NUTRITIONAL STATUS AND IQ LEVEL OF THE AUTISTIC CHILDREN IN BANGLADESH ALONG WITH THE PERCEPTION OF THEIR PARENTS ABOUT AUTISM

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DECLARATION

I hereby solemnly declare that this thesis represents my own work and that it has not previously been submitted for a degree at this or any other University.

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ABBREVIATIONS

ASD	Autism Spectrum Disorder
IPNA	Institute of Paediatric Neurodisorder & Autism
BMI	Body Mass Index
DU	Dhaka University
INFS	Institute of Nutrition & Food Science
NDDs	Neuro-developmental Disorders
BMRC	Bangladesh Medical Research Council
IQ	Intelligence Quotient
BSMMU	Bangabandhu Sheikh Mujib Medical University
GoB	Government of Bangladesh
BBS	Bangladesh Bureau of Statistics
HAZ	Height-for-Age Z-score
HH	Household
MUAC	Mid-upper Arm Circumference
PEC	Post Enumeration Check
PSU	Primary Sampling Unit
WAZ	Weight-for-Age Z-score
WHO	World Health Organization
WHZ	Weight-for-Height Z-score
RDA	Recommended Dietary Allowance

DEDICATED

TO

All the parents of children with Autism Spectrum Disorder

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SUMMARY

Disorder of neural development characterized by impaired social interaction and communication and also by restricted as well as repetitive behavior is known as autism. Autism affects information processing in the brain by altering the way nerve cells and their synapses connect and organize. However how does this occur is not well understood. A cross-sectional study was conducted by us between January'2014 to June'2016 and the study aimed to describe the nutritional status of autistic children in Bangladesh and it's relation with IQ level as well as perception of their parents about autism. Nutritional status was assessed by means of nutritional data, anthropometric data and providing a questionnaire to parents. A total of three hundred & eighty four children (age group 1-12 years) with autism were enrolled in this study. The parents were asked to complete the questionnaire regarding the socio-demographic and eating behavior of their children. They were also asked to provide a 24-hour Re-call Method by average of three days food diary. IQ assessment was done with Bayley Scales of infant development (BSID), Independent Behavior Assessment Scale (IBAS), Wechsler Intelligence Scale for Children-Revised (WISC-R). Data analysis was done by SPSS version 20, ANOVA tests & T test. Children with autism exhibited several abnormalities in terms of eating behavior. Energy intake was lower than the RDA in all age group of the autistic children. Mean intake of protein & calcium were higher than the RDA in all age group of the autistic children but in fat intake it was lower in only 10-12y age group. In case of mean intake of iron it was higher than the RDA in all the age group except 7-9 years & 10-12years age group. VitA, thiamine, VitC intake were lower than the RDA. In case of riboflavin & niacin in two age group 1-3 years & 4-6years they were higher than the RDA but in age group 7-9y & 10-12y it was lower than the RDA. Deficient intake of protein, thiamine, niacin & zinc was highly significant with low IQ level of the autistic children (P value was .00). According to the anthropometric data, nutritional status of the ASD children was almost in normal range. But there was also malnutrition and a relation with malnutrition & IQ level existed. Those who had poor nutritional status, they had low IQ level. So far as parent's perception is concerned the perceptional level of the parents in most of the cases didn't associate with their educational level and most of them didn't have much awareness about Autism.

CHAPTER-I

INTRODUCTION

INTRODUCTION

1.1 Background

Autism is a neural development disorder characterized by impaired social interaction and communication, along with restricted and repetitive behavior. Autism not only information processing in the brain but also altering the nerve cells and their synapses connect and organize. However how does this occur is not well understood[1]. The first appearance of autism starts during infancy or childhood, and generally follows a steady course without remission.[2]Most of the symptoms gradually begin after the age of six months, and on established by age two or three years[3]and after that it would be continue through adulthood, but most of the time in more muted form.[4]It could not be identified by a single symptom, but with a characteristic triad of symptoms it could be easily identified. Sometimes atypical eating, are also common although not essential for the diagnosis.[5] Autism also implies difficulties in learning societal and linguistic skill apart from excessively following repetitive routines and behaviors. For example, a person with autism may have an obsession with a certain topic, such as cars wheel, special odor, may also have problems making eye contact, or may show he or she is happy by spinning around instead of smiling.[6] Autism has three defining core features: (1) Problems with social interactions; (2) Impaired verbal and nonverbal communication and (3) a pattern of repetitive behavior with narrow, restricted interests.[7]

Autistic children may have different disorders and they are also vulnerable to poor nutritional status. Children with intestinal disorders and chronic intestinal inflammation may not absorb nutrients needed to maintain the immune system. Some children with ASDs may have low or high levels of vitamins and minerals. When considering the addition of vitamins and minerals to a child's diet, the family should talk to a medical professional or nutritionist who is knowledgeable in nutritional therapy and evaluate the child's nutritional status through a blood test or clinical assessment. Most individuals with autism manifest mental retardation perform poorly in the intelligence tests, three fourths of children with autism function in the mentally retarded range. Generally children with lower IQ level, the greater likelihood of autism. Perception of autistic child's parent on autism is very important. The parents of the children suffering from autism cannot always provide adequate and timely treatment and care, despite increasing evidence of the effectiveness of early interventions in improving an affected child's condition.[8]

In a research it would have been established that family income and other measures of socioeconomic status (SES) are highly associated with cognitive, intellectual and achievement outcomes in childhood.[9-14] In that research the correlation studies between SES and child outcomes in typically developing children suggest that higher SES is associated with higher IQ[15-16], higher vocabulary development[17], better school achievement[18-19], and a variety of domains indicated better child health and development than children of lower SES.[12]The strong relationship between SES and measures of intellectual ability illustrate the relevance of SES to neuroscience. At birth, the brain is dependent upon experiences and environmental stimulation for healthy development.[20-21] In turn, there is now a large literature which documents this

interdependency between familial factors (e.g. genes) and the environment.[22-26]Over the course of development, familial factors and the environment continue to influence and interact with each other. It is evidence based that structural and functional brain development depends on unfavorable environmental experiences.[24,27]Based on decades of neuroscience research, it is clear that stress and environmental complexity are the two primary experiential influences on brain development.[28-29] Because SES is incontrovertibly correlated with differences in life stress and family resources, it is understandable that SES would influence experience-dependent patterns of neural activity and development.[30-32] Thus, the differences in families across the continuum of SES may create different experiences of stress and environmental complexity, potentially creating systematic changes to cognitive and brain development[33], and intellectual outcomes.[34] Lower language and executive function—the two main components of a two-factor IQ score, can be seen in lower SES children, as early as kindergarten.[35]Hackman et sl.[36]summarized the research across a number of disciplines to identify potential environmental mechanisms through which SES may affect cognitive development. The prenatal factors, parent-offspring interactions and cognitive stimulation partly underlie the effects of SES, corroborating the hypotheses of the Family Stress model, whereby economic disadvantage affects children's wellbeing through its effects on the parent.[37-39] This model nicely synthesizes how two mechanisms from different disciplinary perspectives—parent-offspring interactions and stress—can converge to shape cognitive and brain development.

Early childhood is a period when children experience new foods, tastes, and textures. Parents of toddlers and young children often describe their children as "picky eaters", refusing to try or eat a variety of foods. Although picky eating is not uncommon among young children who are

typically developing, pickiness in children with autism spectrum disorders (ASDs) may be even more restrictive and may extend beyond the early childhood period.[40-42]Parents of children with ASDs report many challenges with children's daily activities, behavior, and communication. Parents also frequently express concern related to mealtimes.[43]Parents of children with ASDs often report that their children are highly selective eaters, with very restricted repertoires of food acceptance that may be limited to as few as five foods. Management of food selectivity and concerns about dietary adequacy have been found to be a major reason for referral of children for nutrition services.[44] Picky eating, also referred to as food selectivity, is a significant problem because it may be associated with inadequate nutrition as a result of the restricted diet.[45-51]Despite considerable anecdotal evidence and case reports to support that food selectivity is a significant problem in children with ASDs, only a few empirical studies have compared food intake and eating patterns of children with ASDs to that of typically developing children or other clinical populations.

The emotional state of parents and siblings sometimes adversely affects the chronicity and severity of autism.[52]. Apart from the symptoms, stress is also caused during the length of the treatment, knowing that there is no treatment which can "cure" autism.[53] It is said that parents of children with autism have higher levels of anxiety.[54]Stress experienced by parents can significantly affect their adaptation to the world of autism and in the care of a child with special needs. According to Bluth[55] . Parenteral inter-relational level also could depend on presence of children with autism spectrum disorder .[56] Also according to Sivberg's survey; it is observed that parents of children with autism, compared to the control group, had more psychological stress, worry and emotional burnout, physical health burden, isolation from the rest of the family and

friends. In comparison though, mothers of children in the autism spectrum tend to be affected to a greater extent on the existence of autism in the family, and have higher levels of stress and depression, worse physical health, psycho-emotional lower resistance, less life satisfaction and more guilt.[53] Based on these data we can see that growing a child with Autistic Spectrum Disorders is a stressful experience, however, as demonstrated in the investigation of, there are benefits and these are increasing the estimate towards life, health and people in general.

1.2 JUSTIFICATION

In a human body brain is the largest organ which need food & drink for development like any other organ. But the linkage between this diet and brain cells yet unrecognized. In so many research it would be clear that for dietary intake brainwork has been depend which ultimately influence our live. These procedures may be started from early infancy of life. For example, 70% of the energy absorbed by a fetus during pregnancy is directed towards brain development. So every stage of life the correlation of diet & brain has been observed. Mental health and well-being varies on significant diet, but there appears to be no point at which diet has no effect. Although there are different researches looking into important aspects of autistic patients, these have not sufficiently covered the issue of nutritional status and the intelligence capacity. From the existing literature indication is found that there is strong connection between autism, nutritional status and the IQ level. Malnutrition could affect the nervous system of the autistic children as well as intelligence capacity. Perception of their parents about autism is also very much important for proper understanding of the condition of the autistic children. Since the 1970s, there has been a dramatic rise in the number of reports documenting increasing rates of ASD cases, especially in Western countries; however, few reports have been published about the occurrence of autism in developing countries, especially in Bangladesh, a gap that underscores the need for increasing awareness among professionals and parents. This study is an attempt to fill this gap.

1.3 RESEARCH QUESTION

What is the nutritional status and IQ level of the autistic children in Bangladesh along with the perception of their parents about autism?

1.4. OBJECTIVES

1.4a. General Objective

To assess nutritional status and IQ level of the autistic children in Bangladesh along with the perception of their parents about autism

1.4b. Specific Objectives

1. To verify nutritional status of the autistic children
2. To determine the IQ level of the autistic children
3. To evaluate perception of their parents about autism
4. To evaluate socio-economic condition of the family with autistic children

1.4c. Operational Definitions

Autism Spectrum Disorder (ASD)

Autism spectrum disorder (ASD) is defined by the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)* as a persistent impairment in social interaction and communication across multiple contexts that presents in early development and causes clinically significant social, educational, and occupational deficits (American Psychiatric Association, 2013).

Nutritional status

Nutritional status the condition of the body in those respects influenced by the diet; the levels of nutrients in the body and the ability of those levels to maintain normal metabolic integrity. ("nutritional status." A Dictionary of Food and Nutrition)

IQ (Intelligence Quotient)

IQ is a number meant to measure people cognitive abilities (intelligence) in relation to their age group.(Brain Matrix)

1.5. LITERATURE REVIEW

Autism spectrum disorders (ASDs) comprise a complex set of related developmental disorders that are characterized by impairments in communication, social interaction, and repetitive behaviors. Impairments in sensory processing are also extremely common. The prevalence of ASDs is increasing and is currently estimated to affect 1 in 150 children. ASDs are considered to be a major health and educational problem, affecting many areas of daily living, including eating. Children with ASDs are often described as picky or selective eaters.[43]

Studies examining food selectivity in children with ASD include: those with an ASD group only, those with a typically developing comparison group, and those with a comparison group of children with other special needs. In the UK, Cornish[45] examined the diets and weight status of 17 children with ASDs, ages 3 to 10 years, and found that 10 of the 17 children (59%) ate fewer than 20 different foods. In a survey sent to parents of 43 children and adolescents with ASDs 4 to 26 years about dental treatment, oral hygiene behavior, and nutrition, including food preferences and eating patterns, Klein and Nowak[57] found that 53% of the participants were reported to be reluctant to try new foods. Williams et al.[51] surveyed 100 parents of children with ASDs ages 22 months to 10 years; 67% of the parents reported that their child was a “picky eater”, in spite of the fact that nearly three quarters (73%) reported that their child had a good appetite for foods that they liked. This suggests that picky eating is not associated with a lack of appetite. The authors reported that the factors parents felt influenced food selectivity were: texture (69%),

appearance (58%), taste (45%), smell (36%), and temperature (22%). The most frequently reported eating and oral behavior problems were reluctance to try new foods (69%), resistance to taking medicine (62%), eating too few foods (60%), mouthing objects (56%), and rituals surrounding eating (46%). Similarly, in a qualitative analysis of parent reports of 100 children with ASDs (79 children with autism, 21 with Asperger syndrome) ages 2 to 16 years, Whiteleyetal.[58] found that eighty-three percent (83%) of parents reported that their child ate a restricted repertoire of foods as their core diet. Physical texture or consistency of food was often cited as the underlying factor in the choice of foods, although characteristics of food such as the brand, product name or packaging/wrapping were also reported as determining factors. While these studies indicate that a high percentage of children with autism are selective eaters, the lack of a comparison group makes it is difficult to tell whether these characteristics more prevalent in children with ASD than in a sample of typically developing children.

Raiten and Massaro[49] published one of the first studies designed to compare the dietary intakes of children with ASDs and typically developing children. In their study of 40 children with ASDs and 34 typically developing children, the authors found that children with ASDs were more likely to adhere to the same foods and to show more food preferences than their typically developing peers. However, no statistical analyses were reported to indicate whether these differences were significant.

In a more recent and larger scale study, Schrecket al.[59] compared food selectivity in 138 children with ASDs and 298 typically developing controls, ages 7.0–9.5 years. Parents completed a food preference inventory developed by the author to assess the extent to which children ate a variety of foods. Parents of children with ASDs reported that their children refused significantly more foods and had a less varied diet than did parents of children without ASDs. In addition, the

children with ASDs were reported to eat fewer foods within each food group category; in general, children with ASDs ate about half the number of foods in each food group except starches, where they ate about two-thirds the number of foods as typically developing children. Children with ASDs also were significantly more likely to accept only low-texture foods such as those that had been pureed. The authors concluded that children with ASDs had a significantly greater degree of food selectivity than typically developing children. Using the same data set in a subsequent analysis, Schreck et al.[60] reported that most of the restricted food intake in children with ASDs could be attributed to food presentation, such as different food items touching on a plate or specific utensil requirements. Across all food groups, children with ASDs ate fewer types of foods than did other members of their family. However, food preference (as defined by the number of different foods eaten) was also found to be related to the family's food preferences. In this study, as in the other studies described above, food selectivity remained broadly defined, and food texture was not defined.

In a study to examine the eating behaviors and nutrient intakes of children with ASDs, Schmitt and colleagues[50] asked the parents of 20 boys with ASDs and 18 typically developing boys ages 7–10 years to complete a questionnaire on eating behaviors and food preferences and a 3-day food record. Boys with autism spectrum disorders ate a considerably smaller variety of foods than controls (17±6 vs. 22±6 over a three-day period) and more often made their food choices based on texture than did the boys in the control group. Seventy percent of children with autism chose their food based on texture, compared to 11% of children without autism. Further, the parents of boys with ASDs reported having greater difficulty getting their child to eat. Boys with ASDs also had a particular aversion to mushy food. However, the authors did not provide any specific information on how they categorized food to determine variety or how they defined

mushy foods since the sensory characteristics of "mushy" food are not clear. In addition, there were no diagnostic criteria for autism; it was determined by parental report.

Several studies have compared food selectivity in children with ASDs to that of children in other clinical populations. In a retrospective chart review of 349 children ages 1 month to 12 years referred for a feeding evaluation (225 had developmental disabilities, 26 had ASDs), Field et al.[61] found that the prevalence of food selectivity by type of food was significantly higher for children with ASDs than the other children in the study. However, information was obtained from a chart review based on interdisciplinary team evaluations and medical records, but no specific information was provided on how assessments were made.

In another study on food selectivity in children with ASDs and other developmental disabilities, Williams et al.[62] conducted a review of 178 children with and without developmental disabilities, ages 2 to 12 years, referred to a feeding program for selective eating. The sample included three groups: typically developing (n=69), ASDs (n=64), and other special needs (n=45). The evaluation incorporated a food frequency questionnaire which asked parents to report how many foods their child had eaten and also included a 3-day food record. The authors did not find differences between groups in the types or variety of foods consumed. However, the authors categorized their data by food group and did not appear to assess the numbers of different foods independent of food group that the child ate. Furthermore, all the children studied were referred for selective eating; therefore, it cannot be determined whether picky eating is more common in children with ASDs.

Using a parent interview, Dominick et al.[63] studied the prevalence of atypical behavior, including atypical eating behavior, in 67 children with ASDs and 39 children with a history of language

disorders, ages 4–14 years. Atypical eating behavior was defined as food refusal, selectivity, or unusual behaviors or rituals associated with mealtimes. In the sample of children with ASDs, more than three quarters showed atypical eating behavior compared with only 16% of the children with a history of language disorders. Sixty-three percent (63%) of the children with ASDs were reported to eat a restricted range of foods. Over 30% of parents of children with ASDs reported that their child showed a preference for food based on textures. Problems were reported to have begun in the first year of life, with almost all the children demonstrating these behaviors prior to age 3. At the time of the study, 88% of children continued to have atypical eating problems, indicative of a persistent problem.

Whereas the studies reported above all were based on parent report, Ahearn et al.[64] conducted a laboratory-based observational study of food acceptance in 30 children, ages 3 to 14 years, with autism or pervasive developmental disorder-not otherwise specified (PDDNOS). Children were seen for six separate sessions during which time their acceptance of 12 foods from four different categories of food (i.e., fruit, vegetable, starch, or protein) was assessed. Each session consisted of six consecutive presentations of each of four food items, one from each category. One of the four foods was offered in a pureed form. Food acceptance was determined and categorized as low, moderate, or high, depending upon the number of bites of food the child took. Food selectivity was classified as over-selective, moderately selective, or mildly selective, based on bites accepted within a food group. There was also an additional category for texture selectivity. Seventeen of the children were categorized as having low food acceptance, and 17 were categorized as being selective for either food type or texture. The authors reported that the findings were significant based on a chi-square analysis. These findings support the hypothesis that food selectivity is high in children with ASDs. The authors point out that food was offered

as bites rather than servings which may have altered acceptance. Additionally, four children refused all foods presented during the assessment; however, these children were reported to accept at least two of the food items at other times. It was suggested that this discrepancy may have been the result of a new environment with unfamiliar staff and an unusual feeding procedure. The studies described above indicate that food selectivity is a significant problem for many children with ASDs. However, the lack of a clear definition of food selectivity, the small numbers of children in most of the studies, and the lack of a control group make it difficult to draw conclusions regarding the magnitude and impact of the problem.

Restricted intakes of food can lead to nutritional insufficiency if the types and variety of foods remain restricted. This makes food selectivity a potential health risk. However, despite the widespread concern over food selectivity in children with ASDs, only a few studies have actually assessed the nutritional adequacy of these children's diets and they have revealed mixed findings. Two of the studies that reported a high degree of food selectivity in children with autism also assessed the nutrient adequacy of the children's diet. Raiten and Massaro[49] analyzed a 7-day diet record for 40 children with ASD and 34 typically developing children. They also assessed caregivers' perceptions of their children's eating habits and clustered these into the categories of sameness, specific eating behaviors, and specific food preferences. Despite the fact that there were higher numbers of children with ASDs in each cluster, they found no difference in the adequacy of the nutrient intakes between the two groups. However, overall adequacy of the diet based on nutrient needs was not provided.

In a small study, Schmitt et al.[50] compared the nutrient intake of 20 boys with autism and 18 controls 7–10 years of age using a 3-day food diary. There was no difference in nutrient intake between the two groups, although as noted earlier, the eating behaviors differed among the boys

with ASD and the controls. In another small study of children ages 3 to 5 years with and without ASDs, Lockneret al.[48] found that most children met the EARs for selected nutrients. However, a greater proportion of children with ASD was below the EAR for vitamin A.

In contrast, Cornish[45] reported inadequate nutrient intakes in children with autism based on a 3-day dietary recall and a food frequency checklist. Nine of 17 children with autism (53%) had intakes that were below the recommended nutrient intake for one or more nutrients. There was an inverse relationship between variety and nutritional adequacy; as the daily variety decreased, the number of nutrient intakes that fell below the recommended amount increased. Intake of protein, vitamin A, thiamin, vitamin B12, folic acid, sodium, potassium, magnesium, phosphorous, and copper were determined to be adequate for all children. Inadequate intakes of iron, vitamin D, vitamin C, niacin, riboflavin, and zinc were found in one or more children. The majority of children did not consume adequate amounts of fruit and vegetables, but 94% of the children ate foods on a daily basis that the authors considered to be in the "fatty" and "sugary" food groups. Two other studies collected 3-day food records in groups of children with ASDs. Ho and Eaves[65] reported low calcium intake in their sample; however, limited conclusions can be drawn from their data because the overall number of children for whom calcium intake was inadequate was not reported. Information was also lacking on the intake of other micronutrients. Levy et al.[66] only reported on the macronutrient content of children's diets which was found to be adequate in almost all the children. A substantial number of children also had a high protein intake. They provided no information on the micronutrient content of the diets.

In a recent study to examine nutritional intake between children with ASD and typically developing children, Herndon et al.[47] used a 3-day diet record and found that a large number of both children with ASDs and typically developing children consumed less than the

recommended dietary intakes for several nutrients, including calcium, iron, vitamins D and E, and fiber. Children with ASDs were also found to have higher intakes of vitamins B-6 and E and lower intakes of calcium than typically developing children. When the analysis excluded children on gluten-free/casein-free (GFCF) diets, these differences were no longer significant, except for higher vitamin B-6 intake in the children with ASDs. In summary, results of studies of nutrient intake of children with ASDs have produced conflicting results with different studies indicating that the nutrient intakes of children with autism are below, above or the same as children without ASDs. Several studies have compared the intakes of children with ASDs to dietary standards but they did not include a control group so it was not possible to consider what was unique to ASD. Even more importantly, most studies did not compare children with ASDs with and without food selectivity so it was not possible to determine whether food selectivity placed children at risk. Various factors such as changing definitions of ASDs and parental dietary restrictions such as GFCF diets may influence current findings such that it is not clear if differences between children with ASDs are due to parental dietary restrictions or to food selectivity. Determining nutritional risk of this population is essential to develop strategies to maximize health. Similarly, examining data for individual children is critical given the high variability within this population.

Various factors may contribute to food selectivity and a number of explanations have been proposed.[58]One of these factors relates to sensory sensitivity (also referred to as sensory defensiveness or sensory over-responsively). Ayres[67] first described sensory defensiveness in the tactile domain (tactile defensiveness) in some children with learning and behavioral disorders. She described tactile defensiveness as an over-reaction to certain experiences of touch, often resulting in an observable aversion or negative behavioral response to certain tactile stimuli that

most people would find innocuous. For example, children who show tactile defensiveness often have difficulty being cuddled and pull away from touch. It is possible that early tactile sensitivity may contribute to some of the sensory feeding issues such as difficulty with food textures seen in children with ASDs.

Early descriptive research identified the problem of tactile defensiveness in children with ASDs, although they did not use that terminology. Ornitz and Ritvo[68] described behaviors in children with ASDs that were characterized by the inability to tolerate certain tactile materials such as woolen blankets or clothes that came in contact with their skin. In his initial description of children with Asperger's syndrome, Hans Asperger (1944, cited in 25) also described the sensory over- and under-sensitivities in this population. Numerous individuals with ASDs and their families have identified atypical processing of sensory information.[69]

Recent research has reported a high prevalence of sensory processing disorders in children across the autism spectrum and at various ages. Leekam[70] reported that in a sample of 200 children with ASDs, >90% had sensory abnormalities and sensory symptoms and that these occurred in multiple domains. In particular, the proximal domains of touch and smell/taste distinguished autism and non-autism groups. Dunn, Myles, and Orr[71] examined the differences between children with Asperger syndrome and typically developing children and found differences on almost all (96%) of the items on the Sensory Profile[72], a parent questionnaire that assesses children's responses to every day sensory activities. Rogers et al.[73] reported that both children with ASDs and children with Fragile X syndrome had more sensory sensitivity symptoms than children with other developmental disabilities or typically developing children. Ben-Sasson et al.[74] examined young children and found that toddlers with ASDs showed high frequency of under- responsibility (89%) and over-responsibility (75%), with 67% of the group showing both

under- and over- responsibility. Baraneket al.[75] reported similar findings in a sample of children ages 2 to 7 years with ASDs, although the prevalence was somewhat lower (63% under-responsiveness, 56% over-responsiveness, and 38% both over responsiveness and under-responsiveness).

In a recent meta-analysis, Ben-Sassonet al.[76], reviewed results from 14 studies (of 97 potential studies identified), 13 of which included a comparison group of typically developing children and four of which included a comparison group of children with developmental disabilities. The meta-analysis found significant between-group (ASD: comparison) differences. Mean effect sizes across studies was high and significant, with the majority of 42 individual effect sizes Cohen's d >.81 indicating that children with ASDs were much more likely to have sensory processing challenges than children without ASDs. Overall, research indicates that sensory issues are extremely common in children with ASDs. In fact, some researchers have argued that atypical sensory processing should be one of the diagnostic criteria of ASDs.[77] Sensory issues are seen in very young children, seem to persist, and are seen across a range of severity of ASDs.

Many researchers as well as individuals with ASDs have suggested that there is a link between the sensory processing problems that a person experiences and difficulties managing daily life.[78] Eating is one of the areas of daily life activities that may be negatively affected by sensory aversions.[79] Oral defensiveness, which may be a component of tactile defensiveness, is defined as an avoidance of certain textures of food and avoidance of activities using the mouth, such as tooth brushing. Tactile defensiveness and oral defensiveness may be part of a larger problem in modulating sensory input which can take different forms. Oral over-responsiveness (defensiveness) may result in difficulty with food textures and therefore food selectivity. Oral under-responsiveness, in which the child does not appear to adequately perceive sensations, may

result in the child over-stuffing his/her mouth. Oral seeking behavior may result in the child putting everything in his/her mouth for the purposes of oral stimulation. Such concerns can be seen in multiple sensory modalities such as hearing, vision, taste, smell, and touch. Of particular interest in this paper is sensory over- responsibility, which may result in a child being a "picky" or selective eater.

Smith et al.[80] studied children ages 3–10 years with and without tactile defensiveness who did not have autism. Using the Sensory Profile[72], the authors reported that children who showed tactile defensiveness had significant differences in eating habits and food choices as compared to children who scored in the normal range. The children with tactile defensiveness were reported to have a fair to poor appetite, hesitated to eat unfamiliar foods, did not eat at other people's houses, and refused certain foods because of smell and temperature. They also were resistant to eating vegetables, with overall vegetable consumption being half that of children without tactile defensiveness. Children with tactile defensiveness also were reported to gag and/or bite their inner lips and cheeks. Furthermore, these children showed more limited selection of foods and had a pronounced aversion toward textures, smells, and temperatures of food compared to children who did not show tactile defensiveness. This study suggested that food selectivity is not a unique characteristic of autism per se, but may reflect sensory defensiveness.

It has been suggested that sensory sensitivity may lead children with ASDs to restrict their intake to food of preferred, tolerable, and manageable textures.[64]In the studies described here; the texture of foods was consistently identified as a related aspect of food acceptance, suggesting that sensory sensitivity may be a contributing factor to food selectivity. Attwood pointed out that the resistance to eating certain types of food may relate to texture or smell. For example,

olfactory over- responsibility may result in a person becoming highly uncomfortable in the school cafeteria, being bothered by the smells of other children's foods.[81]

In addition to the relation between food selectivity and sensory sensitivity, it is also possible that the mealtime behavior problems frequently seen in children with ASDs may reflect problems with sensory sensitivity. Leekamet al.[70] suggested that particular sensory inputs can cause behavior problems in individuals with ASDs who are unable to describe their distress. Of importance is the finding that sensory-based feeding issues create increased stress and negatively affect family mealtimes and quality of life.[82] Fiese and Schwartz[83] emphasized the importance of mealtimes since it is the primary daily activity that families share as a group and highlighted the importance of a positive family climate during mealtimes. Child behavior problems during mealtimes increase family stress and are disruptive to the family climate. Research and clinical observations indicate that food selectivity is a major problem in children with ASDs. One of the consistent themes in the food selectivity literature relates to food textures. It is possible that sensory sensitivity experienced by many children with ASDs may contribute to their difficulty with food texture and resultant food selectivity. Further research is needed to inform appropriate interventions.

Evidence to date suggests that food selectivity is a frequently occurring problem in children with ASDs and that their unusual eating patterns may be a significant stressor for their families.[82]Some literature suggests that the diets of children with ASDs are nutritionally inadequate, although these findings are mixed. Moreover, research indicates that sensory sensitivity is frequently seen in children with ASDs and may explain their difficulty with food textures, smells, and tastes and may contribute to the development of food selectivity. Greater

insight into the factors that give rise to eating difficulties is important because it allows for the design of more focused interventions.

Feeding problems are complex and often multi-factorial. Complex problems are often best addressed using an interdisciplinary approach. In the case of children with ASDs who are displaying highly selective eating patterns, interventions might be devised using the input of a dietitian, an occupational therapist, and a behavioral psychologist. Children with food selectivity are often first referred to dietitians for help with eating and nutrition. Parents are often concerned that their child is not eating a nutritionally adequate diet. Since sensory issues are so common in children with ASDs and may influence feeding and family mealtimes, it is important for dietitians to talk with families about children's responses to different types of sensory input, particularly tactile/texture, gustatory, and olfactory input. If it appears that sensory issues are a concern, the child can be referred to an occupational therapist for an evaluation of sensory processing. The occupational therapist will typically interview the parent and may administer a parent questionnaire such as The Sensory Profile[72], which includes a section on Oral Sensitivity. The use of food records and/or 24-hour diet recalls can help provide information on the total intake profile to guide determination of at-risk nutrients (calories, micro and macronutrients). Nutrition support may be needed in the form of vitamin and mineral supplementation. This may be especially true when the child is a selective eater and is on a specific diet such as a gluten-free, casein-free diet. The dietitian or other nutrition professional can also suggest ways to enrich the diet so that every bite contributes to nutritional adequacy in the child's diet. While working on increasing the acceptable foods, nutrition counseling is critical.

Meta-analyses of 12 randomized controlled trials from low-income and middle-income countries show that supplementation with multiple micronutrients in pregnancy leads to increased birth

weight. Trials of supplementation with multiple micronutrients during pregnancy in Bangladesh and in pregnant women in Tanzania infected with HIV suggest small benefits to infants' motor development[84-85] and to mental development in China[86], compared with iron and folic acid alone. In Peru, zinc supplementation during pregnancy had no effect on children's cognitive, social, or behavioral development at ages 4–5 years.[87] In Nepal, children whose mothers received iron and folate during pregnancy had better intelligence quotient (IQ), executive, and motor functioning than the placebo group at ages 7–9 years[88]; provision of multiple micronutrients or iron plus folate plus zinc had no benefits, possibly because of zinc inhibition of iron absorption.

Evidence for longer-term effects of IUGR is less consistent. Significant effects of birth weight unadjusted for gestational age were identified on IQ at age 5 years[89] and on highest school grade achieved.[90] However, contributions of prematurity cannot be estimated. No significant differences were identified between term LBW and normal birth weight children in IQ or parent reported behavior at 6 years in Jamaica[91], or at 8 years in Brazil[92], and no difference in self-reported behavior at 12 years in South Africa.[93] By contrast, a large study in Taiwan[94] reported significant small deficits in academic achievement of term LBW at 15 years. More evidence is needed on long-term effects of IUGR in low-income and middle-income countries on IQ, and specific cognitive and social skills.

A recent study from Bangladesh provides further evidence of the high incidence of maternal depressive symptoms in many low-income and middle-income countries. Maternal depressive symptoms are negatively associated with early child development and quality of parenting across different cultures and socioeconomic groups.[95] In Bangladesh, maternal depressive symptoms were associated with infant stunting, perhaps related to unresponsive caregiving.[96] Risk factors for maternal depression, such as poverty, low education, high stress, lack of empowerment, and

poor social support[95] are also risk factors for poor child development, suggesting that the relation between maternal depression and compromised early child development is multilevel and cumulative.

Two effectiveness studies in low-income and middle income countries have shown positive effects of educational television (a Bangladeshi Sesame Street [Sisimpur] and a Turkish experimental children's programme) on child mathematics and literacy scores.[97-98] Bangladeshi families reported doing more to support their children's learning after viewing the programme[99], and in a longitudinal study poorer children benefited more.[100] Children's television can also increase young children's acceptance of negatively perceived groups (e.g., Israelis and Palestinians).[101] In poor families in high income countries, providing books for young children through primary health services has been shown to increase how often parents read to their children and to improve child language.[102]

Few studies have assessed intervention models for children with disabilities in low-income and middle-income countries. One randomized clinical trial in Bangladesh reported that rural children with disabilities whose caregivers received a parenting training package progressed more on adaptive skills and that the mothers improved in their support for their children, compared with a minimal intervention.[103] Community-based rehabilitation, a strategy advocated by WHO, is widely used but not well assessed— a review of 128 published studies identified few robust assessments.[104] Studies recommend broader community awareness and more evidence, more screening and referral services, and caregiver support.[105] Few studies have assessed which combinations work best, although several combinations exist. Combinations tend to be more effective if addressing risks that co-occur, and if the programme can coordinate interventions to minimize extra work. Adding early child development might be motivating for

parents and childcare workers. Research is urgently needed on how to effectively integrate psychosocial interventions.

Training parents to use behavior management techniques, in combination with medication, reduces serious behavioral problems in children with ASD and related disorders when compared to medication use alone. Researchers randomly assigned 124 children, ages 4 to 13, into two groups – both groups received the antipsychotic risperidone, but in one group, parents received a structured training program teaching them to manage their children's severely disruptive and noncompliant behavior. Risperidone has been shown to reduce tantrums, aggression, and self-injury in children with autism; however, the drug can have side effects like significant weight gain and related health problems. The results of the study showed that while both groups of children improved over the six-month trial, the children whose parents had also received training (over an average of 11 sessions) showed a greater decrease in behavioral problems. These children were also taking a lower dose of risperidone at the end of the trial than the children being treated solely with medication (1.98 mg vs. 2.26 mg/daily). The authors noted that the benefits of actively engaging parents in treatment seemed to increase over time, further supporting the power of parent training. Future studies will evaluate whether the benefits of parent training continue into the future and whether younger children benefit as well. Based on the positive findings of this study, it may be beneficial to provide parent training through schools and community clinics.[106]

About one percent of 8-year-olds in the United States have an autism spectrum disorder, according to a CDC study of children in 2006 that was released in December 2009. This is a 57 percent increase from the rate of 1 in 150 children found in 2002 using the same research methods, although it is unclear how much of the increase results from better diagnosis and

increased awareness. Similar to previous studies, boys were four times as likely to be affected as girls, with 1 in 70 boys receiving a diagnosis. Black or Hispanic children were less likely to have ASD than their white peers, but more research is needed to determine how much of the disparity may result from lower rates of diagnosis in these communities rather than lower rates of autism itself. Investigators analyzed the available medical records and school records of about 300,000 children across the U.S. at 11 sites in the Autism and Developmental Disabilities Monitoring Network. ASD rates ranged across the sites between a high of 1 in 80 children in Arizona and Missouri to a low of 1 in 240 children in Florida. The study also showed that while children are being diagnosed slightly earlier than in 2002, the majority of children are not diagnosed until 3 ½ to 5 years of age – a significant delay considering that most had concerns about their development documented in their records before their third birthday.[107]

Older mothers and older fathers are more likely to have a child with ASD when compared to younger parents, according to a study of 7.5 million children born in California from 1989 - 2002. While previous studies had shown a link between a father's age and autism risk, studies on the effect of a mother's age were not as conclusive. This study found that for every ten-year increase in a mother's age, her risk of having a child with ASD rose by 38 percent, independent of her partner's age. Each ten-year increase in a father's age raised his risk by 22 percent. This effect was seen in all races and ethnicities and was not affected by the baby's birth weight or gestational age. Parents' age had a greater affect on autism risk in first-born children than children born later. More research is necessary to understand why older parents are more likely to have children with ASD, but the authors hypothesize that a number of factors that impact older women may play a role, including hormonal changes that could affect fetal brain development, increased use of assisted reproductive technologies, age-related genetic changes,

and the cumulative effect of exposures to environmental toxins. Older men are known to have accumulated a greater number of spontaneous genetic mutations in their sperm over time, which could increase the chances of having a child with ASD. More research is needed to understand autism risk factors and ultimately to communicate them to the public.[108]

Whenever a person decides to perform a movement, such as lifting his arm, the brain creates a model to predict what kind of sensory information will result. This model gives the person a sense of how the orientation of his arm will feel in relationship to his body, for example. Researchers have found that people with ASD are over-reliant on this sensory feedback (also called "proprioceptive information"), and that greater reliance is linked to greater levels of social impairment and poorer imitation skills. During the study, children were asked to manipulate a robotic arm to move a cursor to a target, "capturing" animals projected onto a screen if the child was quick and accurate enough. Children with ASD and typically developing children were trained on the robotic arm. After the training round, the handle for the robotic arm was moved, making it necessary for the children to readjust to the new positioning. The study revealed that children with ASD were over-reliant on their mental model of how their arm should feel in relationship to their body during the task. They were unable to use visual cues and adjust to the new positioning like their typically developing peers. These findings could explain in part why children with ASD often have issues with motor control and imitation, and may help to develop methods for improving motor skills in the future.[109]

The first long-term study of gastrointestinal (GI) issues in children with ASD found no difference in the frequency of symptoms when compared with typically developing children. While the issue remains a contentious one, this research adds to a body of evidence that GI disorders are no more frequent in children with ASD than they are in the general population. In

the study, researchers tracked all the residents of Olmsted County, Minnesota who were younger than 21 years of age between 1976 and 1997. Within this group, there were 124 children who were diagnosed with ASD. The researchers followed these children, along with typically developing children of the same age and gender, until they were about 18 years old, tracking their gastrointestinal symptoms over many years. They found no difference between the two groups in overall incidence of GI symptoms or specific GI disorders. Although children with ASD were more likely to have constipation or feeding issues such as food selectivity, the authors suggest that these problems resulted from ASD-related behaviors rather than from true GI disorders. They conclude that although there may be subgroups of children with ASD who suffer from concurrent GI disorders that contribute to their behavior, this study suggests that in general, GI disorders are not more common in children with ASD than they are in typically developing children. They caution against the indiscriminate use of restrictive diets, vitamin and mineral supplements, and other related treatments for children with ASD, noting that these alternative treatments should only be used on a case-by-case basis for children with a diagnosed GI disorder.[110]

While autism prevalence has increased dramatically in the last 30 years, it is unclear how much of the increase can be explained by changes to diagnostic criteria and guidelines. After creating a statistical model based on the analysis of service records, researchers estimated that more than one-quarter (26.4%) of the increase in California since 1992 can be explained by a change in diagnosis among a specific group —people initially diagnosed with mental retardation whose diagnosis was later changed to autism. Researchers examined the case records of more than 7,000 people with ASD born before 1987 who were enrolled with the California Department of Developmental Services between 1992 and 2005. They paid particular attention to a group of

patients who were initially diagnosed with mental retardation and then received an alternate or additional diagnosis of autism. After analysis, the researchers found that patients were much likelier to acquire an autism diagnosis after changes to the Diagnostic and Statistical Manual of Mental Disorders (DSM), or other diagnostic guidelines. There have been multiple changes to the DSM definition of autism since 1987, most significantly when the fourth edition was published in 1994. The authors conclude that changes in practices for diagnosing autism have had a substantial effect on the overall autism rate. While the shift in diagnosis from mental retardation to autism accounts for one-quarter of the increase, the reasons for the remaining 75 percent are still unexplained. Understanding the multiple factors that are influencing the increase in ASD may ultimately help to identify the underlying causes.[111]

A 2007 survey of parents across the U.S., called the National Survey of Children's Health (NSCH), showed a similarly increased rate of ASD as the CDC surveillance study (CDC, 2009) published soon after. Parents who participated in the NCSH were asked whether their child had ever been diagnosed with ASD by a doctor or other health professional. They were then asked if their child currently had ASD. Based on the number of parents who said that their child had been diagnosed and still held the diagnosis, researchers estimated that ASD occurs in about 1 in 91 children in the U.S., slightly higher than the rate of 1 in 110 children found in the CDC study. Similar to other studies, boys were four times as likely to have ASD as girls and white children were more likely to be affected than black or multi-racial children. Interestingly, nearly 40 percent of children who had been diagnosed with ASD in the past no longer had the disorder, according to their parents. Black children were more likely than white children to have reportedly lost their diagnosis. The authors note that the number of children losing their diagnosis could be inflated —children who were suspected to have ASD but later found not to

after subsequent assessments would be included in this group. It is also possible that children with developmental delays, mental retardation, or learning disabilities were initially classified as having ASD to obtain needed services. Unfortunately, these hypotheses cannot be tested using the data collected in this study.[112]

Studies have shown that ASD is often diagnosed long after symptoms have appeared or is misdiagnosed as another disorder. Unfortunately, these delays and errors seem to be even more frequent in racial and ethnic minorities. A study published in the March issue of the American Journal of Public Health revealed that black and Hispanic children with ASD were less likely to have been diagnosed by a medical professional than were white children. This was also true of children who identified their race/ethnicity as "other." Most of the Asian and Hispanic children who failed to be diagnosed with ASD also had an intellectual disability (IQ<70), which can complicate ASD diagnosis. However, black children were less likely to be diagnosed regardless of whether or not they had an intellectual disability. Researchers screened health care and education records from about 2,600 eight-year-olds at sites across the U.S. involved in the CDC's Autism and Development Disabilities Monitoring (ADDM) network. Using the records, experienced clinical reviewers assessed whether the child had documented symptoms that met the criteria for ASD and whether an official diagnosis had been made. In total, only 58 percent of children in the study meeting the case definition of ASD had received a diagnosis. In addition to minority groups, girls were also significantly less likely to receive a diagnosis when compared to boys. This was also true of children whose mothers had not completed high school. The authors note that mothers with greater education may be more aware that a diagnosis is necessary to receive educational services. The significant racial and ethnic disparities shown in the study

support the need for continued professional education for clinicians to improve ASD identification in children.[113]

A large national study of children with ASD revealed that the median age of diagnosis was nearly 6 years old and more than one-quarter of the children were not diagnosed until age 8. Experienced clinicians can identify autism between 2 and 3 years of age, so these statistics show that diagnosis is significantly delayed in most cases. With later diagnosis, children with ASD miss a critical window for early intervention, which has been shown to have a profound impact on development. Researchers reviewed the medical records and education records, when available, of the approximately 2,600 children included in the 2002 ADDM surveillance study. An analysis of the data showed that boys were more likely to be diagnosed at a younger age, as were children with intellectual disabilities (IQ<70), and those who had experienced regression. The authors noted that the gender differences in diagnosis could stem from cultural biases about what constitutes normal behavior for girls – for, example shyness may be more socially acceptable. There was no difference in age of diagnosis across races after adjusting for other factors. This study shows significant delays between the age at which diagnosis is possible and when it is actually taking place. Researchers need to conduct research to understand the consequences of late identification and develop methods to improve the timing of diagnosis. Future efforts should also focus on identifying ASD in school-aged children who may not have been diagnosed earlier, according to the study authors.[114]

With the increased emphasis on early detection and the recommendations from the American Academy of Pediatrics that all 18- and 24-month-olds be screened for ASD, it is important for clinicians to understand how the diagnostic criteria for ASD can be applied to children in this age group and which methods and tools can be used to provide the most reliable diagnosis. An article

published in Pediatrics addresses what is known about the early signs of ASD, best practices for diagnosis in very young children, and available interventions. Studies of infants who have an older sibling with ASD show that developmental delays related to the disorder can be detected from 12 to 18 months of age. These signs could include a lack of eye contact, delayed motor skills, repetitive actions with toys, or a lack of babbling. However, doctors are faced with trying to diagnose ASD with assessments that may not be useful for children under two years of age. Research shows that fewer than 1 in 5 children diagnosed with ASD at 20 to 24 months of age were correctly identified by the Checklist for Autism in Toddlers (CHAT) at 18 months. Even if a diagnosis is suspected, clinicians have difficulty recommending appropriate interventions for children less than two years of age. It has not been established whether interventions designed for pre-school age children are beneficial for toddlers. The authors advise clinicians to follow up with parents who express concerns about their toddler's development, referring them for additional evaluation and early intervention services when appropriate. Ongoing research will help to expand the options for diagnosing and treating very young children suspected to have ASD.[115]

Family as well as other social groups is conceived as a group of individuals that interact within a system, according to the theory of systems.[116-117]The family system usually consists of parents and children. Each person does not behave as an isolated entity within the system. Instead, follows a cyclical pattern in which no single behavior is the cause or the result of some events. In this way we see that the relationship and interaction between all members of the family is bidirectional. The behavior of each person influences the behavior of the other, which in return influences the behavior of the first person and so forth. In a family we behold that the parents'

behavior affects their children, whose behavior inevitably affects the parents' behavior and so on.

During the literature review no sufficient data was found about the influence of parental behavior in children with autism. Something that has been examined in the light of the influence of parental feelings is the social development of children with autism. It is known that children with pervasive developmental disorders acquire difficulties in developing social skills.[118] However, Haven et al. observed that the quality of interaction between parents and children appears to have long-term implications for the social development of children with developmental difficulties and children with typical development.[119-120] Furthermore, studies have come to conclusion that the emotional support of parents towards children indirectly affects the development of children's social skills by encouraging emotional competence. Indeed, it has been shown that, when parents are synchronized (e.g. via response) with children's behavior during interaction games, this can result over time in language development in children with Autistic Spectrum Disorders.[121]

A key question is why everyone considers lack of empathy as one of the key features of pervasive developmental disorders. It is initially legitimate to define what we mean by empathy. Empathy is defined as an emotional reaction, which stems from the emotional state or mood of another man.[122] We tell us that experiencing our own emotions enables us to feel empathy and to imagine how others feel.[123] According to Harris there are cases in which we understand the emotion someone feels but we do not feel the same feeling. It is also important to mention that in order to be able to appreciate a feeling, one needs not only to imagine what the other feels, but also what he thinks and wants.[124] Thus, we conclude to what Eisenberg and Strayer reported that there is not right or wrong definition of empathy, but different definitions.[122] Ultimately, it is not

clear which aspects of empathy are common and which are separated in Autistic Spectrum Disorders.

According to Baron-Cohen and Golan literature, it is documented that the emotion recognition and the recognition of mental state is the core difficulty in subjects of autism spectrum.[125-126]Drossinou says: "The management of emotions in autism spectrum disorders refers to the effortless expression of emotion, which is also the main difficulty of autistic children.[127] For them it's hard to express with words what is that bother them, what's confusing, what is it that makes them self-inflicted or beat others." Children with autism, some less and others more, fail to understand or respond adequately to the emotions expressed by others, while when they do, their responses can sometimes or often be strange, unusual and lacks empathy (empathy), e.g. someone's cry of pain may seem strange, striking fact to the child and to impress or make him laugh.[128]

Hamilton and Ujarevic report that, the first investigations carried out relatively to the emotions in autism have shown that individuals with autism face some difficulties to match the emotional facial expressions with emotional expressions of the body and the context.[129] Hobson, in a detailed investigation did not find any evidence for the recognition of basic emotions. The investigation led to the idea that people with autism may have some difficulties in identifying some basic emotions, despite a general lack of recognition.[130-131] Baron-Cohen concluded that the difficulties on the theory of mind can cause some difficulties in selective recognition of the emotion of surprise. Nevertheless, future studies failed to show that several subsequent studies have dealt with both the negative feelings and the positive. Specifically, Ashwin reported they have difficulties in negative emotions such as anger and fear.[132-133] Difficulties have been also observed with respect and the recognition of sadness.[134-135] Certainly there are studies[136-137

which have found deficiencies in recognizing negative emotions, unlike other studies which found shortcomings in the recognition of positive emotions.[129] Therefore, we observe that until now the general idea that exists on the recognition of emotions in autism is very confusing, there are no clear answers on the recognition of emotions. It is unclear whether they have reduced ability to recognize emotions, and in case there is, such a reduced ability whether it equally affects all the emotions.

CHAPTER 2

STUDY DESIGN

2.0. Study Design

2.1 Survey Design

This study focuses nutritional status and IQ level of the autistic children in Bangladesh along with the perception of their parents about autism at a single point in a specified time. Considering time period and resource availability, cross-sectional analytical (to show association, correlation, regression among different variables study design was most feasible for this study.

2.2 Study location

The study had been conducting among autistic children (age 1-12 years) who were diagnosed by Paediatric Neurologist & Psychologist clinically at selected centers in Bangladesh where patients come from different parts of Bangladesh. Data were collected from outpatient department (OPD) of Institute of Paediatric Neurodisorder & Autism (IPNA), BSMMU, OPD of The Centre for the Rehabilitation of the Paralyzed (CRP) in Dhaka, Savar & also specialized centers like: Autism Welfare foundation, The Society for the Welfare of Autistic Children (SWAC), Autistic Children's Welfare Foundation, Bangladesh Jatio Protibondhi Unnoyon Foundation (JPUF), Bangladesh Protibondhi Foundation (BPF), Dhaka. All those hospitals & centers are working with children of autism spectrum disorder. In those centers autism screening, diagnosis, psychological test, management & treatment are given.

Institute of Paediatric Neurodisorder & Autism (IPNA), BSMMU

IPNA, BSMMU will perform the role as a pioneer institution operating on a national level that shall not only provide services in the form of early detection and intervention, but also ensure a 'safe environment for autistic children' where they can learn to develop to their full potential. Additionally this institute will also help in disseminating disability/autism related knowledge and other essentials skills for doctors, teachers, and parents.

IPNA is a humanitarian response to address the needs of these underprivileged children. This institute also hopes that it will serve as the main resource centre for the disabled and autistic children in Bangladesh and in the greater South Asian Region in the days to come.

Centre for the Rehabilitation of the Paralyzed (CRP)

The Centre for the Rehabilitation of the Paralyzed (CRP) has developed into an internationally respected organization. CRP focuses on a holistic approach to rehabilitation, recognizing that all aspects of the rehabilitation process are vital for its success.* To provide treatment, rehabilitation and support services focusing on physical, emotional, social, psychological and economic aspects. * To promote the development of skilled personnel in health care and rehabilitation in the country and the region. * To develop sub-centers in different parts of the country to expand the services for disabled people in collaboration with other organizations (NGO's, Government,

self-help organizations and private sector). * To organize and promote programmes for the prevention of disability. * To develop programmes for disabled children, focusing on early identification, therapeutic interventions and education.

Bangladesh Protibondhi Foundation, Dhaka

The mission is to work for the treatment, education, rehabilitation, health, nutrition and protection of children and adults with disability through training in independent skills by developing, providing, organizing and setting up relevant services through training and facilities.

2.3 Period of Study

This study was conducted from June 2014 to June 2016.

2.4 Study subject

The children (age 1-12 years) who were diagnosed by Paediatric Neurologist and Psychologist clinically as a children of Autism Spectrum Disorder (age 1-12 years) at OPD of Paediatric Neurology Department was study subject. ASD children of different specialized centers were also taken as a study subject. It would be observed that most of the urban, educated parents were coming with their children by recognizing symptoms of autism. But now-a-days people in low socio-economic status also come to the service provider for diagnosis & management of the children with autism but they are poor in number.

2.5 Sampling technique

Purposively sample were taken from study subject. Autism is a rare non-communicable disease & also poorly known to the people of Bangladesh. The children were also rarely diagnosed at OPD of the given centers. Because of poor availability every diagnosed children with autism were included purposively in the study within time-frame, like: placement at IPNA, OPD for 10 months five days in a week from 8 am to 2.30 pm (in this time two hundred autistic children aged 1-12 years were included in the study), next placement were at CRP for 08 months (100 autistic children were included from there), 02 months placement were at JPUF (40 autistic children were included from there), 02 month placement were at SWARC & 01 month were at BPUF (44 autistic children's were included as study sample from there).

Data editing and coding:

Supervisor of the study checked and verified the draft of questionnaires and edited where needed in consultation with the researcher. Draft questionnaires then go for pre-test by researcher to re-check its completeness and validity of codes. After necessary corrections were made the questionnaires were ready for data collection. Food codes and food weights were also measured carefully by the researcher.

2.6 Sample Size

Since the number of the population was precisely unknown in Bangladesh but presumably which will be few thousands, the minimum sample size was estimated. This formula was used:

$$n = Z^2pq/d^2$$

Where, n = required sample size

Z = standardized normal variable

p = proportion of autistic children (unknown)

q = 1-p

d = degree of accuracy desired which is set at 5% level

Here, Z =1.96, p =50% =0.5, q =1-p =1-0.5 =0.5, d =5% =0.05,

$$n = \frac{(1.96)^2 x 0.5 x 0.5}{(0.05)^2} = 384$$

A sample size of 384 was reasonable one. In this respect margin of error was considered 5% and confidence interval 95%. In addition it was ensured that the age of the sample is 1 to 12 years.

2.7 Questionnaire Design

For demographic data collection part of the questionnaire was drafted by the researcher with the help of supervisor & other experts of INFS, University of Dhaka. The Bangla translation of questionnaires also had been drafted at that time. The questionnaire used for the study contains 8 modules and a total of 35 questions. The module on "24 Hours Recall Method" (which is universal) contains 5 items of questions where answer would be comprises of different food items. Questionnaires in terms of number of questions by module are shown in the table 1 below:

Table 1: Number of questions and module selected for the study

Module Title	No. of questions in the study
1. General Information	07
2. Household Information	05
3. Socio-economic Information	04
4. Anthropometric measurement	02
5. IQ measurement	02
6. Child delivery history	01
7. Perception assessment	09
8. 24 Hours Recall Method	05
Total	35

Keeping consistence with the general and specific objectives of the study and terms of reference, the draft questionnaires for nutritional assessment was designed based on the base questionnaires of INFS food data analysis software. The questionnaire was pre-tested on OPD of IPNA, BSMMU at first.

Anthropometric measurement

Anthropometric measurement module was prepared for measuring the height/length, weight of children of age 1 to 12 years. For measuring height/length local made wooden stadiometer was used, for taking weight digital weighing scale (Bathroom scale) was used. For 24 Hours Recall Method foods intake of 24 hours were taken carefully.

2.8 Study Variables

a) Demographic variables: Age, sex, occupation, socioeconomic status

b) Etiological factors: Nutritional Status, IQ level, Nutrient intake, Parents perception

2.9 Selection Criteria

A. Inclusion criteria

- Autistic Children (aged 1-12 years) diagnosed by Paediatric Neurologist & Psychologist (most of the signs & symptoms are shown within 1-12 years range of an autistic children).
- Parents who gave consent on study

B. Exclusion criteria

- Autistic children above 12 years of age
- Any acute illness of the children at examining time

CHAPTER 3

STUDY METHODOLOGY

3.0 Study Methodology

3.1 Study Procedure

After approval of the study protocol by Dhaka University syndicate and getting permission from respective department, the study was conducted. Children (age 1-12 years) who were referred or come individually in to the OPD of different hospitals diagnosed as ASD fulfilled inclusion and exclusion criteria were included in the study. After taking written informed consent from the parents (or legal guardian, attendant), pre-tested questionnaires were fill-up, IQ level were collected from psychologist during data collection & height-weight were also measured by the researcher own.

3.2 Data collection instrument

- Pretested Semi-structured questionnaires were used for demographic data collection,
  For measuring weight, height: Bathroom- scale & locally made stadiometer were used
- IQ assessment tools used by the psychologist were: Bayley Scales of infant development (BSID II), Independent Behavior Assessment Scale (IBAS), Stamford- Binet Intelligence Scale, Wechsler Intelligence Scale for Children-Revised (WISC-R)
- By 24 hour recall method food & nutrient content of the autistic children were calculated by researcher.

The Bayley-II

The Bayley-II is a standardized developmental assessment that evaluates the functioning of infants and young children from 1 month to 42 months of age. It is designed to identify children with developmental delays and aid in intervention planning. The test assesses multiple developmental domains, including cognitive, language (both receptive and expressive), motor (both fine and gross), as well as social emotional and adaptive behavior. The cognitive, language, and motor scales are based primarily on direct assessment, whereas the social-emotional and adaptive behavior scales are caregiver questionnaires. Scaled scores are provided for each subtest, with composite scores and percentile ranks for each overall scale. Developmental age equivalents are also provided for cognitive, language, and motor subtests. Growth scores can also be calculated to evaluate a child's growth over time for cognitive, language, and motor subtests. Designed as a comprehensive measure of cognitive ability for children.

Wechsler Intelligence Scale for Children-Revised (WISC-R)

Population: Ages 6-16years, Score: Verbal, Performance, and Full Scale Scores. Time: (50-75) minutes. Author: David Wechsler. Publisher: The Psychological Corporation. Description: The Wechsler Intelligence Scale for Children-Revised (WISC-R) is a general test of intelligence, which Wechsler defined as, "... the global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment." In keeping with this definition of

intelligence as an aggregate of mental aptitudes or abilities, the WISC consists of 13 subtests divided into two parts, verbal and performance. Scoring: The WISC-R is a collection of 13 distinct subtest divided into two scales - a Verbal Scale and a Performance Scale. The six Verbal Scale tests use language-based items, whereas the seven Performance Scales use visual-motor items that are less dependent on language. Five of the subtest in each scale produce scale-specific IQS, and the 10 subtest scores produce a Full Scale IQ.

Independent Behavior Assessment Scale (IBAS)

The IBAS has four major subscales: motor skills, socialization, communication and daily living skills. Item selection and reduction are described, based on an ecological analysis of behaviors expected of children aged between two and nine years of age. The IBAS can provide a baseline indication of level of skills in a child with intellectual disability, and aid in planning an appropriate curriculum-based programme in discussion with the child's family.

3.3 Facilities

The study was done at outpatient department (OPD) of Institute of Paediatric Neurodisorder & Autism, BSMMU, OPD of The Centre for the Rehabilitation of the Paralyzed (CRP) in Dhaka, Savar & also specialized centers like: Autism Welfare foundation, The Society for the Welfare of Autistic Children (SWAC), Autistic Children's Welfare Foundation, Bangladesh Jatio Protibondhi Unnoyon Foundation (JPUF), Bangladesh Protibondhi Foundation (BPF), Dhaka.

3.4 Statistical Analysis

To analyze the data Statistical Package for Social Science (SPSS) version 21.0 was used. After entry, range and consistency were checked. Statistical analysis was done by using descriptive statistics. Continuous variables were presented as mean values ± standard deviation (SD), and categorical variables were presented as percentages. For data appropriateness significance test (T test, chi-square test, correlation test and coefficient of variation) was done. The analysis was compared the mean intake with RDA for each nutrient. Body Mass Index (BMI) was measured by 5^{th} and 85^{th} Percentile (cut-off points of BMI was weight for age in Z-score of children) .According to BMI, nutritional status was categorized into three groups, namely mild, moderate and severe. Food data were analyzed by software of INFS, University of Dhaka. After macro & micro-nutrient analysis that were compared with demographic data. Data were presented by table and charts. IQ level was measured in different psychological test by registered psychologist,

which were also compared with nutritional status & food intake. Perceptions of the parents were assessed by different assessment questions.

Concepts and definition of nutritional parameter

The WHO growth reference standards (GRS) 2005 are considered to be a technically robust tool to measure, monitor and evaluate the growth of all children and women of reproductive age worldwide, regardless of ethnicity, socioeconomic status and type of feeding. The GRS 2005 have been used in analyzing the anthropometric data in this study.

Stunting: This is a growth retardation indicator. Stunting is usually the end-result of chronic and less severe inadequate nutrition. This is computed on the basis of anthropometric measurement of height-for-age Z score (HAZ) below -2 SD of reference population. The height and weight measurements of children usually quoted in terms of z-score, based on the standard deviations (SDs) above or below the median reference value for a person of a given age. The median minus 2 SD is usually taken as the cut-off point or threshold, below which malnutrition is considered**.** The following cut-off levels are used to categorize severe and moderate forms of stunting:

HAZ = Less than -3.00 SD	: Severely stunted
HAZ = -3.00 SD to -2.01 SD	: Moderately stunted
HAZ = Less than -2.00 SD	: Globally stunted
HAZ = Greater than -2SD	: Not stunted/ normal

Wasting: This is weight- for-height indicator. It indicates weight-for- height impact of hunger, insufficient food intake and food shortages. It measures the weight-for- height Z scores (WHZ) below -2 SD of reference population indicator for acute malnutrition.

WHZ = Less than -3.00 SD	: Severely wasted
WHZ = -3.00 SD to -2.01 SD	: Moderately wasted
WHZ = Less than -2.00 SD	: Globally wasted
WHZ= Greater than -2SD	: Not wasted/ normal

Underweight: Indicates weight-for-age Z-scores (WAZ) below -2 SD of reference population. It indicates no differentiation between chronic and acute. Weight-for-age Z-score (WAZ) below -2 SD of reference population commonly used for national and regional statistics.

WAZ = Less than -3.00 SD	: Severely underweight
WAZ = -3.00 SD to -2.01 SD	: Moderately underweight
WAZ = Less than -2.00 SD	: Globally underweight
WAZ= Greater than -2SD	: Not underweight/ normal

The Body-Mass-Index (BMI): The Body-Mass-Index is a measure for fitness/thinness in adults. BMI cut-off values for Chronic Energy Deficiency (CED) and overweight/obesity of adult for **Asian Population** are as below:

CED	Grade III (Severely thin)	: <16.0
	Grade II (Moderately thin)	: 16.0 to 16.9
	Grade I (Mildly thin)	: 17.0 to 18.4
	Total CED	: < 18.5
	Normal	: 18.5 to 22.9

Obesity/overweight

Increased risk	: 23.0 to 27.4
High risk	: >= 27.5
Total	: >= 23.0

BMI= Weight in kg/ (height in meters) *2. Normally body weight is proportional to body height.

3.5 Quality Assurance Strategy

1) Each & every data were collected by the researcher carefully specially height-weight measurement of the autistic children.

ii. Food intake data were collected with patience for memorizing the parents.

iii. Statistical data were analyzed & entry carefully with help of a statistician in SPSS software

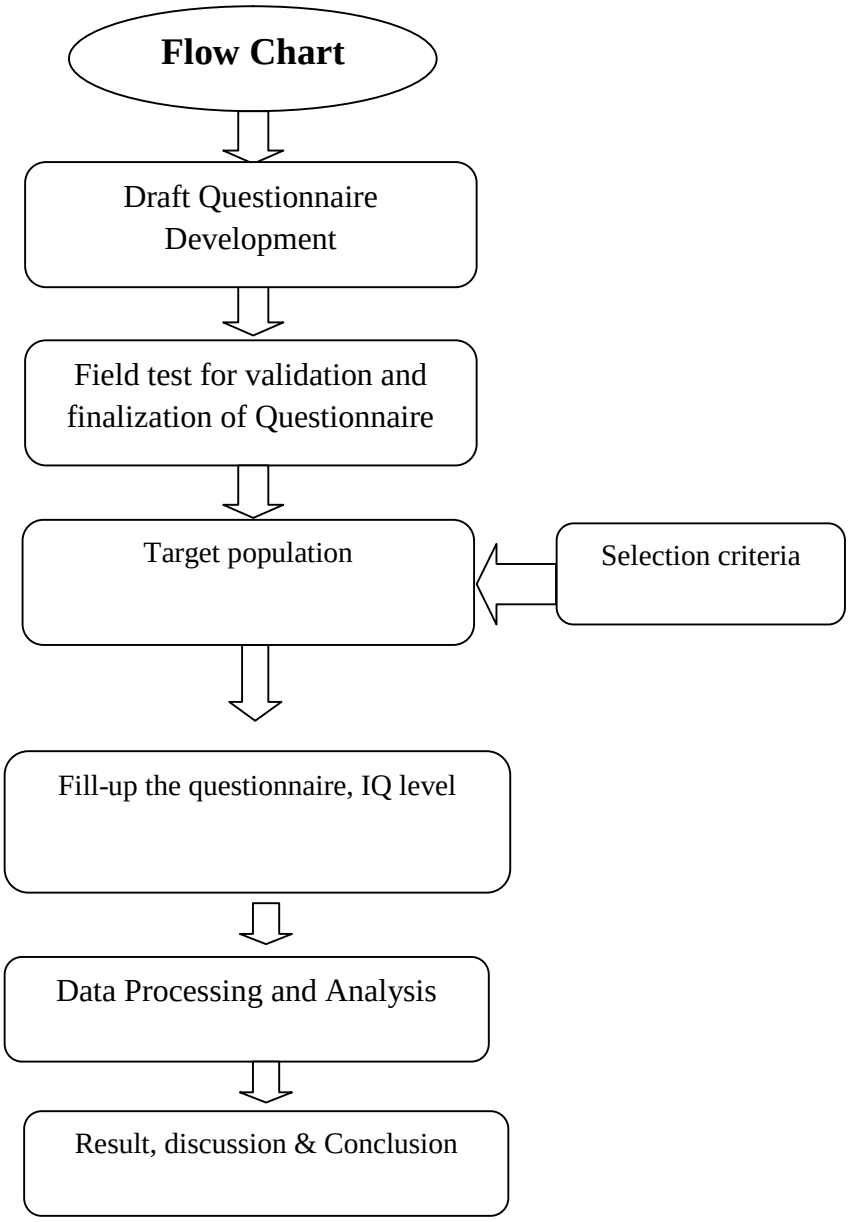
iv. Every steps of study were done under close supervision of supervisor.

v. Children's autism diagnosis was confirmed by checking their all clinical papers of Paediatric Neurologist & IQ level were confirmed by the Psychologist's report.

3.6 Ethical Consideration

The study was conducted maintaining all possible ethical considerations. Informed written consent was obtained before data collection. Informed consent was taken from all contain purposes, methods and benefits of the study. During interview, all sorts of privacy of the data providers were maintained. Confidentiality of data was ensured strictly. Data were preserved in computer and will be used only for the purpose of this research.

3.7 Flow chart of the steps of the study



3.8 Time schedule of the study

Activities	**Time frame**								
	July 2013	**Aug-Oct 2013**	**Nov-Dec 2013**	**Jan-Feb 2014**	**Mar-May 2016**	**June 2016**		**Nov 2016**	**Dec 2016-March 2017**
selection of Topic									
Literature review									
Protocol writing									
Questionnaire Develop & pre-test									
Data collection									
Data analysis									
Thesis writing									
Binding & submission									

3.9 Limitation of the study:

- Large scale study will be helpful to explore the association between nutritional & other factors with ASD.
- Bio-chemical, EEG, MRI, CT-scan, Gene study may be helpful to explore the causation of ASD which could not be possible to done in this study.
- If possible a large scale dietary intervention should be done.
- Large scale counseling of the parents can be conducted.
- Perception of the mass population should be improved by awareness programme through electronic & print media and also through community clinics.
- One 24 hours recall isn't depicting the actual scenario of micro-nutrient intake.
- Seasonality or less season effect on micro-nutrient intake.

CHAPTER 4

RESULT

4.0 RESULTS

After analysis it was found most of the children (37%) were in the 37-71 months of age group, 26% were 72-107 months, 20% were in 108-120 months & 17% were in <36 months. It was observed in case of autism male children were more affected than female children. There were 82% male children and female children were 18%.It was revealed that in Bangladesh most of the participants were Muslim, 90% followed by Hindu 8% and Buddhist 2%.

Age of mother (in year)	**Number**	**Percentage**
15-19	63	16
20-24	81	21
25-29	156	41
>30	84	22
Mean+SD	25.93+5.10	
Age of father (in year)		
21-30	104	27
31-40	242	63
>40	38	10
Mean+SD	33.56+5.58	

Table 2: Age group of parents of autistic children (n=384)

Age (in years) distribution of the autistic child's parents (n=384), mother's mean age were 25 years where SD 5.10 & father's age were 33 years where SD 5.58, when the children with autism was born. (In Table: 2)

Table 3: Mother's Education of autistic children (n=384)

Education	Frequency	Percentage
Primary	16	4.2
SSC & HSC	160	41.7
Graduation	113	29.4
Post-graduation	95	24.7

In Table: 3 regarding the educational level of the mother of the autistic children, 24.7% completed post-graduation, 29.4% completed graduation, 41.7% completed secondary to higher-secondary level & only 4.2% completed primary education level.

The history of mood of delivery of autistic children was born by 54% caesarean section and 46% by normal delivery.

About 81% mothers of the children with autism were housewife & only 18% were in service where as 70% father were in service & almost 30% had involved with business.

In figure 6 shown parents were first discovered the abnormal behavior of the children with autism by <2 years.

Table 4: Monthly family income of autistic children's parents (n=384)

Monthly income	Number	Percentage
<30,000	104	27.2
30000-59999	195	50.8
60000 & above	85	22.0
Total	384	100

Most of the parent (51%) had family income 30000-59999 taka monthly, 27.2% had <30,000 taka & 22% parents had monthly income 60,000taka & above.(In Table: 4)

Table 5: IQ level of the study subjects (n=384)

IQ level	Frequency	Percentage
<69 (significantly delayed performance)	243	63.3%
70-85 (moderately delayed performance)	94	24.5%
85-114 (mildly delayed performance)	4	12.2%

In Table: 5 number of autistic children who underwent psychological test was 384. Among them more than 63% autistic children had IQ level <69 (known as significantly delayed performance by standard method), 24% had IQ level 70-85 (known as moderately delayed performance) & nearly 12% of the children had IQ level 85-114 (known as mildly delayed performance).

Table 6: Psychological test done for measuring IQ level of the study subjects (n=384)

Psychological test	Frequency	Percentage
BSAID (age 1-3.5yrs & no speech, no performance)	364	94
WISC-R (6-15yrs, with speech & performance)	10	3
IBAS (2-9 yrs, no speech & no performance)	10	3

In case of psychological test 94% were done by BSID II (Bayley Scales of infant development), 3% were done by WISC-R (Wechsler Intelligence Scale for Children-Revised) & 3% were done by IBAS (Independent Behavior Assessment Scale). (Table: 6)

Table 7: Abnormal behavior of the study subjects (n=384)

Abnormal Behavior	Number	Percentage
Lack of eye contact	62	16
No response of name	52	14
Poor speech	83	22
Attention deficiency	26	7
Absence of toilet training	67	17
Lack of peer interaction	26	7
Odd behavior	68	17
Total	**384**	**100**

In Table: 7 abnormal behavior of 59% autistic children were mostly identified below 2 years, in between 2-3 years 25% autistic children were identified & above 3 years around 16% children were identified by their parents. To identify abnormal behavior it was detected some behavioral

problems of the autistic children, such as lack of eye contact, no response to calling name, poor speech, lack of attention, don't have toilet training, lack of P-R interaction & odd behavior.

Table 8a: Parent's Perception's label

Perception's label		**Parent's education**		**Chi-square tests (Sig.)**
		Below graduate	Graduate & above	
What do you mean by autism	Very well known	113	177	0.000
	Only know the name	31	27	0.000
	Don't know anything	32	4	0.000
What do you mean by very well known	Know most of the symptoms	117	120	0.029
	Know only major symptoms	32	65	0.025
	Know only two symptoms	26	22	0.555
	Only know as a neurological disorder	1	1	-
From	Media	96	93	0.038

where first know about autism	Relative	26	40	0.029
	By study	3	14	0.242
	Doctor	51	61	-

Table 8b: Parent's Perception's label

Perception's label		**Parent's education**		**Chi-square tests (Sig.)**
		Below graduate	Graduate & above	
Which one is correct for autism	Preventable	48	69	0.000
	Curable	43	78	0.000
	Controllable	85	61	0.003
When do you first discover abnormalities in your child	Before 2 years	95	132	0.073
	2-3 years	26	35	0.073
	3-5 years	4	4	0.011
	Above 5 years	51	37	--
For autism to whom you consult first	Doctor	98	76	0.000
	Relative	23	27	0.000
	Family member	54	105	0.000

Nobody	1	0	--

Table 8c: Parent's Perception's label

Perception's label		**Parent's education**		**Chi-square tests (Sig.)**
		Below graduate	Graduate & above	
Face any difficulty in taking care	Face difficulty	134	158	0.471
	No difficulty	40	44	0.452
	Manageable	2	6	0.698
Sharing with others about the child with autism	Don't share with others	53	72	0.383
	Share with others	123	136	0.348
For the child do you avoid any food	Avoid food	80	97	0.838
	Don't avoid any food	96	111	0.449

Relation between mother's education with different level of their perceptions, in the field of understanding the meaning of autism, about the ultimate outcome of it, with whom they could consult were significantly associated. But other perceptions of mother were not significantly associated with their education. (In Table: 8a, 8b, 8c)

Table 9: Association between age group and nutritional status of autistic children (n=384)

Age in month	HAZ (stunting) n(%)			WAZ(underweight) n(%)			WHZ (wasting) n(%)		
	Severe-3.00 SD & below	Moderate -2.99 SD to -2.00 SD	Normal -2.00 SD	Severe -3.00 SD & below	Moderate -2.99 SD to -2.00 SD	Normal -2.00 SD	Severe -3.00 SD & below	Moderate -2.99 SD to -2.00 SD	Normal -2.00 SD to +2.00 SD
<36	6 (9.4)	5 (7.8)	53 (82.8)	3 (4.7)	12 (18.8)	49 (76.6)	6 (9.5)	14 (22.2)	43 (68.3)
36-59	9 (9.3)	9 (9.3)	79 (81.4)	7 (7.1)	12 (12.1)	80 (80.8)	18 (18.2)	15 (15.2)	66 (66.7)
60 &	26	27	162	3	12	205	10	6	168

above	(12.1)	(12.6)	(75.3)	(1.4)	(5.5)	(93.2)	(5.4)	(3.3)	(91.3)

In Table: 9 it was observed that in case of stunting, 83% autistic children had normal nutritional status of age group below 36 month. In the same age group 7.8% children were moderately stunted & 9.4% children were severely stunted. In 36-59 months age group 81.4% autistic children had normal nutritional status, 9.3% were both moderately & severely stunted. In 60 months & above age group 75.3% children had normal nutritional status, 12.6% moderately stunted & 12.1% severely stunted. In case of underweight, in below age group 36 months 76.6% autistic children had normal nutritional status, 18.8% were moderately underweight & 4.7% were in severely underweight. In 36-59 months age group, 80.8% children had in normal nutritional status, 12.1% moderately underweight & 7.1% were severely underweight. In 60 months & above age group, 93.2% children had normal nutritional status, 5.5% children were moderately underweight & 1.4% children were also severely underweight. In case of wasting, below 36 month age group, 68.3% autistic children had normal nutritional status, 22.2% were moderately wasting & 9.5% had severely wasting. In 36-59 months age group, 66.7% children had normal nutritional status, 15.2% children were moderately wasted, 18.2% children were severely wasted.

In 60 months & above age group 91.3% children had normal nutritional status, 3.3% were found in moderately wasted & 5.4% children were severely wasted.

Table 10: Comparison between Nutritional status of ASD children and Normal children by Z-score (age group below 06 yrs) (n=384)

Nutritional Status	Anthropometric Indicator	Normal Children	Autistic Children
Mild	Stunting	46.2%	82%
	Under-weight	39.7%	78.2%
	Wasting	14.5%	54.5%
Moderate	Stunting	27.2%	8.55%
	Under-weight	28.8%	15.45%
	Wasting	11.6%	18.7%
Severe	Stunting	19.0%	9.35%
	Under-weight	10.9%	5.9%
	Wasting	2.9%	13.85%

Ref: Statistical Pocket Book, Bangladesh 2015, BBS, SID, Ministry of Planning

In Table10 it was observed that in case of below 6 years of children percentages of mild form of malnutrition were more in ASD children than normal children. But in case of moderate and severe malnutrition percentages of malnutrition was more in normal children than in ASD children.

Table 11: Distribution of ASD children by Nutritional status by Gomez Classification (n=384)

Age range In years	Gomez score				Total
	3rd Degree <60.00	2nd Degree 60.00-74.99	1st Degree 75.00-89.99	Normal 90.00& above	
1-3	1 (1%)	2 (3%)	9 (15%)	53 (81%)	65 (100%)
4-6	2 (1.4%)	17 (12.1%)	41 (29.1%)	81 (57.4%)	141 (100%)
7-9	4 (2.9%)	7 (5.0%)	29 (20.9%)	99 (71.2%)	139 (100%)
10-12	1 (2.6%)	4 (10.3%)	4 (10.3%)	30 (76.9%)	39 (100%)
Total	8 (1.97%)	30 (7.6%)	83 (18.8%)	263 (71.6%)	384 (100%)

In table 11 it would be observed that though normal nutritional status were common in ASD children but 1st , 2nd ,3rd degree malnutrition were also present in them.

Table 12: Relation between mother education and nutritional status of ASD children (n=384)

Anthropometric indicator	**Nutritional Status**	**Mother education**			
		Primary	secondary-HS	Graduation	Post-graduation
Weight for Height (WHZ) (wasting)	Malnutrition (-2.00SD)	4 (26.7%)	33 (23.2%)	14 (14.1%)	18 (20.2%)
	Normal (-1.99to 2.00SD)	6 (40.0%)	73 (51.4%)	52 (52.5%)	62 (69.7%)
	Overweight (2.01 & Above)	5 (33.3%)	36 (25.4%)	33 (33.3%)	9 (10.1%)
Weight for Age (WAZ)(underweight)	Malnutrition (-2.00SD)	5 (31.3%)	26 (16.4%)	9 (8.1%)	10 (10.6%)
	Normal (-1.99to	9 (56.3%)	112 (70.4%)	82 (73.9%)	72 (76.6%)

	2.00SD)				
	Overweight (2.01 & Above)	2 (12.5%)	21 (13.2%)	20 (18.0%)	12 (12.8%)
Height for Age (HAZ) (stunting)	Malnutrition (-2.00SD)	5 (31.3%)	44 (27.5%)	23 (20.4%)	18 (19.1%)
	Normal (-1.99to 2.00SD)	11 (68.8%)	116 (72.5%)	90 (79.6%)	76 (80.8%)

Regarding mother education & nutritional status, it was observed that incase of stunting, 31.3% mother had stunted children & 68.8% had normal children, who completed primary education. It was also observed that 27.5% mother had stunted children & 72.5% had normal children, who completed secondary-higher secondary education. In case of graduated mother, 20.4% mother had stunted children & 79.6% had normal children. In case of post-graduated mother, 19.1% mother had stunted children & 80.8% had normal children. It was observed that incase of underweight, 31.3% mother had underweight children & 56.3% had normal children, 12.5% had obese children who completed primary education. It was also observed that 16.4% mother had underweight children, 70.4% had normal children, 13.2% had obese children, who completed secondary-higher secondary education. In case of graduated mother, 8.1% had underweight children, 73.9% had normal children & 18% had obese children. In case of post-graduated mother, 10.6% had underweight children, 76.6% had normal children & 12.8% had obese children. In case of wasting, it was observed that, 26.7% mother had wasted children, 40% had normal children & 33.3% had obese children, who completed primary education. It was also

observed that 23.2% mother had wasted children, 51.4% had normal children, 25.4% had obese children, who completed secondary-higher secondary education. In case of graduated mother 14.1% had wasted children, 52.5% had normal children & 33.3% had obese children. In case of post-graduated mother, 20.2% had wasted children, 69.7% had normal children & 10.1% had obese children. (In Table: 12)

Table 13: Association between nutritional status and IQ level of autistic children (n=384)

Anthropo metric indicator	**Nutritional status**	**IQ Level**			**Total**	**Sig. P< 0.05**
		Below 69, Significantly Delayed performance	70-85, Moderately Delayed performance	85-114, Mildly Delayed performance		
Weight for Height (WHZ) (wasting)	Malnutrition (-2.00SD)	60 (26.2%)	6 (7.4%)	3 (8.6%)	69 (20.0%)	0.000
	Normal (-1.99to 2.00SD)	121 (52.8%)	48 (59.3%)	24 (68.6%)	193 (55.9%)	
	Overweight (2.01 & Above)	48 (21.0%)	27 (33.3%)	8 (22.9%)	83 (24.1%)	
Weight for Age	Malnutrition (-2.00SD)	42 (17.5%)	4 (4.3%)	4 (8.7%)	50 (13.2%)	0.000

(WAZ) (underweight)	Normal (-1.99to 2.00SD)	172 (71.7%)	68 (72.3%)	35 (76.1%)	275 (72.4%)	
	Overweight (2.01 & Above)	26 (10.8%)	22 (23.4%)	7 (15.2%)	55 (14.5%)	
Height for Age (HAZ) (stunting)	Malnutrition (-2.00SD)	58 (23.9%)	23 (24.5%)	9 (19.6%)		
	Normal (-1.99to 2.00SD)	185 (76.2%)	71 (75.5%)	37 (80.4%)		

In Table: 13 regarding Nutritional status & IQ level, it was observed that in case of below 69 IQ level, 23.9% children were stunted & 76.2% children were normal. In 70-85 IQ level it was found that 24.5% children were stunted & 75.5% children were normal. In case of 85-114 IQ level, 23.5% children were stunted & 76.5% children were normal. In case of underweight level, 17.5% children were underweight, 71.7% were normal, 10.8% were obese in below 69 IQ level. In 70-80 IQ level, 4.3% were underweight, 72.3% children were normal & 23.4% children were obese. In 85-114 IQ level, 8.7% were underweight, 76.1%% were normal & 15.2% were obese. It was observed 26.2% children were wasted, 52.8% were normal & 21% children were obese when IQ level was below 69. In 70-85 IQ level, 7.4% children were wasted, 59.3% children were normal & 33.3% children were obese. In 85-114 IQ level, 8.6% children were wasted & 68.6% children were normal & 22.9% children were obese. After comparing nutritional status with different level of IQ, it was found that in case of stunting; there was no significant association between stunting & IQ level (p value not significant). But when IQ level were in two groups

(below 69and 69 &above) then there was significant association between underweight with IQ level and wasting with IQ level (p value<0.05).

Table 14: Relation between mother education and children's IQ level (n=384)

Mother education	**Children's IQ Level**			**Total**
	Below 69, Significantly Delayed performance	70-85, Moderately Delayed performance	85-114, Mildly Delayed performance	
Primary	14 (5.8%)	2 (2.1%)	0 (0.0%)	16 (4.2%)
Secondary to Higher-secondary	101 (41.6%)	43 (45.7%)	16 (34.0%)	160 (41.7%)
Graduation	64 (26.3%)	36 (38.3%)	13 (27.7%)	113 (29.4%)

Post-graduation	64 (26.3%)	13 (13.8%)	18 (38.3%)	95 (24.7%)
Total	243 (100.0%)	94 (100.0%)	47 (100.0%)	384 (100.0%)

If there was no association between mother education & IQ level of the autistic children though more than 50% of the autistic children had relatively better IQ level when mother's education level was at graduation & post-graduation level. In case of moderately delayed performance, 13.8% mother's education level was at post-graduation, 38.3% children mother's education was at graduation & 45.7% children mother's education level was at secondary-higher secondary level. But when education level of mother was at primary level 5.8% children had below 69 IQ level, when education level of mother was at secondary-higher secondary level 41.6% children had IQ level below 69, when education of mother was at graduation level 26.3% children had IQ level below 69, when education level of mother was at post-graduation level 26.3% children had IQ level below 69.(In Table:14)

Table 15: Distribution of ASD children by Per capita food consumption (by age) (n=384)

Food items	1-3y		4-6y		7-9y		10-12y			
	Mean (gm)	SD	Mean (gm)	SD	Mean (gm)	SD	Mean (gm)	SD	Mean (gm)	SD
Cereal	189	165	155	75	168	59	179	61	169	94
Rice	132	169	102	74	120	61	131	63	118	95
White potato	5	18	9	27	12	23	13	25	10	24
Pulse & nut	3	4	7	24	8	16	10	21	7	19
Vegetable	8	37	18	41	22	41	19	49	17	42
Fruits	20	40	21	34	22	32	18	25	21	33
Poultry	12	35	25	47	42	63	64	94	34	63
Eggs	21	32	18	21	17	33	14	19	18	27
Fish	37	41	58	71	53	46	44	36	50	55
Milk product	130	140	133	152	75	115	40	73	99	134
Total food	436	166	461	176	436	166	413	151	441	168

In Table: 15 mean per capita food intake in different age group was calculated. Age group 1-3y, 4-6y,7-9y,10-12y had consumed cereal 189gm, 155gm, 168gm & 179gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed rice 132gm, 102gm, 120gm & 131gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed potatoes 5gm, 09gm, 12gm & 13 gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed pulse & nut 3gm, 7gm, 8gm & 10gm respectively. Age group 1-3y, 4-6y, 7-9y had consumed vegetables 8gm, 18gm, 22gm & age group 7-9y had 19gm consumption. Age group 1-3y, 4-6y,7-9y,10-12y had consumed fruits 20gm, 21gm, 22gm & 18gm respectively. Age group 1-3y, 4-6y,7-9y, 10-12y had consumed poultry 12gm, 25gm, 42gm & 64gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed fish 37gm, 58gm, 53gm & 44gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed milk & milk products 130 gm, 133gm, 75gm & 40gm respectively

Table 16: Comparison of Nutrients intake and age group with RDA

Nutrients	**1-3y,71**			**4-6y,138**			**7-9y,109**			**10-12y,65**		
	M	RDA	%	M	RDA	%	M	RDA	%	M	RDA	%
Energy(kcal)	852.8	754	++	804.8	1094	74%	845.6	1375	61%	871.3	1591	55%
Protein (g)	38.3	19.9	++	44.5	31.0	++	46.1	37.1	++	48.0	44.4	++
Fat(gm)	6.8	2.5	++	7.2	6.5	++	7.4	7.8	+	6.8	9.0	76%
Ca (mg)	419.2	240	++	592.4	226	++	492.7	269	++	364.6	301	++
iron (mg)	9.3	4.6	++	9.4	8.3	+	9.1	10.3	88%	10.5	11.5	91%
viit.A (IU)	619.2	1245	50%	423.5	1099	39%	540.2	1360	40%	1050	1877	56%
Thia (mg)	0.3	.38	79%	0.4	0.65	62%	0.5	0.87	57%	0.5	1.04	48%
Ribo (mg)	0.3	.23	++	0.3	.31	97%	0.3	0.49	61%	0.3	0.44	68%
Niacine (mg)	6.1	4.8	+	7.1	10.0	71%	8.9	13.5	66%	10.8	16.0	68%
Vit.C (mg)	12.4	17.9	69%	15.7	25.3	62%	15.3	27.6	55%	13.8	33.5	41%

In Table:16 mean per capita consumption of different kind of nutrient were calculated. Age group 1-3y, 4-6y, 7-9y, 10-12y had consumed energy 852.8kcal, 804.8kcal, 845.6 kcal & 871.3 kcal respectively. Except 1-3 years age group, energy intake was lower than the RDA in all age group of the autistic children. Mean intake of protein & calcium were higher than the RDA in all age group of the autistic children but in fat intake it was lower in only 10-12y age group. In case of mean intake of iron were higher than the RDA in all the age group except 7-9 years & 10-12years age group, which were 9.1 mg & 10.5mg lower than the RDA. Vit A, thiamine, VitC intake were lower than the RDA. In case of riboflavin & niacin in two age group 1-3 years & 4-6years were higher than the RDA but in age group 7-9y & 10-12y it was lower than the RDA.

Table 17: Association between nutrients and IQ level of autistic children (n=384)

Nutrients Name	**IQ level**				**(ANOVA table) significance P < 0.05**
	Below 69		69 & above		
	Mean	SD	Mean	SD	
Energy (kcal)	816.1	365.2	263.8	836.9	0.11
Protein (g)	41.9	20.9	24.9	44.4	0.00
Fat (g)	6.99	5.03	5.23	7.13	0.46
CH (g)	146.7	81.4	49.3	148.8	0.46
Ca (mg)	505.2	377.2	545.9	492.8	0.48
Iron (mg)	9.77	11.39	8.10	9.47	0.46
Vit A (IU)	511.8	1338.3	2042.9	600.2	0.16
Carotein (U gm)	1769.0	5058.4	3725.3	1727.0	0.82
Thia (mg)	.41	.21	.19	.45	0.00
Ribo (mg)	.27	.20	.22	.28	0.11
Niacine (mg)	7.21	4.58	4.73	8.04	0.00
VitC (mg)	14.28	13.62	16.32	14.76	0.40
Zinc (gm)	312.4	157.0	155.7	339.2	0.00

Relation between children's IQ level with nutrient intake about all nutrients were not associated with IQ level except protein, thiamine, niacin & zinc, which were highly significant with IQ level of the autistic children (p value was 0.00) where CI was 95% & ($P < 0.05$). (In Table: 17)

Table 18: Correlation of Energy intake & Nutritional Status of autistic children (n=384)

Anthropometric Indicator	**Nutritional status**	**Energy intake (in Kcal)** <600	600-999	1000 & above	**Sig. P < 0.05**
Weight for Height (WHZ) (wasting)	Malnutrition (-2.00SD)	27 (33.8%)	28 (14.7%)	14 (18.9%)	0.012
	Normal (-1.99to 2.00SD)	37 (46.2%)	114 (59.7%)	42 (56.8%)	
	Overweight (2.01 & Above)	16 (20%)	49 (25.7%)	18 (24.3%)	
Weight for Age (WAZ)(underweight)	Malnutrition (-2.00SD)	20 (24.4%)	23 (10.95%)	7 (8.0%)	0.00
	Normal (-1.99to 2.00SD)	48 (58.5%)	167 (79.1%)	60 (69.0%)	
	Overweight (2.01 & Above)	14 (17.1%)	21 (10%)	20 (23.0%)	
Height for Age (HAZ) (stunting)	Malnutrition (-2.00SD)	17 (20.5%)	59 (28%)	14 (15.7%)	0.08
	Normal (-1.99to 2.00SD)	52 (62.7%)	125 (59.2%)	55 (61.8%)	
	Overweight (2.01 & Above)	14 (16.9%)	27 (12.8%)	20 (22.5%)	

In Table 18 daily energy intake of the ASD children was correlated with the nutrition status of them. This correlation was also significant in chi-square tests when CI was 95% & ($P<0.05$).

Table 19: Correlation of Nutritional status of autistic children with economic structure of their parents (n=384)

Anthropometric Indicator	Nutritional status	Monthly income(in taka) <25000	25000-4999	5000 & above	Sig P < 0.05
Weight for Height (WHZ) (wasting)	Malnutrition (-2.00SD)	20 28.6%	24 16.0%	25 20.0%	.16
	Normal (-1.99to 2.00SD)	39 55.7%	85 56.7%	69 55.2%	
	Overweight (2.01 & Above)	11 15.7	41 27.3%	31 24.8%	
Weight for Age (WAZ)(underweight)	Malnutrition (-2.00SD)	12 15.6%	24 14.7%	14 10.0%	.66
	Normal (-1.99to 2.00SD)	53 68.8%	118 72.4%	104 74.3%	
	Overweight (2.01 & Above)	12 15.6%	21 12.9%	22 15.7%	
Height for Age (HAZ) (stunting)	Malnutrition (-2.00SD)	13 16.7%	43 26.1%	34 24.3%	.18
	Normal (-1.99to 2.00SD)	50 64.1%	103 62.4%	79 56.4%	
	Overweight (2.01 & Above)	15 19.2%	19 11.5%	27 19.3%	

In Table19 nutrition status of the ASD children was not correlated with the economic status of their parent. This correlation was not significant in chi-square tests when CI was 95% & ($P>0.05$).

CHAPTER 5
DISCUSSION

5.0 DISCUSSION

Autism usually diagnosed in early childhood which is a life-long brain disorder. People with autism may face lots of difficulties like communicating with others, making relationships with peer groups and it would be difficult for them to find it hard to make sense of the world around them. Person to person autism spectrum disorder is varying. It is also varying in severity and in case of speech and also in case of learning disabilities of the people who have or haven't average IQs to hold down a job or maintaining family. People with autism have some core features one of which must be present, like unusual patterns of language development, narrow interests and repetitive and challenging behaviors. Autism spectrum disorder includes Autism, Asperger's syndrome and pervasive developmental disorder. In case of Asperger's Syndrome people with autism have normal form of speech development and IQ level, but they have some social disability which could be related with depression and mental health problems. So they need always specialist support and care to control some significantly challenging behavior. Autism has no racial, ethnic and socio-economic backgrounds for its causation.[138]

Children with autism spectrum disorder (ASD) have so many problems. Of them atypical food intake and problems of food selectivity take them at risks of nutritional deficiencies. In one of case-control study, it would be found that comparison between ASD & normal children's anthropometric measurement and food intake, the body mass indices were below of ASD than normal children. In case of food intake it was also observed that there was limited food variety and inadequacy of some intakes which ultimately made them malnourished.[139] The present study

found that 7.8% children were moderately stunted & 9.4% children were severely stunted below 36 months age group and in 36-59 months age group 9.3% were both moderately & severely stunted followed by 12.6% moderately stunted & 12.1% severely stunted in case of 60 months and above. In case of underweight, in below age group 36 months, 18.8% were moderately underweight & 4.7% were in severely underweight followed by 12.1% moderately underweight & 7.1% were severely underweight in 36-59 months age group. In 60 months & above age group, 5.5% children were moderately underweight & 1.4% children were also severely underweight. In case of wasting, below 36 month age group, 22.2% were moderately wasting & 9.5% had severely wasting. In 36-59 months age group, 15.2% children were moderately wasted, 18.2% children were severely wasted. In 60 months & above age group, 3.3% were found in moderately wasted & 5.4% children were severely wasted. Children with autism are frequently observed to have peculiar eating habits that result from the connatural disease characteristics.[140] Although studies on nutrient intake of children with autism have shown conflicting results[141-143], most studies have reported that the dietary intake of children with autism is less than the recommended amounts of some minerals and vitamins.[144-145] They may also select fewer food categories[146], which may jeopardize their nutritional status, compared with that in children without autism. Moreover, a high prevalence of gastrointestinal ailments may aggravate the digestive and absorption functions among children with autism.[147-148] The interaction between different genetic backgrounds and nutrients may also result in different metabolic models and utility levels of nutrients, regardless of the same quantity and quality of food intake.[149-150] Therefore, appraisal of the nutritional status of children with autism should not be based solely

on their dietary intake. Our study showed that 31.3% mother had stunted children who completed primary education followed by 27.5% stunted children who completed secondary-higher secondary education, 20.4% stunted children among graduated mother and in case of post-graduated mother, 19.1% mother had stunted children. It was observed that 31.3% mother had underweight children & 12.5% had obese children who completed primary education. About 16.4% mother had underweight children and 13.2% had obese children, who completed secondary-higher secondary education. In case of graduated mother, 8.1% had underweight children & 18% had obese children. In case of post-graduated mother, 10.6% had underweight children & 12.8% had obese children. The limited number of published studies on nutrient intakes in children with autism have yielded conflicting results.[151] Our results showed that age group 1-3y, 4-6y,7-9y,10-12y had consumed cereal 189gm, 155gm, 168gm & 179gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed rice 132gm, 102gm, 120gm & 131gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed potatoes 5gm, 09gm, 12gm & 13 gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed pulse & nut 3gm, 7gm, 8gm & 10gm respectively. Age group 1-3y, 4-6y, 7-9y had consumed vegetables 8gm, 18gm, 22gm & age group 7-9y had 19gm consumption. Age group 1-3y, 4-6y,7-9y,10-12y had consumed fruits 20gm, 21gm, 22gm & 18gm respectively. Age group 1-3y, 4-6y,7-9y, 10-12y had consumed poultry 12gm, 25gm, 42gm & 64gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed fish 37gm, 58gm, 53gm & 44gm respectively. Age group 1-3y, 4-6y,7-9y,10-12y had consumed milk & milk products 130 gm, 133gm, 75gm & 40gm respectively. Relation between children's IQ level with nutrient intake about all nutrients were not associated with IQ

level except protein, thiamine, niacin & zinc, which were highly significant with IQ level of the autistic children (p value was 0.00). Based on the 2002 National Survey of Resident Nutritional Status in China, the rates of inadequacy intake and the borderline inadequacy intake were 9·1 and 41·8 % for vitamin A, respectively; the dietary Ca intake was 238 mg/d, which is only one-third of the adequate intakes in Chinese children below 6 years of age.[152] Several studies have also found that children with autism consume significantly lower amounts of Ca than those without autism.[153-155] Based on the detected serum biochemical assessment, serum vitamin A and Ca levels in children with autism were significantly lower compared with those in children without autism (the serum Ca level of children with autism was also less than the reference range). A previous study reported that no significant difference is observed in the serum Ca levels between children with and without autism, and the detected values are within the normal reference range.[156] However, the serum Ca level is increased when the Ca deposited in the skeleton is mobilized, thereby resolving Ca inadequacy. The proportion of Zn intake inadequacy in Chinese children is approximately 50 %.[157] Zn deficiencies may be related with the characteristics of the Chinese diet, in which cereals constitute the main staple food. So for this case inadequacy of fruits, the mean vitamin C intake level in that region, children with autism was inadequate & significantly lower than that of the typically developing children. No differences were observed in vitamin B12 levels between children with and without autism in our study. However, the serum folate levels in children with autism significantly decreased. A recent study has reported that serum homocysteine levels significantly increase and folate and vitamin B12 levels significantly decrease in children with autism compared with those in typically

developing controls.[158] Some studies have also demonstrated that children with autism exhibit impaired methylation and homocysteine metabolism.[159-160]Folate and vitamin B12 have an important function in homocysteine metabolism. Therefore, the folate defect observed in our study may lead to homocysteine accumulation in the body of children with autism. Sometimes it would be suggested that children with autism spectrum disorder were at a higher risk for underweight, eating more legumes, vegetables, fiber, and some micronutrients (traditional Mediterranean diet) but fewer dairy and cereal products, and less iodine, sodium, and calcium than their typically developing peers. It would be also observed differences existed in total energy intake but healthy eating index and food variety score differences were not significant. Sometimes Autism spectrum disorder group had no dietary recommendations for thiamin, riboflavin, vitamin C, or calcium. Risk of inadequate intake of fiber, vitamin E, and sodium was lower in children with autism spectrum disorder than typically developing children. From the research it would be concluded that (1) risk of inadequate intake of some micronutrients in children with autism spectrum disorder and (2) cultural patterns and environment may influence food intake and anthropometric characteristics in autism spectrum disorder.[139] There is growing interest in possible dietary involvement in the etiology and treatment of Autistic Spectrum Disorders (ASD). Research has focused on the physiological and behavioral effects of dietary change but has not examined the effect of exclusion diets on nutritional intake. Nutrient intakes fell below the Lower Reference Nutrient Intake (LRNI) in 12 children (32%) for zinc, calcium, iron, vitamin A, vitamin B12 and riboflavin in the no diet group and four children (50%) for zinc and calcium in the diet group. Fruit and vegetable intakes were higher and cereal, bread and

potato consumption were lower in those children using gluten and/or casein free diets. No significant differences in the energy, protein and micronutrient intakes were found between the two groups of children.[151]

Intelligence is a touchy, and complicated, subject when it comes to autism. Dr. Leo Kanner first described the condition named autism 70 years ago and noted that some children were thought to be intellectually disabled. At that time their social, communication and behavior problems lead them the appearance of intellectual disability to a new world which was unaware of autism's existence. American psychiatrists updated their diagnostic manual in 2013; they faced a lot of difficulty with IQ tests and autism. Although the manual says intellectual disability is common in autism, it also difficult that measuring a child's intellectual ability may be complicated by the symptoms of autism. This study got 63% autistic children had IQ level <69 (known as significantly delayed performance by standard method), 24% had IQ level 70-85 (known as moderately delayed performance) & nearly 12% of the children had IQ level 85-114 (known as mildly delayed performance). From 1966 to 1998, studies found that about only one-fifth of the people with ASD functioned in the "normal range" of intelligence, according to a 1999 review.[161] But years later, in 2014, a U.S. In that study it would be found almost half of the children with ASD had average or above average intelligence, an IQ score above 85. Less than a third of the children with autism had intellectual disability, and 23% had IQ scores in the "borderline range" from 71 to 85.[162] Effective interventions have lessened the severity of children's language and intellectual delays, experts say.[163] In addition, doctors have been diagnosing children with ASD

at younger ages, so treatment and therapies often begin earlier. In fact, researchers reported that toddlers with autism spectrum disorders who underwent an autism therapy called the Early Start Denver Model showed improvements in intelligence, as well as language.[164] Other effective therapies include intensive early interventions that use the principles of Applied Behavior Analysis. Researchers always try to develop a better knowledge of how autism affects the brain. Most of them have looked at the unusual patterns of strengths and weaknesses in people with autism. People with autism vary greatly, either has better visual processing abilities than verbal (language) abilities.[165] Several prominent autism researchers set out to define the "cognitive phenotype" – essentially the intellectual profile – of autism several years ago. In case of high and low IQ individuals with ASD the researcher found lots of chellanges."[166] The intelligence of individuals with Autism Spectrum Disorder (ASD) is not always the same. The pattern of cognitive deficits associated with ASD may differ depending on intelligence. In relative terms, cognitive deficits appear somewhat more severe in individuals with ASD and above average IQs compared to the below average IQ patients with ASD. Even though high IQ ASD individuals enjoy a certain protection from their higher IQ, they clearly demonstrate cognitive impairments that may be targeted in clinical assessment and treatment. Conversely, even though in absolute terms ASD patients with below average IQs were clearly more impaired than ASD patients with average to above average IQs, the differences in cognitive functioning between participants with and without ASD on the lower end of the IQ spectrum were less pronounced. Clinically this may imply that cognitive assessment and training of cognitive skills in below average intelligent children with ASD may be a less fruitful endeavour.[167]

Parents of children with autism spectrum disorder (ASD) must identify, select, and even implement treatments. Child age, cognitive functioning, ASD symptoms, family income, parent education, and cultural background, have strongly influence on ASD treatment. Parents' perceptions about ASD also may contribute in this field. Throughout history mothers are the ones who are typically portrayed as a child's primary caretaker. Typically it is a mother who is pictured next to their child when it comes to taking care of their every day needs. Mothers are the ones who caring a child while still in the womb and are the ones who most children bond with before anyone else. After a methodical review of the literature[168] this was most commonly found individual to care for children with autism as well. The theme of familial relationships impact discusses the effects of having a child with ASD on the family. The changes in the family structure or the relationships within the family were the main caused said half of the mother. The mothers also stated that they felt as though they were required to give more attention to the child with autism rather than any typically developing children within the family. Sometimes the mothers described extended family members not understanding what the mothers were going through, which created tension and distance amongst them. Relation between mother's education with different level of their perceptions, in the field of understanding the meaning of autism, about the ultimate outcome of it, with whom they could consult were significantly associated. But other perceptions of mother were not significantly associated with their education.

CHAPTER 6

CONCLUSION

6.0. CONCLUSION

In this study various aspect of nutritional deficiencies were observed in autistic children in our country. They were exhibited several abnormal eating behaviour. Energy intake was found lower than the RDA. Mean intake of protein & calcium were higher than the RDA in all age group but fat intake was lower in only 10-12y age group. Mean intake of iron were higher than the RDA in all the age group except 7-9 years & 10-12years age group. VitA, thiamine, VitC intake were lower than the RDA in all age grouped. Riboflavin & niacin were higher in two age group 1-3y & 4-6y but those were lower than the RDA in age group 7-9y & 10-12y.

Low intake of protein, thiamine, niacin & zinc were related with the low IQ level in autistic child. However all nutrient intake was not related with IQ level.

According to the anthropometric data, 23% of autistic child had low nutritional status. Thus who had poor nutritional status they also had low IQ level.

In case of parent's perception of autistic child, the perceptional level of the parents in most of the cases didn't associate with their educational level and most of them didn't have much awareness about Autism.

RECOMMENDATION:

In order to address the problem of ASD education level of the parents about autism must be increased. ASD problem symptoms & management of Autism Spectrum Disorders should be included in the curriculum of different education level in Bangladesh. Among the parents mother should be focused because there was a positive association between education level of the mother and IQ level of ASD children. As symptoms appear below two years of age they should be treated as early as possible after diagnosis because earlier the treatment better is the prognosis. The ASD children should be provided with adequate & balanced diet to improve their Nutritional status & IQ level as it was found that some of the children didn't get adequate calories and micronutrients. Awareness raising programme could be arranged for the mass population. Electronic & print media can play an important role in this regard as well as community clinics. Study throughout the country will be helpful to explore the overall situation of the ASD children and to explore whether there is any significant association between nutritional factors & ASD.

CHAPTER 7

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7.0. REFERENCES

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Annexure

Annex A: Figures

Annex B: Informed consent (English & Bangla)

Annex C: Questionnaire

Annex D: Pictures during data collection tools

Annexure

Annex-A

Figure 1: Age (in months) group distribution of Autistic children (n=384)

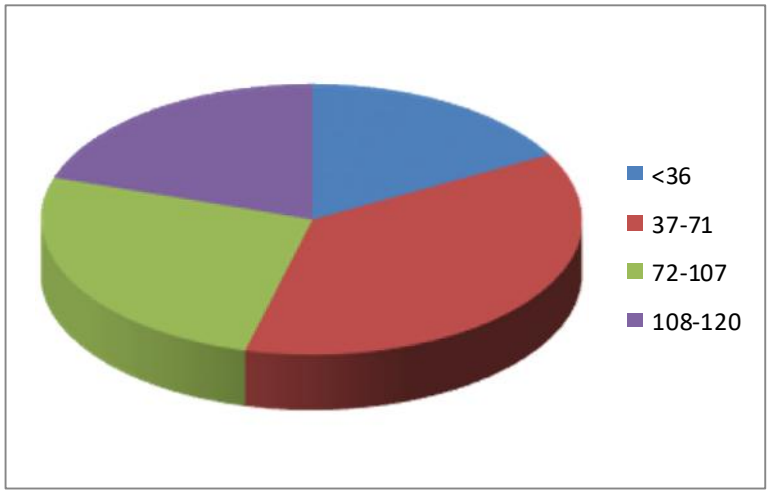


Figure 2: Sex distribution (n=384)

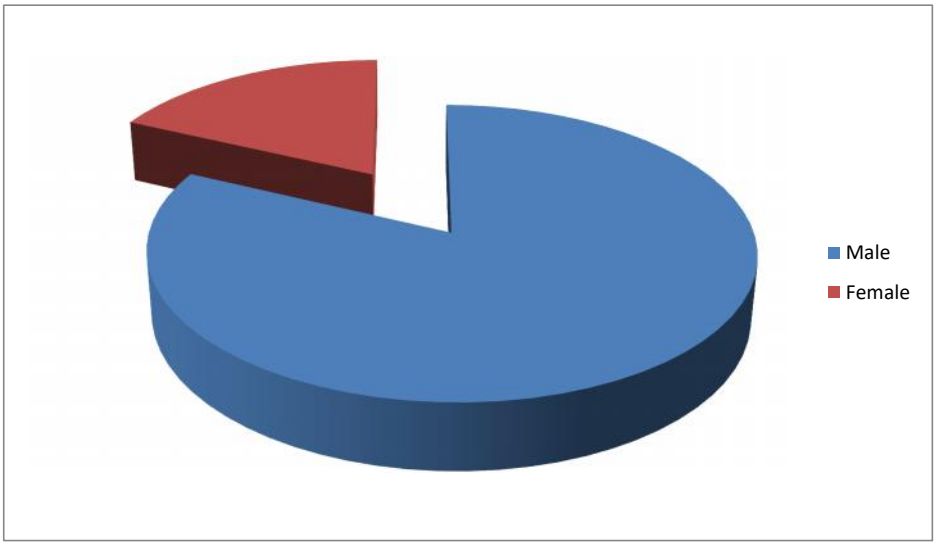


Figure 3: Religion (n=384)

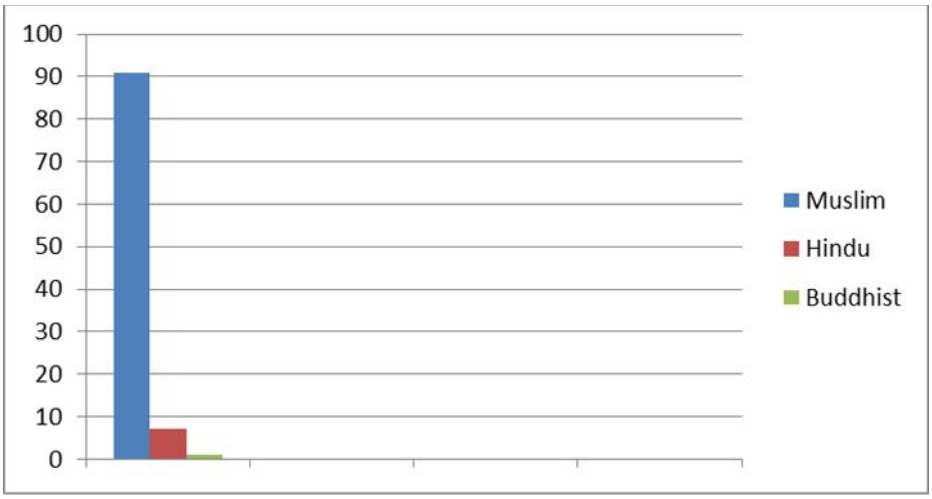


Fig 4 : Mode of delivery of ASD children (percentage)

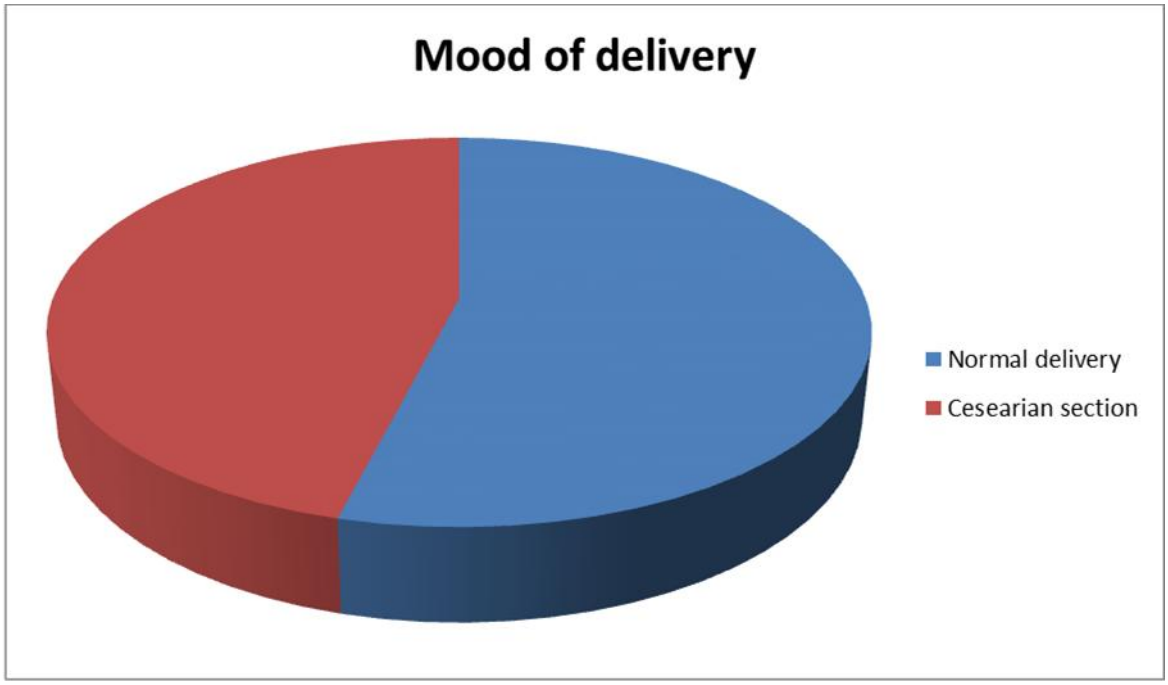
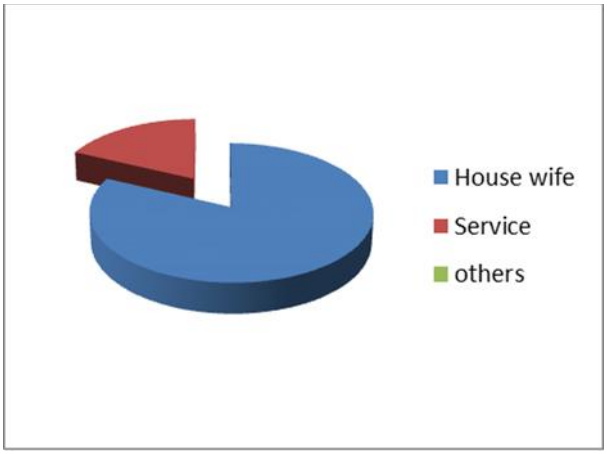
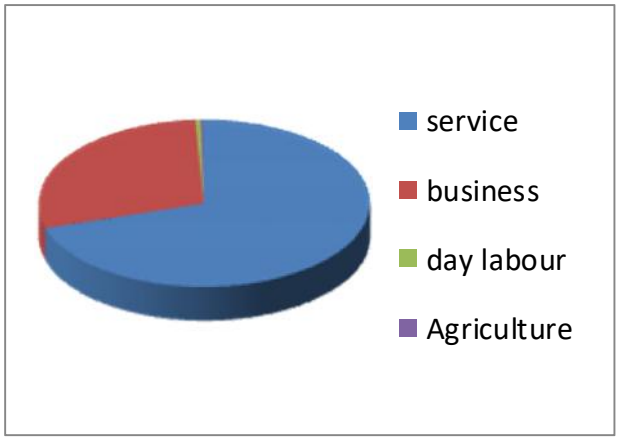


Figure 5: Occupation of parents

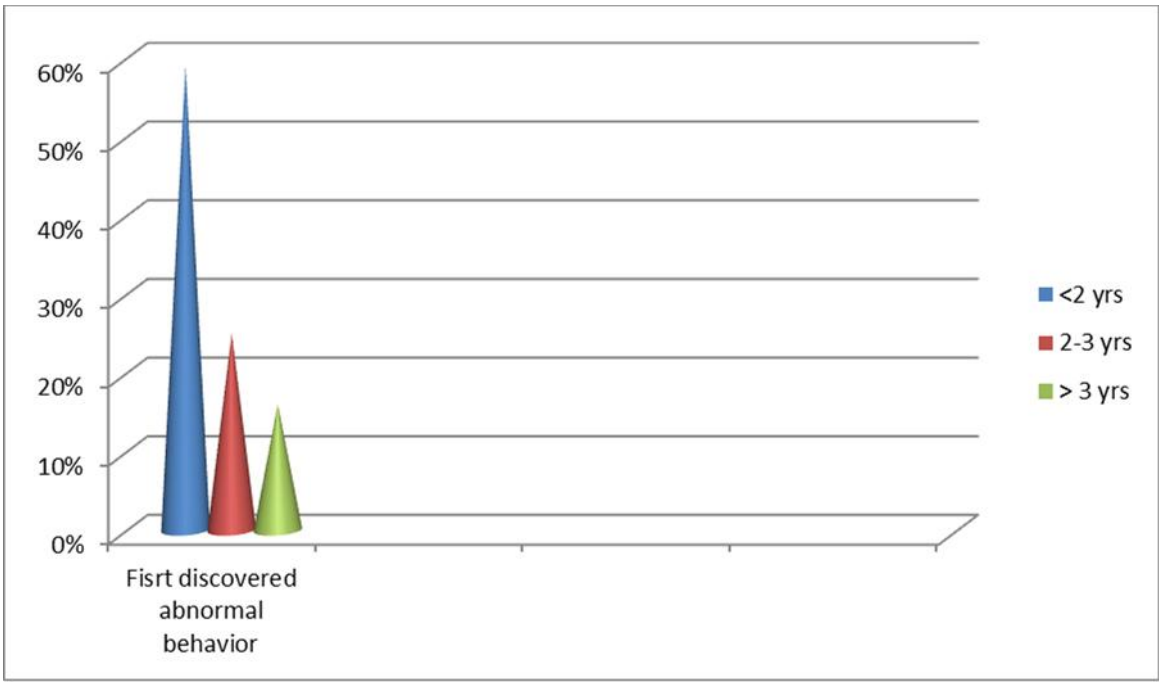


Mother's Occupation



Father's Occupation

Figure 6: Abnormal behavior of the study subjects



Annex- B

Informed Consent Paper

I am Dr. Jannatara Shefa, student of PhD in Nutrition, INFS under University of Dhaka, wish to study on "A study on the nutritional status and IQ level of the autistic children in Bangladesh along with the perception of their parents about autism." I hopefully expect necessary information from you to fulfill the questionnaire. I also like to assure you that, this data will be used for the study purpose and will be kept fully confidential. Therefore please feel free to response to the questions asked and help the research aimed for the save of suffering humanity.

Thank you for your kind co-operation.

Parents name: Researer signature :

Signature & Date:

Child's name:

AwffveKiAbgwZcÎ

আমি ডা. জান্নাতারা শেফা, পুষ্টি ও খাদ্য বিজ্ঞান ইনস্টিটিউট, ঢাকা বিশ্ববিদ্যালয়ের একজন পি.এইচ.ডি গবেষক। আমার গবেষনার বিষয় "বাংলাদেশের অটিস্টিক শিশুদেও পুষ্টিগত অবস্থা এবং বুদ্ধিমত্তা নির্ণয়, একই সাথে অভিভাবকদেও অটিজম বিষয়ে সম্যক ধারণা পর্যবেক্ষণ"। আমি উক্ত গবেষণার জন্য আপনার নিকট হতে উত্তরাকাওে আপনার সন্তান সম্পর্কে তথ্য নিতে ইচ্ছুক। আমার কাছে দেয়া আপনার তথ্য সম্পূর্ণ গোপন থাকবে এবং তা শুধুমাত্র উক্ত গবেষণায় ব্যবহৃত হবে। আমার গবেষণার ফলে অটিস্টিক শিশুদের পুষ্টিগত সমস্যা চিহ্নিত হবে এবং তা সমাধানে কার্যকরি ভূমিকা রাখবে। আশা করি আপনি সদয় অনুমতি ও প্রয়োজনীয় তথ্য দিয়ে মানবতার সেবায় অংশগ্রহণ করবেন।

আপনার অংশগ্রহণ ও সহযোগিতার জন্য আপনাকে ধন্যবাদ।

অভিভাবকের নাম : গবেষকের নাম :

অভিভাবকের স্বাক্ষর ও তারিখ :

শিশুর নাম :

Annex-C

Interview Questionnaire Form

ID No	:	Date:	……
Code of the Respondent			
Relationship to the Child			
District			
General Information			
1.1 Code of the child			
1.2 Date of birth			
1.3 Age in years			
1.4 Age of Mother when the child born			
1.5 Age of Father when child born			
1.6 Sex	1. Male	2. Female	
1.7 Religion	1. Muslim	2. Hindu	3. Buddhist 4. Christian
2.0 Household Information			
2.1 Number of Children	(1) 1-2	(2) 2-3	(3) >4
2.2 Year of schooling of mother	(1) Illiterate	(2) Primary	(3) Secondary-Higher Secondary (4) Graduation (5) Post-Graduation

2.3 Year of schooling of Father	(1) Illiterate	(2) Primary	(3) Secondary-Higher Secondary (4) Graduation (5) Post-Graduation
2.4 Occupation of the father:	(1) Day labor	(2) Agriculture	(3) Business (4) Service (5) Others ….....
2.5 Occupation of the mother	(1) Housewife	(2) Agriculture	(3) Business (4) Service (5) Day Labor (6) Others ……
3.0 Socio-economic information			
3.1 Monthly family income:			
3.2 Monthly family expenditure:			
3.3 Housing status:	1. Own house	2. Govt. house	3. Rented house 4.Non-rented house 5. Others specify …..
3.4 Condition of latrine	1. Sanitary	2. Non-sanitary	3. Open 4. Slab (partially sanitary)
4.0 Anthropometric measurement:			
4.1 Child: Wt (Kg):	Height (cm):		
5.0 IQ level measurement			
5.1			
1	85-114	Mild delayed performance	
2	70-85	Moderately delayed performance	

3	69 & below	Significantly delayed performance	
5.2	For IQ measurement which tool is used		
1	BSAID		
2	WISC-R		
3	IBAS		
6.0	Delivery History		
6.1	Mode of delivery of ASD child 1. Normal delivery 2. Caesarean section		
7.0	Perception assessment		
7.1 What do you mean by autism	1. Very well known	2. Only know the name	3. Don't know anything
7.2 What do you mean by very well known?	1. Most of the symptoms	2. Know only major symptoms	3. Know only two symptoms 4. Only know as a neurological disorder
7.3 From where first know about autism?	1. Media	2. Relative	3. By study 4. Doctor
7.4 Which one is correct?	1. Autism is preventable	2. Autism is curable	3. Autism is controllable
7.5 When did you first discovered abnormal behavior of your child?	1. <2 Years	2. 2-3 Years	3. 3-5 Years 4. > 5
7.6 To whom did you consult first about your child	1. Doctor	2. Relative	3. Family members 4. No body

7.7 Did you face any difficulty/problem to take care of your child	l. Face difficulty	2. No difficulty	3. Manageable
7.8 Sharing with others about the child with autism?	1. Don't share with others	2 Share with others	
7.9 For the child do you avoid any food?	1. Avoid food	2. Don't avoid any food.	

8.0 24 hours recall method

Sl No	Time	Food item	Description of foods	Cooking method	Unit (Household measurement)	Food Code	Weight (gm)
8.1	Breakfast Time:						
8.2	Mid morning Time:						
8.3	Lunch Time:						
8.4	Afternoon snacks Time:						
8.5	Dinner Time:						

8.0 24 N›Uv wi-Kj g¨v_W

ক্রম	সময়	খাবারেরা নাম	খাবারের বিবরণ	রন্ধন প্রণালী	খাবার কোড	ওজন (গ্রাম)
৮.১	সকালের নাস্তা					
	সময়:					
৮.২	মধ্য সকালের নাস্তা					
	সময়:					
৮.৩	দুপুরের খাবার					
	সময়:					
৮.৪	বিকালের নাস্তা					
	সময়:					
৮.৫	রাতের খাবার					
	সময়:					
	মোট					

আই ডি নং : ..... তারিখ: .....

সাক্ষাৎকারীর কোড : .....

শিশুর সাথে সাক্ষাৎকার গ্রহণকারীর সম্পর্ক : .....

জেলা : .....

১.০ সাধারণ তথ্য:

১.১ শিশুর কোড : .....

১.২ শিশুর জন্ম তারিখ: :.....

১.৩ শিশুরবয়স : .....

১.৪ শিশুর জন্মের সময় মায়ের বয়স : .....

১.৫ শিশুর জন্মের সময় বাবার বয়স : .....

১.৬ লিঙ্গ : ১. পুরুষ

২. মহিলা

১.৭ ধর্ম : ১. ইসলাম

২. হিন্দু

৩. বৌদ্ধ

৪. খ্রিস্টান

২.০ পারিবারিক তথ্য:

২.১ পরিবারে শিশুর সংখ্যা

১। ১-২

২। ২-৩

৩।>৪

২.২ মায়ের শিক্ষাগত যোগ্যতা: (১) নিরক্ষর

(২) প্রাথমিক

(৩) মাধ্যমিক-উচ্চমাধ্যমিক

(৪) স্নাতক

(৫) স্নাতকোত্তর

২.৩ বাবার শিক্ষাগত যোগ্যতা (১) নিরক্ষর

(২) প্রাথমিক

(৩) মাধ্যমিক-উচ্চমাধ্যমিক

(৪) স্নাতক

(৫) স্নাতকোত্তর

২.৪ বাবার পেশা (১) দিনমজুর

(২) কৃষিকাজ

(৩) ব্যবসা

(৪) চাকুরীজীবী

(৫) অন্যান্য

২.৫ মায়ের পেশা (১) গৃহিণী

(২) কৃষিকাজ

(৩) ব্যবসা

(৪) চাকুরীজীবী

(৫) অন্যান্য

৩.০ আর্থ-সামাজিক অবস্থা

৩.১ পরিবারের মাসিক আয়:

৩.২ পরিবারের মাসিক ব্যয়:

৩.৩ গৃহের অবস্থা: ১) নিজগৃহ

(২) সরকারীবাড়ী

(৩) ভাড়াবাড়ী

(৪) অন্যান্য

৩.৪ পায়খানার অবস্থা: (১) স্যানিটারী (২) স্যানিটারীনয়

(৩) খোলা (৪) স্ল্যাব

৪.০ শারীরিক পরিমাপ:

৪.১ শিশুর: ওজন (কেজি)..... উচ্চতা(সে.মি.) .....

৪.২ মা/বাবার: ওজন (কেজি) ..... উচ্চতা(সে.মি.) .....

৫.০ বুদ্ধি বৃত্তির পরিমাপ:

৫.১:

১) ৮৫-১১৪ : মৃদু বুদ্ধি কম সম্পন্ন

২) ৭০-৮৫ : মধ্যম বুদ্ধি কম সম্পন্ন

৩) ৬৯-কম : তীব্র বুদ্ধি কম সম্পন্ন

৫.২ বুদ্ধি পরিমাপক স্কেল:

১) বিএসএআইডি

২) উইস্ফা-আর

৩) আইবিএএস

৬.০ প্রসব ইতিহাস:

৬.১ শিশুটি ভুমিস্ট হয়

১) স্বাভাবিক প্রক্রিয়ায়

২) অস্ত্রপচারের মাধ্যমে

৭.০ পিতা-মাতার সচেতনতার অবস্থা নিরূপন:

৭.১ অটিজম বলতে কি বোঝেন?

১) খুব ভালো বোঝেন

২) শুধুনাম জানেন

৩) একেবারে কিছুই জানেন না

৭.২ খুব ভালো বোঝেন বলতে কতটুকু বোঝেন?

১) প্রায় সকল উপসর্গ জানেন

২. শুধুমূল উপসর্গ জানেন

৩) শুধু দুটি উপসর্গ জানেন

৪) শুধু জানেন মস্তিস্কজনিত রোগ

৭.৩ কোথা থেকে অটিজম শব্দটি শুনেছেন?

১) টিভি

২) আত্মীয়

৩) বই পড়ে

৪) চিকিৎসকের কাছে

৭.৪ কোনটি সঠিক? অটিজম ....

১) রোধ করা যায়

২) চিকিৎসায় ভালো হয়

৩) তীব্রতা কমানো যায়

৭.৫ কখন আপনার শিশুর অস্বাভাবিক আচরণ লক্ষ্য করলেন?

১) <২ বৎসর বয়সে

২) (২-৩) বৎসর বয়সে

৩) (৩-৫) বৎসর বয়সে

৪) > ৪ বৎসর বয়সে

৭.৬ কার সাথে প্রথম শিশুর সমস্যার কথা আলোচনা করলেন?

১. চিকিৎসক

২.আত্মীয়

৩. পরিবারের সদস্য

৪. কারও সাথে না

৭.৭ শিশুটি প্রতিপালনে কোন সমস্যা হয় কি?

১. সমস্যা হয়

২. সমস্যা হয় না

৭.৮ শিশুটির সমস্যা নিয়ে অন্যের সাথে আলোচনা করেন কি?

১. না

২. হ্যাঁ

৭.৯ শিশুর জন্য কোন খাবার কি এড়িয়ে চলেন?

১. না

২. হ্যাঁ

Annex: D

AUTISM DIAGNOSTIC CHECK-LIST

Dr. Mallika Banerjee

5-point scale on which :
'1' = 'not present at all'
'2' = 'mildly'
'3' = 'moderately'
'4' = 'strongly'
'5' = 'mostly present'.

Items	1	2	3	4	5
1. Lacking interest in external world					
2. Unusual interest in inanimate object					
3. Constantly fidgeting without purpose					
4. Lack of expression by abstract symbol					
5. Lack of judgment power					
6. Lack of response to own name					
7. Restricted to own interest					
8. Lack of eye-hand coordination					
9. Short attention span					
10. Inability to sit, stand or wait at one place when required					
11. Sometimes show special ability in any physical or mental work					
12. Lack of eye contact					
13. Lack of meaningful look at object					
14. Lack of meaningful and insightful play					
15. Lack of imaginative play					
16. Lack of time concept					
17. Inability to finish task within required time					
18. Lack of perception of space					
19. Inability to perform pretend play					
20. Lack of ability to follow general academics					
21. Fond of puzzle like visual games					
22. Lack of comprehension					
23. Interest in unusual play.					
24. Lack of expression of emotions like joy, happiness, sadness, anger etc.					
25. Lack of identification / recognition of emotional states of others					
26. Lack of spontaneous interest					
27. Crying and/or laughing without apparent reasons					
28. Showing anger towards self – self-hitting etc.					
29. Temper outbursts, explosive and unpredictable					

INDEPENDENT BEHAVIOUR ASSESSMENT SCALE (IBAS)

Name _____ Sex _____ Age _____ Psy. _____ Dated _____

	TOILETING	SCORE		DRESSING	SCORE		SELF-CARE	SCORE		DOMESTIC SKILL	SCORE
১.	প্যান্ট ভিজে গেলে অস্বস্থিবোধ করা।		১.	কাপড় পড়াতে এবং খুলতে সহযোগীতা করা।		১.	দাঁত মাজতে সহযোগীতা করা।		১.	কিছু চাইলে দেয়া। (পেপার)	
২.	মল মূত্র ত্যাগের কথা বলতে পারা।		২.	নিজের কাপড় বাছাই করা।		২.	চুল আচরানো, নখ কাটায় সহযোগিতা।		২.	নির্দিষ্ট স্থানে ময়লা ফেলা।	
৩.	নির্দিষ্ট জায়গায় বাথরুম করা।		৩.	সাধারণ কাপড় খুলতে পারা। (প্যান্ট/জামা)		৩.	পানির কল ছেড়ে নীচে হাত দেয়া।		৩.	বই/জামা/স্কুল ব্যাগ/খেলনা ব্যবহারের পর গুছিয়ে রাখা।	
৪.	বাথরুম শেষে উঠতে পারা।		৪.	সম্পূর্ণ দিগম্বর হয়ে যাওয়া।		৪.	ভেজা মুখ টাওয়াল টিসু দিয়ে মোছা		৪.	খেলনা/বাড়ী আসবাপত্র ময়লা হলে পরিস্কার করা।	
৫.	দিনে মল নিয়ন্ত্রণ করতে পারা।		৫.	চেন, বোতাম খুলতে পারা।		৫.	আঙ্গুল/ব্রাশ/মাজন দিয়ে দাঁত মাজা।		৫.	ময়লা/পরিস্কার কাপড় আলাদা স্থানে রাখা।	
৬.	একা বাথরুমে যেতে পারা।		৬.	সাধারণ কাপড় পড়তে পারা। (প্যান্ট/টিলাজামা)		৬.	গোসল করে শরীর মোছা।		৬.	খাবার এর সময় খাবারের পাত্র এগিয়ে নিয়ে যাওয়া।	
৭.	ঘুমের মধ্যে মল ত্যাগ না করা।		৭.	ঠিক ভাবে জুতা, সেন্ডেল পায়ে দেয়া।		৭.	সাবান দিয়ে হাত মুখ ধোয়া।		৭.	খাবার শেষে প্লেট সরানো।	
৮.	নিজের প্যান্ট খুলে বাথরুমে যাওয়া।		৮.	কাপড়ের চেন, বোতাম লাগাতে পারা।		৮.	নিজে ঠিকমত দাঁত মাজা।		৮.	সাধারণ জিনিস পরিস্কার করা।	
৯.	বাথরুমে নিজে পরিস্কার হওয়া। হাত ধোয়া		৯.	কাপড় পড়ে সঠিক ভাবে বোতাম ঘর লাগানো		৯.	নিজে নিজে গোসল করে জামা পরা।		৯.	অন্যকে আপ্যায়ন করা।	
১০.	মল ত্যাগ শেষে স্থানটি পরিস্কার করা।		১০.	জুতার বকলেস ফিতা লাগাতে পারা।		১০.	খাওয়ার আগে পড়ে হাত ধোয়া।		১০.	ঘরের কাজে বাবা, মাকে সাহায্য করা।	
১১.	বাথরুমে বসে দরজা বন্ধ করা।		১১.	জামার পেছনের বোতাম/চেন খোলা		১১.	আগুন/পশু/পোকা মাকড় থেকে নিরাপদ থাকা।		১১.	কাপড় ধূতে পারা।	
১২.	পিকনিক বা বাজার যাত্রাকালে মলমূত্র নিয়ন্ত্রণ করা।		১২.	জামার পেছনের বোতাম/চেন বন্ধ করা।		১২.	ধারালো বস্তু সাবধানে ব্যবহার করা।		১২.	স্কুল/বাইরে যাওয়ার প্রয়োজনীয় কাজ করতে পারা টিফিন/পানি।	
১৩.	নতুন জায়গায় বাথরুম আছে কিনা বলতে পারা।		১৩.	শীত/গরমের কাপড় নির্বাচন করা।		১৩.	প্রতিদিন প্রয়োজন অনুযায়ী চুলের পরিচর্যা করা		১৩.	স্কুল/বাইরে থেকে আসারপর নিজের জিনিস গুছানো, ব্যাগ জামা।	
১৪.	দূরের যাত্রায় বাথরুম নিয়ন্ত্রণ করা। (বাস)		১৪.	রং ডিজাইন কাপড় মিলিয়ে পড়া।		১৪.	সাবান/শ্যাম্পু দিয়ে চুল পরিস্কার করা।		১৪.	উঠান/ঘর/রুম পরিস্কার করতে পারা।	
			১৫.	স্কুল/বাড়ী/বাইরে যাবার কাপড় নির্বাচন করা।		১৫.	আঙ্গুলের নখ কাটতে পারা।		১৫.	ভারী কাপড় নিঙরিয়ে মেলে দাওয়া, শুকিয়ে গেলে নিয়ে আসা।	
						১৬.	সামান্য কেটে/পুড়ে গেলে যত্ন নেয়া।		১৬.	ঘুমানোর আগে নিজের বিছানা করতে পারা।	
						১৭.	হেটে রাস্তা/পুল পার হওয়া।		১৭.	সাধারণ কাপড় ইস্ত্রী করা।	
						১৮.	নিজের কাপড়/বই/খেলনা গুছিয়ে রাখা।		১৮.	খাবার গরম করা, রাস্তাপার হয়ে দোকানে সঠিক জিনিস কেনা।	
						১৯.	খাবার ঢেকে রাখতে পারা।		১৯.	ঘরের টুকি টাকি জিনিস মেরামত করা।	
						২০.	সামান্য অসুস্থ হলে যত্ন নেয়া।				

RS ____ RS ____ RS ____ RS ____

MOTOR SK	RS	
SOCEALIZ SK	RS	
COMM SK	RS	
DAILY. LSK	RS	

TOTAL SCORE	

WISC-R রেকর্ড ফর্ম

ওয়েক্সলার শিশু বুদ্ধি অভিক্ষা

নাম _____ বয়স _____ ছেলে/মেয়ে

ঠিকানা _____

পিতার নাম _____

বিদ্যালয় _____ শ্রেণী _____

পরীক্ষণের জায়গা _____ পরীক্ষক _____

নির্দেশকারক _____

রেখা অঙ্কন

মান গননা	বাচনিক অভিক্ষা					মান গননা	কার্য্য সম্পাদন অভিক্ষা						মান গননা
	তথ্য	সাদৃশ্য	অংক	শব্দার্থ	বোধশক্তি		ছবি সমাপ্তি	ছবি বিন্যাস	নক্সা তৈরী	অংশ জোড়া দেওয়া	সংখ্যা প্রতীক	বাঁধা	
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	প্রাঃ গননা	মান গননা
বাচনিক অভিক্ষা		
তথ্য	_____	_____
সাদৃশ্য	_____	_____
অংক	_____	_____
শব্দার্থ	_____	_____
বোধ শক্তি	_____	_____
বাচনিক গননা		_____
কার্য সম্পাদন অভিক্ষা		
ছবি সমাপ্তি	_____	_____
ছবি বিন্যাস	_____	_____
নক্সা তৈরী	_____	_____
অংশ জোড়া দেওয়া	_____	_____
সংখ্যা প্রতীক	_____	_____
কার্য সম্পাদন গননা		_____
মান গননা		_____
বাচনিক গননা	_____	_____
কায্য সম্পাদন গননা	_____	_____
পুরা মান গননা	_____	_____

Child's Name _____ Child's Gender _____

Caregiver's Name _____

Daycare/ School program _____

Place of Testing _____

Teacher _____ Examiner _____

Reason for Referral _____

	Year	Month	Day
Date of Testing			
Date of Birth			
Chronological Age			
Adjustment for Prematurity			
Corrected Age			

Bayley Scales of Infant Development Second Editon

Behavior Rating Scale Record Form

Factor	Raw Score	Percentile	Classification
Attention/ Arousal			
Orientation/ Engagement			
Emotional Regulation			
Motor Quality			
Additional Items			
Total Raw Score			

Observations and General Comments

Attention/ Arousal Factor

Ratiag

		1-5 month	6-12 months	13-42 months
3.	Predominant State			
4.	Lability of State of Arousal			
5	Positive Affect			
6.	Negative Affect			
7.	Soothability When Upset			
9.	Energy			
11.	Interest in Test Materials and Stimuli			
13.	Exploration of Objects and / or Surroundings			
19.	Orientation to Examiner			
	Total Attenion / Arousal Factor			

Orientation/ Engagement Factor

3.	Predominant State			
4.	Lability of State of Arousal			
5.	Positive Affect			
9.	Energy			
11.	Interest in Test Materials and Stimuli			
12.	Initiative with Tasks			
13.	Exploration of Objects and / or Surroundings			
15.	Persistence in Attempting to Complete Tasks			
16.	Enthusiasm Toward Tasks			
17.	Fearfulness			
19.	Orientation to Examiner			
20.	Social Engagement			
	Total Orientation / Engagement Factor			

Emotional Regulation Factor

6.	Negative Affect			
8.	Hypersensitivity to Test Materials and Stimuli			
10.	Adaptation to Change in Test Materials			
14.	Attention to Tasks			
15.	Persistence in Attempting to Complete Tasks			
18.	Frustration with Inability to Complete Tasks			
19.	Orientation to Examiner (Do not add to Total Raw Score Ages 13-42 months)			
21.	Cooperation			
29.	Frenetic Movement			
30.	Hyperactivity			
	Total Emotional Regulation Factor			

Motor Quality Factor

22.	Gross-Motor Movement Required by Tasks			
23.	Fine-Motor Movement Required by Tasks			
24.	Control of Movement			
25.	Hypotonicity			
26.	Hypertonicity			
27.	Tremulousness			
28.	Slow and Delayed Movement			
29.	Frenetic Movement (Do not add to Total Raw Score (Ages 13-42 months)			
	Total Motor Quality Factor			

Additional Items

7.	Soothability When Upset			
8.	Hypersensitivity to Test Materials and Stimuli			
10.	Adaptation to Change in Test Materials			
27	Tremulousness			
	Total ditional Items			
	Total Raw Score			
		1-5 months	6-12 months	13-42 months

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Date-27.4.17