Introduction
I INTRODUCTION

“We are all God’s children,
Our minds are stronger than diamond
We will win, win, win with our mighty will”

quoted Abdul Kalam (2006) in an inaugural address of a Seminar on Disabilities to motivate the differently abled including autistics to overcome their disabilities and explore their tremendous inner potential.

American Psychiatric Association (2000) classifies autism as a “pervasive developmental disorder” characterized by severe impairment in several areas of development such as social interaction, communication and imagination. The word autism comes from the Greek word “autos” meaning self and people with autism prefer solitude to social interaction (DeLong 2008). But Desorgher et.al., (2000) define autism as not a psychological condition but a neuro-gastro-immunological disorder resulting from an immuno-genetic error during foetal development. Minshew et.al., (2007) asserted that autism is also defined as a polygenetic developmental neurobiologic disorder with multiorgan system involvement, though it predominantly involves central nervous system dysfunction. This disorder has a broad impact on cognitive and neurologic functioning.

Autism is one of the most severe childhood disorders, affecting nearly one out of every 500 children. Early detection and integration can immensely enhance the prognosis of these children (www.autismindia.com). Barbaresi et.al., (2005) and Fombonne (2009) speculate that autism and the related conditions in the autism spectrum have become the focus of interest fueled by concerns about the apparent increase in the number of children with these developmental disorders, since

- 1 in 50 children is diagnosed with autism
- 1 in 94 boys is on the autism spectrum
- 67 children are diagnosed per day
- A new case is diagnosed almost every 20 minutes
- More children will be diagnosed with autism this year than with AIDS, diabetes and cancer combined
- Autism is the fastest growing serious developmental disability
- Autism costs United States of America over $90 billion per year, a figure
expected to double in the next decade

- Boys are four times more likely than girls to have autism (www.autismspeaks.org)

Shattuck (2006) stated that the spurt in the prevalence rate could be due to diagnosis substitution since the definition of autism underwent a “corrective narrowing” in 1994, when the American Psychiatric Association published the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), the coding system of mental illness used in the US. Children who had previously been disabled began in the 1990s to be labeled as autistic.

Autism has become one of the most difficult and controversial child health issues because of controversies over etiology and the effectiveness of interventions (Levy and Hyman 2005 and Green 2006). Symptoms of autism manifest by the age of three years, and affected individuals often require constant care from family members and professionals (Kolevzon et.al., 2007) because these children display abnormal behaviours that cause serious distress for both the child and the family. Unusual eating habits, abnormal sleep patterns, temper tantrums and aggression to self and to others are among the most common of these abnormal behaviours (Dominick et.al., 2007).

Since the prevalence of autism is surging by 2020, 10 per cent of the population is expected to suffer from autism, poising to make India most populous country in terms of autistic patients across the globe, which makes fresh strides in autism research more relevant to India. As the prevalence rate increases, the resulting costs of this lifespan condition on national economics would rise concurrently. In countries such as India, these costs could cripple the nation’s health and education budgets within a few years (www.autism-society.org).

Autism can be devastating for affected families; there cannot be a more wrenching experience than to watch a severely disabled child struggle with life in a world with which they can hardly communicate. Families also reported high levels of burden following their child’s diagnosis as they are confronted with extraordinary demands on their time, energy, and financial resources (Barbaresi et.al., 2006). The uniqueness of each individual with autism makes the experience of raising a child with autism different for each family (Gupta and Singhal 2005), and it was found that
divorced parents are a common side effect of autism. Divorce rates in autism community is high ranging from 80-85 per cent, since caring for an autistic child often can result in marital hardships and isolation (www.blisstree.com).

Today, as a result of a dramatic shift in perspective that has been taking place over the past two decades, persons with disabilities have started to be viewed as people who must enjoy the full spectrum of civil, political, social, cultural and economic rights, said United Nations Secretary- General Kofi Annan in a statement (www.mnddc.org/news/). In October 2007, India signed the UN convention on rights of persons with disabilities, promising to “promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedom by all persons with disabilities and to promote respect for their inherent dignity” (www.autismaspergerssyndrome.suite101.com). With growing importance on persons with disabilities including autism, research is focused on appropriate intervention strategies. Children on the autism spectrum experience the ‘triad of impairments’ along with certain unique behaviour characteristics which is a major impediment in leading a normal life.

The treatment options for autism are multifold including medical therapy, behaviour therapy, physiotherapy, occupational therapy and several alternative therapies. Nutrition therapy for the autistic children has not been given its due importance in many countries especially India. Autistic individuals experience a cascade of biochemical and nutritional abnormalities. Williams et.al., (2000) reported that children with autism frequently have significant eating difficulties with highly restricted range of food choices. Eating habits and patterns are often unusual and have an impact on family life. Lowe (2010) affirms that autistic children tend to refuse more foods and restrict their diets to a smaller variety of foods than other children.

For an autistic child, however, who may not be able to accurately communicate his needs, his hunger goes unnoticed, or he may not want to eat and may have many food aversions. For these reasons, integrating nutrition therapy into treatment for children with autism is critical. Autism is complex and involves a spectrum of challenging behaviours. Almost all autistic children have nutritional deficiencies, food intolerances or gastrointestinal disorders that are not thoroughly addressed.
The goal of nutrition therapy in autism is to support the structure and function of the child’s brain and body to perform at the optimal level and to maximize the child’s brain function so that the response to other treatment is enhanced. Proper nutrition therapy should include a comprehensive nutrition assessment and also address feeding problems, any gastrointestinal problems, or need for vitamin and mineral supplementation. Children with autism are more negatively affected due to their problems with sensory integration dysfunction. Many autistic children may also have a subclinical nutrition deficiency causing irritability, poor concentration, depression, anxiety, sleep disturbance or loss of appetite (Strickland 2009).

According to Matthews (2009) attention to nutrition and specific diets are intended to help balance biochemistry, promote systemic healing and provide relief of autism symptoms. Individuals on the autism spectrum may have trouble digesting proteins such as gluten and casein, the protein present in wheat and milk. Elevated levels of certain peptides have been found in the urine of children with Autism Spectrum Disorder (ASD), suggesting the incomplete breakdown of peptides. The incomplete breakdown and the excessive absorption of peptides may cause disruption in biochemical and neuroregulatory processes in the brain, affecting brain functions. The removal of the proteins from the diet is the only way to prevent further neurological and gastrointestinal damage (www.autism-society.org).

Whiteley (2001) produced evidence of an abnormal peptide component in the urine of children with autism and proposed that the source of this opioid activity could be exogenously produced opioid peptide which is 2000 times more potent than pharmaceutical morphine.

Poor digestion often encountered in autistic subjects may be due to environmental factors, genetic susceptibility, inflammation and immune system response to certain foods and low levels of beneficial flora. The above factors can affect the brain, causing foggy thinking- affecting attention, language and learning. Brain and gut, both abnormal in autism, are particularly sensitive to oxidative injury (Mc Ginnis 2004).

The gut is an essential component to understand and address in autism. The largest part of the immune system (70%) is found in the gut which is often
imbalanced in autism. It is unable to fight viruses, yeast, and other pathogens properly and contributes to an overactive inflammatory and allergic response.

Some hypothesise that children with ASD have what is referred to as a “leaky gut”- tiny holes in their intestinal tract that may be caused by an overgrowth of yeast producing toxic substances, the toxic metabolites from the gastrointestinal tract seeps into the blood stream contributing to behavioural and medical problems in individuals with autism, such as confusion, hyperactivity, stomach problems and fatigue. Therefore the use of nutritional supplements, anti-fungal drugs and yeast-free diet may reduce the behavioural problems (www.autism-society.org). Yeast overgrowth disrupts the balance of healthy bacteria in the gut. A proper diet can “starve” the yeast and aid in reestablishment of a healthy gut environment (Usman 2001).

According to Matthews (2009) improving digestion, reducing inflammation and healing the gut are important steps in overall health and healing of autistic children. When children’s detoxification systems are not working optimally or are overburdened by pre-existing toxins, avoiding additional toxins from food is important. Food based chemicals can cross the blood brain barrier and affect the brain, creating hyperactivity, aggression, irritability and self-injurious behaviour. Food allergies that are common in autistic children are related to IgE response which can create an almost immediate reaction after eating a problem food. Identifying food sensitivities and removing all potential allergens to minimize challenges to the child’s delicate immune system has been proven to be helpful for many autistic children (www.autism.com).

Malabsorption is a common problem related to autism, many subjects suffering from autism experience chronic gastrointestinal inflammation and structural compromise in the digestive tract. This intestinal inflammation likely reduces nutrient absorption therefore the road to autism recovery begins with the diet (Horvatho et.al., 1999).

Dietary intervention is the cornerstone in the treatment of autism. Making calculated omissions and additions to food choices is the first step in improving autistic children’s health and well being. Certain food substances are known to be
problematic and should be avoided and other foods rich in healing nutrients are beneficial when added to childrens’ diets (Matthews 2010).

Strambi (2006) opined that children with ASD require special dietary management. If these cases are diagnosed at an early stage, they can be helped through diet. Children suffering from autism have much lower level of vitamins A, C, D, E and all B vitamins (except choline) and some minerals such as zinc, magnesium and selenium. Tryptophan depletion has been found to increase negative behaviours such as hand flapping, banging and hitting (Leklem 1999). Various reports support the concept that certain nutrients are helpful for autistic children, specifically folate, vitamin B6, magnesium, vitamin C and probably vitamin B12 (Shaw et.al., 1997; Ratner 1998 and Werbach 1999). Mousain-bosc et.al., (2006) stated that behavioural improvement has been observed in autism children by supplementing a combination of vitamin B6 and magnesium.

Various nutrients have been found to be beneficial for the autistic children; ω-3-fatty acids have been found to be one of the nutrients with diverse health potential for autistics. Some scientists proposed that autism, dyslexia, attention deficit hyperactivity disorder (ADHD) and dyspraxia are a related group of neurodevelopmental disorders that are caused by problems in the metabolism of essential fatty acid (Richardson and Ross 2000; Young and Conquer 2005 and Kidd 2007). For unknown reasons, the brain and bodies of individuals with autism have problems converting the EFA from foods into the forms that are necessary for many biochemical reactions (Tsalamanio 2006).

Mood and behaviour problems in humans have been linked to a lack of omega-3 EFA in the diet (Richardson and Ross 2000; Ruxton 2004 and Young and Conquer 2005). Currently there are only a few studies revealing the effectiveness of EFA supplementation as a treatment for autism (Richardson and Ross 2000; Young and Conquer 2005; Genuis and Schwalfenberg 2006; Richardson 2006; Kidd 2007 and Meguid 2008).

A very important nutrient that has been studied widely as a supplement for the autistic children is N, N- dimethylglycine (DMG), an amino acid derivative that is naturally found in the human body and supports transmethylation process, (Laryea et.al., 1998). There is a report of a Korean study which used DMG for autistic
children and found that it improved verbal communication and behaviour (Kendall et.al., 2000).

Children with autism have a gut flora which produces toxins (Gibson and Roberfroid 1995). Among the effective natural treatments for yeast infection the use of probiotics, or what is commonly called friendly bacteria is found to be a promising one. The strategy behind this natural candida cure is flooding the intestines with friendly, beneficial bacteria so that yeast and harmful bacteria would not thrive. Therefore probiotics could play an important role in helping autistic children by tackling the neurotoxins.

Laboratory evidence suggests that probiotics are very proactive, producing substances such as acids, bacteriocins and hydrogen peroxide, which can kill harmful bacteria and interfere with their ability to produce toxins. Other new evidence suggests that probiotics act directly on the immune system, boosting both T-helper and natural killer cells (Delcenserie et.al., 2011). Dosman (2007) reported that 77 per cent of autism children had restless sleep, which improved significantly with iron therapy, suggesting a relationship between sleep disturbance and iron deficiency in children with ASD.

Early diagnosis is important because outcome improves with multi modal and intensive treatment. Literature surveys indicate that the nutritional therapy for the autistic children had been focused on supplementing individual nutrients and their outcomes on either the nutritional status or the behaviour of the autistic children. Comprehensive studies including the various attributes of the autistic children had not been conducted so far, therefore the present investigation was carried out to make a wholesome assessment of these children after suitable dietary intervention.

With the increasing prevalence of ASD at an alarming speed, the role of food in treating the children cannot be ignored any more. Research thrust towards the dietary needs of the autistic children has become the need of the hour. Since the research has revealed the beneficial impact of some foods to bring about the positive behavioural changes in the autistic children, there is a need to develop special foods/recipes using the food ingredients and make them available in the market. Nutritional supplements significantly contribute towards their improvement of IQ, scholastic test scores and early neurological development. However studies on the development of
special food products for the autistic children and impact of incorporating the beneficial foods and eliminating the unhealthy foods are scarce. Hence the present study was planned to fulfill this lacuna. In this investigation a value added food supplement which was natural and free of additives was developed specially for the autistic children and the impact of supplementing this food on the nutritional and the behavioural outcomes of these children was studied.

Many parents sense that adjusting the diet may help to treat the symptoms associated with autism. However they are not aware of the suitable dietary modifications required for their children. In order to address their apprehensions getting nutrition information to the parents is essential. Nutrition education would help the parents to develop positive attitudes towards good nutritional practices, establish lifelong healthful eating patterns and take action for good health (Owens 2008). Therefore a comprehensive nutrition education module was included in the present investigation to facilitate the parents acquire accurate and current nutrition information on autism. It will be a big boon to the parents who meet with a painful experience of managing their disabled child.

The present investigation on “Promoting Nutritional Status and Behaviour Pattern of the Autistic Children through Dietary Intervention” was carried out with the following objectives: To

1. elicit information on the background details and nutritional profile which have a bearing on health and nutrition of the autistic children.

2. formulate a diet module comprising of a cyclic menu suitable for autistic children and introduce desirable dietary practices through nutrition education to mothers and children.

3. formulate a food supplement incorporating probiotics and evaluate the impact of feeding on nutritional status and behaviour of the children.

4. study the association of the environmental and intrauterine risk factors and the incidence of autism.