Chapter Five: Discussions and Conclusion

Summary of the Findings

The main seven objectives of the study “Impact of socio-economic status, nutritional awareness of mothers and nutritional status on the cognitive development of the pre-school children” were discussed.

Objective 1: To study whether Nutritional Awareness of Mother is associated with socioeconomic status.

The result of correlation analysis between Nutritional Awareness of Mother (NAM) & Total Socio Economic Status (SES), was found to be highly significant. The inter dimension correlation analysis between Nutritional Awareness of Mother namely knowledge of food and nutrients, Health benefits of nutrients/ food, Cooking procedure, Appliance usage, Cleanliness, hygiene, and sanitation, Knowledge of healthy food habits and Preservation of food, and Socio Economic Status including the dimensions Mother education, Father education, Total income, Mother occupation and Father occupation were also positive and significant respectively. Thus it showed that there was significant association between Socio Economic Status (SES) & Nutritional Awareness of Mother (NAM).

Objective 2: To study whether Nutritional Awareness of Mother is associated with Nutritional Status of the child.

The result of chi square analysis between Nutritional Awareness of Mother and Nutritional Status of the child showed significant association between Nutritional Awareness of Mother and Nutritional Status of the child. The study showed that awareness of mother about nutrition helped them to provide better nutritional status to their child. It can be concluded that stunting, wasting and underweight (below normal), Normal and Above Normal category of Height for Age, Weight for Height and weight for age in children were significantly associated with Nutritional Awareness of Mother. Thus nutritional Awareness of mother influences nutritional status of child.
**Objective 3:** To study whether Nutritional Awareness is associated with Cognitive Development of the child.

The significant correlation was found between Nutritional Awareness of Mother (NAM) & Cognitive Development Score (CDS). The dimensions of Nutritional Awareness of Mother (knowledge of food and nutrients, Health benefits of nutrients/food, Cooking procedure, Appliance usage, Cleanliness, hygiene, and sanitation, Knowledge of healthy food habits and Preservation of food) were strongly and positively correlated with the dimensions of Cognitive Development of child (Conceptual Skill, information, comprehension, visual perception, memory and object vocabulary).

**Objective 4:** To study whether Nutritional Status and Cognitive development of the child varies with respect to gender.

Based on the result of conditional distribution and chi square analysis of cognitive development of children with gender and nutritional status with respect to Weight for Age, Weight for Height and Height for Age with gender had shown a significant association. The Nutritional Status and Cognitive development of the child varies with respect to gender. This study also showed overall boys have higher cognitive development in comparison to girls.

**Objective 5:** To study whether Nutritional Status and Cognitive development of child varies with respect to Habitat (Urban and suburban)

Based on the result of conditional distribution and chi square analysis of cognitive development of children with habitat and Nutritional Status (Weight for Age, Weight for Height and Height for Age) with habitat had shown a significant association. Nutritional Status and Cognitive development of the child varies with respect to habitat. Thus habitat based variation was found in cognitive development and Nutritional Status of children.
**Objective 6**: To study the impact of SES, child nutritional status, and Nutritional Awareness of Mother on the cognitive development of the child.

On the result of multiple regression analysis, models was developed and conclude that cognitive development of children can be predicted by Socio Economic Status (SES), Nutritional Awareness of Mother (NAM) and Nutritional Status (NS) of child. The SES had more influence on cognitive development of children in comparison to Nutritional Awareness of Mother (NAM) and Nutritional Status (NS) of child.

**Objective 7**: To study the impact of SES, Nutritional awareness of Mother on the child nutritional status.

Based on the result of the multi logistic model, the nutritional status of child could be predicted by Socio Economic Status and Nutritional awareness of Mother. In the present study, all the 300 children were classified in to three categories, in case of Weight for Height (WFH) all 300 children were classified but in case of Weight for Age (WFA) and Height for Age (HFA), in each only two cases remain unclassified and all 298 children were classified.

**General Discussions on the Findings**

**Nutritional awareness of mother and socio economic status.** One of the important findings of this study was nutritional awareness of mother associated with Socio Economic Status (SES). In this study the nutritional awareness of mother with all its dimensions (knowledge of food and nutrients, health benefits of nutrients /food, cooking procedure, appliance usage, cleanliness, hygiene and sanitation, healthy food habits and preservation of food) were found to have significant positive correlation with SES with all its dimension (parental education, parental income and parental occupation). The high socio economic condition of the family provides high purchasing power, high nutritional awareness and better health facility when required in comparison to low socio economic condition of the family. The child’s poor growth was associated with low SES and poor nutritional awareness of mother. Children born in poverty are at a higher risk of death from infections and parasitic diseases, drowning or accidents (Puckett & Black, 2001).
As a result of poverty, mothers in families can face many stressors. Children in poverty are also more likely to be premature, and exhibit low weight for their height which can affect brain growth and development. The children who were persistently poor have greater deficits in IQ and more behaviour problems at age five than children who experienced transitory poverty, and children who were never poor (Duncan, Brooks-Gunn and Klebanov, 1994).

The high socio economic mother generally have vast knowledge regarding good diet in consultation with friends, family members, internet facility, magazines, interaction with different cultured person, exchange of recipes and more opportunities to purchase variety of foods full of nutrients for their family.

In this study the nutritional awareness of mother with all its dimensions were found to have significant positive correlation with maternal education, one of the dimension of SES. The, maternal education has greater impact on nutritional awareness and indirectly on raising the child by providing good environment for growth and development (Reich, 2005; Aruna, Sahanaz & Vidyasagar 2001). In lower SES of the family mother education is very low and interaction is also limited and secondly they have no purchasing power for variety of nutrients. mother’s nutritional knowledge was determined to increase in parallel with the education level(ozdagen et al., 2012; varyiam et al., 1999)

In this study the nutritional awareness of mother with all its dimensions were found to have significant positive correlation with father education, one of the dimension of SES. The father’s health knowledge is most positively associated with immunizations decisions of the child (Aslam, 2010)

In this study the nutritional awareness of mother with all its dimensions were found to have significant positive correlation with father occupation, one of the dimension of SES. The father occupation promotes the healthy eating of the family, better health facility, clean home environment free of infections and clean potable water for child growth and development. The father is the primary earner and decision maker in
the family, so high occupation of father is sole responsible for providing amenities for child development.

In this study the nutritional awareness of mother with all its dimensions were found to have significant positive correlation with mother occupation, one of the dimensions of SES. The mother’s occupation also provides various resources for child development. The educated professional mothers have more awareness of various food supplements due to interaction with colleagues from different cultural background and various friends.

In this study the nutritional awareness of mother with all its dimensions were found to have significant positive correlation with Total income, one of the dimensions of SES. Household assets, Maternal education and modern contraceptives remained an important determinant of children’s nutritional status (Kabubo-Mariara, Ndenge, & Mwabu, 2009).

In this study the SES with all its dimensions were found to have significant positive correlation with cleanliness, hygiene and sanitation, one of the dimension of nutritional awareness of mother. The cleanliness of surroundings, potable clean water, infection free environment and washing fruits and vegetables with clean water is need for healthy development of child. The poor sanitary conditions at home and in neighbourhood, poorly educated mother, absence of father and low birth weight were negatively associated with cognitive performance (Santos, Assis, Bastos, Santos, Santos, Strina, Prado, Filho, Rodrigues & Baneto, 2008).

In this study the SES with all its dimensions were found to have significant positive correlation with knowledge of food and nutrients, one of the dimensions of nutritional awareness of mother. The poor Mother has no knowledge of cheap food with large amount of nutrients and thus purchases same food with their little resources to fill the mouth of their family. The mother’s nutritional knowledge was increased with their educational level (one of SES dimension, maternal education) and age of mother (Ozdagon, Uçar, Akan, Yılmaz, Sürückoğlu, Çakıroğluand Özçelik, 2012).
In this study, the SES with all its dimensions were found to have significant positive correlation with all the dimensions of nutritional awareness of mother. The poor environment, poor health facility, no change in their diet and deficiency accumulates which leads to variety of developmental deficits. The substantial developmental deficits observed among children who on average were poor, over a number of years relative to those who were not (Korenman, 1994). In poor family, SES is an important determinant of cognitive development than stature (height for age) (Johnston, et al 2005). SES of the family determines the ability of a mother to practice what she knows about child health and nutrition (Mwangome, Prentice, Plugge & Nw enekat al., 2010). It was apparent that there was strong link between children’s family background, development and educational attainment (Blanden, Gregg & Macmillan, 2007; Feinstein, 2003; Gregg & Macmillan, 2009; Heckman & Masterov, 2007). In some isolated cases across socioeconomic levels an inconsistency in the association between maternal education and child nutritional status was also observed (Reed, Habicht, & Niameogo, 1996). Neggers et al. (2003) had showed low-income African–American children whose mother was obese had risk of children with diminished intellectual ability, but normal motor skills.

**Nutritional awareness of mother and nutritional status of child.** The second most important finding was Nutritional awareness of mother associated with Nutritional Status (NS) of child. The nutritional awareness of mother (knowledge of food and nutrients, health benefits of nutrients /food, cooking procedure, appliance usage, cleanliness, hygiene and sanitation, healthy food habits and preservation of food) and implementation of awareness for their family helps in well-developed nutritional status of their children. The nutritional status of child indicates the child proper health and development of various vital activities at the critical period of their growth and development. Maternal education, Maternal labor force and Nutritional Status, which indirectly emphasize the need of nutritional awareness of mother. The mother in Indian society is primarily look after the child and well aware mother provide balanced food to child and thus nutritional status is perfect for their age. The ignorance of mother accumulates too many health hazards, various deficiency disease and malnutrition which
are the main cause of IMR. According to United Nations Children’s Fund (UNICEF), education is an important factor in decreasing child and baby mortality.

This study corroborates with the study of Blaylock, Variyam & Lin (1999) who found that more mothers knows about the health and nutrition, the better is the overall quality of her children’s diet, for preschoolers more so than older children. It was earlier proved that education provides more knowledge to mother to help their children succeed academically (Davis-Kean, 2005). The maternal education was a major factor which was associated with child’s survival even after controlling social class and economic variable. The qualities of young child’s diet are positively associated with higher level of maternal education (Wachs, 2005). The various model pathways linking nutritional status and maternal education were studied and concluded that 60% effect of maternal education on child nutritional status was accounted (Bellessa, Renata & Haas, 2005). The significant casual effect of mother’s education on child height was empirically tested and implied a substantial loss in child health caused by the educational interruptions (Qihui, 2010).

In this study the nutritional awareness of mother were found to have associated with Nutritional Status of children. Nutritional status of children was also found to be significantly associated with immunization and breastfeeding status (Adeladza, 2009). The maternal labor force participation has a positive but insignificant effect on child health, measured in terms of stunting and a combined indicator of stunting and wasting (Mugo, 2012). Growing empirical evidence points out that factors modifying households’ power distribution in favour of women, are associated with larger improvements in child health and increases in childcare expenditure (Duflo, 2000 and 2003; Hoddinott & Haddad, 1995; Lundberg, Pollak, & Wales, 1997; Reggio, 2011; Thomas, 1990 & 1994).

In some isolated cases, it may find contradicting result where nutritional awareness of mother did not improve nutritional status of child. The maternal education did not play a significant role on the nutritional status of the children when mothers are incarcerated in the prison with their children (Ndanu, 2008). The inconsistency in the association between maternal education and child nutritional status across socioeconomic levels was also found (Reed, Habicht & Niameogo, 1996).
Nutritional awareness of mother and cognitive development of child. The third most important finding was nutritional awareness of Mother associated with cognitive development of child. The seven dimension of Nutritional Awareness of Mother (knowledge of food and nutrients, health benefits of nutrients /food, cooking procedure, appliance usage, cleanliness, hygiene and sanitation, healthy food habits and preservation of food) and five dimension of cognitive development of child(Conceptual skill, Information, Comprehension, Visual perception, Memory and Object vocabulary) were also positively significantly related. Nutrition plays a major role in development of nervous system. However, certain aspects of the home environment correlated with cognitive development, specifically the manner in which the mother responded emotionally and verbally to her child, and the organization of the child's physical and temporal environment. Research has shown that nutrition can change the way in which a certain genetic factor is expressed by supplying the gene with specific molecules or nutrients which are required to express the full potential for development (Rosales, Reznick & Zeisel, 2009).

In this study the CDS with all its dimensions were found to have significant positive correlation with knowledge of food and nutrients, one dimensions of nutritional awareness of mother. Maternal intake of very-long-chain n-3 PUFAs during pregnancy and lactation may be favorable for later mental development of children (Helland, Smith, Saarem, Saugstad, & Drevon, 2003). The father’s health knowledge is most positively associated with immunizations decisions while mother’s health knowledge and her empowerments within the home are channels through which her education impacts her child's height and weight respectively (Aslam, 2010). The first few years of life are important in laying the foundation of good health for the children. The beneficial effect of Early Childhood Development intervention on the cognitive test scores was large for the most nutritionally challenged children who are in the stunted range (Watanabe, Flores, Fujiwara, and Tran, 2005). The infant who suffered nutritional deficit in womb and born small for gestational age shows risks of cognitive deficits, which ultimately hampers their performance in school age, adolescence and adulthood. Stunting in early childhood is common in developing countries and is associated with poorer cognition and
school achievement in later childhood (Chang, Walker, Grantham-McGregor and Powell, 2002).

In this study the CDS with all its dimensions were found to have significant positive correlation with healthy food habits, one dimensions of nutritional awareness of mother. The child health and nutrition have considerable effect on post schooling productivity (Behrmann, 2012). The educational achievement of child depends on maternal education and NS (stunting) of child (Hioui, Azzaoui, Ahami & Aboussaleh, 2011). There is strong association between parent’s educational attainment and child educational attainment (Ernisch, & Francesconi, 2000). The Children with chronic severe iron deficiency in infancy had lower motor scores at the beginning of the study and a lower but parallel trajectory for motor scores through early adolescence (Tal, Rosa, Agustin, Elias, & Betsy 2006). There are various evidences which show that under nutrition in early life had greater impacts on cognitive and neuropsychological development (Grantham, Mcgregor, Baker & Hannigham, 2005).

In this study the CDS with all its dimensions were found to have significant positive correlation with health benefits of nutrients /food, one dimensions of nutritional awareness of mother. The mothers with more knowledge of child development are more likely to provide developmental stimulation to their children and that their children in turn have better developmental outcomes. Maternal behaviour and psycho-social development of preschoolers showed significant association (Aruna, Shahnaz & Vidyasagar, 2001). The continuous intake of low nutrition, affects motivation, attention, and concentration which have negative effect on learning (Brandt, 2010). The cognitive development of child depends upon nutrition, home environment and child education (Bangiran et al., 2009).

In this study the CDS with all its dimensions were found to have significant positive correlation with cleanliness, hygiene and sanitation, one dimensions of nutritional awareness of mother. The poor environment with unhygienic conditions favorable for host of diseases and infection affects nutritional status of child which ultimately leads to developmental deficits. The mothers from low SES were at risk of children having diminished intellectual ability but normal motor ability (Neggers,
Laude (1999) found no significant correlation between the total amount of mother-child interaction and child cognitive development.

In this study the CDS with all its dimensions were found to have significant positive correlation with, cooking procedure one dimensions of nutritional awareness of mother. The mothers who provide nutritious fresh and wholesome food to their child have better Nutritional Status and cognition. Mother’s health knowledge and her empowerment within the home are channels through which her education impacts her child’s height and weight respectively (Aslam, 2010). The balanced nutrition with adequate amount of micronutrients at appropriate time helps in normal brain development. Even the slightest forms of food insecurity (with or without clinical manifestation of malnourishment) can affect a young child’s development and learning potential (WHO, 2006).

In this study the CDS with all its dimensions were found to have significant positive correlation with preservation of food, one dimensions of nutritional awareness of mother. Mother awareness of preserving food helps to consumption of food with their nutrient value intact and thus child gets all nutrients for their brain development and has healthy developments of different factors of cognitive development. Nutrition education can have a significant effect in promoting healthy eating habits, and schools can contribute to reduce nutrition-related problems by integrating nutrition interventions. The child health and nutrition have considerable effect on post schooling productivity (Behrmann, 2012).

Preterm babies exposed to skin to skin contact (Kangaroo Mother Care) showed a better mental development and better results in motor tests (Thakural, Chawla, Agarwal, Deorari & Paul, 2009). The relationship between psychosocial quality of family context and the cognitive development of school going children and found empirically that children who were exposed to more conflicts in 5 years, and who scored higher on the scale in eight years, were found to have improved cognitive development scores over time in comparison with other groups (Arranz, Oliva, Miguel, Olabarrieta & Richards, 2010)
Most of earlier findings relates with nutrition of child and cognitive development of child, nutrition of child and SES of family, cognitive development of child and SES of family, maternal education and IQ of child, mother nutritional status and developmental deficits in child, which encompasses importance of nutritional awareness of mother who provide care and assistance to the child.

**Nutritional status and cognitive development of child with respect to gender and habitat.** The fourth and fifth most important findings showed Nutritional Status and cognitive development of child varies with respect to gender and habitat. The stunting is the nutritional indicator most consistently correlated with children's mental development and delayed neurosensory integration, low IQ and school achievement in older children (Grantham-McGregor, Walker, Himes & Powell, 1996).

**Nutritional status and habitat.** In the study the NS of Urban are far better than the NS of suburban children. Similar result was found in Assam children (6-14 years) of tea garden workers of (suburban area) Assam compared to NCHS standard and affluent Indian children, the mean height and weight of tea garden children was inferior at all ages (Medhil, Barua & Mahanta, 2006). A remarkable influence of Mother literacy upon child survival in both urban and rural areas were found and survival of Female babies are safer to be victims of death at their very early age as compared to Male infants (Ullah, 2008) which indirectly relates to present findings. Similarly studies have reported that rural girls were more likely to be severely undernourished than boys in Bangladesh (Choudhury, Hanifi, Rasheed & Bhuiya, 2000; Sen & Mondal, 2013). When using a simple urban/rural comparison, the prevalence of stunting was significantly higher in rural area (Kennedy, Nantel, Brouwer & Kok et al., 2005).

**Cognitive development Score and habitat.** In the study the cognitive development of urban children dominates over cognitive development of suburban children. The ethnic background of the parents did not make a difference in the perceptions of cognitive development of Children (Moussaoui & Braster, 2011). The family background seems to have a dominant influence on a child’s cognitive development at an early stage (Tua, & Lawa, 2010). However, among households located in rural areas of India and Peru there seem to be differences in the allocation of resources between boys and girls (Novella,
2013). But very few studies in context to habitat at this age corroborated the present findings.

**Cognitive development score and gender.** The present study found that overall average Cognitive Development Score for boys are significantly higher than overall average Cognitive Development Score for girls. The present study has further observed girls have lower cognitive score compared to boys (Jan et al., 2011) but in rural Malaysia girls (7-9 years) performed better academically than boys. Female Malaysian higher education students earn better grades, in general, than male Malaysian students (Kamogawa, 2003). This study finds similar results to the previous literature which finds that girls in India are disadvantaged with respect to boys, in terms of less investment in health inputs and outcomes (Barcellos et al., 2012; Jayachandran & Kuziemko, 2011; Subramanian & Deaton, 1991). In-depth studies are required to further interpret gender differences.

**Nutritional status and gender.** The present study has further observed a greater prevalence of undernutrition among girls than boys, which is consistent with the result reported in similar studies in the country (Tigga, Sen, & Mondal, 2015; Srivastava, Mahmood, Srivastava, Shrotriya, & Kumar, 2012). In India, maternal bargaining power has a negative effect on girls’ health (Novella, 2013). In India, the opposite effect is found and boys show better health when mothers have more power in household decisions (Novella, 2013). Similarly studies have reported that rural girls were more likely to be severely undernourished than boys in Bangladesh (Choudhury, Hanifi, Rasheed & Bhuiya, 2000; Sen & Mondal, 2013). The existing literature also suggests that the gender differences in the prevalence of undernutrition were more pronounced in poor socio-economic groups with girls being more undernourished than boys (Cheah, Wan Muda, Hussin, & Thon, 2010; Mondal & Sen, 2010; Tigga, Sen & Mondal, 2015). Some contradicting result was also found outside India. In rural regions of Morocco showed that under nutrition among boys was more serious than that among girls according to all three indicators; stunting, wasting and underweight (Hioui et al 2011; Tee, Khor, Ooi, 2002).

**Cognitive development of child, socio economic status, nutritional awareness of mother and nutritional status.** The last two findings was very interesting as it helps
in predicting cognitive development of children while knowing socio economic status of the family, nutritional status and nutritional awareness of mother, and secondly nutritional status of child by only knowing socio economic status of the family and nutritional awareness of mother.

But the model development was a new finding in this field to find cognitive development of child with respect to two variables TNAM and TSES. Thus the model developed to predict cognitive development of child was best fit with nutritional awareness of mother and socioeconomic status only in case of normal and above normal category of Nutritional Status children where as in the below average category of Nutritional Status, cognitive development is affected by Nutritional Status. Jan, Mitra, Hasmiza, Pim, Lor & Manon, (2011) predict academic performance and cognitive function of 6-9 years old children by Gender, Birth weight, Height-for-age, Weight-for-age, Father's education, Mother's education, Income, Breastfeeding duration, Haemoglobin and Ferritin and found 22% and 23% variation in academic performance and cognitive function was explained by predictor variables only. Thus the present model is far better than earlier developed models with various predictor variables for preschool children.

Secondly the nutritional status of child was also classified by knowing socio economic status (Father's education, Mother's education, Total Income, Father's occupation and Mother’s occupation) and nutritional awareness of mother(knowledge of food and nutrients, health benefits of nutrients /food, cooking procedure, appliance usage, cleanliness, hygiene and sanitation, healthy food habits and preservation of food). The predicted classification of the child was carried out on three aspects of Weight For Age, Weight For Height, and Height For Age by Multiple logistic regression established based on only mother nutritional awareness and socioeconomic status in 99.3% cases. To improve the extent of level of percentage of accuracy, more independent variables may be considered such as nationality, lifestyle, habitat, breastfeeding duration, environment etc. (Reed, Habicht & Niameogol, 1996) had developed a model and the values predicted by this model, Zp, represent the children's expected weight-for-age z-scores, given the village of residence and the wealth ranking of the household and considered only 17.5%
variation in nutritional status of the children from village to village due to the difference in overall conditions within the community.

**Conclusion**

The child proper growth and development needs better SES, Nutritional Awareness of mother, and Nutritional Status. The children’s better development, both health wise and cognition wise depends on the mother’s wellbeing. The mother’s awareness about nutrition and nutrients helps child to free from various deficient diseases. The better nutritious food provided by mother helped in all round development of the child. The more the mother aware about the various sources of nutrients the more care and proper diet is given to the child. The caring of child’s nutrition solely depends on mother’s knowledge and awareness of nutrients. How well mothers do this depends on their access to resources. The SES (parental education, parental occupation and parental income) of family provides crucial role in child development, low SES means unhealthy connections, low health services, and child care. The maternal education was also very important in child’s growth and development. The awareness and education of mother provides cosy and beneficial environment for child’s healthy development in all aspects. The awareness of mother (knowledge of food and nutrients, health benefits of nutrients /food, cooking procedure, appliance usage, cleanliness, hygiene and sanitation, healthy food habits and preservation of food) knows the importance of breast feeding immunization care and basic preliminary knowledge of nutrients. The children with proper balanced diet are healthy in respect of others. The better SES, Nutrition, and child care provide better cognitive development of the child. The model developed predicts cognitive development of child by SES, NAM, and NS. SES was the stronger significant predictor than NAM of cognitive development. The second model was developed to predict Child Nutritional Status classification by SES, and Nutritional Awareness of Mother.