Chapter V

Discussions
5.

DISCUSSION

According to Cora et al (2010), school age children around the global suffer from micronutrient deficiencies and malnutrition. Nutritional deprivation during the school-aged years can further constrain the physical and cognitive development of school children, possibly limiting their educational achievement and attenuating the impact of educational interventions for social development. Malnutrition during the school aged years may even directly and indirectly compromise the health and survival of the future generation, as malnourished children approach adolescence and their reproductive years in a nutritionally and educationally disadvantaged position. Yet, school-aged children are not commonly included in health and nutritional surveys. An up to date overview of their nutritional status across the world is not available. Most of the research focuses on malnutrition in young children under 5 years of age. So in the present study, an attempt was made to assess the nutritional status of school going children in the age-group 6-12 years in rural areas of Aligarh district and the associated socio-demographic characteristics related to children. The findings of the present study have been discussed under the following headings in the light of relevant review of literature:

5.1. Nutritional status of school-going children

5.2. Socio-demographic factors associated with nutritional status of school-going children

5.3. Energy and protein consumption pattern of school-going children

5.4. Prevalence of clinical signs of nutritional deficiency disorders
5.1. Nutritional Status of School-Going Children

In the present study, nutritional status of school-going children was determined on the basis of two anthropometric indices—heights for age and BMI for age, using WHO z score system. Height for age z score (HAZ) and BMI for age z-score (BAZ) were calculated with the help of WHO anthro-plus software.

**Height for Age (HAZ):** According to Martorella et al (1992) stunting (low height for age) is associated with long term consequences, such as impaired intellectual achievement and school performance and also leads to reduction in adult body size and, subsequently, reduced work capacity and obstetric complications. Regarding the classification of height for age (WHO, 2007 standards) 40.3% of school going children were found stunted and 27.7% were severely stunted in the present study. The overall prevalence of stunting (stunted + severely stunted) among children was 68%. The prevalence of stunting was found to be higher than the study conducted by Saluja et al (2010), which reported that 43.8% children of primary school age were stunted in the Meerut city of Uttar Pradesh. Another study done in rural areas of Maharashtra by Patil and Wasnik (2009) showed the lower prevalence of stunting i.e. 30.3% than the present study (68%). In the present study, only 32% of school-going children were found in the normal category of height for age. Mekonnen et al (2013), reported in their study on malnutrition and its correlates among rural primary school children of Fogera district that, the overall prevalence of stunting was 30.7% and 0.6% of the students were severely stunted.

**BMI for Age (BAZ):** As mentioned in WHO tech rep ser 854 (1995), thinness (low body mass index [BMI] for age in school aged children can result in delayed maturation, deficiencies in muscular strength and work
capacity and reduced bone density later in life. The classification of BMI for age (WHO, 2007 standards) of school going children showed that 49.7% and 29.7% were found in the categories of thinness and severe thinness respectively. The overall prevalence of thinness (thin + severely thin) was 79.4% among the children.

The findings of the present study showed the higher prevalence of thinness than the studies conducted by Chakraborty et al (2009) i.e. 62.2% and Srivastava et al (2012) i.e. 33.3% in the West Bengal and Uttar Pradesh respectively. It was revealed in the study conducted by Mekonnen et al (2013) that the overall prevalence of thinness among rural primary school children of Fogera district was 37.2% (which was much lower than the present study) and only 6.5% of children were found severely thin in their study.

5.2 Socio-Demographic Factors Associated with Nutritional Status of School Going Children

According to Babar et al (2010), nutritional problems are not just medical problems rather they have roots in many sectors of development such as economy, education etc. Malnutrition is caused by a number of intervening factors that form a web of causation and enhance each other’s effect. It is largely the by product of poverty, insufficient education, ignorance, low income, large family size, occupation etc. In the present study the effect of various socio-demographic factors, like age of the child, gender, parents education, fathers occupation, mothers’ working status, family type, number of siblings and socio-economic status of the family on nutritional status of school going children was determined. The discussion on these related factors to nutritional status of children of school age have been presented as follows:
Age of the Children: In the present study majority (32.3%) of children were found in the age group 6-7 years and only 6.3% children were in the age group 11-12 years. In regard of height for age, the highest prevalence of stunting (68.5%) was observed in the age group 6-7 years and lowest prevalence (13.2%) was found in the age group 11-12 years. The study conducted by Srivastava et al (2012), showed that prevalence of stunting was highest in the age group 5-6 years. According to Srivastava et al (2012), nutritional status was positively correlated to age, indicating poor nutritional status of young children whereas the result of the present study showed the insignificant association (p>0.05) between age group and height for age of school going children. Mushtaque et al (2011), observed that stunting among children aged 5-6 years and 7-8 years was significantly lower as compared to children aged 9-10 years and 11-12 years. In regard of association between age-group and BMI for age of school going children, the highest prevalence (75.8%) of thinness was observed in the age group 6-7 years and lowest 8.8% in the age group 11-12 years. In the study conducted by Mushtaque et al (2011), children aged 5-6 years (11%) and 7-8 years (8%) were significantly less likely to be thin as compared to children aged 9-10 years (9%) and 11-12 years (17%). The findings of the present study indicated the significant association (P<0.01) between age group and BMI for age of school going children. According to Subal et al (2012), children of all ages were very thin and they were in very critical position with respect to their nutritional status was concerned. Chesire et al (2008), reported in their study that children who were over nine years of age were more underweight (72.4%) and stunted (77.2%) than those below eight years. In regard of BMI for age, Mushtaque et al (2011), found that children aged 5-6 years and 7-8 years were significantly less likely to be thin as compared to children aged 9-10 years and 11-12 years.
Gender: The proportions of male and female school-going children in the present study were 52.6% and 47.4% respectively. In regard of height for age, the prevalence of overall stunting was higher (75.9%) among females and the rate of normal children for height for age was higher (31%) among male children than female (24.1%). This study did not find any significant relationship between gender and nutritional status i.e. height for age of school going children (p>0.05). The similar study was done by Khalil and Khan (2004) in which stunting was observed in 79.73% of boys and 81.80% of girls. In another study conducted by Saluja et al (2010), prevalence of stunting was higher (46.0%) among girls than boys (41.8%).

The association between BMI for age and gender of school going children showed that there was higher prevalence of thinness (86.1%) among female children than male children (73.4%) of school going age group and the rate of normal children for BMI for age was higher among male children (26.6%) than female children (13.9%). There was significant association (p<0.01) between gender and BMI for age of school going children. Contrary to the findings of present study, Anjum et al (2012), found the higher prevalence of overall thinness among males (31.9%) than females (26.2%). Kaushik et al (2008), also observed the similar pattern for thinness among male and female children i.e. 27.8% and 19.4% respectively. In support of the findings of present study, Bhoite and lyer (2011), reported that stunting was more prevalent among girls than boys but it was different in case of thinness as they found that thinness was more in boys than girls. Contrary to the findings of present study, prevalence of thinness was more in boys (77.6%) than girls (76.4%) in the study conducted by Subal et al (2012).
Mandot et al (2009), supported the findings of present study, in regard of stunting as the rate of stunting was higher among girls (i.e. 46.9%) than boys (i.e. 44%), in regard of thinness, the contrary findings were revealed as prevalence of thinness was higher among boys (69.7%) than girls (59.3%). Patil and Wasnik (2009), observed the similar trend for stunting (boys=30.4%; girls=30.1%) and thinness (boys = 16.9%; girls = 16.6%) among both the sexes. Srivastava et al (2012), and Mian et al (2002) reported no significant association between gender and nutritional status of children. Gender disparity in stunting and thinness was also found insignificant by Mushtaque et al (2011).

Father’s Education Level: Majority i.e. 50% of children were having fathers who were literate. The proportions of illiterate and primary educated fathers were 24.3% and 25.7% respectively. The overall prevalence of stunting was higher (77.8%) among the children of primary educated fathers. Babar et al (2010), stated that paternal literacy level was indirectly associated with child nutritional status. Fathers may be important because he plays more active role in certain health seeking decisions and household income, in our social setup. In the present study insignificant association (p>0.05) was observed between father’s education level and nutritional status (height of age) of school going children.

In regard of BMI for age, the highest prevalence of thinness (80%) was observed among the children who had illiterate fathers’ and maximum percentage (27.4%) of normal children for BMI for age was found among children whose fathers were literate. The findings revealed the significant association (p<0.01) between fathers’ education level and nutritional status i.e. BMI for age of school going children. The same trend was observed by Rahman et al (2009) that fathers’ education was an
important determinant and has a positive impact on child health and nutritional status. Higher level of fathers' education plays an important role to ensure better nutritional status of children. On the other hand Mukherjee et al (2007) reported that fathers' education was not significantly associated with any of three indices of malnutrition i.e. stunting, wasting and underweight.

Mothers' Education Level: As stated by Smith and Haddad (2000), mothers' education level within the same social class is a key determinant of their children's health. A high level of maternal education could lower childhood malnutrition. In the present study the proportions of children who were having illiterate, literate and primary educated mothers were-46.0%, 35.1% and 18.9% respectively. In regard of height for age, it was found that stunting was more prevalent among children (78.9%) who were having illiterate mothers and there was highly significant (p<0.01) association between height for age and education level of mothers. The similar findings were revealed in the study conducted by Kaushik et al (2012), in which it was stated that educational status of mothers have a significant association with nutritional status of children. According to Ejekwu et al (2012), stunting was significantly associated with mother's education.

In the present study, the association between maternal education level and BMI for age showed that majority i.e. 93.2% children were found thin who were having illiterate mothers. Maximum percentage (69.7%) of normal children was observed among those who were having mothers with primary education. It was found in the study conducted by Babar et al (2010) that BMI values were negatively correlated of mother's education. According to Joshi et al (2011), more than 68% of mothers of malnourished children were illiterate compared to 56% of
normal children. The present study showed the significant association (p<0.01) between maternal education level and BMI for age. Mukherjee et al (2008) observed the similar trend that mothers’ education has a strong independent effect on a child’s nutritional status. It was reported by Srivastava et al (2012), that the risk of malnutrition was significantly higher among children whose mothers education was less than or equal to 6th standard.

**Fathers’ Occupation:** Concerning the occupation of fathers, out of total 350 school-going children, 36.6% of them were having the fathers who were skilled workers and majority i.e. 63.4% of children were having the fathers who were unskilled workers. The relationship between fathers’ occupation and nutritional status i.e. height for age showed that there was higher prevalence of stunting (i.e. 77%) among school going children whose fathers were unskilled workers. In regard of fathers’ occupation and BMI for age of school going children, it was found in the present study that, 93.3% (majority) children were thin whose fathers were unskilled workers. The significant association was observed between fathers’ occupation and nutritional status (i.e. height for age and BMI for age) of school going children (p<0.01). From the existing evidences (Vella et al, 1992 and Pelletier et al 1993), it is clear that childhood malnutrition is associated with a number of socio-economic and environmental characteristics, parents occupation was one of them. The similar finding were observed by Badrialaily (2008), which indicated that fathers occupation was had significant association with nutritional status of elementary school children in Banda Aceh municipality, Indonesia. Nabag (2011) also stated that fathers’ profession was the most important determinant of children’s nutritional status.
Family Type: In regard of the family type, 60% of children (maximum percentage) belonged to joint families and 36.4% (maximum percentage) children were in the normal grade of height for age who belonged to nuclear families. Concerning about the association between family type and BMI for age, it was found that there was 94.8% prevalence (highest) of thinness among the children who belonged to joint families. The statistical significant association was seen between the family type and nutritional status (HAZ and BAZ) of school going children.

Vazir et al (1998) also stated that small family size was the significant factor for positive development as nuclear families were significantly related to better nutritional status. Contrary to the findings of present study, Devi et al (1999), showed that family type was not related to the child’s physical development. According to Ejekwu et al (2012), significant association was found between stunting and household size. In support of present study, Srivastava et al (2012), revealed that the risk of malnutrition was significantly higher among children living in joint families. Similar tread was observed by Batool et al (2012), which explains that large family size seem to be associated with poor health status of primary school-children. According to Mian et al (2012), malnutrition was more commonly observed in large families.

Mothers Working Status: In the present study, majority i.e. 63.7% of children were having the non working mothers. In regard of mothers working status and height for age of school going children, it was found that majority (77.1%) of children of non-working mothers were stunted and maximum children (36.2%) were found in the normal grade of height for age whose mothers were engaged in income generating activities (working mothers). The association between mothers working status and BMI for age, the higher prevalence of thinness (91.9%) was observed.
among the children of non working mothers. The highly significant association was established between the mothers working status and nutritional status (i.e. HAZ and BAZ) of school going children (p<0.01). According to Joshi et al (2011), occupation of mothers was found to have highly significant association with malnutrition among children. Contrary to the findings of present study, Badrialaily (2008) showed that mothers' occupation had no association with nutritional status of elementary school children in Banda Aceh Municipality of Indonesia. According to Strivastava et al (2012), the risk of malnutrition was significantly higher among children of working mothers. Contrary to the findings of present study, Mukherjee et al (2008), reported no significant relationship between the working status of mothers and presence of malnutrition in their children.

**Number of Siblings:** It was found in the present study that majority (58.6%) of the school going children were having more than 3 siblings. The association between numbers of siblings with height for age of school going children indicated the higher prevalence (77.1%) of stunting among the children who were having more than three siblings. On the other hand, 34.5% (majority) children were under the normal category of height for age who were having less than or equal to three siblings in the family. Statistically there was significant association between the number of siblings and nutritional status i.e. height for age of school going children (p<0.01). In regard of number of siblings and BMI for age, majority (93.1%) of children who were having more than three siblings, were under the category of thinness (thin+ severely thin). Majority (40%) of children were found under the normal category of BMI for age, who were having less than or equal to three siblings. The statistically significant association was seen between number of siblings and BMI for
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age of school-going children (p<0.01). The similar pattern of stunting and thinness was observed by Mushtaq et al (2011) as stunting was significantly higher (12%) among the children having more than three siblings and it was lowest (4%) among children having no sibling. In case of thinness, he found that children having more siblings were significantly more likely to be thin. Data from NFHS II (2000) also indicated that children with three or more older siblings were more likely to suffer chronic malnutrition. In support of the findings of present study, Kumari et al (2007) stated that in families with more number of children, less attention was paid for the fulfillment of nutritional requirements of the children. Families with single child had the highest percentage of normal children and with an increase in the family size, a significant decrease in the percentage of normal children was observed. The severity of malnutrition increased with an increase in the number of children in the family.

Social Class: Concerning the social class of school going children, the proportion of children belonging to lower middle and upper middle social class was 60.3% and 39.7% respectively. In regard of social class and height for age, majority of children (77.7%) from lower middle social class were found stunted and maximum percentage i.e. 36% of children from upper middle social class were under the normal category of height for age. Social class and height for age of school going children were significantly associated (p<0.01). The association between social class and BMI for age highlighted the higher prevalence (92.4%) of thinness among children who belonged to lower middle social class and very less percentage i.e. 7.6% of children from lower middle social class were found under the normal category of BMI for age. Significant association was observed between social class and BMI for age among school going
children \((p<0.01)\). Sherriff et al (2000), reported the higher prevalence of stunting and wasting among school children belonged to low-income households. According to Mushtaque et al (2011), rural and urban children with low socio-economic status had significantly higher risk of being stunted and thin than urban children with middle or higher socio-economic status. In support of the findings of present study, Babar et al (2010), stated that among children from upper socio-economic class, very less percentage \((19.28\%)\) were found under the category of low BMI for age. According to Mukherjee et al (2008), socio-economic status was one of the important determinants of nutritional status of children. Joshi et al (2011) also found that monthly per capita income was significantly associated with malnutrition among children. Chesire et al (2008), also supported the findings of present study as monthly household income was found to be the significant factor of nutritional status of the children. Kumari (2007) reported that the higher the economic status, the lower the percentage of malnutrition. Significant association was observed between stunting and family income by Ejekwu et al (2012).

5.3 Energy and Protein Consumption Pattern of School Going Children

In regard of energy and protein consumption pattern of school-going children, majority of children were having inadequate energy \((62\%)\) and protein \((72\%)\) consumption pattern. On the other hand, 38\% and 28\% children were found under the category of adequate energy and protein consumption pattern respectively. The findings of Mehrotra et al (2011), highlighted that the diet of 20\% rural children were deficient in protein than the recommended dietary allowances, on the other hand energy deficiency was exhibited by 54\% of rural respondents.
In contrast to the findings of present study, Oldewage (2010) revealed that there was deficient intake of all the nutrients except for protein, carbohydrates and thiamine among primary school children in Qwa-Qwa. In support of the findings of present study, Prabhakar (2011), revealed that the percentage of adequacy in energy and protein intake was belong the respective RDAs. Sankhla et al (2004), also found that there was highly inadequate energy and protein intake than RDA among the children of Udaipur district of Rajasthan. Kulsum et al (2008), revealed in their study that only 22% of children consumed diets adequate in protein and energy. The study of Sati and Dahiya (2012), reported that the intake of all the nutrients including energy except protein was significantly lower than the recommended dietary allowance.

The associations between energy consumption pattern and nutritional status of school going children showed the higher prevalence of stunting (41.5%) and severe stunting (39.6%) among the children whose energy consumption pattern was inadequate. Similarly, in case of BMI for age, majority of children (50.7%) were found thin and severely thin (42.4%) who were having inadequate pattern of energy consumption. In case of protein consumption pattern and nutritional status of children, it was found in the study that majority of children were severely stunted (40.1%) who were having inadequate pattern of protein consumption. The overall prevalence of stunting was low (58.1%) among the children who were having adequate pattern of protein consumption. In regard of B.M.I. for age, highest prevalence of thinness (54%) and server thinness (40.5%) was found among the children who were having inadequate pattern of protein consumption. Statistically significant association was observed between nutritional status and energy and protein consumption pattern of school going children. Chesire et al (2008), revealed that 24-hr dietary
recall did not have significant influence on the nutritional status of the children, whereas in the present study, there was significant association between energy/protein consumption pattern and nutritional status of children. In the present study, various factors like age group of children, gender, social class, type of family, mothers’ education level and maternal working status were found to be significantly associated with energy and protein consumption pattern of school-going children. In regard of age group and energy and protein consumption pattern, it was found that majority of children (69%) in the age group 6-7 years were having inadequate energy consumption pattern. On the other hand highest percentage i.e. 78.6% of children in the age group 9-10 years were having inadequate protein consumption pattern. In case of gender and energy and protein consumption pattern, majority (43.5%) of boys were having adequate pattern of energy consumption and highest percentage (78.9%) of girls were having inadequate pattern of protein consumption. Similar findings were revealed by Sahoo and Pal (2006) as dietary intake among the tribal girls was very poor in comparison to recommended dietary allowances. In support of the finding of the present study, Mitra et al (2006), observed that both boys and girls consumed lower amount of energy and protein than the recommended dietary allowances in all the age groups, whereas boys consumed marginally higher energy than girls in all age group. In case of protein consumption, they found that girls consumed higher amount of protein compared to boys in 4-6 years of age-group but less in 7-9 years and 10-12 years age groups. The relationship between social class and energy and protein consumption of school going children showed that majority of children (57.6%) from upper middle social class were having adequate pattern of energy consumption. On the other hand, highest percentage (82.9%) of children from lower middle class were having inadequate pattern of protein consumption. In regard of
association between family type and energy and protein consumption pattern, 72.4% (majority) of children from joint families were having inadequate energy consumption pattern and less percentage i.e. 51.4% of children from nuclear families were having inadequate pattern of protein consumption. The relationship between mothers’ education level and energy and protein consumption pattern of children showed that majority (82.6%) of children of illiterate mothers were having adequate pattern of energy consumption and in case of protein consumption pattern, highest percentage i.e. 87% of children of illiterate mothers were having inadequate pattern of protein consumption. In regard of maternal working status and energy and protein consumption pattern, majority (71.7%) of children of non working mothers were having inadequate pattern of energy consumption. On the other hand, very less percentage i.e. 16.1% of children of non working mothers were having adequate protein consumption pattern. The similar trend was observed by Kulsum et al (2008) as protein calorie adequacy was significantly influenced by literacy or economic status of mothers. In the present study, statistically significant associations of gender, social class, family type, mothers’ education level and working status of mother with energy and protein consumption pattern of school going children were observed. Age group of children and energy and protein consumption pattern was insignificantly associated.

5.4 Prevalence of Clinical Signs of Nutritional Deficiency Disorders

In the present study, there was 28% prevalence of thin and lusterless hair, 5.7% Bitot spots, 6.3% night blindness, 29.4% pale conjunctiva, 17.4% koilonychia, 8.0% Glossitis, 6.0% cheilosis and 15.1% bleeding gums among 350 school going children. It was surprising
to mention that no case of goiter was found during the course of study. It was further revealed in the study that prevalence of thin and lusterless hair (28.8%), Bitot spot (6.5%), pale conjunctiva (29.9%), Glossitis (9.8%), Cheilosis (8.2%) and Bleeding Gums (17.4%) was higher among boys than girls. On the other hand, night blindness (7.4%) and koilonychias (18.7%) were more prevalent among girls than boys. The similar trend for vitamin A deficiency was observed by Khan and Mahmood (2012) as there was 6.37% prevalence of Vitamin A deficiency among school children of Bareilly. In their study, prevalence of VAD was slightly higher among boys as compared to girls, but in the present study, prevalence of Bitot spot was higher among boys and night blindness was more prevalent among girls than boys. Chandra and Salil (1994), reported the 35% prevalence of night blindness among school children and contrary to the findings of present study, Chandra and Salil (1994) further revealed the greater prevalence of night blindness among boys than girls. In their study, 14% of total school children showed the presence of Bitot spot, which was higher than the findings of present study. Similar trend was observed by Chandra and Salil (1994) in case of prevalence of Bitot spot among boys and girls as higher percentage of boys than girls showed the presence of Bitot spots. Chauhan et al (2011) revealed the significantly higher prevalence of VAD among girls and boys. Very high prevalence (48.80%) of Bitot spot was found by Nigudgi et al (2012) among school children of Gulbarga city, India. Prabhankar and Gangadhar (2009) revealed the 94.1% prevalence of lack of luster among the studied children, which was greater than the findings of present study.

Chandra and Salil (1994), observed the slightly lower prevalence (26%) of lack of lustre in the hair than the present study (28%). Similar to
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the findings of present study, greater percentage of boys than girls showed lack of lustre in their hair. Prevalence of koilonychia was observed in 11 percent of school children by Chandra et al (1994), which was lower than the findings of present study (17.4%). Contrary to the findings of present study, Chandra et al (1994) revealed the higher prevalence of koilonychia among boys than girls. Mehrotra et al (2011) observed that 4.5% rural children had bleeding gums which was lower than the present findings (15.1%). Pale conjunctiva and Glositis was observed in 34% and 8% respectively among school children by Chandra and Salil (1994).

Limitations of the Study:

- Ordinal position of the study was not included in the personal profile of the child. So the impact of ordinal position on nutritional status of school going children was not assessed in the present study.

- Spin the bottle method which is considered the least statistically desirable technique, was adopted by the researcher for the selection of households.

- The present study was limited to anthropometric measurement, clinical examination and 24 hr dietary recall method. Biochemical examination of school going children could be adopted by the researcher for the confirmation of micro-nutrient deficiency disorders.

- The present study was based on a single 24 hour recall which does not accurately show usual food consumption

- The interview schedule was developed in English and administered in Hindi.
Future Research Area:

- Besides anthropometric measurements, clinical examination and 24 hr dietary recall method, other techniques of nutritional assessment of school-going children like laboratory and biochemical assessments should be done to support the evaluation of nutritional status of children in a big way. Due to time limitations, this was not possible in the present study, but the finding of the present study have paved way to explore deep into the physiological and biological aspects of the children in this age group for the future research.

- A study based on the effect of mothers feeding pattern during pregnancy and lactation, time to initiate the breastfeeding and complementary feeding, birth weight of the child on the present nutritional status of school going children can be conducted in the future.

- The results of the present study reflects very poor nutritional status of the school going children among both boys and girls. A similar study need to be done in the same area of study with larger sample and also data from other places can throw some more light in these dimensions.

- A study based on the impact of maternal nutritional knowledge and infectious diseases among school going children on nutritional status of the children in this age—group can be conducted in future.

- A comparative study among rural and urban areas of Aligarh District focusing on nutritional assessment of school going children can be done in future.