

**Prevalence of Malnutrition among the Nepali Children of  
Mirik, Darjeeling**

A Dissertation Submitted

To

**Sikkim University**



In Partial Fulfilment of the Requirement for the

**Degree of Master of Philosophy**

By

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# सिक्किम विश्वविद्यालय SIKKIM UNIVERSITY

(भारत के संसद के अधिनियम द्वारा वर्ष 2007 में स्थापित और नैक (एनएएसी) द्वारा वर्ष 2015 में प्रत्यायित केंद्रीय विश्वविद्यालय)  
(A central university established by an Act of Parliament of India in 2007 and accredited by NAAC in 2015)

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## DECLARATION

I, Sagar Chettri, hereby declare that the dissertation entitled “Prevalence of Malnutrition among the Nepali Children of Mirik, Darjeeling” is an original work carried out by me under the guidance of Dr. Maibam Samson Singh. The contents of this dissertation did not form the basis of any previous degree to me or to the best of my knowledge, and that the dissertation has not been submitted by me for any research degree in any other university/institute. This is submitted to the Sikkim University, for the award of the degree of Master of Philosophy in Anthropology.

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**Prevalence of Malnutrition among the Nepali Children of Mirik, Darjeeling**

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*Gangtok, April , 2018*

*Sagar Chettri*

<b>CONTENTS</b>	<b>Page No.</b>
Declaration	
Plagiarism Check Certificate	
Acknowledgement	
List of tables	
List of figures	
Chapter I: Introduction	1-9
Chapter II: Review of Literature	9-18
Chapter III: Materials and Methods	19-27
Chapter IV: Results	28-50
Chapter V: Discussion	51-57
Chapter VI: Conclusion	58-60
References	61-69

## **LIST OF TABLES**

1. Table 1: Distribution of mean height, mean weight, and mean BMI among the boys and girls of Mirik.
2. Table 2: Distribution of Underweight, Stunting and Wasting among the boys and girls of Mirik.
3. Table 3.1: Distribution of underweight, stunting and wasting in relation to the community among the boys of Mirik.
4. Table 3.2: Distribution of underweight, stunting and wasting in relation to the community among the girls of Mirik.
5. Table 4.1: Distribution of underweight, stunting and wasting in relation to Religion among the boys of Mirik.
6. Table 4.2: Distribution of underweight, stunting and wasting in relation to Religion among the girls of Mirik.
7. Table 5.1: Distribution of underweight, stunting and wasting in relation to income group among the boys of Mirik.
8. Table 5.2: Distribution of underweight, stunting and wasting in relation to income group among the girls of Mirik.
9. Table 6.1: Distribution of underweight, stunting and wasting in relation to the occupation of father among the boys of Mirik.
10. Table 6.2: Distribution of underweight, stunting and wasting in relation to the occupation of father among the girls of Mirik.
11. Table 7.1: Distribution of underweight, stunting and wasting in relation to the education of Father among the boys of Mirik.

12. Table 7.2: Distribution of underweight, stunting and wasting in relation to the education of Father among the girls of Mirik.
13. Table 8.1: Distribution of underweight, stunting and wasting in relation to House type among the boys of Mirik.
14. Table 8.2: Distribution of underweight, stunting and wasting in relation to House type among the girls of Mirik.
15. Table 9.1: Distribution of underweight, stunting and wasting in relation to Family size among the boys of Mirik.
16. Table 9.2: Distribution of underweight, stunting and wasting in relation to Family size among the girls of Mirik.
17. Table 10.1: Distribution of Underweight, Stunting and Wasting in relation to Sanitation among the boys of Mirik.
18. Table 10.2: Distribution of underweight, stunting and wasting in relation to sanitation among the girls of Mirik.
19. Table 11: Distribution of underweight, stunting and wasting in relation to infectious diseases among boys and girls of Mirik.
20. Table 12: Distribution of underweight, stunting and wasting in relation to full immunization among boys and girls of Mirik.

## **LIST OF FIGURES**

1. Figure 1: Distribution of mean height, mean weight, and mean BMI among boys and girls of Mirik.
2. Figure 2: Distribution of underweight, stunting and wasting among the boys and girls of Mirik.
3. Figure 3.1: Distribution of underweight, stunting and wasting in relation to the community among the boys of Mirik.
4. Figure 3.2: Distribution of underweight, stunting and wasting in relation to the community among the girls of Mirik.
5. Figure 4.1: Distribution of percentage of underweight, stunting and wasting in relation to Religion among the boys of Mirik.
6. Figure 4.2: Distribution of percentage of underweight, stunting and wasting in relation to Religion among the girls of Mirik.
7. Figure 5.1: Distribution of underweight, stunting and wasting in relation to income group among the boys of Mirik.
8. Figure 5.2: Distribution of underweight, stunting and wasting in relation to income group among the girls of Mirik.
9. Figure 6.1: Distribution of underweight, stunting and wasting in relation to the occupation of father among the boys of Mirik.
10. Table 6.2: Distribution of underweight, stunting and wasting in relation to the occupation of father among the girls of Mirik.
11. Figure 7.1: Distribution of Percentage of Underweight, Stunting and Wasting in relation to the education of Father among the boys of Mirik.



12. Figure 7.2: Distribution of Percentage of Underweight, Stunting and Wasting in relation to the education of Father among the girls of Mirik
13. Figure 8.1: Distribution of percentage of underweight, stunting and wasting in relation to house type among the boys of Mirik
14. Figure 8.2: Distribution of percentage of underweight, stunting and wasting in relation to house type among the girls of Mirik.
15. Figure 9.1: Distribution of percentage of underweight, stunting and wasting in relation to Family size among the boys of Mirik.
16. Figure 9.2: Distribution of percentage of underweight, stunting and wasting in relation to Family size among the girls of Mirik.
17. Figure 10.1: Distribution of Percentage of Underweight, Stunting and Wasting in relation to Sanitation among the boys of Mirik.
18. Figure 10.2: Distribution of Percentage of Underweight, Stunting and Wasting in relation to Sanitation among the girls of Mirik.
19. Figure 11: Distribution of percentage of underweight, stunting and wasting in relation to infectious diseases among boys and girls of Mirik.
20. Figure 12: Distribution of percentage of underweight, stunting and wasting in relation to full immunization among boys and girls of Mirik.

# **CHAPTER I**

## **INTRODUCTION**

Malnutrition is a state of imbalance in the body caused by the lack of or presence of excess nutrients and improper utilization of nutrients (Blossner et al. 2005). It can simply be defined as the insufficient, excessive or imbalanced consumption of nutrients (Relethford 2010). Nutrition is the utilization of food to grow, repair and for the maintenance of our body. According to Vorster (2009), human nutrition is a complex, multifaceted scientific domain indicating how substances in food provide essential nourishment which is required for the maintenance of life. He describes the process of human nutrition as a process whereby the body obtains and uses the necessary substances obtained from the food to maintain the structural and functional integrity of the body. Human nutrition is concerned with the use of food and nutrients for life, health, growth, development and well being (WHO 2000), and thus involves food consumption, nutritional requirements and relationship between diet and health (Allen and Prentice 2005). Optimal balanced nutrition is a major determinant of health which can be used to promote health and well-being of an individual (Vorster 2009). Good nutrition is vital for survival, growth and well-being throughout the various stages of human growth, from the stage of foetal development onto the stage of infancy, childhood, adolescence, and adulthood (WHO 2016). While good nutrition plays a vital role in enabling a child to grow, develop, learn and play, malnutrition has a negative effect on the physical and mental health of the child. For a community to be productive in the future, the health of the children should be good, which is

possible only with adequate nutrition. Adequate nutrition of children and adults is increasingly being seen as a basic human right and is observed that the energy requirement of children up to 12 years is not adequately met (UNICEF 2012). The age range of five to twelve years in children are the starting point of human mortality risks, with high risks of early childhood mortality due to infectious diseases and increasing risks of non-communicable diseases (UNICEF 2012). Despite being a healthy age range relative to all others, the number of deaths exceeded an estimated 2 million in 2010. This age range is also crucial for human development. The malnourished children may later become adults with reduced performance in both physical and mental work capacity (Bogin 1999). Children require a diet dense in energy and protein because of the rapid brain growth and relatively small body size which means a small digestive system, which limits the total food intake (Bogin 1997). So, lots of care should be given to the nutrition of infants and children. This can help not only in improving the physical growth of the child but also in reducing susceptibility to various kinds of diseases and illness. Thus a healthy child can grow on to become a healthy adult.

Malnutrition can be categorized into under-nutrition and over-nutrition. However, for the present research, I am considering malnutrition only as a deficiency of nutrition or under-nutrition. Under-nutrition arises in the body in the absence of adequate amount of calories and proteins, which are necessary for its proper growth and maintenance (Relethford 2010). The inadequate dietary intake may be a result of interacting factors like household food insecurity, inadequate maternal and child care and poor health and environmental services (Gillespie and Hadded 2003). Malnutrition in children is caused mainly due to inaccessibility to highly nutritious food, poor feeding practices



such as inadequate breast feeding, and feeding of wrong food to the child (WHO 2016). Severe or repeated infection of diseases such as diarrhoea, pneumonia, measles and malaria may also result in under-nutrition among the children (WHO 2016). Inadequate diet and diseases are closely linked to the general standard of living, environmental conditions, and ability to meet basic household needs such as food, housing and health. All age groups are prone to malnutrition but among them, children are the most vulnerable owing to their high nutritional requirements for growth and development (Bogin 1997).

Malnutrition in children may result in low height for age or stunting and low weight for height or wasting. Stunting refers to a child who is too short for his or her age. Stunting is the failure to grow both physically and cognitively and is the result of chronic or recurrent malnutrition. The devastating effects of stunting can last a lifetime. Stunting is a good long term indicator of the nutritional status of a population because it does not vary appreciably by the season of data collection or other short-term factors, such as epidemic illnesses, acute food shortages, or shifts in economic conditions (NFHS-2 1999). Stunting in children occurs as a result of poor nutrition in early childhood. Children suffering from stunting may never grow to their full height and their brains may never develop to their full cognitive potential. Globally, approximately 155 million children suffer from stunting (NFHS-2 1999). These children begin their lives at a marked disadvantage, they face learning difficulties in school, and numerous health problems. Although there are very low chances of early childhood stunting being reversed, the child affected can be saved from further damage to his health. Stunting is an indicator of the long-term effects of malnutrition and it does not vary according to recent dietary intake or diarrheal disease. It

constitutes the foundation for human development, by reducing susceptibility to infections, but helping in the enhancement of learning capacities and adult productivity (UNICEF 2013).

Wasting refers to a child who is too thin for his or her height. Wasting, or acute malnutrition, is the result of recent rapid weight loss or the failure to gain weight. A child who is moderately or severely wasted has an increased risk of death, but treatment is possible. Wasting in children is the life-threatening result of hunger and/or disease. Children suffering from wasting have weakened immunity, are susceptible to long term developmental delays, and face an increased risk of death, so they require urgent treatment and care to survive. In 2016, nearly 52 million children were wasted and 17 million were severely wasted and has been found that stunted and underweight mothers have higher risks of giving birth to underweight babies (Laguna 2015). The prevalence of wasting and stunting has been observed to be higher among the poor households, which show that malnutrition may persists through transmission of poverty over generations (Laguna 2015).

Malnutrition is commonly associated with chronic disease in children (Reilly 2002). Malnutrition usually refers to a number of diseases, each with a specific cause which may be related to one or more nutrients. In the present context, malnutrition is synonymous with protein-energy malnutrition, which signifies that there is an imbalance between the supply of protein and energy and the body's demand for them to ensure optimal growth and function (Ministry of women and child Development 2007). This imbalance includes both inadequate and excessive nutrient intake; the former leading to malnutrition in the form of wasting, stunting and underweight, and the latter resulting in overweight and obesity. Malnutrition in children is the

consequence of a range of factors that are often related to poor food quality, insufficient food intake, and severe and repeated infectious diseases, or frequently some combinations of the three (UNICEF 2012). These conditions, in turn, are closely linked to the overall standard of living and whether a population can meet its basic needs, such as access to food, housing and health care. Growth and nutritional assessment thus not only serves as a means for evaluating the health and nutritional status of children but also provides an indirect measurement of the quality of life of an entire population.

Optimal nutritional status can be obtained only when children have access to a healthy environment including safe water, sanitation and good hygiene practices (UNICEF 2013). Poor sanitation, inadequate water, inferior quality of water and inappropriate hygiene behaviour adversely affects the health of young children (UNICEF 2012). WHO data on the burden of disease shows that about 3.1 percent of deaths worldwide are due to unsafe water, sanitation and hygiene, which has also been the cause of about 88 percent of the diarrheal disease (WHO 2002). Environmental factors also affect the growth and development of children. A household's source of drinking water is often linked to its socioeconomic status.

According to WHO report, Child under nutrition remains high, despite improvements over the last decade (WHO 2016). Another report by the World Health Organisation provides an estimate that about 50 percent of the malnutrition in children across the globe is associated with recurrent diarrhoea or intestinal infections, which was because of the use of unsafe drinking water, or improper sanitary practices (WHO 2016). It has been seen that diarrhoea is one of the leading causes of mortality in children, mostly in children under five years of age, and almost eleven percent of the



total deaths in the children under five have been a result of diarrhoea (NITI Aayog, 2015).

There are several methods for assessing the malnutrition in children such as anthropometry, biochemical indicators and clinical signs of malnutrition (Blossner et al. 2005). Some of the anthropometric measurements used for assessing the nutritional status of an individual include weight, height, skin fold thickness, and head, waist, and hip and arm circumferences. The measurement or a combination of the measurements can provide information on body size, and proportion and also helps in determining the body composition and fat distribution (Allen and Prentice 2005). Among the combination of measurements, the weight and height can be used to determine the Body Mass Index (BMI) of an individual. The Body mass index is calculated using the individual's weight in kilogram divided by height in meter square. Although there are many ways with the help of which the nutritional status of a population can be evaluated, the body mass index (BMI) is most widely used because it is inexpensive, non-invasive and suitable for large scale surveys (Bose and Chakroborty 2004; Ulijaszek and Kerr 1999; WHO 1995). The assessment of the nutritional status of children has been widely done using the anthropometric indices such as weight for age and height for age (WHO 1995). For my research I have used these anthropometric methods. Anthropometry is the single most universally applicable, inexpensive, and non-invasive method to assess the size, proportions, and composition of the body (Bose and Chakroborty 2004). In addition to this, the equipments used for the measurements are relatively cheap and simple to use. The nutritional status of a child is normally expressed in the z-score of the concerned indicator. A z-score for height for age less than two standard deviations (SD) indicates

stunting. Similarly, a z-score less than 2 SD for height for weight indicates wasting. A z-score of less than 3 SD indicates severe malnourishment (Wang and Chen 2012). Data such as underweight, stunting, wasting, and overweight are obtained from measurements of height and weight. Anthropometric measurements assess body size and composition, and reflect inadequate or excess food intake, insufficient exercise, and disease.

While malnutrition can manifest in multiple ways, the path to prevention can be the same, which are adequate maternal nutrition before and during pregnancy and optimal breastfeeding in the first two years of the child's life, nutritious and safe foods in early childhood, and a healthy environment including access to basic services and opportunities for physical activity. These key ingredients can deliver a world where children are free from all forms of malnutrition. Despite this opportunity, the UNICEF, WHO, World Bank global and regional child malnutrition estimates from 1990 to 2017 reveal that we are still far from a world without malnutrition (FAO 2017). The monitoring and surveillance of the nutritional status and dietary intake of the children of any community is essential in order to understand the association with malnutrition or development of any chronic diseases. This may help in development of more efficient and preventive measures in the near future for the community.

### ***Statement of the Problem***

Children are one of the most important parts of a community as well a nation and they constitute about one-fifth of the entire population. Thus, the health of children is of utmost importance. The age of children is a period of nutritional significance as this is the prime time to build up the nutrients in the body to prepare for the rapid growth of adolescence (Singh 2014). Studies show that once children become stunted, they are likely to remain stunted into adulthood (Martorell et al. 1994), and the same is applicable to wasting and underweight as well. Thus, it should be our utmost priority to understand the causes, effects and prevalence of it early in the childhood stage, so that preventive measures can be taken. The health of the child is affected by various biological and socio-economic factors. A study of the prevalence of underweight, wasting and stunting in relation with various factors responsible for it is essential in order to understand and prevent them. Underweight, Stunting and wasting are regarded as the important indicators of poor nutrition and poor health of any population (Pal et al. 2017). However, the information available on the nutritional status of the children of Mirik is very limited. Further, the studies of malnutrition have mainly been focussed on children below the age of 5, and very few studies have been carried out in the age group of 5 to 10. Studies on malnutrition focussing on this age group have not been carried out among the Nepali children in Mirik, Darjeeling. Therefore, the present research is conducted to study the prevalence of malnutrition among the children aged 5 to 10 and its association with various socio-economic determinants.



### *Objectives*

- To study the prevalence of malnutrition among Nepali children of Mirik.
- To assess the relationship between malnutrition and family socio-economic conditions.
- To examine the health problems associated with malnutrition.

## **CHAPTER II**

### **REVIEW OF LITERATURE**

The quest for food does play an influential role in population growth, urban expansion, religion, science and technological development (Vorster 2009). The first revolution in terms of nutrition was seen only during the second half of the eighteenth century. It was during this period that scientists observed that the intake of certain food influences the body's function, provides protection against diseases and helps in restoration of health (Vorster 2009). During this first revolution, nutrition was studied from a medical paradigm, by mainly studying the chemical structure and characteristics of nutrients found in food. The prevention of deficiency diseases and chronic non-communicable diseases were also studied during this phase (Vorster 2009). The second revolutionary phase in nutrition was seen during the late 1980s, during which the emphasis was shifted from the medical paradigm to a social and behavioural one, focussing on the problems of food insecurity and malnutrition (Vorster 2009). The United Nations Children's Fund conceptual framework (UNICEF 1998) states that the two immediate causes for child malnutrition, death and disability are inadequate dietary intake and disease. The child's appetite can be directly affected by the illness and thus reducing the nutrients absorbed by the body. In addition to this, as a result of illness, most of the nutrients absorbed are used up by the body in fighting the illness rather than for body growth. The underlying causes of malnutrition which manifest themselves at the household level are unavailability of food, poor water and sanitation and inadequate health services (UNICEF 1998). All these underlying causes are directly associated with many socio-economic factors such as

family income, parental education, and occupation. Low socio-economic conditions may result in lack of adequate income to meet basic human needs, the inability to keep up with the average standard of living in the society, lack of access to basic services such as better health care or safe drinking water. When these deprivations are experienced in early childhood, the chances of the child recovering in the later stage of his life are very slim. If a child undernourished may be stunted, and if proper care is not provided to the stunted child, it can affect cognitive development, resulting in learning difficulties and poor health in adolescence and adulthood. Children from households with a low standard of living are twice as likely to be undernourished as children from households with a higher standard of living.

The combination of malnutrition and infection causes most of the preventable deaths in developing countries, certainly among young children. Malnutrition increases the risks of infectious disease, and the infection leads to malnutrition. Good nutrition undoubtedly is a major factor for better health in the more developed countries and improving the diet in poor countries is a pre-requisite for achieving satisfactory health conditions in the world. Out of the 667 million children under the age of five worldwide, 159 million are stunted and 50 million are wasted, according to the data by UNICEF (2015). It is estimated that the prevalence of severe malnutrition is around two percent in the least-developed countries and one percent in other developing countries, which translates to about 10 million severely malnourished children at one time (Briend et al. 2006). The concentration of malnutrition is found to be greatest in Asia and 70 percent of the world's malnourished children reside in the region (Gillespie and Haddad 2003). Each year about 13 million infants and children die in the developing countries (WHO 1996) and one of the important factors causing

the high morbidity and mortality among the children is malnutrition (Vella et al. 1992).

According to India National Family Health Survey-2 (1999), under nutrition among children was substantially higher in rural areas than urban areas. It was also found that children whose mothers are illiterate were more likely to be undernourished compared to those whose mothers have completed at least high school. Since the mothers are the prime caretakers of young children, their own health is of utmost importance. Poor health during pregnancy may result in low birth weight of the child, which greatly affects the nutritional status of the child in the future. National Family Health Survey-3 (2006) reported that the prevalence of under nutrition in India was 33 percent among total male population and 28.1 percent among the total female population. In urban areas, 19.8 percent and 17.5 percent of the males and females were undernourished, while in case of rural areas, it was 38.8 percent and 33.1 percent. A Nationwide Rapid Survey on children (RSoC), was conducted by the Ministry of Women and Child Development and UNICEF in 2013-14, among the states of India. It is found that in comparison to the data from the National Family Health Survey conducted in 2006, the prevalence for stunting, underweight and wasting has decreased, although the absolute levels of child malnutrition was still found to be high (Dasgupta et. al, 2016). A study was conducted by Frangillo et al. (1997), in order to study the association of socio-economic and demographic factors with the patterns of stunting and wasting in children. The study showed that there was considerable variation among the nations. The reason for the variation was the differences in energy availability, female literacy, immunization rate and gross product. According to a report by the UNICEF (2014) on the nutritional status of the children from the

Scheduled Tribe population of eleven Indian states, the prevalence of severe stunting in the tribal population was 9 percent higher than that of the non-tribal population. The higher percent of stunting was associated with stunting and illiteracy of the parents and with household poverty (Seshadri and Ramakrishna 2018).

Studies carried out in China, Egypt and Mexico show that both stunting and overweight appear as public health problem in children, although the prevalence of underweight and wasting have decreased significantly, compared to the last decade (Kennedy et al. 2006). A cross-sectional study was conducted by Galgamuwa et al. (2017) among pre-school and school going children in three rural communities of Sri Lanka. Anthropometric measurements were collected to calculate weight-for-age, height-for-age and BMI-for-age, of a total of 547 children aged 1-15 years of age. The study showed that 35.6 percent, 26.9 percent and 32.9 percent of the children were underweight, stunted and wasted respectively. Maternal employment, high number of siblings, low monthly income was significantly associated with under nutrition among the school children. Another cross-sectional study was carried out by Naotunna et al. (2004) in Sri Lanka among pre-adolescent children, among school children of 100 rural schools. Anthropometric measurements were done to calculate the BMI, height for age and weight for age Z-scores. The measurement done for 4939 children revealed that the prevalence of underweight and stunting was 25.93 percent and 43.92 percent respectively. Hakeem (2001) in his comparative study to compare the heights and BMI's of children and adults belonging to three distinctively different income groups of Karachi, found that the rate of underweight was significantly higher at the low income level as compared to low or high income level, which was 31 percent in the low income group, while it was 21 percent in the middle income group and 22

percent in the high income group. Study by Groeneveld et al. (2007) among 583 children in Quetzaltenago, Guatemala showed that the prevalence of stunting was significantly higher in children with low socio-economic conditions than those in comparatively higher socio-economic condition.

Studies among Polish children aged 7-9 years old boys by Maturik et al. (2009), shows that 6.9 percent of the children were underweight. Kelishadi et al. (2008) in his study in Iran, among 21,111 school students which included 10,253 boys and 858 girls, found that the prevalence of underweight was 13.9 percent (8.1% of boys and 5.7% of girls). Assessment of nutritional status of the Andean population of Puna and Quebrada of Humahuaca, Argentina of children aged 2-9 was conducted by Romaguera et al. (2008). The studies revealed that stunting was one of the major nutritional problems in children with stunting prevalence of 10.7 percent. Similar studies among South African school children aged between 8 to 11 years of age by Jinabhai et al. (2003) showed that moderate stunting ranged from 2.9 percent to 40.2 percent and mild stunting ranged from 31.4 percent to 75 percent of the total studied children. Among the urban and rural school children aged 6-13 years of Oaxoco, Southern Mexico, studies was done by Malina et al. (2008), in which it showed that compared to the 1970's, the prevalence of stunting in 2000 was declining owing to better medical facilities and improvement in their socio-economic conditions. Li et al. (2009), in his study to assess the nutritional status of children in China, among 5-19 aged children, found the prevalence of stunting as 13.8 percent.

Studied carried out among Meitei children shows the prevalence of underweight 30.21 percent and 33.86 percent among the boys and girls respectively (Singh and Devi 2013). The prevalence of wasting, stunting and underweight was 21.2 percent, 47.4



percent and 51.7 percent respectively among the children (6-8 years) of tea garden workers of Assam (Medhi et al. 2006). A cross-sectional study was conducted by Dey et al. (2011) among the school going adolescent in a rural block of Darjeeling, West Bengal shows that 27 percent of males and 29 percent of females were malnourished. The study further shows that 44 percent of the participants were stunted and 14 percent were severely stunted. Assessment of nutritional status among children belonging to Sonowal Kachari tribal ethnic group of Dibrugarh, Assam, showed that the overall prevalence of thinness (low BMI for age) was observed to be 25.99 percent (28.08% for boys and 23.92% for girls). The study showed that the rural Sonowal Kachari region was facing a great risk in terms of undernourishment which was greatly pronounced among children of early ages (Singh and Mondal 2013).

Education plays an important role in a child's nutrition and health. Studies were carried out by Kassauf and Senauer (1996) among the children of Brazil, focussing on the effects of parental education on malnutrition among children. The study found out that the most serious malnutrition problem among the Brazilian children was stunting as reflected in their height for age. It was found that malnutrition was far more widespread among the children of parents with little or no education. The problem of malnutrition is more acute among the children of backward communities whose parents are from low socio-economic conditions. Studies by Sain (1994), among the Santhals living in the Birbhum district of West Bengal, shows that 62.73 percent of the people living were illiterate, and the income of more than 40 percent of the people fall within the range of Rs.301- 500 per month. This directly affected the nutritional status of the children of this population. The study showed that 40 percent of the children in age group of 0-12 years were malnourished, only 12.77 percent of the

males and 18.72 percent of children among the entire village population were normal. Low income level is directly linked to poverty and poverty in turn directly affects the quality of life of the family. Since children are more vulnerable in terms of health and nutritional status, they are seen to be affected the most. Studies show that children living in poor conditions suffer from more severe malnutrition compared to the children living in better conditions (Pelletier et al. 1995; Kumar et al. 2011). Children in the higher economic strata have better nutrition, with more access to better social and health services, unlike the people from lower economic strata who in the absence of good nutrition, tend to be malnourished (Bogin 1999).

The prevalence of both low weight for age and low height for age was negatively associated with household income among Khasi boys of Meghalaya (Khongsdier and Mukherjee 2003). Studies by Noh et al. (2014) showed that the effect of parental economic status on underweight in children slightly increased at lower levels of parental economic status. Children from low socio-economic status families are very much associated with growth retardation and inadequate neuro-behavioral development (Dipietro et al. 1999). Socio-economic status is the main factor for many diseases in childhood, including respiratory illness (Hann et al. 1989; Klerman 1991; Rosenbawn 1992; Johnston-Brooks et al. 1998; Colen 1999). Children from low income families are more likely to suffer from various infection and diseases and the average length of stay for poor children in acute care hospitals is longer than the average for children with comparatively higher income (Bradley and Kelleher 1992). Studies by Hill et al. (2015) show that in the age group 5-14 years, the percentage of death is highest in South Asia and sub-Saharan Africa, and that the percentage of

death is higher among the low and middle income group than the higher income group.

Various diseases related to poor provision of water and sanitation has resulted in death of thousands of children per day in poor urban communities around the world (Bartlett 2005). About 88 percent of the deaths from diarrreal diseases are due to poor hygiene and lack of sanitation (UNICEF 2008). Infectious diseases in school going children greatly affect their learning ability, cognitive function and educational attainment (UNICEF 2008). A lack of basic hygiene resulting in various infectious diseases has been the cause of death of a large number of children around the world. The severity and frequency of the disease can be reduced by taking proper actions relating to hygiene, sanitation and water supply (Wash 2007). Improving the quality and quantity of water, and close monitoring of the living conditions can significantly reduce the rate of mortality and morbidity in children (Wash 2007). Studies by Freeman et al. (1980), among the children from Guatemalan villages in Central America, after carrying out voluntary food supplementation programme for seven years, showed that both nutritional and social environment measures are related to various dimensions of cognitive competence. The results also suggested that nutritional intake, independent of social factors, affects the cognitive development of the child. Childhood stunting leads to a significant reduction in adult size, as demonstrated by a follow-up of Guatemalan infants, who two decades earlier, had been enrolled in a supplementation programme.

Studies show that poor sanitation and hygiene practices are associated with higher incidence of diarrheal disease in young children (Fewtrell et al. 2005). Studies by Hakim et al. (2015) among children of Tangail district of Bangladesh found out that

the basic hygiene behaviours of children have significant positive effects on their nutritional status. The association of poor hygienic behaviours and under nutrition was also seen in study by Haque et al. (2014), among primary school children.

## **CHAPTER III**

### **MATERIALS AND METHODS**

#### ***Land and People***

The state of West Bengal lies between 85° 50' and 89° 50'E longitude, and 21° 38' and 27° 10' N latitude. The state has a total area of 88,752 square kilometres. The state of West Bengal is surrounded by Bangladesh on the eastern side, and Nepal and Bhutan in the north. The Indian states of Sikkim, Assam, Odisha, Jharkhand and Bihar also border West Bengal. The Darjeeling Himalayan region in the northern extreme of the state is a part of the eastern Himalayas mountain range. The capital of the state is Kolkata, which is also its largest city. In terms of area, it ranks 14<sup>th</sup> among all the states of India, and it is divided into 23 districts. According to 2011 Census, the total population of West Bengal was 91,347,736, with a population density of 1029 per square kilometres. The sex ratio of female and males was 950: 1000 and a literacy rate of 77.08 percent (Census of India 2011).

The district of Darjeeling, which lies to the northern part of Bengal, lies between 26° 31' and 27° 13'N latitudes, and between 87° 59' and 88 ° 53'E longitudes. It contains a total area of 3,149 square kilometres, and a population of 18,46,825 according to the 2011 census (Census of India 2011).The name Darjeeling is derived from the name 'Dorje-ling', meaning the land of the thunderbolt. Darjeeling, a district of West Bengal, is further divided into four sub-divisions- Darjeeling, Kurseong, Siliguri and a newly added sub division of Mirik, which previously was within the Kurseong sub-division.

The present research was focus on the Tamang and the Limboo communities of Mirik. The Tamang people are believed to have come from Tibet, and they are tribes belonging to the Tibeto-Burman language family. The word Tamang means ‘Horse-Traders’. A popular belief is that the word Tamang was derived from a Tibetan word *Tamag*, where *Ta* means “horse” and *Mag* means “rider”.

The Limboos are also a tribal community believed to have migrated from Tibetan province of *Tsang*, South of Tangpo. This is a reason why the Limboos are also known as *Tsong* by Bhutia (Risley, 1894). The term Limboo means Archers (Subba, 1999) and is commonly used. They are also known as *Yakthumba*, which means *yak*-hill, *thum*- place, and *ba*- people, put together as the “hillmen”.

Out of the total Scheduled Tribe population of Mirik, majority of the population belong to the Tamang and Limboo communities. The Tamang community is the larger of the two communities in terms of population in Mirik. Both Tamang and Limboo communities have their own traditional and social customs and attires, which distinguish them from each other as well as from other communities.

Tamangs have their own script and language. The Tamang language has many words which are the same as in Tibetan language. They use the Devnagari script. The Limboo community also have their own language, known as *Yakthung pan*, which is from the Tibeto-Burman family, and uses the Sirijunga script. The Limboo language is descendant of *Kirati* branch of the *Tibeto-Burman* language.

In terms of religion and religious practices, the Tamangs followed animism in the beginning but now they follow Mahayana sect of Buddhism. However, they have retained many animism practices such as the *Khepa-Soom*, a practice of paying homage to the ancestors using blood sacrifices, and *Banbo sherab*, which is an act of



giving farewell to the departed soul with offerings. There are also few people from the Tamang community, who have converted to Christianity.

Unlike the Limboo communities from Nepal or Sikkim, who follow their own religion, called *Yumaism*, the Limboo community from Mirik, as in most parts of Darjeeling follow Hinduism. Although they identify themselves as Hindus, most of the rituals and practices they follow are different from that of the traditional Hindu rituals, but are consistent with the *Yumaism* religion. A small portion of Limboos have converted themselves into Christianity in the Darjeeling Hills.

The traditional dress of the Tamangs consists of *Bakhu*, *Tunga*, *Bhoto*, *Birkhey topi*, *Gada* and *Surki* for the males and for the females, *Gunyu*, *Fariya*, *Cholo*, *Bakhu*, *Pangden* and *Docha*. In case of the Limboo community, the traditional attire for the men is the *Lapedda*, which is a kind of a shirt, and *Sumba*, trousers along with a white Turban and the traditional attire for the limboo women is the *Phareeya*.

The Tamangs observe *Lotshar* as their main festival, which usually takes place during December-January. They also celebrate many other Buddhist festivals such as *Guru Rimpoche's Trungkar Tshechu*, *Saga Dawa*, *Dukpa Tsheshi*, *Lhabab-Duechen*, *Pang Lhabsol*, *Loosung* and some may also participate in joining the Hindu festivals of Dashain and Tihaar. The Limboo community from Mirik celebrate all the Hindu festivals like Dashain and Tihaar.

The Tamangs have their own unique folk songs in the Tamang dialect, known as the Tamang Selo, which they sing in all festive occasions and is usually accompanied by the popular folk dances such as *Damphu* dance, and *Chomlu* dance. The folk songs are about their life and culture, varied in content and meanings, composed in Tamang dialect. They sing the songs in all festive occasions along with *Damphu* dance. The

popular folk dance of Tamangs are *Damphu nach*, *Chomlu nach*, *Mhendomaya nach*, *Lama Bakcham nach*, *Manichhepa*, *Tormamharso nach* and *Jungwa nach* (Sharma 2017).

The Limboo community also have their own folk songs and dances. Some of the ethnic Limboo songs are *Hakpare Samlo*, *Palam Samlo*, *Sewa Samlo*, *Khyali Samlo* and *Swapma Samlo*. They also enjoy various traditional dances. *Yaklang* or paddy dance and *Kelang* or drum dance are the most popular in the Limboo community.

In almost all communities in Mirik, rice is the staple diet, which is usually taken with pulses, vegetables and meat. The Tamang as well as the Limboo people are mostly non-vegetarians and they eat all kinds of meat. However, within the community, there are certain Tamangs belonging to the *Blon thar* who do not take buffalo and those from the *Negi thar* and *Lopchen thar* do not take pork. Similarly, in the Limboo community, those belonging to the *Khewa thar* do not eat chicken, the *Nembangs* do not eat mutton, *Mangyung* do not eat buff, and *Khamdak* do not eat beef.

Endogamy is the norm among both the Tamangs and the Limboos, though the cases of community exogamy have been increasing these days. A marriage through negotiation is the common practice, though elopement is becoming popular to avoid heavy expenses on marriage.

A large number of people from both communities are engaged as tea garden workers, as tea plantation is one of the productions of Mirik. Apart from tea, people from Mirik are also engaged in farming. This involves growing of oranges, ginger, which are sold in large numbers to Siliguri. Local vegetables like squash are also been sent to Siliguri to be sold. Apart from these, there is a lack of jobs and employment opportunities for youth and many of them go to other states of India or to other countries for jobs.

### ***Study Area***

The study was conducted among the Nepali children of Tamang and Limboo community of Mirik. Mirik is a hill resort located in the Darjeeling district of West Bengal. The name *Mirik* comes from the Lepcha word which means “place burnt by fire”. Mirik is located at an elevation of 1,495 m and lies within the co-ordinates 26°54’N to 26°57’N and 88°10’E to 88°13’E. Mirik is 52 km north-west of Siliguri city and 49 km south-west of Darjeeling town. Mirik was granted the status of sub-division recently in 2017, and before that it lied within the Kurseong sub-division in the district of Darjeeling. The whole area of Mirik is divided into urban unit or the notified area, and the rural area. The urban unit is administered by a Municipality and it comprises of 9 wards. The rural unit is administered by the Mirik Community Development Block, which has 6 Gram Panchayats, namely, Chenga Panighata, Pahilagaon School Dara-I, Pahilagaon School Dara-II, Soureni-I, Soureni-II and Duptin.

According to Census 2011, the total population of Mirik urban unit was 11,513 of which 5,688 were males and 5,825 were females. While the total population of rural area was 46,374, out of which there was 23,394 males and 22,980 females. As per the Census, the population density of Mirik Municipality area was 2154 person per square kilometres. Compared to the density of population of the area in Census 2001, the number of person has increased by 292 per square kilometres. The sex ratio of the area, as per the Census was 1024, which indicated that there were 1024 female per 1000 male (Census of India 2011).

The total number of children in the age group of 0-6 years was 1098, the number of children in the age group of 6-10 years was 900 and there were 1073 children in the

age group of 10-18 years. The literacy rate in Mirik municipality, according to 2011 census, was 81.59 percent, where the male literacy was 86.52 percent and the female literacy was 76.79 percent. The area had a Scheduled caste population of 754 which accounts to 6.55 percent of the total population of the area, and a Scheduled Tribe population of 3910, which was 33.96 percent of the total population (Census of India 2011).

According to a survey by the State Urban Development Agency (SUDA) in 2006, there were 830 households in the Mirik municipality which belonged to the Below Poverty Line (BPL) households. A majority of the population in Mirik belongs to the Hindu community, and Census 2011 shows that out of the total population, 55.15 percent were Hindus, 35.40 percent were Buddhist and 4.87 percent were Christian.

There is a Taluka Court, which has a Civil Judge and a Judicial Magistrate. There is one police station and one Primary Health Centre in Mirik. The services offered by the health centre are inadequate for the people because of absence of specialised departments and no provision of Intensive Care Unit. As a result, all severe cases are referred to hospitals in Kurseong, Darjeeling or Siliguri which are at least 50 km away. However, there is presence of Integrated Child Development Schemes (ICDS) in the area, the aim of which is to improve nutrition and health status of women and children in the age group of 0-6 years. In Mirik there are 152 Aganwari centres in position.

Lack of drinking water is another crucial problem faced in the hilly area. Most people drink water from tube wells, streams or jhoras. In terms of educational institutions, there are three primary schools, and two secondary schools run by the government of West Bengal, although many private schools for children have been started. There is

one Degree college but it offers only arts stream. Due to lack of Science subjects in higher secondary schools and colleges, students interested in the field of science are forced to go to Kurseong, Darjeeling, Siliguri, or Sikkim for further studies. The economy of Mirik is mainly based on tourism with a small percentage of income generated from tea industry and agriculture as well.

### ***Anthropometry***

The data for the present study was collected from both boys and girls aged 5 to 10 to find the prevalence of underweight, stunting and wasting. Selected anthropometric measurements such as height and weight were taken on the subjects. Standard techniques of taking anthropometric measurements were followed as proposed by Weiner and Lourie in 1981. Height and weight was measured to the nearest 0.5cm and 0.1kg with subjects wearing light clothes. Z-score was utilized to classify each subject as underweight, stunted or wasted.

### ***Data on socio-economic conditions***

Data on socio-economic and demographic parameters such as age, family size, household income, occupation, education, family size etc, were collected using appropriate schedule. Data on household income were collected directly from the head of the households.

Data on household per capita income was classified as follows:

Above 75<sup>th</sup> percentile (> Rs.3333.33) = High income group.

50<sup>th</sup> to 75<sup>th</sup> percentile (Rs.2000-3333.33) = Middle income group.

Below 50<sup>th</sup> percentile (< Rs.2000) = Low income group.

Data on educational attainment of individuals were classified into four categories, namely Illiterate, Primary, secondary and graduation and above. The illiterates are

those individuals who were not able read or write. The primary level of education includes those individuals who studied up to class V. In the secondary level of education, we included those individuals who attended standard VI to XII. In the graduation and above level of education, we included those individuals who have completed graduation and those pursuing higher studies.

The data on occupation of the parents were classified as tea garden worker, farmer, government employee, business and others. Others category includes drivers, carpenters, those working in parlors and hotels etc.

The data on religion of each subject is categorized as Hindu and Non-Hindu. Non-Hindu includes Buddhist and Christian. The data on family size is categorized into less than or equal to four and greater than or equal to five. The data on sanitation is categorized into average and good. The data on health and infectious disease was collected through the one week recall method.

### ***Statistical Analysis***

The data were analyzed using MS-Excel for the present research. The parameters taken were analyzed statistically to find out the mean, standard deviation for the anthropometric measurements. Z-scores of concerned indicators is utilized to classify each subject into different category malnutrition as wasting, stunting and underweight. According to the WHO growth references (2007), weight for age z-score of less than -2SD considered as underweight. A z-score for weight for height less than -2SD indicates wasting. Similarly, a z-score for height for age less than -2SD indicates stunting. A z-score of less than -3SD in BMI for age indicates severe underweight. The same z-score of less than -3SD indicates severe wasting in weight



for height, and severe stunting in height for age (WHO 2007). Chi-square and t-test was used to find out the level of significance.

## CHAPTER IV

### RESULTS

Table-1 and figure-1 shows basic data on mean weight, height and BMI with standard error among boys and girls of Mirik. The table shows that the mean height of boys ( $119 \pm 10.11$ ) and girls ( $118.74 \pm 9.93$ ) was found more or less the same. Similarly, mean weight of boys ( $21.86 \pm 5.02$ ) and girls ( $21.75 \pm 4.76$ ) was also found more or less the same. The result shows that the mean BMI value among boys ( $15.29 \pm 2.20$ ) and girls ( $15.29 \pm 2.21$ ) was also found almost the same.

Table 1: Distribution of mean height, mean weight, and mean BMI among the boys and girls of Mirik

Category	No. of Samples	Mean Height $\pm$ SE (in cm)	Mean Weight $\pm$ SE (in kg)	Mean BMI $\pm$ SE (in kg/m <sup>2</sup> )
Boys	136	$119 \pm 10.11$	$21.86 \pm 5.02$	$15.29 \pm 2.20$
Girls	143	$118.74 \pm 9.93$	$21.75 \pm 4.76$	$15.29 \pm 2.21$
Total	279			

Figure 1: Distribution of mean height, mean weight, and mean BMI among boys and girls of Mirik

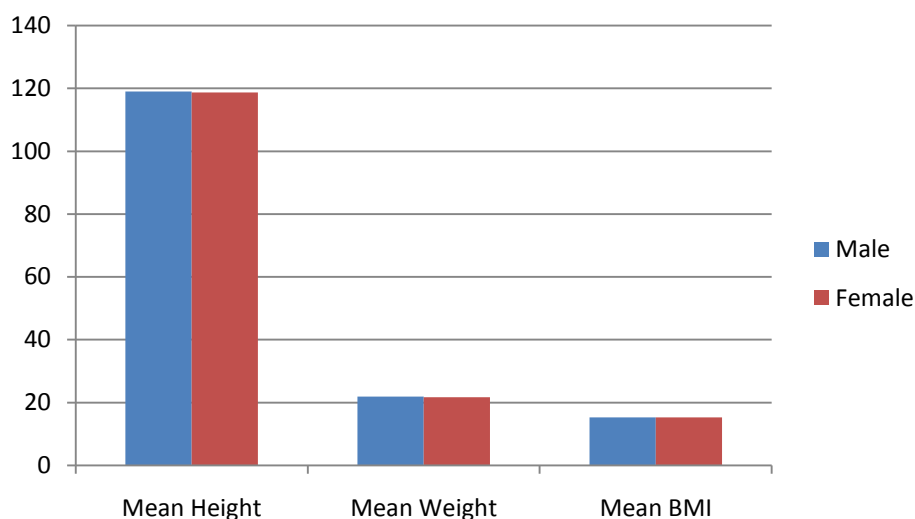


Table-2 and figure-2 shows the distribution of underweight, stunting and wasting among the boys and girls of Mirik. The percentage of underweight, stunting and wasting among the boys was 12.50 percent, 13.24 percent and 15.44 percent, respectively. Similarly, among the girls, the percentage of underweight, stunting and wasting was 3.50 percent, 16.08 percent and 6.99 percent, respectively. The differences in the distribution of underweight, stunting and wasting among boys and girls were statistically significant ( $\chi^2 = 7.90$ ,  $df= 2$ ,  $p<0.05$ ).

Table 2: Distribution of Underweight, Stunting and Wasting among the boys and girls of Mirik

Category	No. of samples	Underweight	Stunting	Wasting
Boys	136	17(12.50%)	18(13.24%)	21(15.44%)
Girls	143	5(3.50%)	23(16.08%)	10(6.99%)
Total	279	22(7.89%)	41(14.70%)	31(11.11%)

$\chi^2 = 7.90$ ,  $df= 2$ ,  $p<0.05$

Figure 2: Distribution of underweight, stunting and wasting among the boys and girls of Mirik

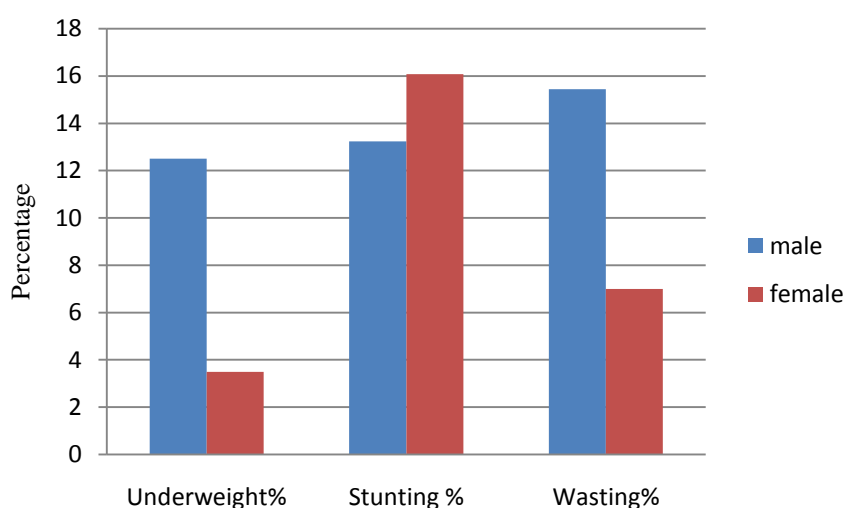


Table-3.1 and figure-3.1 shows the distribution of underweight, stunting and wasting in relation to the two communities among the boys of Mirik. The higher percentage of underweight (16.90%), stunting (15.49%) and wasting (19.72%) was found among Limboo community compared to the percentage of underweight (7.69%), stunting (10.77%) and wasting (10.77%) in the Tamang community. The distribution of underweight, stunting and wasting in relation to the two communities were statically not significant ( $\chi^2 = 0.356$ ,  $df=2$ ,  $p>0.05$ ).

Table 3.1: Distribution of underweight, stunting and wasting in relation to the community among the boys of Mirik

Community	No. of samples	Underweight	Stunting	Wasting
Tamang	65	5(7.69%)	7(10.77%)	7(10.77%)
Limboo	71	12(16.90%)	11(15.49%)	14(19.72%)

$\chi^2 = 0.356$ ,  $df=2$ ,  $p>0.05$

Figure 3.1: Distribution of underweight, stunting and wasting in relation to the community among the boys of Mirik

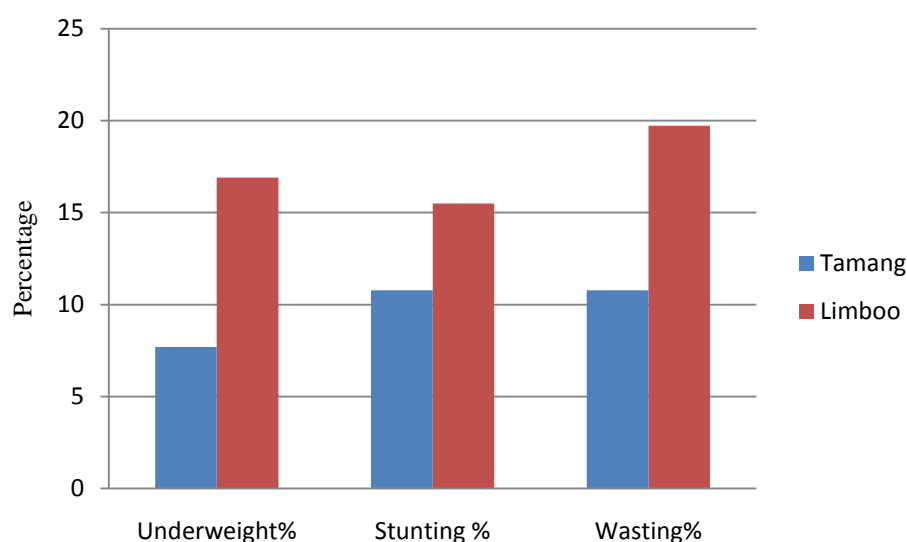


Table-3.2 and figure-3.2 shows the distribution of underweight, stunting and wasting in relation to the two communities among the girls of Mirik. The percentage of underweight (5.08%) and stunting (16.95%) was slightly higher among the Tamang community compared to that among the Limboo community (underweight-2.38% and stunting-15.47%). While the percentage of wasting was higher among the Limboo community (10.71%) compared to that of Tamang community (8.47%). The distribution of underweight, stunting and wasting in relation to the two communities were statically not significant ( $\chi^2=0.895$ ,  $df=2$ ,  $p>0.05$ ).

Table 3.2: Distribution of underweight, stunting and wasting in relation to the community among the girls of Mirik

Community	No. of samples	Underweight	Stunting	Wasting
Tamang	59	3(5.08%)	10(16.95%)	5(8.47%)
Limboo	84	2(2.38%)	13(15.47%)	9(10.71%)

$\chi^2=0.895$ ,  $df=2$ ,  $p>0.05$

Figure 3.2: Distribution of underweight, stunting and wasting in relation to the community among the girls of Mirik.

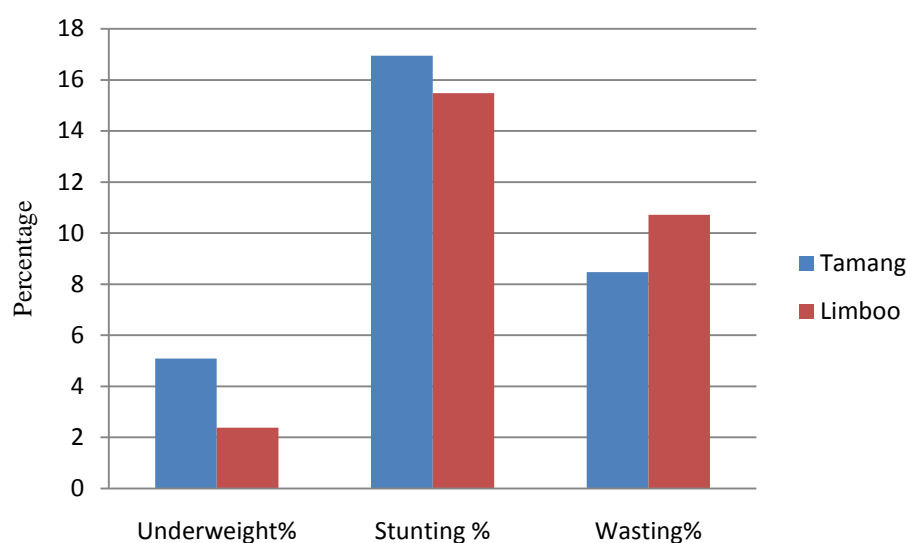


Table 4.1 and figure 4.1 shows the distribution of underweight, wasting and stunting in relation to religion among the boys of Mirik. It shows that 100 were Hindus and 36 were from Non-Hindu communities. Among the Non-Hindus, 8.33 percent were underweight, 11.11 percent were stunted and 8.33 percent were wasted. Among the Hindus, 14.00 percent were underweight, 14.00 percent were stunted and 18.00 percent were wasted. The differences in the distribution was statistically not significant ( $\chi^2=2.362$ ,  $df=2$ ,  $p>0.05$ ).

Table 4.1: Distribution of underweight, stunting and wasting in relation to Religion among the boys of Mirik

Religion	no. of samples	Underweight	stunting	Wasting
Non-Hindu	36	3(8.33%)	4(11.11%)	3(8.33%)
Hindu	100	14(14.00%)	14(14.00%)	18(18.00%)

$\chi^2=2.362$ ,  $df=2$ ,  $p>0.05$

Figure 4.1: Distribution of percentage of underweight, stunting and wasting in relation to Religion among the boys of Mirik

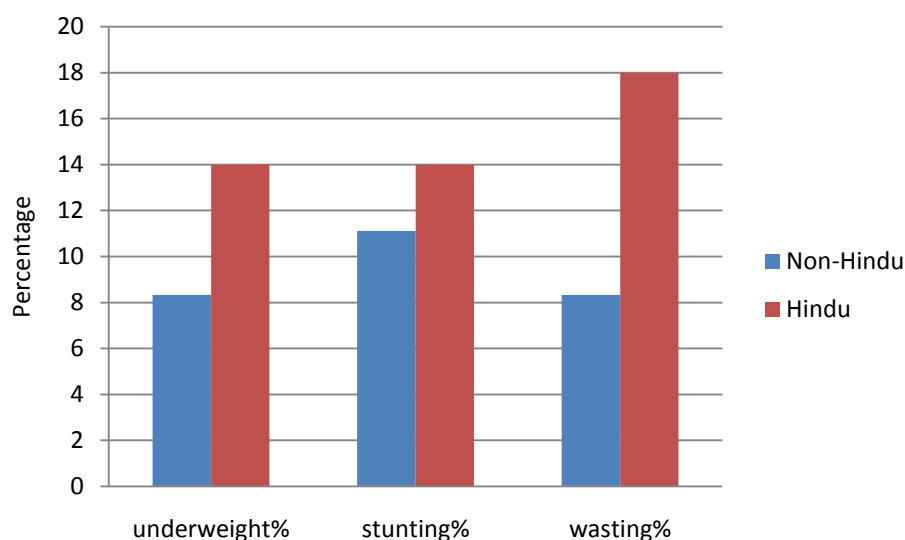


Table 4.2 and figure 4.2 shows the distribution of underweight, wasting and stunting in relation to religion among the girls of Mirik. It shows that 110 were Hindus and 33 were from Non-Hindu communities. Among the Non-Hindus, 6.06 percent were underweight, 18.18 percent were stunted and 12.12 percent were wasted. Among the Hindus, 2.73 percent were underweight, 15.45 percent were stunted and 9.09 percent were wasted. The differences in the distribution was statistically not significant ( $\chi^2 = 1.306$ ,  $df=2$ ,  $p>0.05$ ).

Table 4.2: Distribution of underweight, stunting and wasting in relation to Religion among the girls of Mirik

Religion	no. of samples	Underweight	Stunting	Wasting
Non-Hindu	33	2(6.06%)	6(18.18%)	4(12.12%)
Hindu	110	3(2.73%)	17(15.45%)	10(9.09%)

$\chi^2 = 1.306$ ,  $df=2$ ,  $p>0.05$

Figure 4.2: Distribution of percentage of underweight, stunting and wasting in relation to Religion among the girls of Mirik

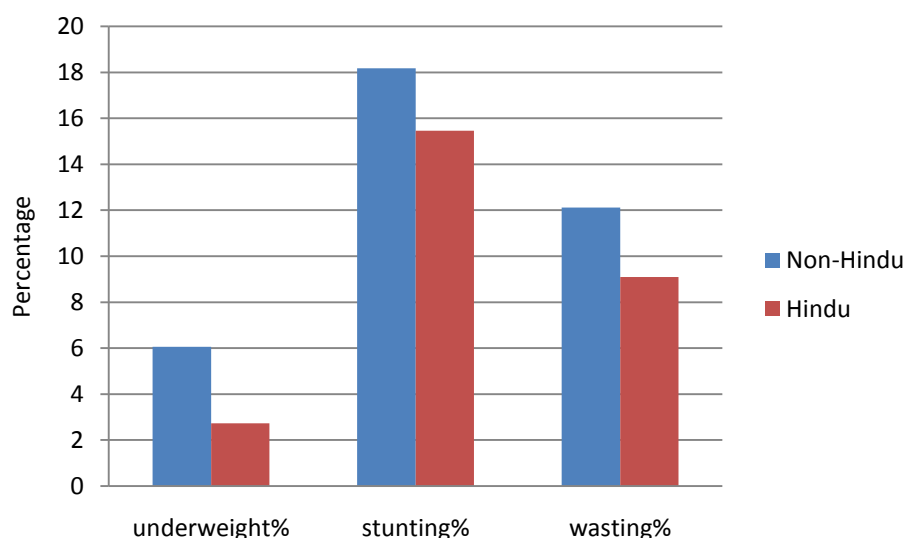


Table-5.1 and figure-5.1 shows the distribution of underweight, stunting and wasting in relation to the Income group among the boys of Mirik. The prevalence of underweight was found highest in the lower income group (14.00%) followed by middle income group (13.95%) and high income group (9.30%). Similarly, the prevalence of stunting was found highest among the lower income group (24.00%) followed by middle income group (13.95%) and the higher income group. However, the prevalence of wasting was found highest in the middle income group (25.58%) followed by low income group (18.00%) and the higher income group (2.33%). The distribution of underweight, stunting and wasting in relation of various income group were statically not significant( $\chi^2=8.61, df=4, p>0.05$ ).

Table 5.1: Distribution of underweight, stunting and wasting in relation to income group among the boys of Mirik

Category	no. of samples	Underweight	Stunting	Wasting
lower income	50	7(14.00%)	12(24.00%)	9(18.00%)
middle income	43	6(13.95%)	6(13.95%)	11(25.58%)
high income	43	4(9.30%)	0(0.00%)	1(2.33%)

$\chi^2=8.61, df=4, p>0.05$



Figure 5.1: Distribution of underweight, stunting and wasting in relation to income group among the boys of Mirik

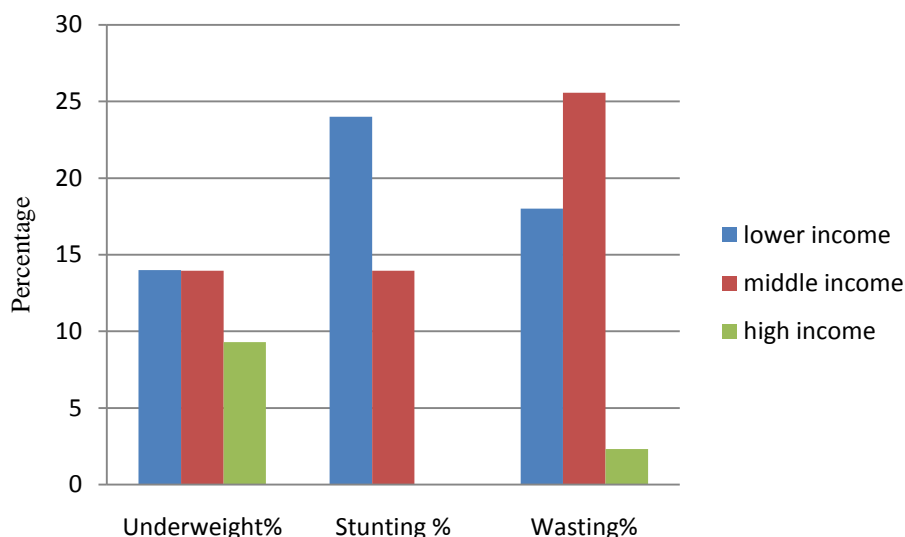


Table-5.2 and figure-5.2 shows the distribution of underweight, stunting and wasting in relation to the income group among the girls of Mirik. The prevalence of underweight was found highest in the lower income group (4.41%) followed by almost equal prevalence among middle income group (2.43%) and high income group (2.94%). The prevalence of stunting was found highest among lower income group (25.00%) followed by middle income group (12.20%) and high income group (2.94%). Likewise, the prevalence of wasting was found highest in the lower income group (13.24%) followed by middle income group (2.44%) and the high income group. The distribution of underweight, stunting and wasting in relation of various income group were statically not significant( $\chi^2=3.59$ ,  $df=4$ ,  $p>0.05$ ).

Table 5.2: Distribution of underweight, stunting and wasting in relation to income group among the girls of Mirik

Category	No. of samples	Underweight	stunting	Wasting
lower income	68	3(4.41%)	17(25.00%)	9(13.24%)
middle income	41	1(2.43%)	5(12.20%)	1(2.44%)
high income	34	1(2.94%)	1(2.94%)	0(0%)

$\chi^2=3.59$ ,  $df=4$ ,  $p>0.05$

Figure 5.2: Distribution of underweight, stunting and wasting in relation to income group among the girls of Mirik

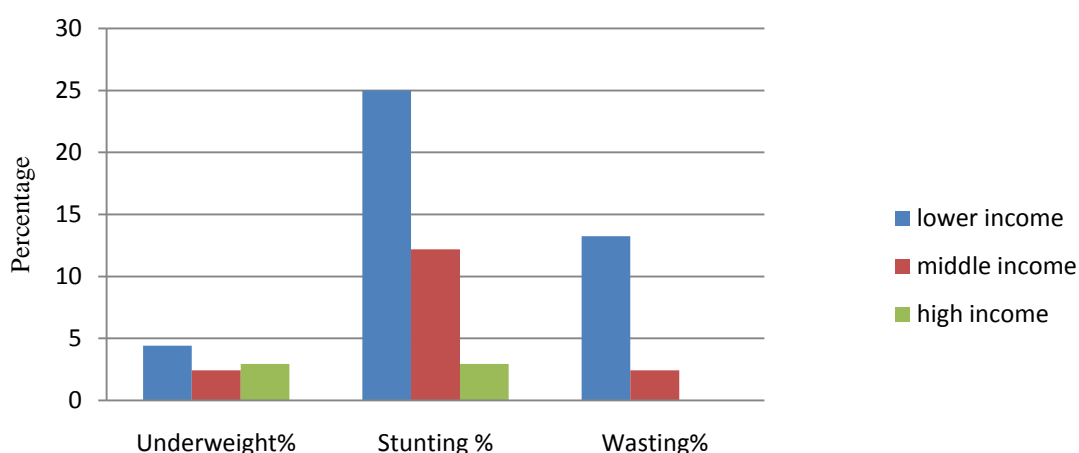


Table-6.1 and figure-6.1 shows the distribution of underweight, stunting and wasting in relation to the occupation of the father among the boys of Mirik. In the different occupational groups like tea garden worker, farmer, government employee, business and others, the percentage of underweight was found to be 12.12 percent, 0 percent, 8.70 percent, 20.83 percent and 12.50 percent respectively. Similarly, the percentage of stunting among tea garden worker, farmer, government employee, business and others was found to be 27.27 percent, 25 percent, 0 percent, 8.33 percent and 10.42

percent respectively. The percentage of wasting was seen as 18.18 percent, 12.5 percent, 0 percent, 29.17 percent and 14.58 percent among tea garden workers, farmer, government employee, business and others respectively. The differences in the distribution of underweight, stunting and wasting of male children in relation of father's occupation were statistically not significant ( $\chi^2 = 10.99$ ,  $df=8$ ,  $p>0.05$ ).

Table 6.1: Distribution of underweight, stunting and wasting in relation to the occupation of father among the boys of Mirik

Occupation of Father	No. of samples	Underweight	Stunting	Wasting
Tea Garden Workers	33	4(12.12%)	9(27.27%)	6(18.18%)
Farmer	8	0(0%)	2(25%)	1(12.5%)
Government Employee	23	2(8.70%)	0(0%)	0(0%)
Business	24	5(20.83%)	2(8.33%)	7(29.17%)
Others	48	6(12.50%)	5(10.42%)	7(14.58%)

$\chi^2 = 10.99$ ,  $df=8$ ,  $p>0.05$

Figure 6.1: Distribution of underweight, stunting and wasting in relation to the occupation of father among the boys of Mirik

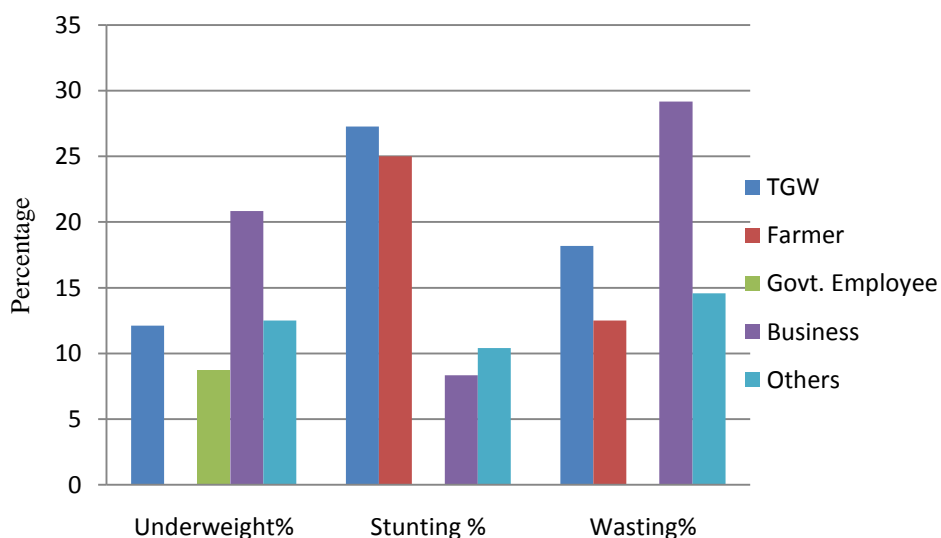


Table-6.2 and figure-6.2 shows the distribution of underweight, stunting and wasting in relation to the occupation of the father among the girls of Mirik. In the different occupational groups like tea garden workers, farmers, Government employees, business and others, the percentage of underweight was found to be 3.23 percent, 8.33 percent, 5.26 percent, 0 percent, and 5.45 percent respectively. Similarly, the percentage of stunting was found to be 22.58 percent, 50 percent, 5.26 percent, 11.54 percent, 23.64 percent among tea garden workers, farmer, Government employee, business and others respectively. The percentage of wasting was seen to be 16.13 percent, 8.33 percent, 0 percent, 3.85 percent and 14.55 percent among tea garden workers, farmer, Government employee, business and others respectively. The differences in the distribution of underweight, stunting and wasting of female children in relation of father's occupation were statistically not significant ( $\chi^2 = 5.74$ ,  $df=8$ ,  $p>0.05$ ).

Table 6.2: Distribution of underweight, stunting and wasting in relation to the occupation of father among the girls of Mirik

Occupation of Father	No. of samples	Underweight	Stunting	Wasting
Tea Garden Workers	31	1(3.23%)	7(22.58%)	5(16.13%)
Farmer	12	1(8.33%)	6(50.00%)	1(8.33%)
Government Employee	19	1(5.26%)	1(5.26%)	0(0.00%)
Business	26	0(0.00%)	3(11.54%)	1(3.85%)
Others	55	3(5.45%)	13(23.64%)	8(14.55%)

$\chi^2 = 5.74$ ,  $df=8$ ,  $p>0.05$

Figure 6.2: Distribution of underweight, stunting and wasting in relation to the occupation of the father among the girls of Mirik.

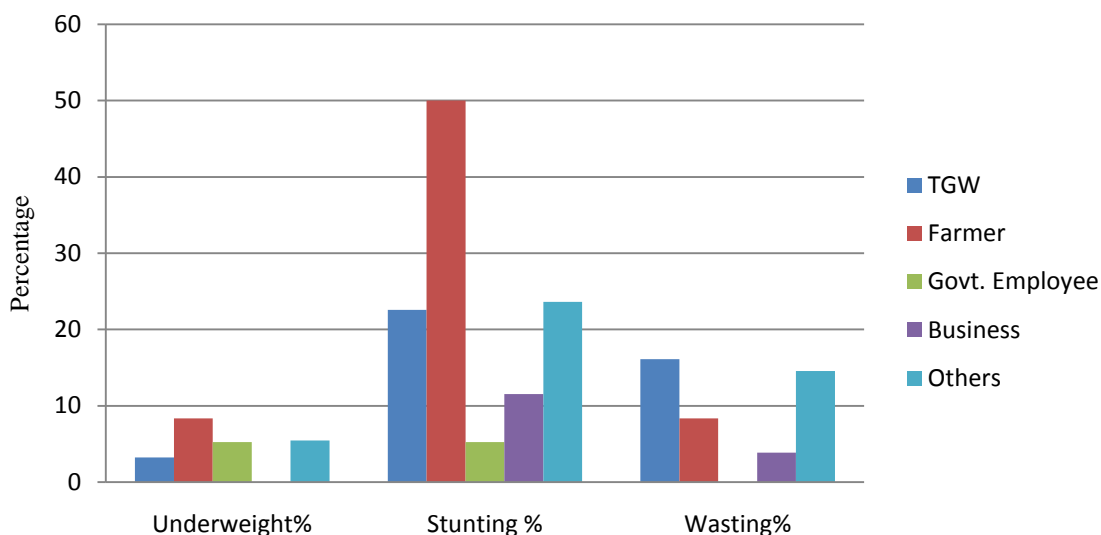


Table-7.1 and figure-7.1 shows the distribution of underweight, stunting and wasting in relation to the education of father among the boys of Mirik. The higher prevalence of underweight was found among children whose father attained secondary education (14.58%). The prevalence of underweight among the children whose father were illiterate (12.5%), primary education (11.54%) and graduation or above level of education (11.11%) was more or less the same. However, the percentage of stunting was found highest in the primary category (26.92%) and lowest among those whose father had attained graduation or above level of education (5.56%). The frequency of stunting among children whose father is illiterate and secondary education was 12.50 percent and 14.58 percent respectively. The prevalence of wasting in the secondary education category (22.92%) was seen slightly higher than the primary education category (19.23%), while the lowest prevalence was seen among those attaining graduation or above level of education (9.26%). The differences in the distribution of

underweight, stunting and wasting in relation to education of father among the boys of Mirik was not significant ( $\chi^2=4.4$ ,  $df=6$ ,  $p>0.05$ ).

Table 7.1: Distribution of underweight, stunting and wasting in relation to the education of Father among the boys of Mirik

Father's Education	Number of samples	Underweight	Stunting	Wasting
Illiterate	8	1(12.5%)	1(12.50%)	0(0.00%)
Primary	26	3(11.54%)	7(26.92%)	5(19.23%)
Secondary	48	7(14.58%)	7(14.58%)	11(22.9%)
graduate and above	54	6(11.11%)	3(5.56%)	5(9.26%)

$\chi^2=0.990698$ ,  $df=6$ ,  $p>0.05$

Figure 7.1: Distribution of Percentage of Underweight, Stunting and Wasting in relation to the education of Father among the boys of Mirik

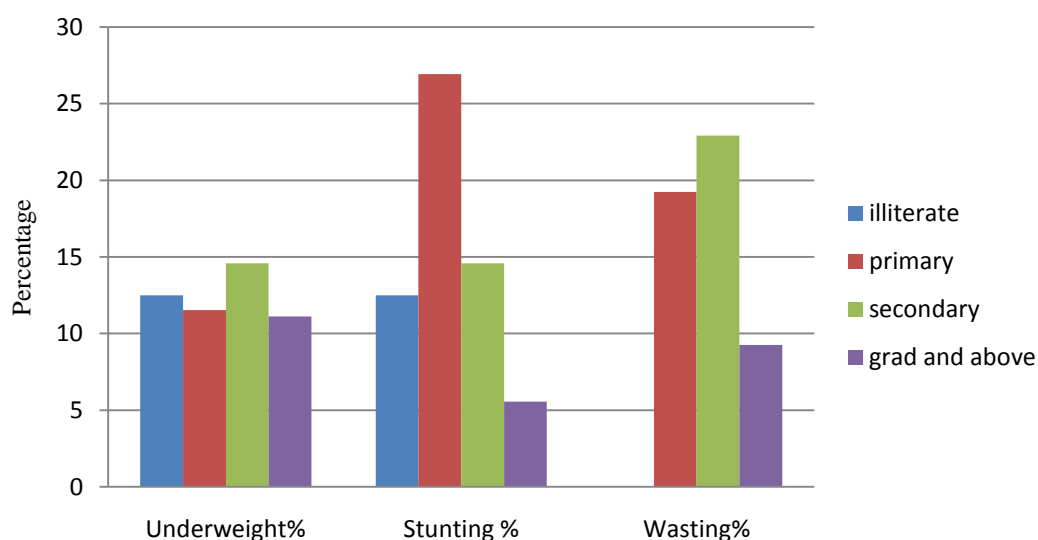


Table-7.2 and figure-7.2 shows the distribution of underweight, stunting and wasting in relation to the education of father among the girls of Mirik. The highest percentage of underweight was found among those whose father never attended school (8.33%). This was followed by 5.17 percent and 3.33 percent of underweight among secondary

level of education and primary education respectively. Similarly, the percentage of stunting (33.33%) and wasting (25.00%) was found highest in the illiterate category and lowest level of stunting and wasting was found among those whose father had attained graduation or above level of education( stunting-6.98% and wasting-2.33%).The frequency of stunting among girls whose father attained primary and secondary education was 20.00 percent and 17.24 percent respectively. The table further shows the prevalence of wasting among girls whose father attained primary and secondary education was 10.00 percent and 12.07 percent respectively. The differences in the distribution of underweight, stunting and wasting in relation to education of father among the girls of Mirik was not significant ( $\chi^2 =1.31$ ,  $df=6$ ,  $p>0.05$ ).

Table 7.2: Distribution of underweight, stunting and wasting in relation to the education of Father among the girls of Mirik

Child's father's Education	Number of samples	Underweight	Stunting	Wasting
Illiterate	12	1(8.33%)	4(33.33%)	3(25.00%)
Primary	30	1(3.33%)	6(20.00%)	3(10.00%)
Secondary	58	3(5.17%)	10(17.24%)	7(12.07%)
graduate and above	43	0(0.00%)	3(6.98%)	1(2.33%)

$\chi^2 =2.5795$ ,  $df=6$ ,  $p>0.05$

Figure 7.2: Distribution of Percentage of Underweight, Stunting and Wasting in relation to the education of Father among the girls of Mirik

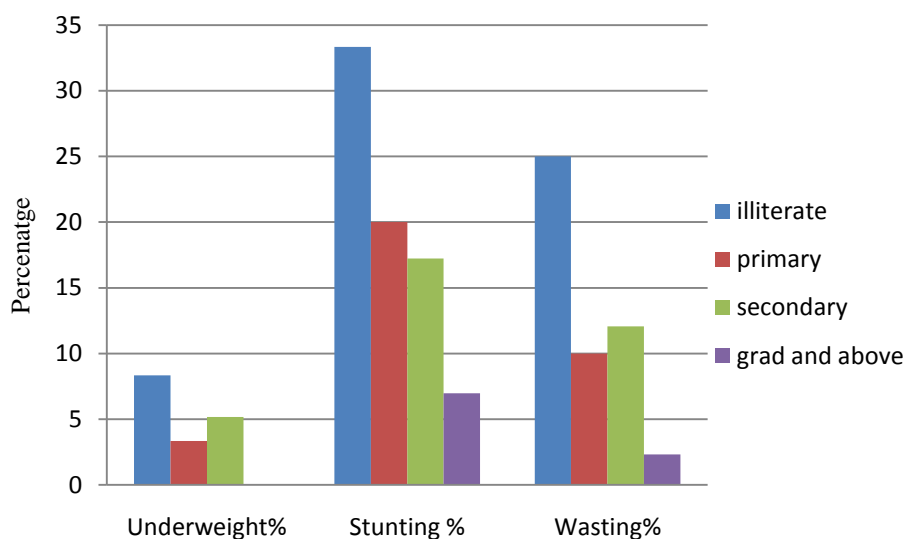


Table 8.1 and figure 8.1 shows the distribution of underweight, stunting and wasting in relation to house type among the boys of Mirik. The table shows that 40 lived in Kachcha house while 96 lived in pakka house. Among those living in Kachcha house, 10.00 percent were underweight, 30.00 percent were stunted and 17.50 percent were wasted. Among those living in pakka houses, 13.54 percent were underweight, 6.25 percent were stunted and 3.00 percent were wasted. The difference in the distribution were statistically significant ( $\chi^2 = 65.519$ ,  $df=2$ ,  $p<0.05$ )

Table 8.1: Distribution of underweight, stunting and wasting in relation to House type among the boys of Mirik

House Type	no. of samples	Underweight	stunting	Wasting
Kachcha	40	4(10.00%)	12(30.00%)	7(17.50%)
Pakka	96	13(13.54%)	6(6.25%)	14(3.00%)

$\chi^2 = 65.519$ ,  $df=2$ ,  $p<0.05$



Figure 8.1: Distribution of percentage of underweight, stunting and wasting in relation to house type among the boys of Mirik

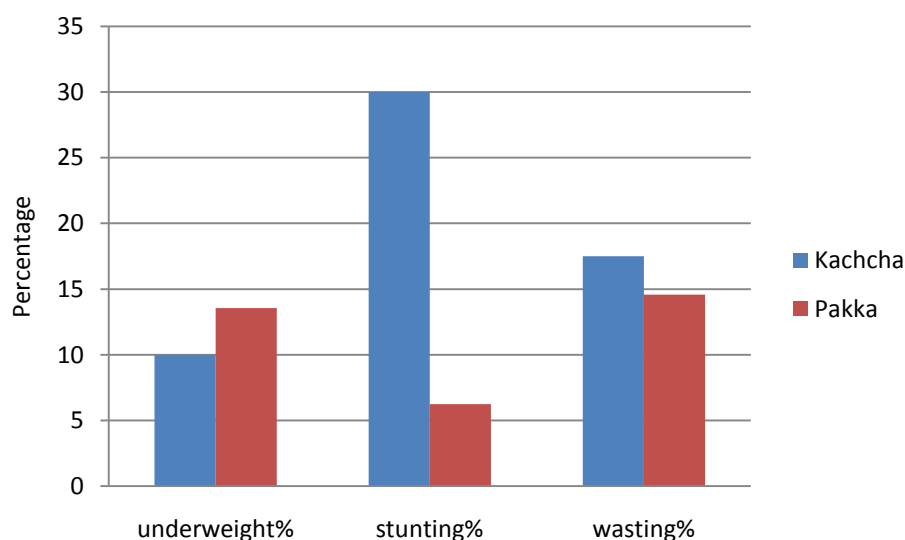


Table 8.2 and figure 8.2 shows the distribution of underweight, stunting and wasting in relation to house type among the girls of Mirik. The table shows that 46 lived in Kachcha house while 97 lived in pakka house. Among those living in Kachcha house, 6.52 percent were underweight, 28.26 percent were stunted and 19.57 percent were wasted. Among those living in pakka houses, 2.06 percent were underweight, 10.31 percent were stunted and 5.15 percent were wasted. The difference in the distribution were statistically insignificant ( $\chi^2 = 1.844$ ,  $df=2$ ,  $p>0.05$ )

Table 8.2: Distribution of underweight, stunting and wasting in relation to House type among the girls of Mirik

House Type	no. of samples	underweight	stunting	Wasting
Kachcha	46	3(6.52%)	13(28.26%)	9(19.57%)
Pakka	97	2(2.06%)	10(10.31%)	5(5.15%)

$\chi^2 = 1.844$ ,  $df=2$ ,  $p>0.05$

Figure 8.2: Distribution of percentage of underweight, stunting and wasting in relation to house type among the girls of Mirik

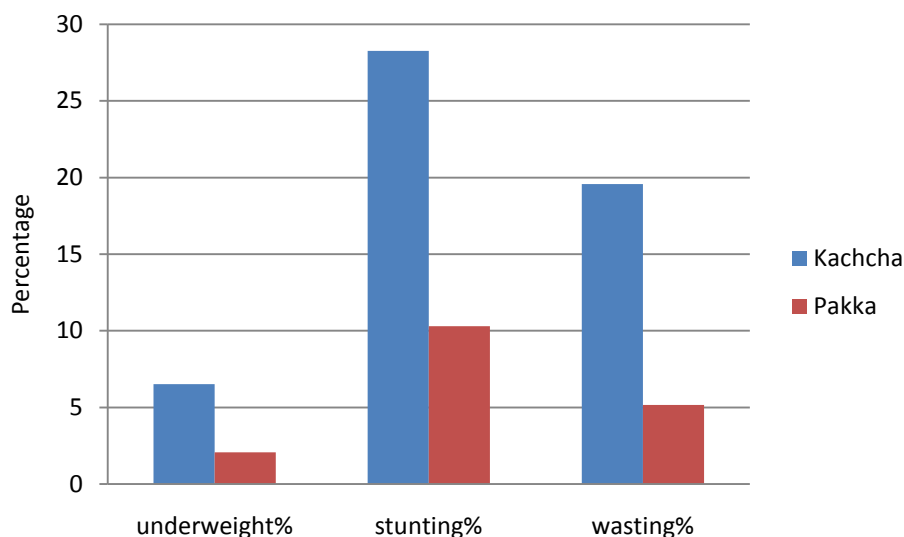


Table 9.1 and figure 9.1 shows the distribution of underweight, stunting and wasting in relation to the family size among the boys of Mirik. The table shows that 87 children had family members of less than or equal to four and 49 children had family members of greater than or equal to five. Among those with family members less than or equal to four, the percentage of underweight, stunting and wasting was 6.90 percent, 16.09 percent and 13.79 percent respectively. Among those children with a family size of greater than or equal to five, the percentage of underweight, stunting and wasting was 22.45 percent, 8.16 percent and 18.37 percent respectively. The differences in the distribution was statistically significant ( $\chi^2 = 55.184$ ,  $df=2$ ,  $p<0.05$ ).

Table 9.1: Distribution of underweight, stunting and wasting in relation to Family size among the boys of Mirik

Family Size	no. of samples	Underweight	Stunting	Wasting
$\leq 4$	87	6(6.90%)	14(16.09%)	12(13.79%)
$\geq 5$	49	11(22.45%)	4(8.16%)	9(18.37%)

$\chi^2 = 55.184$ ,  $df=2$ ,  $p<0.05$

Figure 9.1: Distribution of percentage of underweight, stunting and wasting in relation to Family size among the boys of Mirik

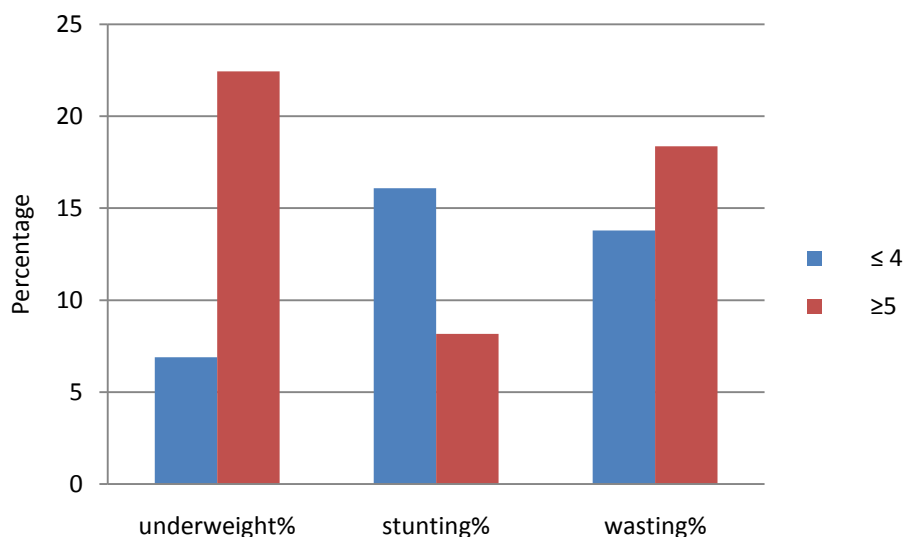


Table 9.2 and figure 9.2 shows the distribution of underweight, stunting and wasting in relation to the family size among the girls of Mirik. The table shows that 87 children had family members of less than or equal to four and 56 children had family members of greater than or equal to five. Among those with family members less than or equal to four, the percentage of underweight, stunting and wasting was 4.60 percent, 12.64 percent and 10.34 percent respectively. Among those children with a family size of greater than or equal to five, the percentage of underweight, stunting and wasting was 1.79 percent, 21.43 percent and 8.93 percent respectively. The differences in the distribution was statistically significant ( $\chi^2=13.80$ ,  $df=2$ ,  $p<0.05$ )

Table 9.2: Distribution of underweight, stunting and wasting in relation to Family size among the girls of Mirik

Family Size	no. of samples	underweight	Stunting	Wasting
≤ 4	87	4(4.60%)	11(12.64%)	9(10.34%)
≥5	56	1(1.79%)	12(21.43%)	5(8.93%)

$\chi^2=13.80$ ,  $df=2$ ,  $p<0.05$

Figure 9.2: Distribution of percentage of underweight, stunting and wasting in relation to Family size among the girls of Mirik

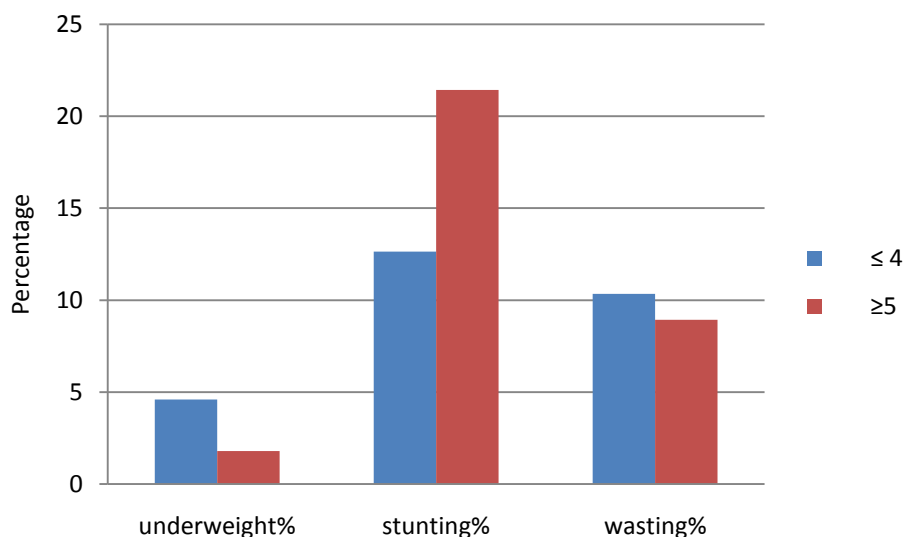


Table 10.1 and figure 10.1 shows the distribution of underweight, stunting and wasting in relation to sanitation among the boys of Mirik. The table shows that the percentage of underweight in average and good level of sanitation was 8.82 percent and 13.73 percent respectively. The percentage of stunting (32.35%) and wasting (20.59%) were higher in the children with average level of sanitation as compared to the children with better or good level of sanitation (stunting-6.86% and wasting-13.73%). The differences in the distribution of underweight, wasting and stunting were statistically significant ( $\chi^2 = 7.296$ ,  $df=2$ ,  $p < 0.05$ ).

Table 10.1: Distribution of Underweight, Stunting and Wasting in relation to Sanitation among the boys of Mirik

Sanitation	Number of samples	Underweight	Stunting	Wasting
Average	34	3(8.82%)	11(32.35%)	7(20.59%)
Good	102	14(13.73%)	7(6.86%)	14(13.73%)

$\chi^2 = 7.296$ ,  $df=2$ ,  $p < 0.05$

Figure 10.1: Distribution of Percentage of Underweight, Stunting and Wasting in relation to Sanitation among the boys of Mirik

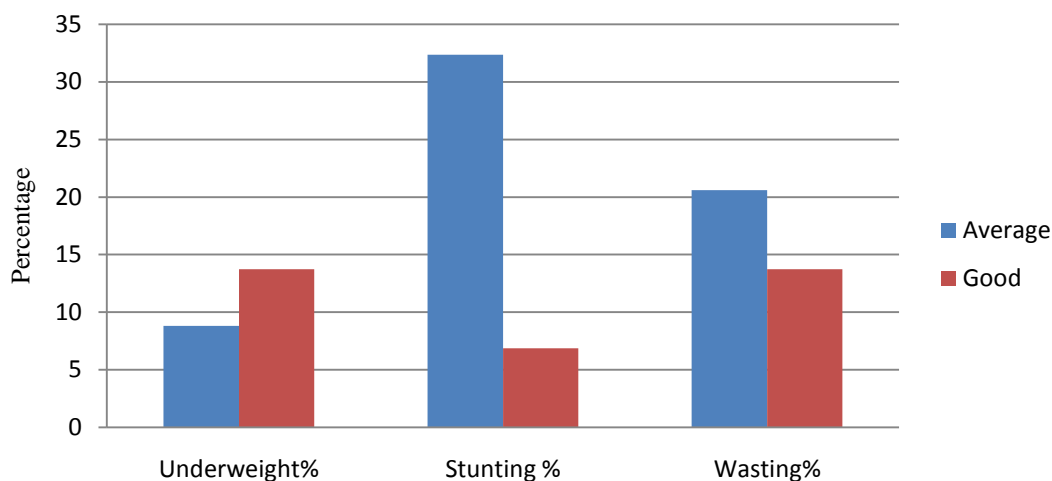


Table 10.2 and figure 10.2 shows the distribution of underweight, stunting and wasting in relation to sanitation among the girls of Mirik. The table shows that the percentage of underweight was higher in good level of sanitation (4.12%) than average sanitation (2.17%). The percentage of stunting (19.57%) and wasting (13.04%) were higher in the children with average level of sanitation as compared to the children with better or good level of sanitation (stunting-14.43% and wasting-8.25%). The differences in the distribution of underweight, wasting and stunting were statistically not significant ( $\chi^2=0.834$ ,  $df=2$ ,  $p>0.05$ ).

Table 10.2: Distribution of underweight, stunting and wasting in relation to sanitation among the girls of Mirik

Sanitation	Number of samples	Underweight	Stunting	Wasting
Average	46	1(2.17%)	9(19.57%)	6(13.04%)
Good	97	4(4.12%)	14(14.43%)	8(8.25%)

$\chi^2=1.969148$ ,  $df=2$ ,  $p>0.05$

Figure 10.2: Distribution of Percentage of Underweight, Stunting and Wasting in relation to Sanitation among the girls of Mirik

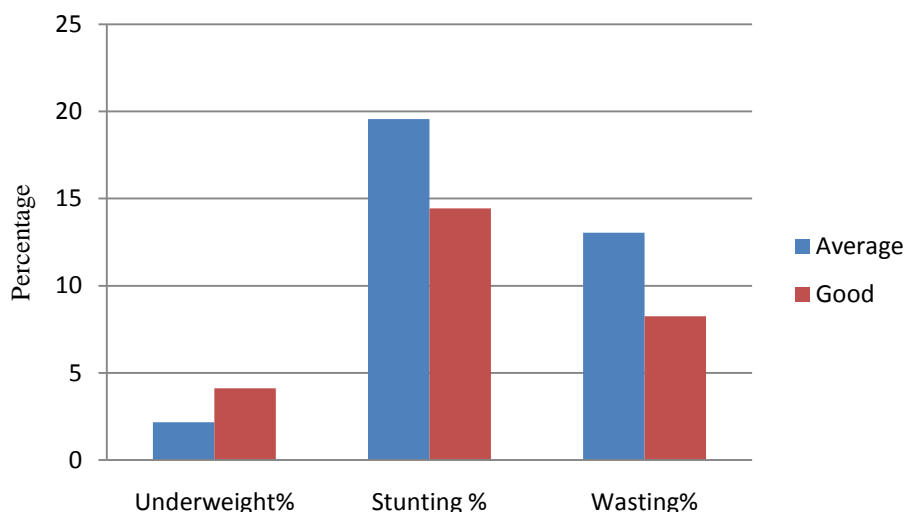


Table 11 and figure 11 show the distribution of underweight, stunting and wasting among both boys and girls in relation to infectious disease. The table and figure shows that the percentage of underweight, stunting and wasting among the boys who were affected with infectious disease was 5.56 percent, 33.33 percent and 16.67 percent, respectively. Among the girls affected by any infectious disease, the percentage of underweight, stunting and wasting was 9.52 percent, 28.57 percent and 14.29 percent, respectively. The differences in the distribution was statistically insignificant ( $\chi^2=0.571$ ,  $df=2$ ,  $p>0.05$ ).

Table 11: Distribution of underweight, stunting and wasting in relation to infectious diseases among boys and girls of Mirik

Affected by Infectious Disease	no. of samples	Underweight	Stunting	Wasting
Boys	18	1(5.56%)	6(33.33%)	3(16.67%)
Girls	21	2(9.52%)	6(28.57%)	3(14.29%)

$\chi^2=0.571$ ,  $df=2$ ,  $p>0.05$

Figure 11: Distribution of percentage of underweight, stunting and wasting in relation to infectious diseases among boys and girls of Mirik

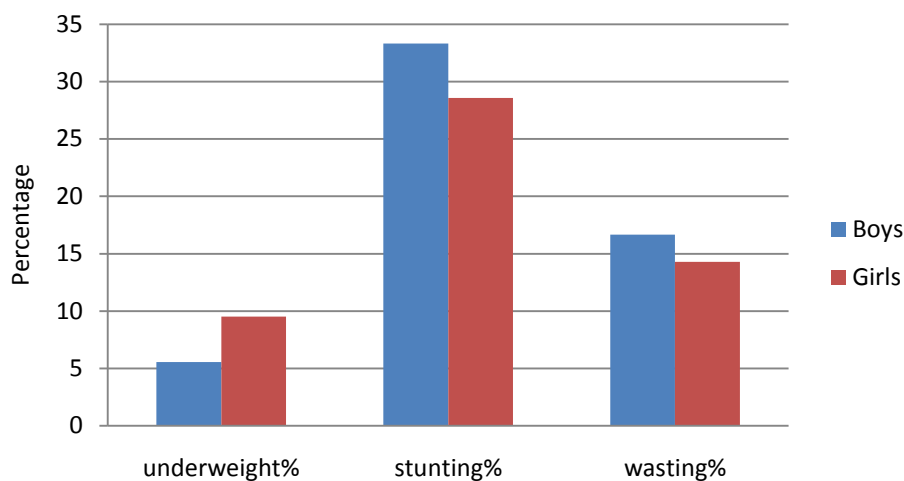


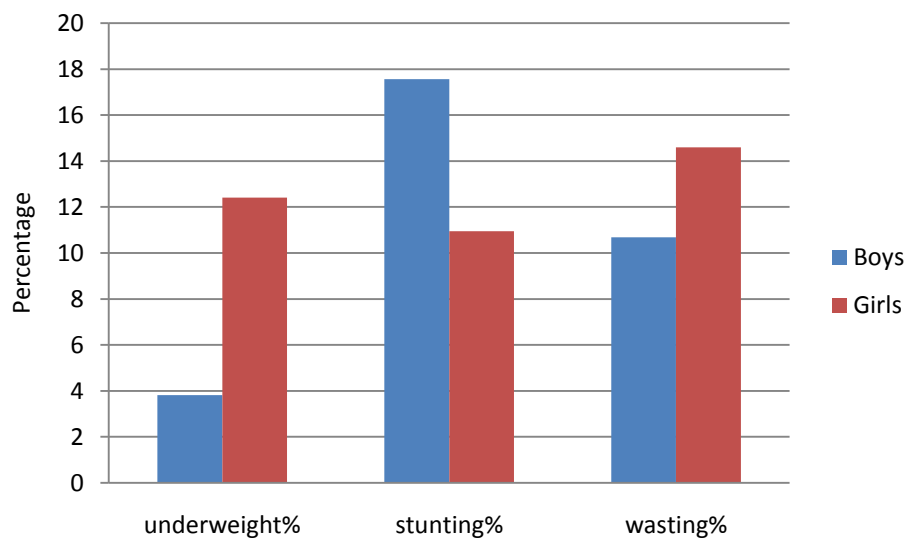
Table 12 and figure 12 shows the distribution of underweight, stunting and wasting in relation to full immunization among boys and girls of Mirik. The table shows that among the 131 boys who were fully immunized, the percentage of underweight, stunting and wasting was 3,82 percent, 17.56 percent and 10.69 percent respectively. Among the girls who were fully immunized, the percentage of underweight, stunting and wasting was 12.41 percent, 10.95 percent and 14.60 percent respectively. The differences in the distribution was statistically significant ( $\chi^2=122.004$ ,  $df=2$ ,  $p<0.05$ ).

Table 12: Distribution of underweight, stunting and wasting in relation to full immunization among boys and girls of Mirik

Category	full immunization	underweight	stunting	Wasting
Boys	131	5(3.82%)	23(17.56%)	14(10.69%)
Girls	137	17(12.41%)	15(10.95%)	20(14.60%)

$\chi^2=122.004$ ,  $df=2$ ,  $p<0.05$

Figure 12: Distribution of percentage of underweight, stunting and wasting in relation to full immunization among boys and girls of Mirik





## **CHAPTER V**

### **DISCUSSION**

Since the children today become adults in the future, the future of any community will depend on how the children are raised today. If the children are given proper nourishment and health care, they will have better physical and mental growth. Being in their growing stage, children are prone to diseases and infections, thus the children require a lot of energy input not just to meet their daily needs, but to fight against infections and diseases as well. The prevalence of malnutrition is very high in India with almost half of the world's undernourished population living in India alone (Krishnaswami 2000). The age of 5-10 years in children is vital in terms of nutritional significance, as this is the period where nutrients are built up not only for proper growth and maintenance of the body but also to prepare the body for the rapid adolescent growth (Singh 2014). This is also the period wherein the children are most vulnerable to infectious diseases (UNICEF 2012). Furthermore, children start to go to schools during this period, so any negative effect on their health as a result of malnutrition or any infectious diseases may hinder their ability to learn and think (Bundy et al. 2009). Socio-economic factors such as income, occupation and education are directly associated with the availability of food, quality of drinking water, health services and sanitation, which in turn are the underlying causes of malnutrition (UNICEF 1998). Although, the current situation of malnutrition is rapidly being checked and monitored and preventive measures are being taken all across the globe, but there is still a high prevalence of underweight, stunting and

wasting around the world, especially around the developing and underdeveloped nations.

The present research shows the nutritional status of the boys and girls of Mirik, Darjeeling. The distribution of underweight, stunting and wasting population in relation with various socio-economic conditions such as income, education, occupation, family size, type of house, as well as sanitation and infectious diseases. According to the present study, the mean height, mean weight and mean BMI of the boys and girls were almost the same, with that of the boys slightly higher than the girls. The study shows that while the percentage of underweight and wasting was higher among the boys as compared to the girls, the prevalence of underweight, stunting and wasting was considerably high among both boys and girls. Among all age groups, children are the most vulnerable to malnutrition owing to the high nutritional requirements for their body growth and development (Bogin 1997). In addition to this, low dietary intakes, inequitable distribution of food within the household, improper food storage and preparation, infectious disease and inadequate care also increases their vulnerability (Grima and Genebo 2002). Kennedy et al. (2006) in his studies in China, Egypt and Mexico found that stunting was a major health problem in children, although there was a significant decrease in the prevalence of underweight and wasting. Studies by Galgamuwa et al. (2017) among pre-school and school going children of Sri Lankan rural community showed high prevalence of underweight, stunting and wasting. Similar studies carried out by various scholars across different nations such as Li et al. (2009) in China, Kelishadi et al. (2008) in Iran, Jinabhai et al. (2003) in South Africa and Hakeem (2001) in Karachi, Pakistan have also reported high prevalence of stunting, wasting and underweight in their

studies. Studies among the Meitei children by Singh and Devi (2013) and among the children of Darjeeling by Dey et al. (2011) also show high prevalence of malnutrition. The present study shows that in case of boys, the percentage of underweight, stunting and wasting was higher among the Limboo community as compared to the Tamang community, while in girls, the percentage of underweight and wasting was higher among the Tamang community. In case of religion, among the boys, the higher prevalence of underweight, stunting and wasting was seen among the Hindu population, as compared to the non-Hindu population. However, in girls, greater percentage of underweight, stunting and wasting was seen among the non-Hindu population. Variations can be seen with respect to malnutrition among different communities and religion as a result of difference in their lifestyles and dietary patterns. In the present study, it could be seen that both communities had their own taboos in case of eating of meat of different animals, and the same could be seen among the different religions as well.

Income, occupation and educational status are important factors explaining the nutritional status of an individual. The income and occupation of the parents have a direct impact on the quality of lifestyle that the family can afford, like better quality food and better health care facilities. On comparison with those with higher income, those with lower income were more likely to be under-nourished (Grima and Genebo 2002). The present study is consistent with the above studies, and it was seen that among both boys and girls, the highest prevalence of underweight and stunting was seen among the lower income group. The prevalence of wasting and stunting has been observed to be higher among the poor households (Laguna 2015) or among family with low monthly income (Galgamuwa et al. 2017; Hakim 2001; Groeneveld et al.

2007). Since they find it difficult to provide adequate nutritious foods to the family, they are most associated with inadequate diet and diseases, ultimately leading to malnutrition (Black et al. 2008). In relation to occupation, higher prevalence of stunting, wasting and underweight was seen among the tea garden workers, farmers, and people engaged in small business like shops. Tea gardens in Mirik occupy a large portion of the land and the factories employ a huge population of workers. A large number of people in Mirik work in tea garden, with many of them working as laborers in tea factories, and others engaged in plucking of tea leaves and maintenance of the plants. Many of them are also farmers and are engaged in cultivation, mostly oranges, ginger and vegetables. However, these people engaged as tea garden workers and farmers, are those who have a very low salary or income. The pay given by the tea company is very less, and is hardly sufficient to meet the needs of the family. In case of farming, the production being low and rapidly declining, the earnings are very low as well. With their low income, they find it difficult to take better care of their family in terms of food or health care. Thus, there is high prevalence of malnutrition among their children. The present study conducted among the children of Mirik shows similar results to the study among the children of tea garden workers of Assam, who were also found to have a high prevalence of wasting, underweight and stunting (Medhi et al. 2006). Hakeem (2001) in his study among the children of Karachi, found that underweight was more prevalent among the lower income group. Groeneveld et al. (2007) found similar results in his study of nutritional status among the children in Guatemala, where the prevalence of stunting was higher in children with lower socio-economic conditions. Pelletier et al. (1995) and Kumar et al. (2011)

in their studies have also observed that children living in poor conditions suffer from greater risks of malnutrition.

The education of the parents plays a vital role in any community. It can be seen that as a result of illiteracy and less education, the awareness about nutrition, dietary habits, sanitation may be low, which will have a direct impact on the nutritional status of the children. People with no schooling or with only low level of education will face difficulties in getting better jobs with good salary, directly affecting the income of the family and thus the quality of life they lead will be affected. The present study shows that there was higher percentage of underweight, stunting and wasting among those children whose parents were illiterate or had attained only primary level of education. Kassauf and Senauer (1996), in their study found that the prevalence of malnutrition was more widespread among children whose parents had little or no education. Similar results were observed among the Santhals of Birbhum district of West Bengal where a high percentage of the children, whose parents were illiterate, were found to be malnourished (Sain 1994). A report by Indian Family Health Survey (NFHS-2 1999), states that children whose mothers are illiterate are more likely to be malnourished. Study by Gupta et al. (1991), among severely malnourished children of Nizamuddin busty showed strong relation between the nutritional status of the children and the educational level of the mothers.

In both boys and girls, those children living in kachcha houses had higher prevalence of underweight, wasting and stunting, as compared to those living in Pakka houses. Greater percentage of underweight and wasting in boys and greater percentage of stunting in girls was seen in family with members greater than or equal to five. The number of people in a family is directly proportional to the amount of food required to

feed, so larger families will mean it will be difficult to provide proper nutritious food to the children. Also, it will be hard for the parents to provide proper health care to the children. The greater number of children is mainly due to short birth intervals, which not only hampers the health of the mother, but the health of the children is adversely affected too. With more children, the care that can be given to each child by the parents will be less, with the younger sibling given more care. The number of members in a family is directly associated with the amount of food that can be given to each individual. The greater the family size the lesser is the food intake per individual, especially in families from low socio-economic conditions (Ajao et al. 2010). It is seen that the family size has a negative impact on the child's growth and large household size has been regarded as a risk factor for malnutrition in children (Pelto et al. 1991).

Greater percentage of stunting and wasting was observed among both boys and girls who did not have proper sanitation and hygienic practices. Sanitation and hygiene are the pre-requisites in maintaining good health and poor sanitation and hygiene is one of the main causes of the acquiring of infectious diseases, which further leads to malnutrition among the children. The lack of basic hygiene behavior and poor sanitation has been associated with poor nutritional status and higher incidence of infectious diseases in young children (Hakim et al. 2015; Park 2007). Unsafe water, inadequate sanitation and hygiene have been associated with more than fifty percent of the malnutrition in children and are one of the leading causes of child deaths across the globe (WHO 2016). Boys affected with infectious disease were seen to have a greater prevalence of stunting and wasting as compared to the girls. Among the

children fully immunized, greater prevalence of underweight and stunting was found among girls, while greater prevalence of stunting was found among the boys.

The study had some limitations as well. Firstly, data on dietary habits was not collected as the people from the community were affected by 104 days of strike due to which, irregular patterns of diet was followed by the people. Thus, the data would be inconsequential to my research.

Secondly, the data on infectious diseases was collected using the one week recall method, but in my research there were many cases when the children were affected by a disease before two weeks or more.

## **CHAPTER VI**

### **CONCLUSION**

In conclusion, the present study among the children of Mirik shows that the prevalence of underweight, stunting and wasting is greatly influenced by various socio-economic factors such as family income, occupation, education of parents, family size and type of house. Sanitation and hygiene also played an important factor in influencing the health of the children and thus the prevalence of underweight, stunting and underweight is also influenced by it. It was observed from the present study that the prevalence of malnutrition was considerably high among the children.

The present study showed that the mean height, mean weight and mean BMI of the boys and girls were almost the same, with boys little higher than the girls. The percentage of underweight and wasting was seen to be higher among the boys as compared to the girls. This could be due to the lack of inadequate medical facilities, low level of income of the people, lack of education and less awareness about good sanitation and hygiene.

According to the present study, the percentage of underweight, stunting and wasting was higher among the Limboo boys as compared to the Tamang boys. However, the percentage of underweight and wasting was higher among the Tamang girls. In case of religion, it was observed among the boys that there was higher prevalence of underweight, stunting and wasting among the Hindu population, as compared to the non-Hindu population. In case of the girls, greater percentage of underweight, stunting and wasting was seen among the non-Hindu population. Difference in dietary



habits, lifestyles and differences in food taboos in different communities as well as different religion could be associated to the variation in their nutritional status.

The present study shows that the highest prevalence of underweight and stunting was seen among the lower income group in both boys and girls of different communities. In relation to occupation, higher prevalence of stunting, wasting and underweight was seen among the tea garden workers, farmers, and people engaged in small business. It was seen that a large number of people from the lower income group were farmers or tea garden workers. Their low income being inadequate to provide quality food and better health care, prevalence of malnutrition was higher.

The present study shows that there was higher percentage of underweight, stunting and wasting among those children whose parents were illiterate or had attained only primary level of education. Illiteracy or low education level has resulted in lack of awareness about health and dietary habits, which in turn has resulted in the prevalence of higher malnutrition among the children of Mirik. In both boys and girls, those children living in kachcha houses had higher prevalence of underweight, wasting and stunting, as compared to those living in Pakka houses. People living in kachcha houses had poor living and sanitary conditions, which had a negative impact on the health of the children. Greater percentage of underweight and wasting in boys and greater percentage of stunting in girls was seen in family with members greater than or equal to five. It was seen that greater family size meant lesser amount of food available per head, and less amount of care could be given to each child.

Higher percentage of stunting and wasting was observed in both the sexes with poor sanitation and hygienic practices. Boys affected with infectious disease were seen to have a greater prevalence of stunting and wasting as compared to the girls. Girls show

the higher prevalence of underweight and stunting than boys in both the communities who are fully immunized. However, boys show higher frequency of stunting in both the communities who are fully immunized. Poor sanitation and hygiene has a direct impact on the health of the child, leading to underweight, wasting and stunting among the children.

In conclusion, the present study focused on the prevalence of malnutrition among the children of Mirik, which was found to be high in both the sexes. The study also showed strong relation between malnutrition and various socio-economic factors in both boys and girls of Limboo and Tamang communities. The study further showed that there was strong association between health and sanitation and immunization. It was seen that there is a great need for spreading of awareness about the causes and consequences of malnutrition and the importance of socio-economic factors in maintaining the health of a child.

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