0.001).[24]

VII) BIRTH INTERVAL:

It is generally accepted belief that PEM is a "disease child gets when the next child arrives" or "sickness of the deposed child", underlying the importance of subsequent deliveries. The growth potential of a child gets affected whenever a new arrival occurs within 3 years.

In a cross sectional study by Banerjee. B (2005) ,done at Kolkata, West Bengal it was observed that prevalence of underweight was 68.7% among children of birth interval less than 36 months, while it was significantly less ($p<0.05$) in children with birth interval of more than 36 months.[10]

In a study by Sandip Kumar Ray (2000), among the children with sibling interval of less than 36 months, 68.7% children were malnourished. However, the prevalence rate was significantly less ($p<0.05$) in children with sibling interval of 36 months or more. [14]

In a study by Deoki Nandan (1999), The prevalence of grade II and grade III PEM showed an increase with the lessening of the spacing as this was lowest (14.6% and 1.0% respectively) in those whose spacing was three years or more and highest (38.3 and 9.0%respectively) in those whose spacing with the elder child was less than one year.This difference was found significant statistically ($X^2 = 15.4$, d.f.- 6, $p < 0.01$).[24]

VIII) EXCLUSIVE BREAST FEEDING:

Breast milk is the best available food for infants and those who have been deprived of this, are expected to show a greater prevalence of malnutrition. Delay in the initiation of breast-feeding is known to be detrimental to the health of infants and children and lead to malnutrition.

Many studies have shown that there is an association between breast-feeding practices and prevalence of underweight and stunting.

In a study by Chakraborty S et al (2006),the proportions of underweight among children who had exclusive breastfeed for less than 6 months(64.6%) were significantly higher ($p<0.01$) than those who were breastfed more than 6 months(35.4%).[18]

In a study by Panpanich R et al (2003),for children aged up to 6 months, the prevalence of under nutrition, wasting and stunting in the exclusively breastfed group was 0.0 per cent, 1.9 per cent and 7.7 per cent, respectively, compared to 2.1 per cent, 4.3 per cent and 8.5 per cent, respectively in partial/ non-breastfed children ($p > 0.05$). For children aged between 7-12 months, the under nutrition, wasting, and stunting in the exclusively breastfed group was 23.1 per cent, 15.4 per cent and 7.7 per cent, respectively, compared to 13.4 per cent, 7.3 per cent and 9.8 per cent, respectively in partial/non-breastfed children ($p > 0.05$).[25]

In a study by Suvra Pathi et al (2003),it was observed that malnutrition was higher in those infants were partially breastfed and topfed (71.4%) when compared with the infants who were exclusively breastfed(21.21%).[26]

IX) TIME OF WEANING:

Delayed weaning is also detrimental to health. Appropriate age of weaning at six months was associated with decreased prevalence of under nutrition.

In a study by Rasania SK (2001),It was observed that weaning was started at optimum age of 4-6 months in 42.9% children, started early (<4 months) in 24.5% children while in rest it was

delayed beyond six months. Severe malnutrition was significantly higher ($p<0.05$) in children where weaning was delayed.[27]

In a study by Malik AS(2006), it has been found that out of 270 children in whom weaning was started at 4th month, 184 (68.2%) were normal and 86 (31.8%) were malnourished children. In 315 weaning was begined after one year and above had 144 (45.7%) were normal 171 (54.3%) malnourished among them. The Odd ratio is 2.54 showing that children exposed to late weaning after one year are having malnutrition 2.54 times more as compared to other children who received weaning earlier than 4th month.[28]

X) IMMUNIZATION STATUS:

Immunization against vaccine preventable diseases like tuberculosis, measles prevents the child from later complications like malnutrition. Partially and non-immunized children were at higher risk of malnutrition as they were not protected against the vaccine preventable diseases including measles and contributing to the vicious cycle of malnutrition and infection.

In a cross sectional study by Banerjee. B (2005) , at Kolkata, West Bengal significantly higher ($p<0.05$) prevalence of malnutrition was observed among partially immunized and non–immunized children (81.25% and 88.23% respectively) in comparison to fully immunized children (62.07%).[10]

In a study by Bloss Emily et al (2004),up to date vaccination was significantly protective of underweight (OR=0.45;CI 0.22-0.89) and also to stunting with children without up to date vaccination being more than twice as like to be stunted than with complete vaccination (OR=2.63;95%CI 1.16-5.98).[12]

In a study by Sandip Kumar Ray (2000), a significantly higher ($p<0.05$) prevalence of malnourished children were observed amongst partially immunized and non-immunized children (81.25% and88.23% respectively) in comparison to fully immunized children (62.07%). Severe degree of malnutrition was also significantly higher ($p<0.05$) among partially immunized and non-immunized children (12.5% and 11.76% respectively) in comparison to the fully immunized children (6.89%).[14]

XI) MICRONUTRIENT DEFICIENCY:

In a study conducted by Regional Medical Research Center for Tribals (ICMR) (2005), Jabalpur, India revealed that 61.6% of preschool children were underweight, 51.6% were stunted and 32.9% were wasted. Study revealed Vitamin A deficiency in the form of Bitot's spots was recorded in 1.6% children.[8]

In a cross sectional study done by Garg S.K (1997),to determine the nutritional status of children in 1to 6 year age group, it was found that 41.8% were normal and of the rest 39.8%,16% and 2.4% were suffering from malnutrition of Grade 1,2 and 3 respectively. Micronutrient defiencies like aneamia,xerophthalmia and goiter were present in 14.7%,1.6% and 0.6% children respectively.[16]

In a study by Reddy. D.C.S (1994) conducted to know the epidemiology of nutritional deficiency disorders among tribal preschool children in Uttar Pradesh, malnutrition was found to be 59.2%.Vitamin A deficiency signs were observed in 17.89% children (xerosis in11.58%,bitot's spots in 4.21% and night blindness in 5.26%) similarly 11.58% children manifested signs of vitamin B complex deficiency like glossits and angular stomatits.[29]

XII) INFECTIONS:

Infections, notably diarrhea, respiratory infections, measles and intestinal worms which increase requirements for calories, protein and other nutrients, while decreasing appetite, absorption and utilization capacity. It is a vicious circle –infection contributing to malnutrition and malnutrition contributing to infection, both acting synergistically.

In a study by Sandip Kumar Ray (2000), it was noted that 37.9% children suffered from diarrhoeal episodes. Out of them 75% were having different degrees of malnutrition and it was significantly (<0.05) higher than the overall prevalence rate (62.97%). Prevalence of severe degree of malnutrition was also more than double (14.58%) in children who suffered from diarrhoea than the overall prevalence of severe degree of malnutrition (6.65%) which was also statistically significant (<0.05). Among the children with acute respiratory tract infection, 69.98 percent were suffering from malnutrition with 8.32% having severe degree of malnutrition and both were significantly higher than the overall prevalence (<0.05).[14]

In a study by Awasthi S (1997), 67.6% were underweight (weight for age <-2 SD), 62.8% were stunted (height for age <-2 SD) and 26.5% were wasted (weight for height <-2SD). Parasites were detected in 17.5% (95% CI 15.3%-19.9%) children by a single direct fecal smear examination. Of these, Ascaris lumbricoides was found in 124 (68.1%) and Giardia lamblia in 60 (32.9%). There was no association between weight or height and parasite positivity.[30]

DEFINITION OF MALNUTRITION:

Mal means any deviation from normal phenomenon and malnutrition is defined as any deviation from normal nutrition.

Malnutrition can be broadly classified into two forms a) overnutriton and b) under nutrition.

a) Overnutrition leading to obesity and its complications
b) Undernutrition :
    1. Overall deficiency-due to inadequate, improper quality of food intake eg:starvation.
    2. Specific deficiency (Hidden hunger)-due to inadequate intake of one or more specific nutrients like vitamins,proteins,minerals or calories. eg:Vit A deficiency, Nutritional anaemia ,etc.

Clinical Manifestations of Malnutrition:

Malnutrition exhibits a wide spectrum of clinical manifestations based on overall undernutrition and / or specific undernutrition.Even in overall undernutrition its clinical manifestations varies from mild undernutrition to severe forms like marasmus and/or kwashiorkor.

CLASSIFICATION OF MALNUTRITON:

Various methods of classifications are in vogue to grade malnutrition. They are as follows:

1. Anthropometric methods of grading malnutrition[3]
    a. Gomez classification
    b. Jelliffe's classification

c. Indian academy of pediatrics classification

d. Waterlows classification

e.Welcome Trust Classification

f. WHO classification

Gomez classification:

Gomez' classification is based on weight. It locates the child on the basis of his or her weight in comparison with a normal child of the same age. In this system, the "normal" reference child is in the 50^{th} centile of the Boston standards

$$\text{Weight for age} = \frac{\text{Weight of the child}}{\text{Weight of normal child of same age}} \times 100$$

Between 90 and 110% : normal nutritional status

Between 75 and 89% : 1st degree (mild) malnutrition

Between 60 and 74% : 2nd degree (moderate) malnutrition

Under 60% : 3rd degree (severe) malnutrition

Jellife's classification-Based on weight for age,>90% is considered as normal.

Grades	**percentage of weight for age**
I	80-90%
II	70-80%
III	60-70%
IV	<60%

Indian academy of pediatrics classification:

Based on weight for age, >80% of expected for age is considered normal

Grades of malnutrition

Grade I : 71-80%

Grade II : 61-70%

Grade III: 51-60%

Grade IV: $\leq$ 50%

Waterlows classification:

Waterlows classification is based on height for age.

Children with height >95% of expected for the age : Normal

Children with height 90-95% of expected for the age: Marginal

Children with height 85-90% of expected for the age: Moderate

Children with height <85% of expected for the age : Severe

Welcome Trust Classification: Based on deficit in body weight for age and presence of edema.

Percentage of body weight	**with edema**	**without edema**
80-60%	Kwashiorkor	Underweight
<60%	Marasmic Kwashiorkor	Marasmus

WHO classification:

WHO recommends three terms, stunting, underwieght and wasting for assessing the magnitude of malnutrition in national health programmes.

	Moderate Undernutrition	**Severe Undernutrition**
Symmetrical edema	No	Yes
Weight for age	SD score -2 to -3	SD score < -3
(Measure for underweight)	(80-89% 0f expected)	(70-79% of expected)
	Underweight	severe underweight
Weight for height	SD score -2 to -3	SD score < -3
(Measure for wasting)	(70-79% of expected)	(<70% of expected)
	Wasting	Severe wasting
Height for age	SD score -2 to -3	SD score < -3
(Measure of stunting)	(85-89% of expected)	(<85% of expected)
	Stunting	Severe stunting

METHODOLOGY

Study setting:

The present study was carried out in Shivanagi village, which is rural field practice area of BLDEU's Shri B.M.Patil Medical College, situated 27km away from Bijapur and has population of 7060.[32]

Study population:

Comprises of 0-5 year age group children, in Shivanagi village.

Study design: Community based cross sectional study.

Duration of study: August 2009-July 2010.

Inclusion criteria:

All preschool (0-5years) children

Exclusion criteria:

Children of the parents/guardians who were not willing to participate in the study.

Non-permanent residents of village.

Sample size:

The total population of Shivanagi is 7060.

Under five (0-5 year) children constitute 13% of total population.

Therefore total number of pre-school children in Shivanagi will be about 904.

With prevalence rate of undernourishment being 43.67% [33]and allowable error 10% using statistical formula

$$n = 4pq/l^2$$

Where 'p' is probability of occurrence, 'q' is probability of non-occurrence

and 'L' is allowable error (% of 'p'); the worked out sample size is 510.

Interview with mother

List of all under five children was prepared by conducting house-to-house survey.

In a family, if there were more than one underfive children, then only one child was randomly selected and included in the study.

Of 1030 families with a preschool child, 510 were selected from the list by using systematic random sampling technique. The first family was selected by noting down the last digit of a currency note and every 2nd family will be subsequently selected till 510 pre school children are covered.

Methodology: A pilot study was conducted in a neighboring village for 1 month, from July 09 to August 09.50 families with a preschool child were interviewed. Based on the practical experience, the proforma was redesigned. The research study was conducted at village Shivanagi from Sept. 09 to Aug .10.

Collection of data:

Study was done for 3 days in a week from 9:00 AM to 12:30 noon.

510 families having preschool children were included in the study. After getting written consent, children were examined for their health status and sociodemographic profile of the family was obtained from parents /guardians. The information was collected in a pretested proforma.

Diagnostic criteria:

Malnutrition has been defined as "any deviation from normalcy resulting due to relative or absolute deficiency or excess of one or more nutrients ".The micronutrient deficiency conditions like anaemia,xerophthalmia,rickets,goiter and vitamin B complex were diagnosed clinically on the presence of specific signs and symptoms.

Instruments used for data collection:

i) **Stethoscope:** A standard stethoscope of 16 inches was used.

ii) **Weighing machine:**

- Infants were weighed in a scale pan with minimum clothing.
- For 1-5 year age groups, a standard UNICEF Salter spring balance was used. Weight was taken without shoes and with minimum cloths on the body, nearest to 0.1 kg.

iii) **Measuring tape and card board:**

- Infantometer was used to measure height of children below one year. Length was taken to the nearest 0.1 cm.
- For 1-5 year age groups; height was taken in the standing position by using stadiometer (without footwear with steel measuring tape,) measuring to the nearest 0.1cm.The children were made to stand straight with heels, buttocks, shoulders and back of head touching the wall. Head was held comfortably erect with the lower border of orbit of the eye in the same horizontal plane as the external canal of the ear and the arms hanging loosely by the sides with palms facing the thigh. The headpiece was then lowered gently making contact with the top of head.
- In 1-5 year children, the left mid arm circumference was measured while hanging freely. The midpoint was assessed by measuring the distance between the acromial process of scapula and the olecronon process of ulna, and the measurement was taken to the nearest 0.1 cm.

Study variables:

Head of family:

Person in family who looks after financial matters and who takes major decisions.

Education status:

Formal Education of father and mother was recorded as stated by the subject,

a) Illiterate: Person who could neither read nor write.

Person who can only read but not write.

b) Primary: The person who had studied up to or less than VII standard.

c) Secondary: People with education between VII and X standard.

d) College: People with education up to Pre University.

e) Post graduate: People with university level education.

Nature of Family:

a. Nuclear: A family consisting of a married couple and their unmarried, dependent children.

b. Joint: A number of married couples (who are in biological relationship with each other) and their children who live in the same house.

c. 3 Generation: consists of 3 generations related to each other by direct decent, living together.

Food habits:

a. Vegetarian: person who consumes only vegetarian diet.

b. Mixed: person who consumes both vegetarian and non-vegetarian diet.

Socioeconomic status:

The per capita income was classified using the modified B.G.Prasad's classification.

Socioeconomic status of family:

Socioeconomic status	**Prasad's classification 1961(per capita income per month in Rs)**	**Modified Prasad's classification in study period (2009-10)**
Class I	100 and above	3600 and above
Class II	50-99	1800-3599
Class III	30-49	1080-1799
Class IV	15-29	540-1079
Class V	Below 15	Below 540

As our study period was from August 2009 to July 2010, the mean consumer price index for that period was taken.[34]

Modification was done with the aid of multiplication factor (MF), which was obtained as below:

MF = value of consumer price index (average value for study period) x 0.0493

=727 x 0.0493 =35.84≈36

Birth order: The living siblings were taken into consideration for birth order of living children.

Birth interval: The interval between the successive pregnancies was considered.

Family size: It consists of the total number of live children a mother has borne at the time of study.

Exclusive breast feeding: Feeding the child with only breast milk for a minimum duration of 6 months (vitamins, minerals and medicines can be given if required for child's health or for minor ailments as per physician's advice).

Appropriate age at weaning: This was considered as 6 months**.**

Pre lacteal feeds: Feeds given to the newborn before starting breast feeding**.**

Top milk feeding: Any milk apart from breast milk introduced before the age of 6 months.

Immunization status:

Children above one year were considered as fully immunized if they were administered BCG, OPVI/II/III, DPT I/II/III and measles; considered as partially immunized if one or more dose of any above mentioned vaccines were not given; considered non-immunized if no vaccine was administered before completing one year age

Dietary intake: Dietary history was collected using 24-hour recall basis method. The nutrient intakes of each child were computed to derive the energy and protein consumption using standard conversion tables given by National Institute of Nutrition, Hyderabad. The quantity of breast milk was estimated based on data specific to Indians. The values of energy and protein consumed were assessed for adequacy by comparing with the Recommended Dietary Allowance (RDA) for 1-3 years children. The RDA value for energy and protein requirement for 1-3yr children is was considered to be 1240 kilo calories and 22 grams proteins, while for 4-5 years children it is considered to be 1690kilo calories and 30 grams proteins. As per ICMR standards >90% of RDA consumption of calories and proteins was considered adequate.[35]

Grades of malnutrition:

The height and weight of each child was compared with WHO reference data for that particular age and sex to get weight for age, height for age and weight for height indices. Children below -2SD of the reference median on any of these indices were considered as undernourished and termed as underweight, stunted and wasted respectively. Children below -3SD were considered to be severely undernourished. The mid upper arm circumference was used to classify malnutrition in children aged 1 to 5 years. Children with less than 13.5 cms were considered as mildly malnourished and those less than 12.5 cms were considered as severely malnourished.

General physical examination:

Head to toe examination was done to find out signs of micronutrient deficiencies. Children were examined with minimum clothing under broad day light.

Statistical methods:

Graphs, pictograms, Percentage and Chi square test were used for analysis.

RESULTS AND DISCUSSION

Table 1: Distribution of children according to Age and Sex:

Sl. No.	Age (In months)	Males		Females		Total	
		No.	%	No.	%	No.	%
1	0-12	59	48.76	62	51.24	121	23.7
2	13-24	67	54.92	55	45.08	122	23.9
3	25-36	56	52.83	50	47.17	106	20.8
4	37-48	56	61.43	35	38.57	91	17.8
5	49-60	30	42.86	40	57.14	70	13.7
	Total	**268**	**52.55**	**242**	**47.45**	**510**	**100**

In the present study comprising of 510 children aged 0-5 years, maximum number of children 68.4% were in the age group of 0-3 years.

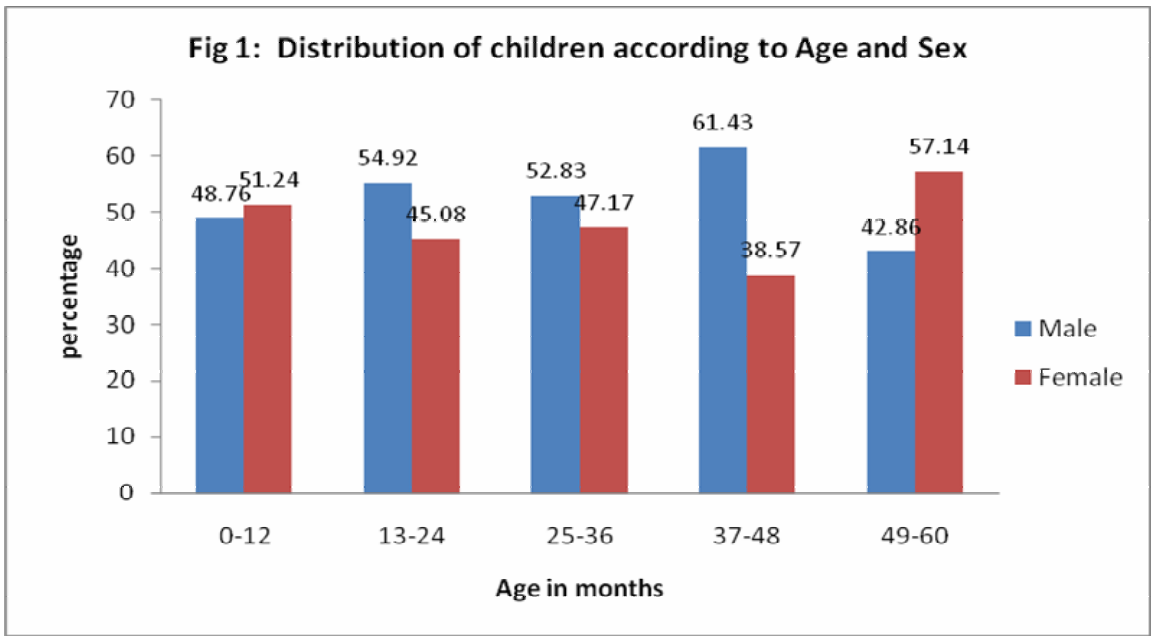


Table 2: Distribution of children according to Religion:

Religion	Preschool children	
	No.	Percentage
Hindu	470	92.2
Muslim	40	7.8
Total	**510**	**100**

Out of 510 children 470(92.2%) were Hindus and 40 (7.8%) were Muslims.

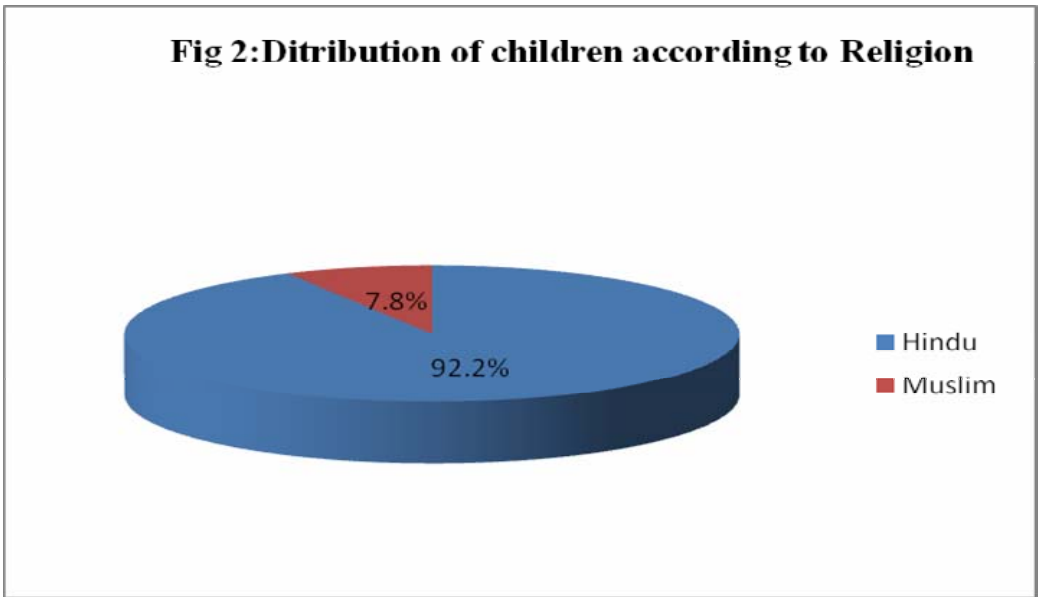
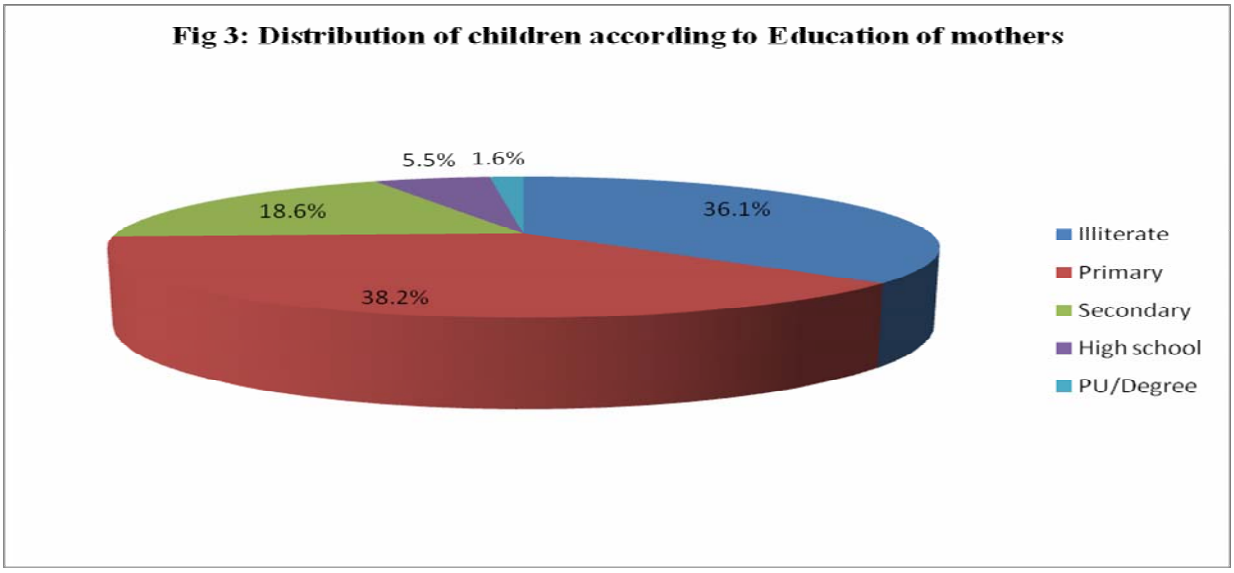


Table 3: Distribution of children according to Education of mothers:

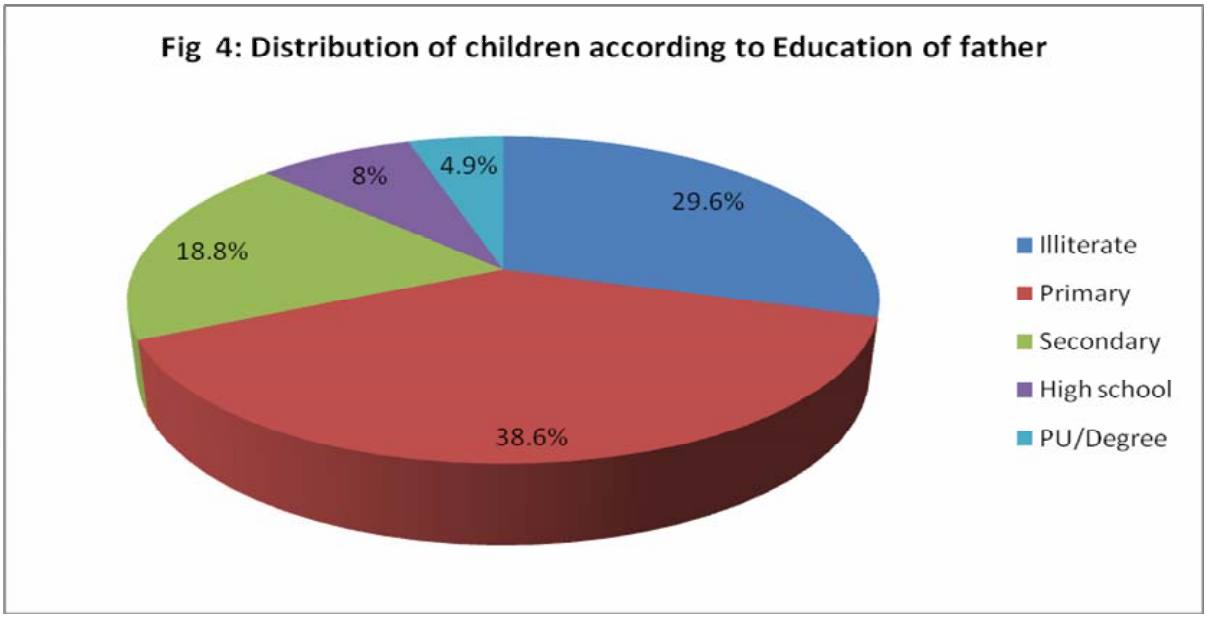
Education of mothers	Under five children	
	No.	**Percentage**
Illiterate	183	36.1
Primary	196	38.2
Secondary	95	18.6
High school	28	5.5
PU/Degree	8	1.6
Total	**510**	**100**



Compared with the national (56%) and state (54%) [36] averages for illiteracy among females, our study showed a lower illiteracy (36.1%) among females.

Table 4: Distribution of children according to Education of father:

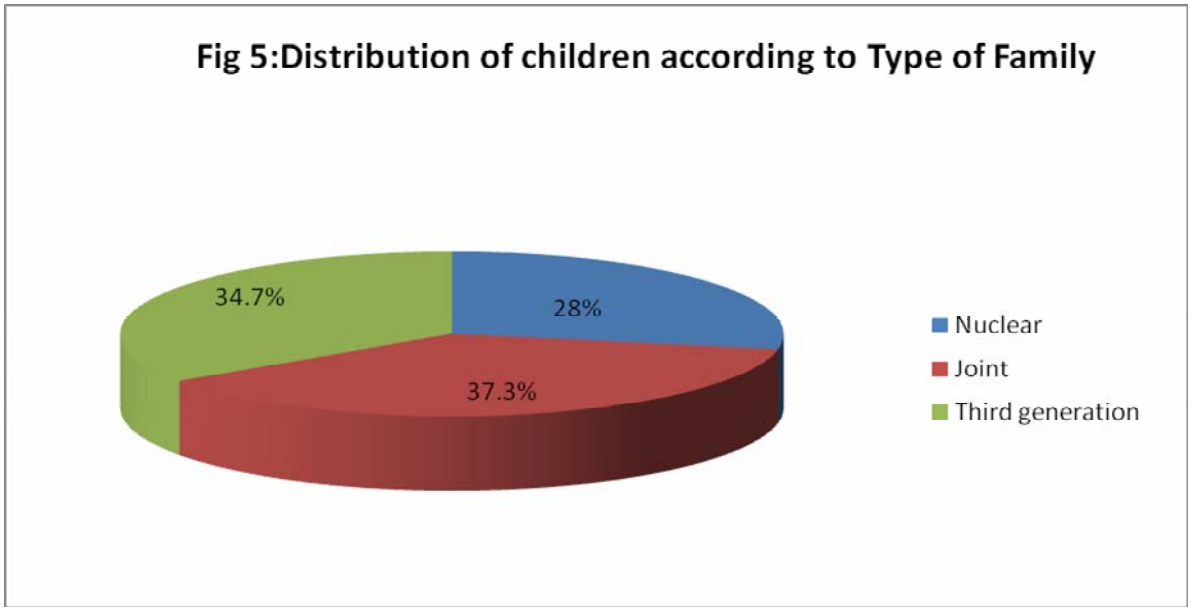
Education of fathers	Preschool children	
	No.	Percentage
Illiterate	151	29.6
Primary	197	38.6
Secondary	96	18.8
High school	41	8.0
PU/Degree	25	4.9
Total	**510**	**100.0**



Our study showed a higher illiteracy rate (29.6%) among males compared to national (24%) and state averages (24%) [36].

Table 5: Distribution of children according to type of families:

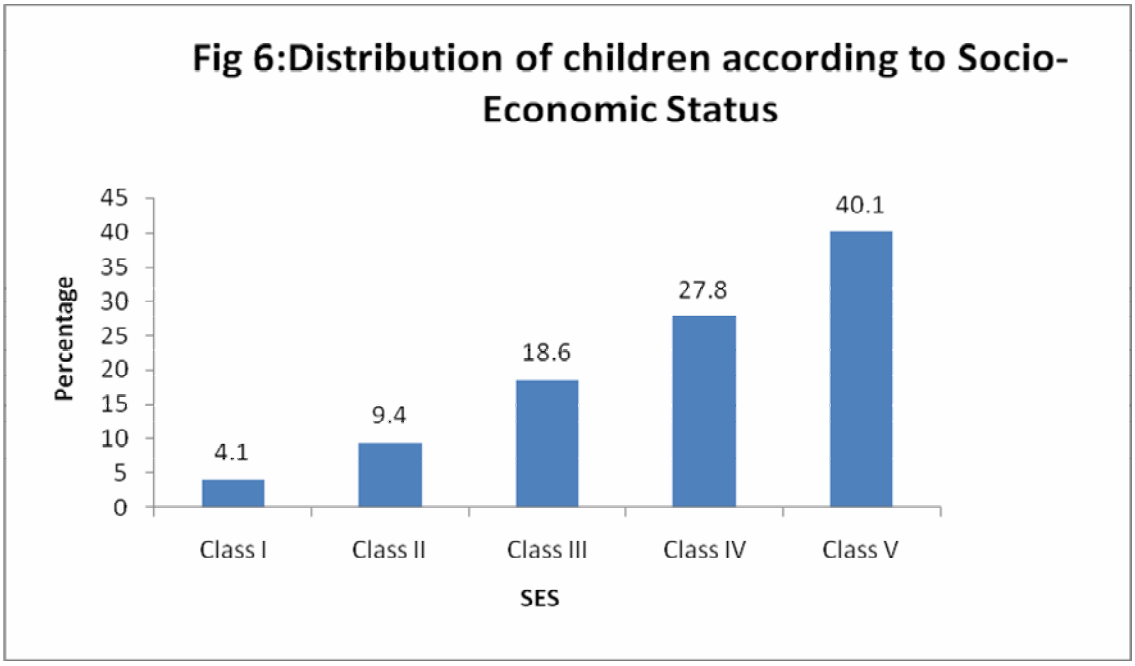
Type of Family	No	Percentage
Nuclear	143	28.0
Joint	190	37.3
Three generation	177	34.7
Total	**510**	**100.0**



In the present study 28% of children belong to nuclear families, 37.3% of children belong to joint families and 34.7% children belong to three generation families.

Table 6: Distribution of respondents according to socioeconomic status:

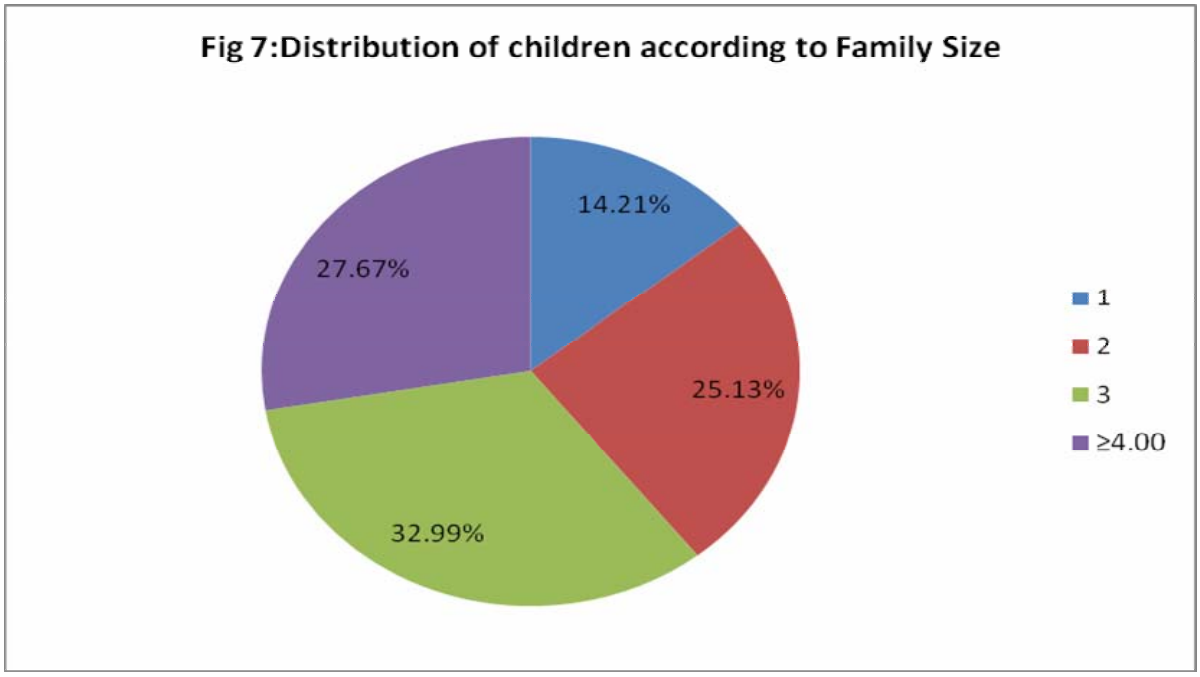
SES	Preschool children	
	No	Percentage
Class I	21	4.1
Class II	48	9.4
Class III	95	18.6
Class IV	142	27.8
Class V	204	40.1
Total	**510**	**100.0**



Maximum number of children belonged to class IV and class V (67.1%) followed by class III (18.6%), class II (9.4%) and class I (4.1%).

Table 7: Distribution of children according to family size

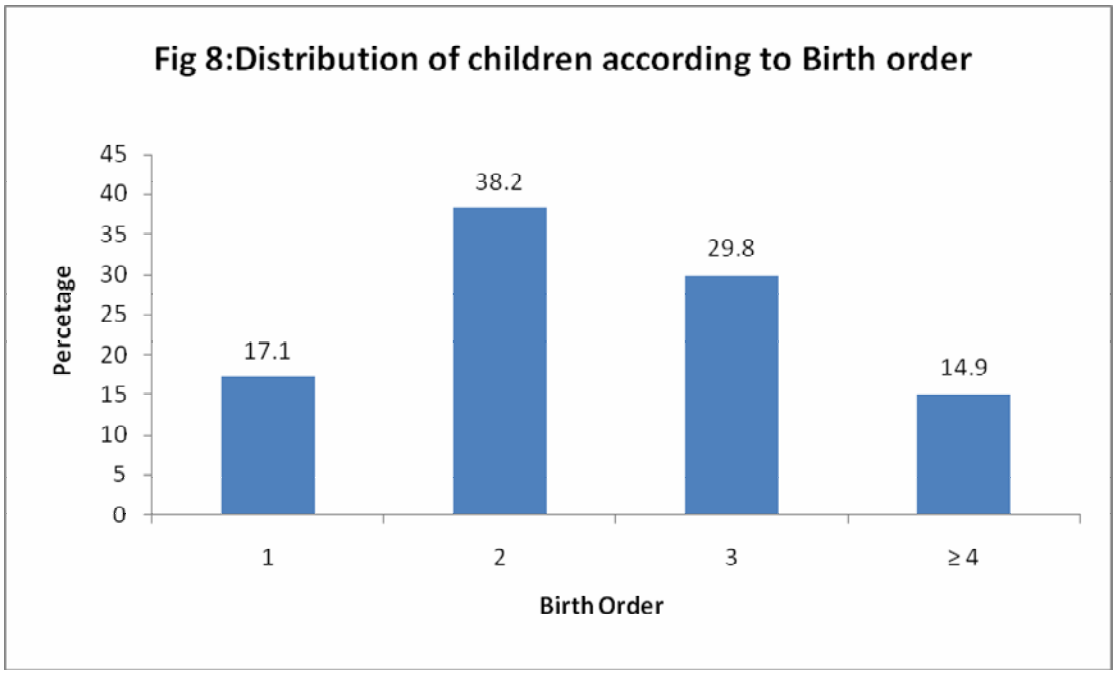
Family size	Numbers	Percentage
1.00	72	14.21
2.00	128	25.13
3.00	168	32.99
≥4.00	141	27.67
Total	**510**	**100.00**



In the present study, majority 168(32.99%) of the mothers had borne 3 children, 141(27.67%) had borne 4 children, 128(25.13) had born 2 children and 72(14.21) mothers had borne 1 child at the time of study.

Table 8: Distribution of children according to birth order:

Birth order	No	Percentage
1	87	17.1
2	195	38.2
3	152	29.8
≥ 4	76	14.9
Total	**510**	**100.0**

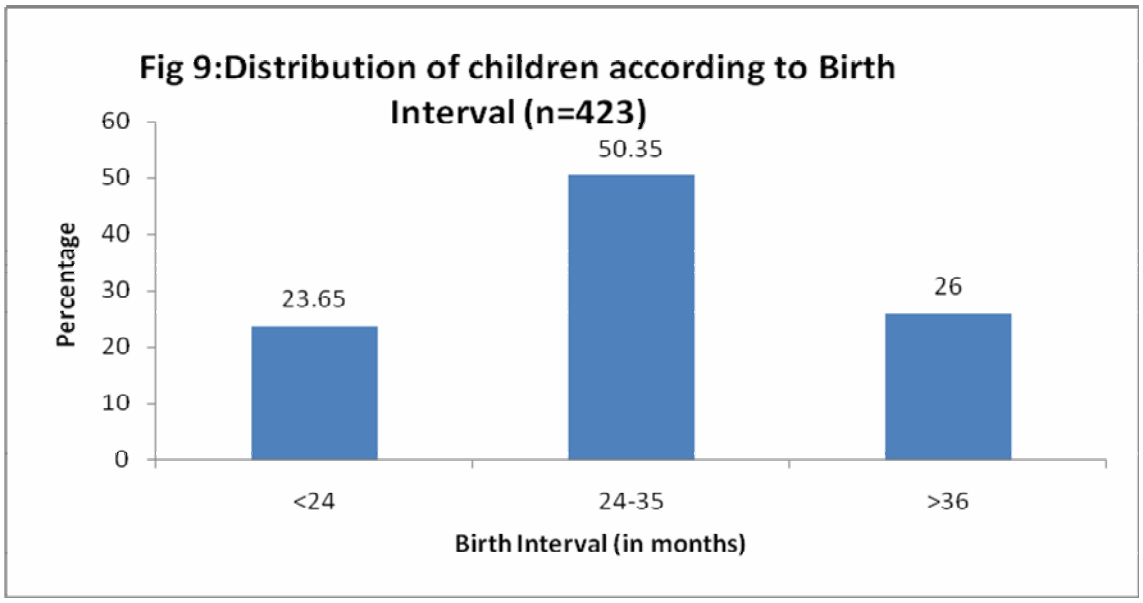


In context to birth order, majority195 (38.2%) were of birth order of two, 152 (29.8%) were of birth order of 3, 76(14.9%) and 87(17.1%) were of birth order of ≥4.

Table 9: Distribution of children according to birth interval (n=423)*:

Birth interval (in months)	No	Percentage
<24	100	23.65
24-36	213	50.35
>36	110	26.00
Total	**423**	**100**

(*children with birth order one are excluded)



In our study 74% have delivered within 3 years followed by 26% who have delivered after 3 years.

Table 10: Distribution of children according to prelacteal feeds given:

Prelacteal feeds	No	Percentage
Given	288	56.5
Not given	222	43.5
Total	**510**	**100.0**

Out of 510 children, 288(56.5%) were given prelacteal feeds, 222(43.5%) did not receive any prelacteal feeds.

Table 11: Distribution of children according to top milk feeding:

Top milk feeds	No	Percentage
Given	135	26.5
Not given	375	73.5
Total	**510**	**100.0**

With regards to top milk feeding, out of 510 children, 375(73.5%) were given top milk feeds, 135(26.5%) did not receive any topmilk feeds.

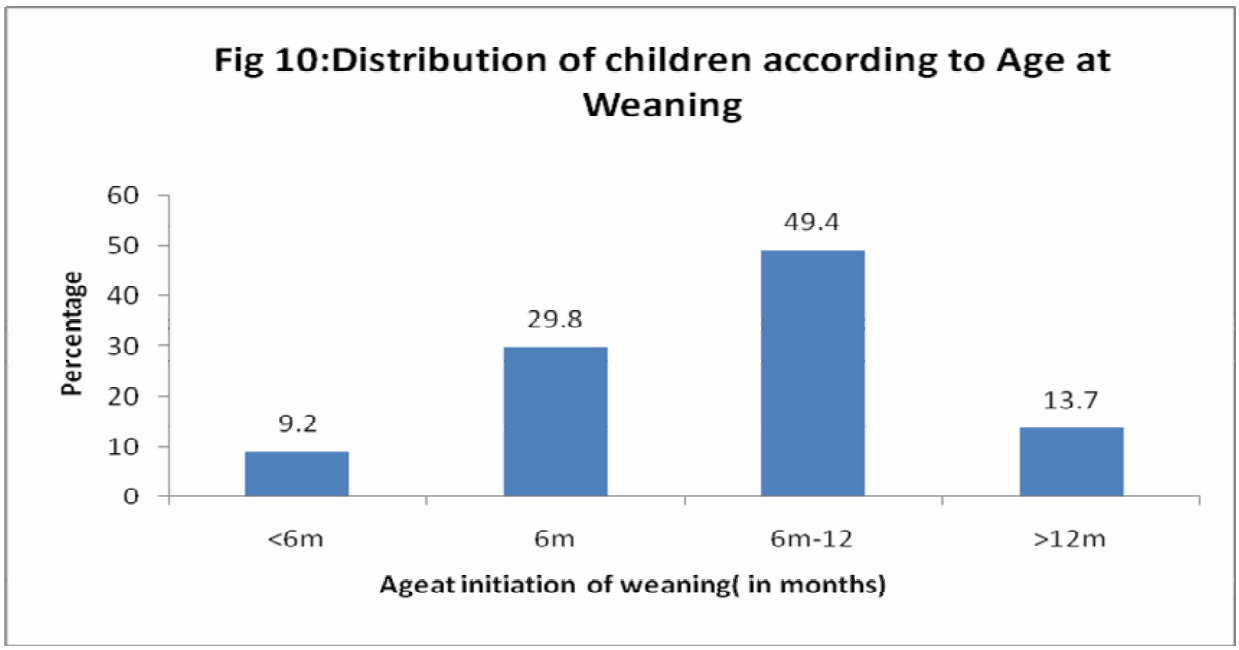
Table 12: Distribution of children according to exclusive breast feeding:

Exclusive breast feeding	No	Percentage
Given	198	38.8
Not given	312	61.2
Total	**510**	**100.0**

In the present study, out of 510 children, 198(38.8%) were given exclusive breast feeding, 312(61.2%) were not given exclusive breast feeding.

Table 13: Distribution of children according to age at weaning:

Age (in months)	No	Percentage
<6	47	9.2
6	141	29.8
7-12	252	49.4
>12	70	13.7
Total	**510**	**100.0**



The appropriate age at weaning which was considered to be 6 months was started in 141(29.8%) of the children, while delayed weaning at 7-12 months was observed in 252(49.4%) children and weaning was delayed for more than 12 months in 70(13.7%) children.

Table 14: Distribution of children according to dietary adequacy:

RDA (%)	Calories No. (%)	Proteins No. (%)
>90	71(13.92)	41(8.03)
70-89	224(43.92)	242(47.45)
50-69	200(39.22)	205(40.19)
<50	15(2.94)	22(4.32)
Total	**510(100)**	**510(100)**

As regards dietary intake, it was observed that calorie consumption was adequate in 71(13.92%) children and protein consumption was adequate in 41(8.03%) children.

Table 15: Distribution of children according to Immunization status (n=389*, Age group 13-60 months):

Immunization status	Under five children	
	No	Percentage
Complete	312	80.2
Partial	77	19.8
Total	**389**	**100**

(*children from 0-12 months are excluded)

Out of 389 children, 312(80.2%) were completely immunized, 77(19.8%) were partially immunized.

Recording weight of infants using scale pan

Recording weight of child using Salter spring balance weighing machine

Table 16: Distribution of children according to weight:

Age (In months)	MALES		FEMALES	
	Children Observed	Weight (In Kg ± SD)	Children Observed	Weight (In Kg ± SD)
0-12	59	7.20 ± 0.94	62	6.14 ± 0.54
13-24	67	9.01 ± 0.88	55	7.78 ± 1.00
25-36	56	10.59 ± 0.61	50	9.84± 0.93
37-48	56	12.16 ± 0.80	35	10.98 ± 1.22
49-60	30	13.2 ± 0.96	40	12.31 ± 0.80
0-60	**268**	**9.98±2.21**	**242**	**9.54±2.36**

The mean weight of male children in the 0-60 months age group is in the range of 7.20±0.94kg to 13.2 ± 0.96 kg and in female children is in the range of 6.14±0.54kg to 12.31 ± 0.80kg. Statistically significant difference was observed in the increasing trend of mean weight between males and females ($t=2.16$, $p<0.05$).

Study conducted in a tribal area near Jabalpur (Punjab), reveals that the mean weight in 0-60 months was 8.2 ± 1.64 kg to12.8 ±1.98 kg for boys and 7.9 ± 1.53kg to 12.4 ± 1.91kg for girls.[8] Compared to our study, these figures are high; this may be due to the variation in diet, cultural and racial factors.

Recording height of child (1-5yrs) by using stadiometer

Table 17: Distribution of children according to height:

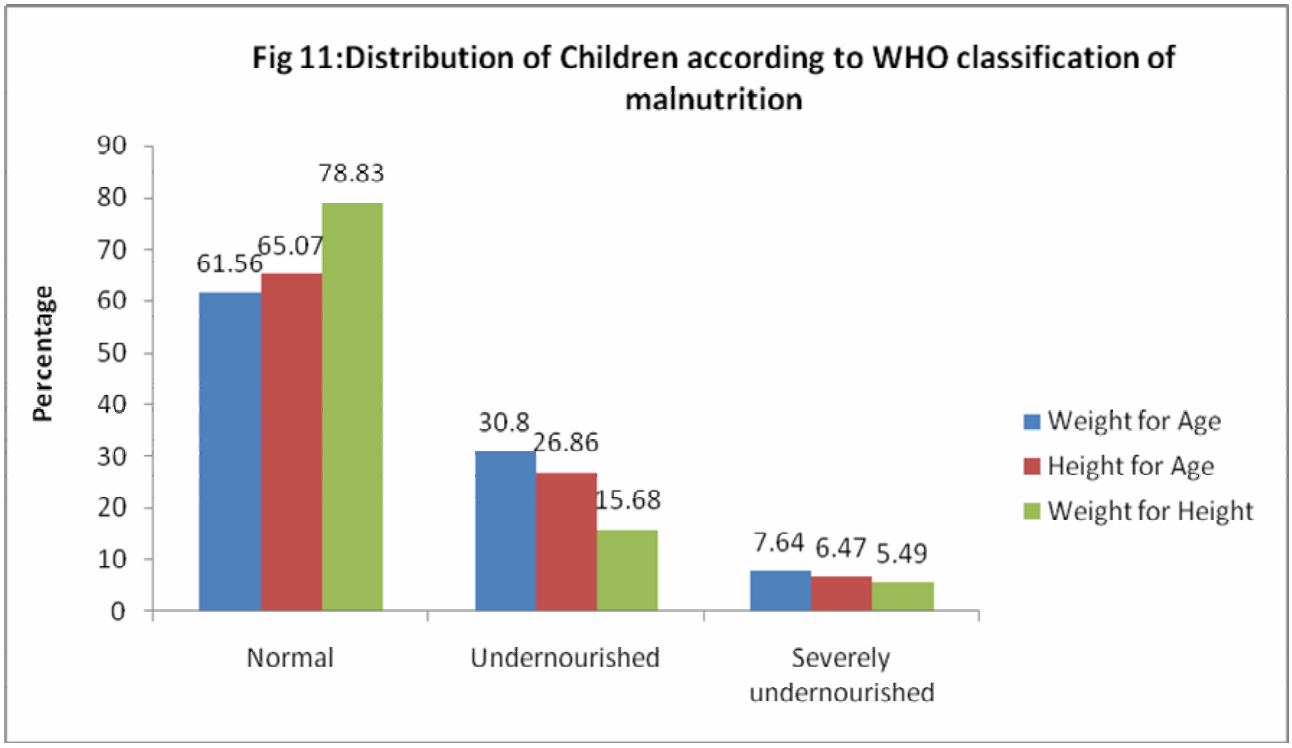
Age (In months)	MALES		FEMALES	
	Children Observed	Height (Cm ± SD)	Children Observed	Height (Cm ± SD)
0-12	59	68.40 ± 2.50	62	64.90 ± 2.43
13-24	67	78.42 ± 2.73	55	77.43 ± 7.77
25-36	56	86.41 ± 1.39	50	84.49 ± 3.62
37-48	56	91.94 ± 2.45	35	90.41 ± 3.19
49-60	30	98.08 ± 2.64	40	96.87 ± 3.03
0-60	**268**	**83.62+10.00**	**242**	**81.68+11.15**

Table shows that the mean height of male children in 0-60 months age group is in the range of 68.40±2.50cms to 98.08 ± 2.64cm and for female children it is 64.90±2.43 cm to 96.87 ± 3.03cm. Statistically significant difference was observed in the increasing trend of mean height between males and females ($t=2.06$, $p<0.05$).

Study conducted in a tribal area near Jabalpur (Punjab), revealed that the mean height in 0-60 months was 72.3 ± 5.48 cm to 95.4 ± 5.56 cm for boys and 70.9 ± 4.95 cm 94.3 ± 6.82 cm for girls.[8]Compared to our study, these figures are high, this may be due to the similar factors as mentioned earlier.

Table 18: Distribution of children according to WHO classification of malnutrition:

Indices	Normal		Undernourished		Severely undernourished	
	No.	%	No.	%	No.	%
Weight for Age (underweight)	314	61.56	157	30.80	39	7.64
Height for Age (stunting)	340	66.67	137	26.86	33	6.47
Weight for Height (wasting)	402	78.83	80	15.68	28	5.49



According to the WHO recommended classification the prevalence of underweight (low weight for age), stunting (low height for age) and wasting (low weight for height) was 157(30.80%), 137 (26.86%) and 80(15.68%) respectively. Severe degree of underweight, stunting and wasting observed were 39(7.64%), 33(6.47%) and 28(5.49%) respectively. No children were observed with overweight or obesity in the present study.

According to NFHS III data (2005-06), shows the total prevalence of underweight, stunting and wasting in Karnataka is to be 33.3%, 42.4% and 18.9%. [4] These figures are high when compared with our study.This may be because female illiteracy in our study population is less (36.1%) compared to National (56%) and State averages (54%).[36]

In another study by (2005) Rao V.G, conducted in tribal area near Jabalpur, revealed that underweight was present in 33.9% children, stunting in 21.5% and wasting in 26.4% children while severe degree of underweight, stunting and wasting was present in 27.7%, 30.1% and 6.5% children respectively.[8] The prevalence of underweight and stunting was found to be high especially in severely undernourished children, compared to our study.

In a study by Saxena N(1997) , conducted in an urban slum of Delhi, it was observed that prevalence of underweight was 37.3% and severe underweight 20.3%, prevalence of stunting and severe stunting was 27.1% and 25.9% respectively, while that of wasting and severe wasting was 16.7% and 5.8%.[17] These figures are also high compared to our study.

Recording of Mid Upper Arm circumference in 1-5years children

Table 19: Distribution of children according to Mid Upper Arm Circumference

(n=389*, Age group 12-60 months):

Mid Upper Arm circumference(in cm)	No	Percentage
>13.5	258	66.32
12.5-13.5	116	29.83
<12.5	15	3.85
Total	**389**	**100**

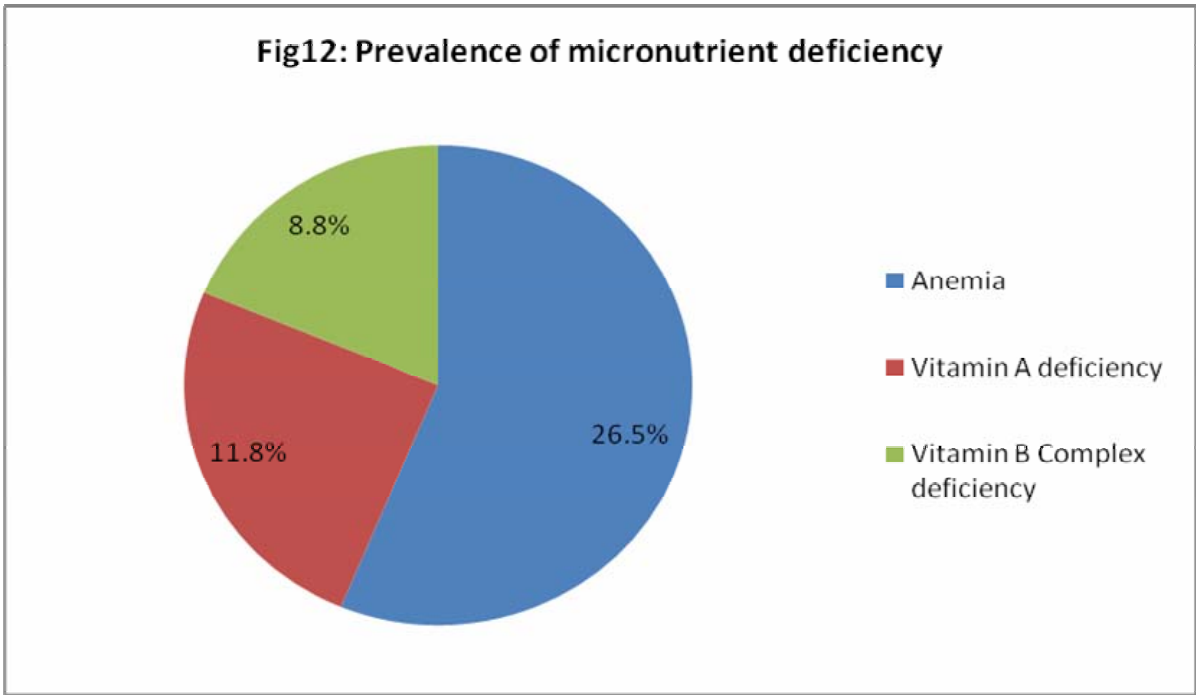
(*children from 0-12 months are excluded)

Based on mid upper arm circumference, mild malnutrition was present in 116(29.83%) children and severe malnutrition was present in 15(3.85%) children is almost similar to the study conducted by Sood A.K. [31]

Kapur.D (2005) reports high prevalence of malnutrition (69.9% in boys and 76.8% in girls) in his study in urban slums of Delhi.[11]

Table No.20: Prevalence of micronutrient deficiency:

Micronutrient Deficiency	Number	%
Anemia	135	26.5
Vitamin A deficiency	60	11.8
Vitamin B Complex deficiency	45	8.8



Among the clinically diagnosed micronutrient deficiencies, the commonest was anemia which was present in 135(26.5%) of children, Vitamin 'A' deficiency in 60(11.8%) children and Vitamin 'B' complex deficiency was present in 45 (8.8%) children mainly in the form of stomatitis and cheilosis.

In a study by Mahapatra et al (2000) in Orissa, it was revealed that 5.8% of children studied had vitamin B complex deficiency mainly in the form of angular stomatitis. Vitamin A deficiency in the form of Bitot spots was seen in 1.3%. [15]

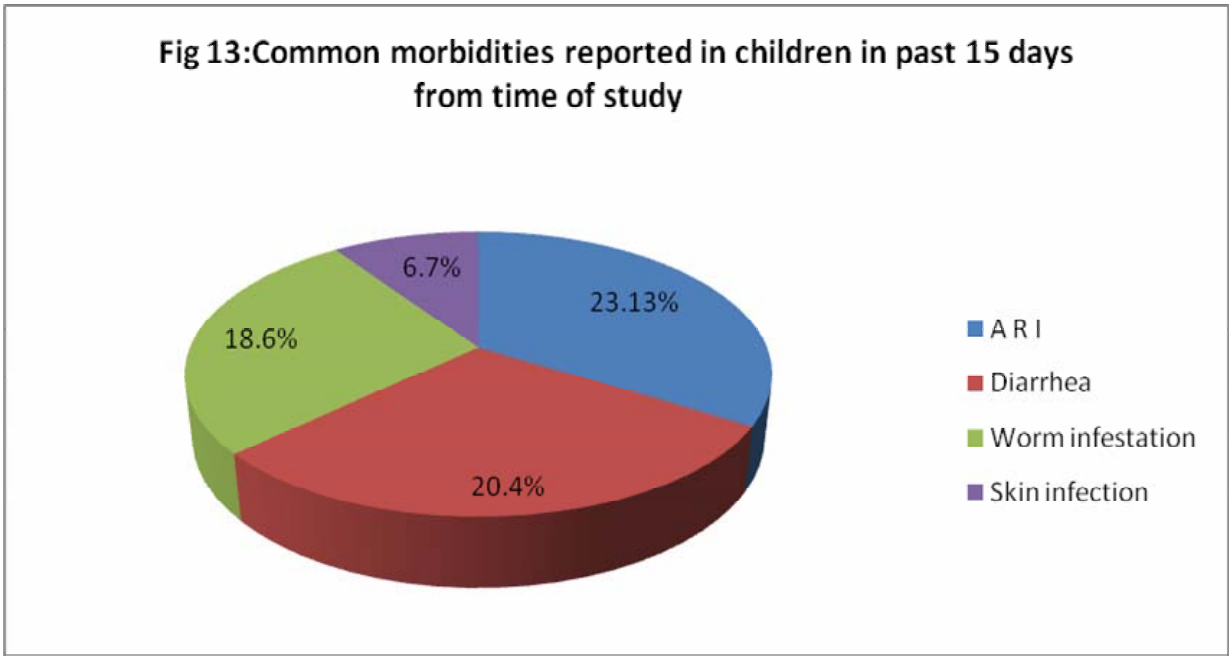
In a study done by Garg S.K (1997),to determine the nutritional status of children in 1to 6 year age group, micronutrient defiencies like aneamia, xerophthalmia and goiter were present in 14.7%, 1.6% and 0.6% children respectively .[16]

In another study done by Reddy C.S (1984) to know the epidemiology of nutritional deficiency disorders among tribal preschool children in Uttar Pradesh, it was observed that vitamin A deficiency was present in 17.89% of children (Xerosis-11.58%, Bitot's spot- 4.21% and night blindness in 5.26% of children). Vitamin B complex deficiency was observed in 11.58% children.[29]

The reporting of higher prevalence of anaemia in our study when compared to the other studies may be because the findings are based only on clinical examination.

Table No. 21: Common morbidities reported in children in past one month from time of study:

Morbidity	Numbers	Percentage
A R I	118	23.13
Diarrhoea	104	20.40
Worm infestation	95	18.62
Skin infection (scabies, pyoderma)	34	6.67



Acute respiratory infections 118(23.13%) were the commonest morbidity reported in children, followed by Diarrhoea in 104(20.40%) children; history of passing worms in 95 (18.62%) children and skin infections (e.g. - scabies, pyoderma) in 34(6.67%) children.

Table 22: Nutritional status of children according to Age:

(A) Weight for Age

Age (In months)	Children Observed		Normal		Underweight		Severe Underweight	
	No.	%	No.	%	No.	%	No.	%
0-12	121	23.7	80	66.1	35	28.9	6	5.02
13-24	122	23.9	68	55.73	41	33.60	13	10.65
25-36	106	20.8	69	65.09	27	25.47	10	9.43
37-48	91	17.8	64	70.32	22	24.17	5	5.50
49-60	70	13.7	33	47.14	32	45.71	5	7.14
Total	**510**	**100**	**314**	**61.56**	**157**	**30.80**	**39**	**7.64**
$\chi 2$ =16.182, DF= 8, p= 0.04								

Table shows that underweight children are more in the age group of 13-24 months and 49-60 months. Moderate underweight was more in 49-60 months of age. Statistically significant relation was found between age of child and underweight.

(B) Height for Age

Age (In months)	Children Observed		Normal		Mild stunting		Severe stunting	
	No.	%	No.	%	No.	%	No.	%
0-12	121	23.7	86	71.08	30	24.79	5	4.13
13-24	122	23.9	74	60.67	39	31.96	9	7.37
25-36	106	20.8	81	76.43	20	18.86	5	4.71
37-48	91	17.8	55	60.44	27	29.67	9	9.89
49-60	70	13.7	44	62.85	21	30.00	5	7.15
Total	**510**	**100**	**332**	**65.07**	**137**	**26.86**	**33**	**6.47**
								χ^2 =10.444, DF= 8, p=0.235

The table shows that the prevalence of both mild and severe stunting is more in the children of age group of 13-24 months and 37-48 months of age. However no statistically significant relation was found between age of child and stunting.

(C) Weight for height

Age (In months)	Children Observed		Normal		Mild wasting		Severe Wasting	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0-12	121	23.7	101	83.48	15	12.39	5	4.13
13-24	122	23.9	87	71.32	27	22.13	8	6.55
25-36	106	20.8	91	85.64	9	8.49	6	5.66
37-48	91	17.8	70	76.93	16	17.58	5	5.49
49-60	70	13.7	53	75.72	13	18.57	4	5.71
Total	**510**	**100**	**402**	**78.83**	**80**	**15.68**	**28**	**5.49**
χ^2 =10.812,DF= 8, p= 0.213								

The table shows that the prevalence of malnutrition as per the weight for height index(mild wasting and severe wasting) is more in the children of age group of 13-24 and 49-60 months. There was no statistically significant difference found between the age group and wasting.

Study by Bloss Emily et al (2004), revealed both underweight and stunting was maximum in 12-24 months age group children at 46.2% and 60.5% and was statistically significant. Even though the percentage prevalence was slightly different the trends were similar to our study.[12]

Similar findings were observed by a study by Mahapatra.A et al (2000). The prevalence of underweight was found to be high in 12-24 months age group at 69 %. The stunting prevalence

was found to be high in 37-48 months age group at 54.4%, while wasting was seen commonly in 12-24 months age group.[15]

Table 23: Nutritional status of children according to sex:

(A) Weight for Age

Sex	Children Observed		Normal		Underweight		Severe underweight	
	No	%	No	%	No	%	No	%
Males	268	52.55	184	68.66	72	26.86	12	4.47
Females	242	47.45	130	53.71	85	35.12	27	11.15
Total	**510**	**100.0**	**314**	**61.58**	**157**	**30.78**	**39**	**7.64**
χ^2=12.52, DF= 2, p=0.002								

As per the sex-wise distribution of malnutrition, mild underweight and severe underweight was present in 72(26.86%) and 12(4.47%) of male children and 85 (35.12%) and 27 (11.15%) of female children.

(B) Height for Age

Sex	Children Observed		Normal		Mild stunting		Severe stunting	
	No	%	No	%	No	%	No	%
Males	268	52.55	194	72.40	62	23.13	12	4.47
Females	242	47.45	146	60.34	75	30.99	21	8.67
Total	**510**	**100.0**	340	66.67	137	**26.86**	33	**6.47**
χ^2=7.44, DF= 2, p= 0.024								

As per the height for age criteria, mild stunting and severe stunting was observed in 62 (23.13%) and 12(4.47%) of male children and 75 (30.99%) and 21(8.67%) of female children.

(C) Weight for height

Sex	Children Observed		Normal		Mild wasting		Severe Wasting	
	No	%	No	%	No	%	No	%
Males	268	52.55	217	80.98	42	15.67	9	3.35
Females	242	47.45	185	76.45	38	15.70	19	7.85
Total	**510**	**100.0**	**402**	**78.83%**	**80**	**15.68%**	**28**	**5.49%**
								χ^2=4.48, DF=2, p=0.107

According to weight for height criteria it was seen that the prevalence of mild wasting and severe wasting were 42(15.67%) and 9 (3.35%) among male and 38 (15.70%) and 19(7.85%) among female children respectively.

Prevalence of malnutrition based on weight for age and height for age reveals that the mild and severe forms of underweight and stunting is more in females than in males and the differene is statistically significant. This may be due to the fact that in rural areas, males will be fed first and whatever remains will be consumed by females.

In a study by Bloss Emily et al (2004), the prevalence of underweight was 29.9% in male and 30% in female children while stunting was present in 46.7% in male children and 48.1% of female children and was statistically not significant[12] as compared with our study.

Similar findings were observed in a study by Ray S K et al (2000) in West Bengal, for overall prevalence of malnutrition, the sex differential was not statistically significant, but statistically significant sex difference was observed in prevalence of severe degree of malnutrition, which was almost double in female children (8.47%) in comparison to male children (4.3%).[14]

Table 24: Nutritional status of children according to father's literacy status:

Literacy Status of father	**Children observed**		**Under weight**		**Stunting**		**Wasting**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Illiterate	151	29.80	60	39.74	53	35.09	37	24.50
Primary	197	38.43	72	36.54	60	30.45	35	17.76
Secondary	96	18.82	29	30.20	24	25.00	18	18.75
High school	41	6.86	25	40.97	25	60.97	10	24.44
PU/Degree	25	6.07	10	40.00	8	32.00	8	32.00
Total	**510**	**100**	**196**	**38.43**	**170**	**33.33**	**108**	**21.17**
			$\chi^2 = 12.12$ DF= 4 P<0.02		$\chi^2 = 18.02$ DF= 4 P<0.01		$\chi^2 = 14.56$ DF= 4 P<0.02	

In context to the nutritional status of children according to the literacy status of father's, a decreasing prevalence of malnutrition was observed with the higher literacy status.

The prevalence of underweight among children of illiterate and literate father's was 60 (39.74%) and 136 (37.99%) .The prevalence of stunting among children of illiterate and literate father's was 53 (35.09%) and 117(32.68%).

Similarly, wasting was observed in 71(65.74%) and 37(34.26%) of children of literate and illiterate father's. Statistically significant difference was observed between all forms of undernutrition and literacy status.

Similar findings were observed by a study by by Ray SK et al (2000) in West Bengal, substantial difference was observed in the prevalence of malnutrition among children belonging to illiterate fathers(74.76%) and literate fathers (57.28%) ,which were statistically significant($p<0.05$).[14]

In contrast to our study findings, Bloss Emily et al (2004) reported neither underweight nor stunting was associated with father's literacy status(OR=0.91 and 0.88, 95% CI=0.53-1.56 and 0.51-1.52 for underweight and stunting prevalence respectively).[12]

Table 25: Nutritional status of children according to mother's literacy status:

Literacy Status	Children Observed		Under weight		Stunting		Wasting	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Illiterate	183	36.1	75	40.98	68	37.15	37	20.21
Primary	196	38.2	57	29.08	45	22.95	35	17.85
Secondary	95	18.6	44	46.31	39	41.05	18	18.94
High school	28	5.5	17	60.71	16	57.14	15	53.57
PU/Degree	8	1.6	3	37.5	2	25.00	3	37.5
Total	**510**	**100**	**196**	**38.43**	**170**	**33.33**	**108**	**21.17**
			$\chi^2 = 18.11$ DF= 4 P=0.013		$\chi^2 = 17.5$ DF= 4 P=0.007		$\chi^2 = 16.3$ DF= 4 p=0. 000	

The prevalence of underweight among children borne by illiterate mothers and literate mothers was 115 (62.5%) and 91 (27.91%) respectively and difference was highly significant (p= 0.013).

Maximum number of stunting was noted in 117(22.94%) and 53(16.25%) of children borne by illiterate and literate mothers respectively and was highly significant (p=0.007).

Similarly the prevalence of wasting among children borne by illiterate and literate mothers was observed to be 75(40.76%) and 33(10.12%) respectively, which was also highly significant (p= 0.000).

It is also observed that there was a declining trend of malnutrition with increase in educational qualification of the mothers.

Similar findings was observed in a study by Ray SK et al (2000), it revealed that the prevalence of malnutrition among the children of literate mothers was comparatively lower (54.93%) than the illiterate mothers (69.55%) and the difference was also statistically significant ($p<0.05$).[14]

Mittal A (2007) reported high prevalence of underweight (60.9% vs 21.2%) and stunting (65.25% vs 31.3%) when compared to our study. [21]

Table 26: Nutritional status of children according to type of family:

Family Type	Children observed		Underweight		Stunting		Wasting	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Nuclear	143	28.0	67	46.85	64	44.75	33	23.07
Joint	190	37.3	60	31.57	52	27.36	39	20.52
3-generation	177	34.7	69	38.98	54	30.50	36	20.33
Total	**510**	**100.0**	**196**	**38.43**	**170**	**33.33**	**108**	**21.17**
			$\chi^2 = 7.9$ DF= 2 P<0.05		$\chi^2 = 11.9$ DF= 2 P<0.01		$\chi^2 = 4.36$ DF= 2 p>0.05	

In our study the prevalence of underweight, stunting and wasting was maximum in children of nuclear families at 46.85%, 44.75% and 23.07% respectively. The difference in prevalence was statistically significant for underweight and stunting ($p<0.05$ and $p< 0.01$) but not for wasting ($p>0.05$).

In another study conducted in rural area of Kenya, Africa by Bloss Emily et al (2004), it was observed that children of larger families appeared to be protective against underweight [OR= 0.49, 95% CI, 0.25-1.00]. Similar findings were observed in our study with less prevalence of

underweight, stunting and wasting among children of joint families than other types of families.[12]

In contrast to our study, Nanda S (1996), reported that the overall prevalence of PEM was significantly higher ($p<0.001$) in infants who were drawn from joint families than those drawn from nuclear families. The prevalence of PEM was 74.6 percent in large and only 21.96 percent in small families.[23]

Table 27: Nutritional status of children according to Socio-Economic status:

Socio-Economic Status	Children Observed		Under weight		Stunting		Wasting	
	No.	%	No.	%	No.	%	No.	%
Upper & Middle(Class I,II,III)	164	32.15	51	31.09	50	30.48	26	15.85
Lower(Class IV,V)	346	67.85	145	41.90	120	34.68	82	23.69
Total	**510**	**100**	**196**	**38.43**	**170**	**33.33**	**108**	**21.17**
			$\chi^2 = 5.45$ DF= 1 P< 0.05		$\chi^2 = 1.93$ DF=1 P>0.05		$\chi^2 = 4.06$ DF= 1 P<0.05	

In the present study the prevalence of malnutrition in the form of underweight, stunting and wasting among children of upper and middle SES (class I, II, III,) and lower SES (class IV ,V) was found to be 51 (31.09%), 50(30.48%), 26(15.85%) and 145(41.90%), 120(34.68%), 82(23.69%) respectively .Statistically significant difference was observed between SES and underweight, wasting but not with stunting.

Similar findings was observed in a study done by Harishankar et al (2004),the prevalence of malnutrition was found to be 52.2%,35.7% and 11.9% in children belong to low ,middle socioeconomic status group respectively In high socioeconomic status only grade I and grade II malnourished children were 5 (9.61%) and 2 (3.85%) respectively. No child of grade III and grade IV malnutrition was found in this socioeconomic group. Nutritional grade with economic status was found to be highly significant($X2=18.91$, $p<0.001$).[19]

In another study by Reddy C.S (2004) conducted in Uttar Pradesh the prevalence of underweight was maximum at 75% among children of low socio-economic status while only 24% among children of high socio- economic status ($\chi^2=5.66$, $DF=2$, $p<0.02$) which is lower when compared with our study. [29]

Table 28: Nutritional status of children according to Birth order:

Birth order	Children Observed		Under weight		Stunting		Wasting	
	No.	%	No.	%	No.	%	No.	%
1	87	17.1	27	31.03	24	27.58	17	19.54
2	195	38.2	73	37.43	62	31.79	39	20.00
3	152	29.8	67	44.07	46	30.26	30	19.73
≥4	76	14.9	29	38.15	38	50.00	22	28.94
Total	**510**	**100**	**196**	**38.43**	**170**	**33.33**	**108**	**21.17**
			$\chi^2 = 12.86$ DF= 3 P< 0.01		$\chi^2 = 11.53$ DF= 3 P<0.01		$\chi^2 = 3.31$ DF= 3 p>0.05	

In our study the association between nutritional status of children and birth order was found to be as follows:

The prevalence of underweight among children of birth order one, two, three and four or more were observed to be 27(31.03%), 73 (37.43%), 67(44.07%) and 29(38.15%) respectively. In context to stunting, 24(27.58%), 62(31.79%), 46(30.26%) and 38(50.00%) children were found to be stunted of Birth order one, two, three and four respectively. With regards to wasting the

prevalence in wasting among children with Birth order one, two, three and four were 17(19.54%); 39(20%); 30(19.73%) and 22(28.94%).

Statistically significant difference was observed between higher birth order and underweight and stunting but not in case of wasting. Thus children with higher birth order were more undernourished than children of lower birth orders.

In a study by Harishankar et al (2004), the prevalence of all grades of malnutrition increases with birth order, 34(43.5%) in birth order three and above 41 (26.9%) in birth order two and 42(20.38%) in birth order one which is lower than our study findings.[19]

Deoki Nandan S et al (1981), observed lower prevalence of undernutrition when compared with our study. The prevalence of grade II PEM was lowest (15.7%) in those families where there was only one child and was highest (21.4%) in the families having five or more children. The families in which there was only one child, the prevalence of PEM grade III was found to be zero and was 7.8 per cent where there were five or more children. This rising trend of the prevalence of PEM grade II and III in relation to total children was found highly significant (X^2 = 78, 82, d.f. - 12, p 0.001).[24]

Table 29: Nutritional status of children according to Birth interval (n=423)*

Birth Interval (In months)	Children Observed		Under weight		Stunting		Wasting	
	No.	%	No.	%	No.	%	No.	%
<24	100	23.65	38	38.00	42	42.00	25	25.00
24-36	213	50.35	81	38.02	56	26.29	38	17.84
>36	110	26.00	50	45.45	48	43.63	28	25.45
Total	**423**	**100**	**169**	**39.95**	**146**	**34.51**	**91**	**21.51**
			χ^2 = 11.15,DF= 2 P<0.01		χ^2 =1.96,DF= 2 p >0.05		χ^2 =1.42,DF= 2 p >0.05	

(*children with birth order one are excluded)

Maximum number of underweight, stunting and wasting was seen in children with birth interval less than 36 months than those children with birth interval more than 36 months. Statistically significant difference was found with reference to birth interval and underweight, stunting but not with the wasting.

Similar findings were observed in a cross sectional study by Banerjee. B (2005) ,done at Kolkata, West Bengal it was observed that prevalence of underweight was 68.7% among children of birth interval less than 36 months, while it was significantly less ($p<0.05$) in children with birth interval of more than 36 months.[10]

Compared to our study a lower prevalence was reported in a study by Deoki Nandan (1999), the prevalence of grade II and grade III PEM showed an increase with the lessening of the spacing as this was lowest (14.6% and 1.0% respectively) in those whose spacing was three years or more and highest (38.3 and 9.0% respectively) in those whose spacing with the elder child was less than one year. This difference was found significant statistically ($X^2 = 15.4$, $p < 0.01$).[24]

Table 30: Nutritional status of children according to Exclusive Breast Feeding:

Exclusive Breast Feeding	Children Observed		Under weight		Stunting		Wasting	
	No.	%	No.	%	No.	%	No.	%
Given	198	38.8	56	28.28	57	28.78	33	16.67
Not Given	312	61.2	140	44.87	113	36.21	75	24.04
Total	**510**	**100**	**196**	**38.43**	**170**	**33.33**	**108**	**21.17**
			χ^2 =13.7 DF= 1 P<0.001		χ^2 = 2.56 DF= 1 p>0.05		χ^2 =4 DF= 1 p>0.05	

In the present study the prevalence of underweight among children given EBF and not given EBF worked out to be 56(28.28%) and 140 (44.87%) and distribution was statistically significant ($p< 0.001$).

With respect to stunting the prevalence was 57 (28.78%) and 113(36.21%) among children who received EBF and who had not received EBF. However this distribution found to be was statistically not significant ($p> 0.05$).

The prevalence of wasting was found to be 33(16.67%) and 75 (24.04%) among children who had and had not been given EBF respectively. Similar to the findings in stunting the distribution among wasted children was not statistically significant with EBF ($p>0.05$).

Similar findings were reported by Bloss Emily et al (2004), that the lack of giving exclusive breast feeding upto 6 months is associated significantly with underweight (OR=2.28, 95% CI=1.3-4.61) .[12]

Study by Chakrabarty S et al (2006), observed that the proportions of underweight among children who had exclusive breastfeed for less than 6 months(64.6%) were significantly higher ($p<0.01$) than those who were breastfed more than 6 months(35.4%) which is higher when compared to our study findings.[18]

Table 31: Nutritional status of children according to time of weaning:

Time of weaning	Children Observed		Under weight		Stunting		Wasting	
	No.	%	No.	%	No.	%	No.	%
<6	47	9.2	24	51.06	17	36.17	12	25.53
6	141	29.6	56	39.71	53	37.58	33	23.40
7-12	252	49.4	84	33.33	69	27.38	41	16.26
>12	70	13.7	32	45.71	31	44.28	22	31.42
Total	**510**	**100**	**196**	**38.43**	**170**	**33.33**	**108**	**21.17**
			$\chi^2 = 20.49$ DF= 6 p= 0.002		$\chi^2 = 20.36$ DF= 6 p= 0.002		$\chi^2 = 9.65$ DF= 6 p= 0.14	

In the present study it was observed that the prevalence of underweight was observed to be maximum among children who were weaned at less than 6 months of age 24 (51.06%), and weaning after 12 months of age 32(45.71%).

The prevalence of stunting is higher among children who weaned at 6 months 53(37.58%) and after 12 months of age 31(44.28%).Statistically significant difference was found between early or delayed initiation of weaning and undernutrition(p= 0.002).

Higher prevalence of wasting was observed among children in whom early 12(25.53%) and delayed weaning was practiced 22(31.42%).However in this setting the distribution was not statistically significant (p=0.14).

Similar to our study findings, Rasania SK (2001) reported that weaning was started at optimum age of 4-6 months in 42.9% children, started early (<4 months) in 24.5% children while in rest it was delayed beyond six months. Severe malnutrition was significantly higher (p<0.05) in children where weaning was delayed.[27]

SUMMARY

Field based study was undertaken in village Shivanagi, rural field practice area of BLDEU's Shri B.M.Patil Medical College, to find out the prevalence of malnutrition and sociodemographic profile of parents of pre-school children. 510 families having under five children were included in the study. Children were examined for their nutritional status and sociodemographic profile of the family was obtained from parents /guardians.

- In the present study, 0-12months age group comprised of 23.7%, 13-24months age group 23.9%, 25-36months age group 20.8%, 37-48 months age group 17.8% and 49-60 months age 13.7% of total children in study.
- Out of 510 children 52.55 % were boys, 47.45% were girls.
- 92.2% of children belonged to Hindu religion followed by Muslim religion 7.8%.
- 36.1% mothers were illiterate, 38.2% had primary education, 18.6% had secondary education, and 5.5% and 1.6% had completed high school and PU/Degree respectively.
- 29.6% fathers were illiterate, 38.6% had primary education, 18.8% had secondary education and 8% and 4.9% had high school and PU/Degree respectively.

- 28% of children belong to nuclear families, 37.3% of children belong to joint families and 34.7% children belong to third generation families.
- According to BG Prasad socioeconomic classification, 4.1% were in class I, 9.4% in class II, 18.6%in class III, 27.8% in class IV, and 40.1 % were in class V.
- 14.21% mothers had borne 1 child, 25.13% had born 2 children 32.99% of the mothers had borne 3 children and 27.67% had borne 4 or more children at the time of study.

- 17.1% were of birth order 1, 38.2% were of birth order 2, 29.8% and 14.9% were of birth were of birth order 3 and ≥ 4 respectively
- In the present study 23.65% have delivered within 2 years and 50.35% between 2-3 years i.e, 74% have given birth within three years after delivery. Only and 26% have delivered after 3 years.
- With regard to Breast feeding practices, 38.8% gave exclusive breast feeding,56.5% were given prelacteal feeds, 73.5% gave top milk feeds.
- Weaning was started at 6 months in 29.8% children.
- Calorie and protein consumption was adequate in 13.92% and 8.03% children respectively.
- In the age group of 13-60 months, 80.2% were completely immunized, 19.8%were partially immunized.
- In our study, statistically significant difference was observed in the increasing trend of mean weight and height between males and females ($p<0.05$).
- The prevalence of underweight, stunting and wasting was observed to be 30.80%, 26.86% and 15.68% while severe degree of underweight, stunting and wasting was

observed in 7.64%, 6.47% and 5.49% respectively. According to Mid Upper Arm Circumference (MUAC), 23.68% of children were malnourished.

- In the present study clinically diagnosed micronutrient deficiencies like anemia, Vitamin 'A' deficiency and Vitamin 'B' complex deficiency was found to be 26.5%,11.8% and 8.8% respectively.
- Children suffered from common morbidities like acute respiratory infections (23.13%), diarrhoea (20.40%), worm infestation (18.62%) children and skin infections (6.67%) were reported in the last one month.
- The prevalence of underweight was highest with 52.86% children in 49-60 months age group. Stunting in 37 to 48 months children (39.56%) and wasting in 13-24 months age group (28.68%). statistically significant difference was observed in underweight but not with the stunting and wasting.
- No child was found to have overweight or obesity in the study area.
- Females were found to be significantly more underweight and stunted (46.29% and 39.64%) when compared with the males (31.34% and 27.60%).But there was no significant difference in prevalence of wasting in males and females.
- Higher prevalence of undernourishment was noticed in children of illiterate mothers with underweight, stunting and wasting being (62.5%), (22.94%) and (40.76%) respectively. This difference was statistically significant ($p<0.01$). Similar findings was also observed with the literacy levels of fathers; this was statistically significant ($p<0.02$).

- Prevalence of underweight, stunting and wasting was maximum in children of nuclear families at 46.85%, 44.75% and 23.07% respectively. The difference in prevalence was statistically significant for underweight and stunting ($p<0.05$ and $p< 0.01$) but not for wasting ($p>0.05$).

- In the present study the prevalence of malnutrition in the form of underweight, stunting and wasting was higher among children of lower Socio Economic Status (SES) (41.90%, 34.68%, 23.69%) when compared with the upper and middle SES (31.09%, 30.48%, and15.85%) Statistically significant difference was observed between socioeconomic status and undernutrition ($p<0.05$).

- Higher prevalence of undernutrition was found in children of birth order three or more compared to those having two or less than two. Statistically significant association between nutritional status and birth order of children with respect to underweight and stunting ($p<0.01$).

- Maximum number of underweight, stunting and wasting was seen in children with birth interval less than 36 months than those children with birth interval more than 36 months. Statistically significant difference was found with reference to birth interval and underweight ($p<0.01$) but not with the stunting and wasting ($p>0.05$).
- Higher prevalence of undernourishment was observed in those children who were not exclusively breastfed (underweight=44.87%, stunting=36.21% and wasting=24.04%) when compared with those who were exclusively breastfed (underweight=28.28%, stunting=28.78% and wasting=16.67%) but this was not statistically significant ($p>0.05$).

- Similarly prevalence of undernourishment was high where delayed weaning was observed but the difference was not statistically significant.

CONCLUSION

The prevalence of malnutrition among 510 children surveyed was underweight, stunting and wasting was 30.80%, 26.86% and 15.68% respectively. Severe degree of underweight, stunting and wasting was observed in 7.64%, 6.47% and 5.49% respectively. These findings are lower when compared with National and State averages. No children were observed with overweight or obesity in the present study.

As per National population Policy primary immunization should be 100%.But in our study primary immunization was only 80.2% and partial immunization was 19.8%.

Among micronutrient deficiencies, nearly quarters of children were detected clinically to have anemia, one tenth of children were found to have Vitamin 'A' deficiency. Some children had Vitamin 'B' complex deficiency.

Undernutrition was significantly high in infants and it decreased with increasing age and significantly higher number of female children were severely underweight and stunted compared to male children.

Undernutrition was significantly more in children of illiterate parents, children who belonged to nuclear and low socioeconomic status families. Higher birth order and less birth interval are also significant risk factors for malnutrition.

Faulty feeding practices like custom of giving prelacteal feeds, and early and delayed initiation of weaning was also significant risk factors for malnutrition. Though prevalence of malnutrition was high among children who were not given EBF, it was not a significant risk factor.

RECOMMENDATIONS

Government of India has initiated a number of programmes to enhance nutritional status of children. Still malnutrition amongst children is a major public health problem.

Efforts should be made by education sector to improve the female literacy status.

In order to reduce the problem, Nutritional education should be incorporated in the curriculum of schools and colleges.

Antenatal care (ANC) should be implemented in true spirit in the sense all aspects of ANC like diet, rest etc,s should be given equal importance. Sensitizing the mother regarding EBF and family planning during pregnancy plays a major role in the long term.

Routine immunization programme should be improved to achieve 100% target level.

A large chunk of rural population are being poor,poverty alleviation programmes like tailoring, home industry products like manufacturing papads, pickles, chilly groundnut mixture etc should be encouraged with involvement of NGO's like Stree Shakti Organization and self help groups, need to be implemented to improve the economic status of families.

BIBLIOGRAPHY

1. World health organization. Health For All, Series.No.1.1978.
2. World health report, World health organization, shaping the future. 2003.
3. Vishnu Bhat. Handbook of Protein Energy Malnutrition;1st edition.New Delhi Peepee Publications;2008. page 1-4.
4. National family health survey. http://www.nfhsindia.org/data/ka-pre.pdf. {Cited on 24-12-2005.}
5. Rajvir Bhalwar.Textbook of Public health and Community medicine 2nd edition.Pune Armed Forces Medical College.2009; 748-749pp.
6. Md.Israt Reyhan,et al. Factors Causing Malnutrition Among Under five Children in Bangladesh. Pakistan Journal of Nutrition; 2006, Vol.5 (6):558-562.
7. Odunayo SI Oyewole AO, Risk factors for malnutrition among rural Nigerian children, Asia Pac J Clin Nutr. 2006; 15(4):491-5.
8. Rao V.G et al.Undernutrition And Childhood Morbidities Among Tribal Pre-School Children. Indian journal of Medical research, 2005; 122(7):43-47.
9. Madhu B Singh et al. Studies on the nutritional status of children aged 0–5 years in a drought-affected desert area of western Rajasthan, India. Public Health Nutrition, 2005; 9(8), 961–967.
10. Banerjee. B, Bandyopadhyay.L, Gender differences in nutritional status, Indian pediatrics 2005; Vol. 42 (4) 400-01.
11. Kapur. D et al. Dietary Intake and growth pattern of children 9-36 months of age in an urban slum of Delhi. Indian pediatrics; 2005; Vol.42 (4): 351-56.

12. Bloss Emily et al. prevalence and predictors of underweight, stunting and wasting among children aged 5 and under in western Kenya, Journal of tropical pediatrics; 2004; Vol.50 (5): 260-270.
13. Joseph. B et al. Prevalence of malnutrition in rural Karnataka, South India, a comparison of anthropometric indicators. Jnl health Popul Nutr; 2002; 20(3): 239-44.
14. Ray S.K. et al. Rapid assessment of nutritional status and dietary patterns in a municipal area, Indian Journal of Community Medicine; 2000;Vol. 25(1): 14-18.
15. Mahapatra.A et al. Nutritional status of pre-school children in the drought affected Kalahandi district of Orissa. Indian journal of Medical research; 2000; Vol. III (3): 90-94.
16. Garg S.K et al. Nutritional status of children (1-6 yrs) in slums of Ghaziabad city, Indian Journal of Community Medicine; 1997; Vol. 22(2): 70-73.
17. Saxena N et al.Prevalence of underweight, stunting and wasting. Indian pediatrics; 1997; Vol.34 (7): 627-31.
18. Chakraborty . S et al. A Study of Protein Energy Malnutrition (PEM) in Children (0 to 6 Year) in a Rural Population of Jhansi District (U.P.), Indian Journal of Community Medicine ; Vol. 31, No. 4 (2006-10 - 2006-12).
19. Harishankar et al.Nutritional Status of Children Under Six Years of Age. Indian J.Prev.Soc.Med. 2004;Vol 35.No 3&4:156-162.
20. Bhalani. KD, Kotecha. PV, Nutritional Status And Gender Differences In The Children Of Less Than 5 Years Of Age Attending Icds Anganwadis In Vadodara City, Indian Journal of Community Medicine 2002,Vol XXVII, No 3.125-129.

21. Mittal A et al. Effect of Maternal Factors on Nutritional Status of1-5-Year-Old Children in Urban Slum Population, Indian Journal of Community Medicine. 2007; Vol. 32, No. 4:10-12.
22. Anoop I et al. Nutritional Status And Feeding Practices In Under-3 Years Old Children In A Rural Community In Ludhiana, Punjab, Health and Population, Perspectives and Issues 1993 16(1&2):3-21.
23. Nanda S et al. The impact of family milieu on the prevalence of protein-energy malnutrition in infants. Indian Journal of Maternal and Child Health. 1996 Jan-Mar; 7(1): 20-3.
24. Deoki Nandan et al. Protein Energy Malnutrition In Children - A Case For The Need Of A Planned Family. Health and Population, Perspectives & Issues 4(2):106-112, 1981.
25. Panpanich R et al.Breastfeeding and its relation to child nutrition in rural Chiang Mai, Thailand. J Med Assoc Thai. 2003 May; 86(5):415-9.
26. Suvra Pathi, et al. Feeding Practices Versus Nutritional Status Of Infants In A Rural ICDS Block Of Orissa. Health and Population, Perspectives and Issues 26 (3): 116-120, 2003.
27. Rasania SK, Sachdev TR, Nutritional Status And Feeding Practices Of Children Attending MCH Centre, Indian Journal of Community Medicine Vol XXVI, No.3, Jul –Sept:2001.
28. Abdul Salam Malik et al.Assessment of nutritional status of children under 48 months of age. Pak Paed J.Mar 2006; 30(1):38-47.

29. Reddy. D.C.S et al. Epidemiology of Nutritional deficiency disorders among tribal pre-school children around Manikpur, Banda district, Uttar Pradesh; Indian journal of preventive and social Medicine; 1984;Vol (15) No.1-2: 57-62.
30. Awasthi S,.Pande V.K. Prevalence Of Malnutrition And Intestinal Parasites In Preschool Slum Children In Lucknow. Indian Pediatrics; 1997; Volume 34-July 1997.
31. Sood A.K., Kapil U, Anthropometry in detection of protein energy malnutrition; Indian pediatrics; 1984; Volume 21(8): 635-39.
32. Govt.of India (2001).Census of India 2001, Provisional Population Totals, Paper-1 of 2001.
33. Bhanderi D, Choudhary SK. An epidemiological study of health and nutritional status of under five children in Semi Urban Community of Gujarat. Indian J Public Health**.** 2006 Oct-Dec; 50(4): 213-9.
34. Insurance worker volume XLVII, No.12, Dec 2008 and Insurance worker volume XLVIII No. 10, Oct 2009.
35 Gopalan C, Sastri. B.V, Balasubramanium S. C, Nutritive value of Indian foods, ICMR, Hyderabad, NIN press 2000.
36. Govt.of India (2001).Census of India 2001, Provisional Population Totals, Paper-1 of 2001.

ANNEXURE

GUIDE : Dr M.M. ANGADI MD
PG: DR.SHARVANAN.E

BLDEU'S SHRI B M PATIL MEDICAL COLLEGE HOSPITAL &
RESEARCH CENTRE BIJAPUR
DEPARTMENT OF COMMUNITY MEDICNE

STUDY OF MALNUTRION AMONG UNDER FIVE CHILDREN IN RURAL FIELD PRACTICE AREA OF BLDEU'S SHRI B.M. PATIL MEDICAL COLLEGE, BIJAPUR.

PROFORMA

1) SERIAL NUMBER:

2) FATHER'S/GUARDIAN NAME :

Occupation:

3) MOTHER'S/GUARDIAN NAME:

Occupation:

4) ADDRESS:

5) FAMILY SIZE:

6) RELIGION: Hindu/ Muslim/ Christian/ others

7) LITERACY STATUS:

Father Illiterate/Literate

If literate Primary/ Secondary/High school/Pu/Degree

Mother Illiterate/Literate

If literate Primary/Secondary/High school/Pu/Degree

8) TYPE OF FAMILY: Joint family/Nuclear family/Third generation family

9) INCOME: Total family income:

Total members in family:

Per capita income per month:

10) FOOD HABITS: Vegetarian/Non vegetarian/Mixed

INDIVIDUAL CHILD:

Name: informant:

Age: Gender: Male/Female

Birth order

Number of siblings:

Birth interval:

Time of starting breast feeding:

Pre lacteal feeds: Given/not given

If given specify

Exclusive Breast feeding: Given/not given

If given, duration

If not given, reasons

Top milk feeding: Given/not given

If given, specify

Time of weaning: month

Weaning foods:

Immunization status: complete/incomplete/nil

If incomplete or nil, reasons

Mile stones: Normal/delayed

Past history

History of ARI/Diarrhoea/Measles in last one month:

Dietary intake

Time	Type	Calories
Morning		
Afternoon		
Evening		
Night		
Total(calories)		
Expected(calories)		
Deficient(calories)		

GENERAL PHYSICAL EXAMINATION:

General appearance:

Hair: Normal/dull and dry/ depigmented/if other changes

Skin: Normal/Dry/ any others

Nails: Pale/Pink/Trimmed/Untrimmed/Clean/Dry/any others

Face: Diffuse pigmentation/Moon face/Old man's face/ specify if others

Eyes: a.Conjunctiva-Normal/Pale/Yellow/Bitot spots/discharge

b.Sclera :Normal/Yellow/others

c.Cornea: Normal/Dryness/hazy/opaque

Lips: Normal/Dryness/hazy/any others

Tongue: Normal/Pale/red and raw/fissured/geographic/others

ANTHROPOMETRIC EXAMINATION:

1. Head Circumference……..cms
2. Chest Circumference……...cms
3. Weight……cms
4. Height/Length…… cms
5. Mid Upper Arm Circumference…… cms

CLINICAL EXAMINATION:

1. Respiratory System:
2. Cardiovascular System:
3. Gastrointestinal System:
4. Central Nervous System: