

The Effectiveness of Using Glutine and Casine Free Meals Provided With Some Sources from Omega 3 and Magnesium in Decreasing the Symptoms of Autistic Children

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Abstract: The present study aims to investigating the effectiveness of glutine and casine free meals provided with some sources from Omega3 and magnesium in improving autism symptoms. The study sample is chosen randomly from Rahma center in Damitta. Twenty-two autistic children aged between 3 to 10 years used in this study. The feeding program starts with 22 autistic children while the children who have completed the program were 10 autistic children. Meals are presented daily during 12 weeks. Glutine and casine free meals provided with some sources of Omega3 and Magnesium are made (Shrimp pizza, Pumpkin Cake, Stem bread and (falafel + fried potatoes + cucumber) Sandwich. Autistic children acceptance of these meals is measured through sensory evaluation questionnaire for mothers, as autistic children can't express their opinion. Chemical composition is made using food composition Table. Results of sensory evaluation done by mothers of autistic children meals shows the acceptance significance ($p<0.05$). Chemical composition shows high content of calcium , Vit.A and magnesium also it consist of omega3. The improvement of autism symptoms is measured through pre and post questionnaire of mothers and teachers. Mothers of autistic children aged between 19 and 23 years during baby birth, and educational level is low in the majority. The improvement is significant in verbal contact, hyperactivity, attention and self harm ($p<0.001$).The improvement significant of eye contact, sleep habit and food habit at $p<0.05$. Social contact in mothers' questionnaire is higher significant than teachers. To sum up, glutine and casine free meals provided with some sources from Omega3 and magnesium could be affective in decreasing symptoms of autistic children.

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1. Introduction:

Autism Spectrum Disorders is not as rare as is commonly thought and, right from the birth of the child with ASD, this affects the entire family, which is a physical, emotional, and financial burden. Autism cannot be cured, but the children's, parents, and families' quality of life can be considerably improved with the Right treatment approaches (Rosa *et al.*, 2010).

Autism Spectrum Disorders (ASDs) are complex neurodevelopment disorders with many biological causes, including genetic, syndromic and environmental. Such etiologic heterogeneity impacts considerably upon parents' needs for understanding their child's diagnosis. A descriptive survey was designed to investigate parental views on the cause(s) of ASD in their child. Among the 41 parents who replied to the questionnaire, genetic influences (90.2%), perinatal factors (68.3%), diet (51.2%), prenatal factors (43.9%) and vaccines (40.0%) were considered to be the most significant contributory factors. Parents reported inaccurately high recurrence risks, misperceptions of the contribution of various putative factors, feelings of guilt and blame regarding

their child's diagnosis, as well as a lack of advocacy for genetic counseling by non-geneticist professionals. This study offers clinicians and researchers' further insight into what parents believe contributed to their child's diagnosis of ASD and will help facilitate genetic counseling for these families (Mercer *et al.*, 2006).

Children with Autistic Disorder have several defining characteristics, including impairment in social interactions, impairment in communication, and stereotyped or repetitive patterns of behaviors and interests (Staci Young, 2008).

Thus, direct eye contact has a rather positive effect on social cognition in controls, whereas this effect is reversed for individuals with ASD (Rosa *et al.*, 2010).

Some children with autism are mute and possess little or no verbal skills. Individuals with autism may also engage in behaviors when there space is invaded or when experiencing frustration or stress. The child with autism may slap, hit, spit, scratch, or kick. Other behaviors include pica (eating inappropriate objects), hyperactivity, impulsivity, short attention span, and tantrums (Bonnie and Hebert, 2003).

Attention deficit/hyperactivity disorder (ADHD), a common behavioral disorder in children, may be associated with co morbid physical and sleep complaints. Dietary intervention studies have shown convincing evidence of efficacy in reducing ADHD symptoms in children. In a pilot study, the effects of an elimination diet on physical and sleep complaints in children with ADHD were investigated. A group of 27 children (3.8–8.5 years old), were assigned randomly to either a diet group (15/27) or a control group (12/27). The diet group followed a 5-week elimination diet; the control group adhered to their normal diet. Parents of both groups had to keep an extended diary and had to monitor the behavior and the physical and sleep complaints of their child conscientiously. The primary endpoint was the clinical response, i.e. a decrease of physical and sleep complaints, at the end of the trial, based on parent ratings on a Physical Complaints Questionnaire. The number of physical and sleep complaints was significantly decreased in the diet group compared to the control group, with a reduction in the diet group of 77% ($p < 0.001$, effect size=2.0) and in the control group of 17% (**Lidy et al., 2010**).

Autism Spectrum Disorder (ASD) or/and Intellectual Disability (ID). Results inconsistent across studies compared with children of mothers aged 25–29 years; children of older mothers had an increased risk of ASD with and without (**Ami et al., 2011**).

Autism is a pervasive developmental disorder characterized by qualitative impairments in social interaction, communication and repetitive, stereotyped behavior. ASD often coexists with other disorders. These include hyperkinetic disorders, aggressive and self-destructive behavior, eating and sleeping problems (**Clarissa, 2010**).

Results indicated that children with autism had more meal time behavioral differences, but these did not translate to significant differences in nutritional status compared to typically developing children. However, there was much variability with in both groups (**Cynthia et al., 2008**).

The efficacy of a gluten-free and casein-free (GFCF) diet in treating autism was tested using a randomized, double blind repeated measures crossover design. The sample included 15 children aged 2-16 years with autism spectrum disorder. Data on autistic symptoms and urinary peptide levels were collected in the subjects' homes over the 12 weeks that they were on the diet. Group data indicated no statistically significant findings even though several parents reported improvement in their children. Although preliminary, the study demonstrates how a controlled clinical trial of the GFCF diet can be conducted, and suggests directions for future research (**Elder et al., 2006**).

Efficacy of omega-3 fatty acids (1.3 g/day) for the treatment of hyperactivity in 27 children ages 3-8 with autism spectrum disorder (ASD). After 12 weeks, hyperactivity, as measured by the Aberrant Behavior Checklist, improved (2.7 ± 4.8) points in the omega-3 group compared to (0.3 ± 7.2) points in the placebo group. Correlations were found between decreases in five fatty acid levels and decreases in hyperactivity, and the treatment was well tolerated. Although this pilot study did not find a statistically significant benefit from omega-3 fatty acids, the small sample size does not rule out small to moderate beneficial effects (**Bent et al., 2011**).

Flaxseed by virtue of its w-3 content reduced triglycerides. Dietary fiber present in flaxseed has the effect of reducing total cholesterol and LDLC. Reduction in fasting blood sugar (FBS) may be due to soluble fiber, lignans, large amount of potassium and the w-3 content in flaxseed (**Mitra and Bhattaharya 2008**).

In all patients, symptoms of hyper excitability (physical aggressiveness, instability, scholar attention, hyper Tony, spasm, mycology) were reduced after 1 to 6 months treatment. Other family members shared similar symptoms, had low ERC-Mg values, and also responded clinically to increased Mg (2+)/vitamin B6 intakes. Two typical families are described (**Mousain-Bosc et al., 2004**).

Notably, essential vitamins, minerals, and omega-3 fatty acids are often deficient in the general population in America and other developed countries; and are exceptionally deficient in patients suffering from mental disorders. Studies have shown that daily supplements of vital nutrients often effectively reduce patients' symptoms. Supplements that contain amino acids also reduce symptoms, because they are converted to neurotransmitters that alleviate depression and other mental disorders (**Shaheen and Karen, 2008**).

Calcium as a molecule plays a significant role in the body, especially in the central nervous system. Calcium homeostasis, especially in the context of the central nervous system, may have crucial implications in many neuropsychiatry conditions. The hypothesis presented will explore the link between the blood-brain barrier (BBB) and calcium homeostasis (CH) as it is a complex, physiological process. Absence of organic deficits associated with conditions, such as pervasive developmental disorder (PDD), autism spectrum disorders (ASD), mental retardation (MR), and attention deficit hyperactivity disorder (ADHD) (**Atmaram et al., 2007**).

2. Subjects and methods:

Subjects:

- 1- Ten children with autism from Rahma Center, Damietta used in this study.
- 2- Gluten-free flour (Tapioca starch – Potato starch – corn flour) was obtained from El- Ansari, Company, Cairo, Egypt.
- 3- Xanthan gum obtained from Line foods, Company, Cairo, Egypt.
- 4- Pumpkin, walnuts, cinnamon, flaxseed, cumin, cloves, fructose, potatoes, turmeric, meat, shrimps, molasses and free yeast obtained from the local market at Damietta.

Methods:

An initial work shop was made for autistic children's mothers and teachers to be aware of health and appropriate nutrition for their children.

At the beginning of the work shop, mothers and teachers of autistic children filled in the questionnaire (pre - questionnaire).

The questionnaire was done after reviewing many researches and studies about autism and autistic children characteristics and C.A.R.S.

It consists of eight items, (visual communication, verbal communication, social interaction, hyperactivity, focus and attention, self-harm, sleep habits and food habits). Each item consists of many statements which mothers and teachers should respond to by one of the following responses (always – usually – often – rarely and never).

Kinds of gluten and casein free meals were produced, supported with omega-3, magnesium and calcium through adding, pumpkin, walnuts, cinnamon, flaxseed, cumin, cloves, turmeric and shrimps. All these additions were to enhance memory, increase attention, reduced aggression and tantrum and improve lack of movement for autistic children, these meals were (pumpkin cake, stem bread, falafel sandwiches with potatoes and shrimp pizza). The sample of the study (autistic children) was chosen randomly from Rahma center in Damietta, aged 3 to 10 years (the mean age 6.5 year). Nutritional program started with

22 children, only 10 autistic children continued the nutritional program daily for 12 weeks.

Chemical analyses for these meals were done through food analysis tables.

A final work shop was made for mothers and teachers of autistic children about healthy nutrition and how to cook different kinds of healthy meals for their children, also they learnt about the psychological needs of these children and how to meet these needs. The questionnaire was filled in after the end of the program during the work shop. Data of the pre and post questionnaire were statistically analyzed with the aid of an SPSS and Excel program to compute percentages, means, standard deviations and t- test.

3. Results and Discussion:

Sensory evaluation:

The mean values±SE. sensory evaluation of autistic children's meals including shrimp pizza, pumpkin cake, stem bread and sandwich (falafel and potatoes cucumber) presented in Table (1).

The mean values± SE of aroma, taste, color, tandems and overall acceptability in pumpkin cake and sandwich (falafel and potatoes cucumber) recorded the highest acceptability respectively, followed by stem bread and shrimp pizza, respectively.

All autism children meals showed a significant at ($p < 0.05$).

The four types of meals were analyzed and illustrated in Table (2). The highest percent of protein was found in shrimp pizza (22.8%), while pumpkin cake showed the lowest percent (6.8%). The percent of fat in pumpkin cake increased than all types of tested meals. Fat in pumpkin cake increased by about 43.1, 30.4 and 10.1g/100g sandwich, stem bread and shrimp pizza, respectively. The highest amount of carbohydrate as a percent recorded for the sandwich, followed by stems bread, pumpkin cake and shrimp pizza, respectively.

Table (1): Sensory evaluation of autistic children's meals.

No.	Treatments	Aroma	Taste	Color	Tandems	Overall acceptability
		10	40	10	20	20
		M±SE.	M±SE.	M±SE.	M±SE.	M±SE.
1	Shrimp pizza	6.2±0.20	35.6±0.22	5.4±0.16	15.2±0.29	15.5±0.22
2	Pumpkin Cake	8.1±0.23	37.7±0.21	7.9±0.23	17.7±0.21	17.9±0.23
3	Stem bread	7.6±0.16	36.8±0.24	6.8±0.20	16.7±0.26	16.8±0.20
4	Sandwich(falafel +potatoes cucumber)	7.7±0.15	36.9±0.23	7.2±0.13	16.8±0.29	17.1±0.23

Pumpkin cake recorded the highest amount of Ca, Fe and V.A, followed by other tested meals, while the highest amount of Mg found in shrimp pizza, on the other hand the stems bread contain the highest amount of V.B than that of other tested meals.

Data in this table indicated that, these foods were rich in calcium although they are free of casein and can supply autistic children with their needs of calcium; the calcium has a good effect on brain function (**Atmaram et al., 2007**). Also, results showed richness in omega-3

(Shaheen and Karen, 2008 and Bent *et al.*, 2011). And magnesium (Mousain *et al.*, 2004). Tested meals are a good effect on reducing self harm and hyperactivity in autistic children, and enhancing

memory and richness in vitamin A, which has a good effect in improving aggression (Shaheen and Karen, 2008).

Table (2): Chemical composition of autistic children meals/100g

Kinds	Protein (g)	Fat (g)	Carbohydrates (g)	Ca (mg)	Fe (mg)	Mg (mg)	Vit. A (IU)	Vit. B (mg)
Pumpkin Cake	6.8	44.2	48.1	1107	36.8	100.5	80.24	10.8
Sandwich(falafel +potatoes cucumber)	13.3	10.1	75.2	61.2	1.7	3.6	100.9	—
Stems bread	19.6	30.4	49.6	168.5	15.9	41	129.5	16.4
Shrimp pizza	22.8	43.1	32.9	291.1	12.1	267.9	933.5	5.3

The mother's age during baby birth illustrated in fig. (1). More than 60% of mothers in the study gave birth autistic child between ages 19 to 23 years, followed by (23 to 27 years) and (27 to 31 years), respectively.

Data in this fig. showed highly significant changes between the three periods. This result disagrees with (Ami *et al.*, 2001).

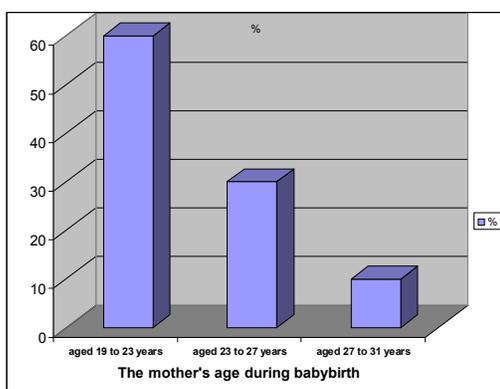


Figure (1): Mother's age during childbirth

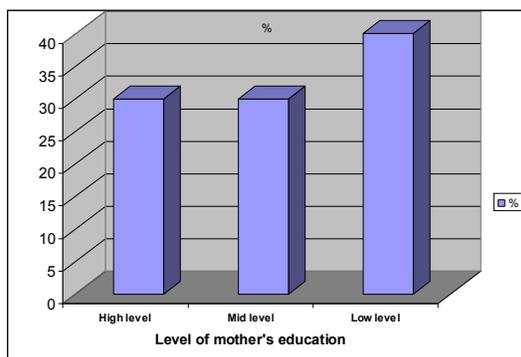


Figure (2): level of Mother's education

Figure (2) showed that giving birth to autistic children was spreadly high with low education mother's (40%), while the proportion of the high level of education of mothers (30%). This emphasizes the

importance of mother's education; to be aware of ways of healthy nutrition these children to feed and psychological causes of autism. Results were highly significant ($p < 0.001$).

Table (4) shows the descriptive (means, SD, t-test and Sig.) for eight symptoms of autistic children (visual communication, Verbal communication, social interaction, hyperactivity, focus and attention, self-harm, sleep habits and food habit). Means \pm SD of scores were higher for post-nutrition program than pre-nutrition program in eight symptoms. Visual communication means scores (24.57 \pm 10.59 and 32.85 \pm 10.59) which indicate the improvement of this symptom ($p \leq 0.08$) but the improvement of verbal communication was better as mean scores (23.57 \pm 5.08 and 35.85 \pm 5.08, $p \leq 0.001$) as autistic children started to say small syllables. This agree with the results of (Lidy *et al.*, 2010). Focus and attention was great significantly improved (23.60 \pm 1.51 and 31.00 \pm 1.51 $p \leq 0.000$), self harm (27.83 \pm 3.98 and 39.16 \pm 3.98 $p \leq 0.001$) and hyperactivity were significantly improved (27.14 \pm 3.64 and 34.57 \pm 3.64 $p \leq 0.002$). But other symptoms, social interaction (27.14 \pm 8.08 and 30.70 \pm 8.08 $p \leq 0.08$), sleep habits (27.0 \pm 3.55 and 30.88 \pm 3.55 $p \leq 0.01$) and food habits of autistic children before and after the feeding (27.28 \pm 7.11 and 31.71 \pm 7.11) was significant ($p < 0.05$). Because autistic children were eating chocolate much before the feeding, while after the feeding did not stop eating chocolate completely but decrease eating chocolate. There are possible trend towards improvement in the areas.

Table (5) showed that the study sample had significantly great improvement in verbal communication (23.57 \pm 3.15 and 34.14 \pm 3.15 $p \leq 0.000$) and hyperactivity (24.42 \pm 2.08 and 34.42 \pm 2.08 $p \leq 0.000$). A significant improvement in self harm (30.33 \pm 4.84 and 38.83 \pm 4.84 $p \leq 0.008$). There are possible trends towards improvement in the areas of visual communication (24.71 \pm 9.66 and 32.57 \pm 9.66 $p \leq 0.07$) and focus and attention (26.00 \pm 3.64 and 30.60

± 3.64 $p \leq 0.04$). The area of social interaction had non-significant differences between the pre and the post nutrition program, but the post degrees consistently

scored higher than the post ones, suggesting that larger studies may be needed to investigate possible differences in that area.

Table (4): "T" values for significant differences means of mothers' questionnaire marks in pre- and post-feeding program

Variable	Before M.	After M.	\pm SD	T.test	Sig.
visual communication	24.57	32.85	± 10.59	2.06	0.08
Verbal communication	23.57	35.85	± 5.08	6.38	0.001
Social interaction	27.6	30.70	± 8.08	1.106	0.08
Hyper activity	27.14	34.57	± 3.64	5.39	0.002
Focus and attention	23.60	31.00	± 1.51	10.9	0.000
self-harm	27.83	39.16	± 3.98	6.96	0.001
sleep habits	27.0	30.88	± 3.55	3.28	0.01
food habits	27.28	31.71	± 7.11	1.64	0.08

Table (5): "T" values for significant differences means of teachers' questionnaire marks in pre- and post-feeding program

Variable	Before M.	After M.	\pm SD	T.test	Sig.
Visual communication	24.71	32.57	± 9.66	2.15	0.07
Verbal communication	23.57	34.14	± 3.15	8.86	0.000
Social interaction	28.54	32.54	± 8.66	1.53	0.15
Hyper activity	24.42	34.42	± 2.08	12.7	0.000
Focus and attention	26.00	30.60	± 3.64	2.82	0.04
Self-harm	30.33	38.83	± 4.84	4.29	0.008

Table (6) showed that the food history of autistic children, eating dairy product group pre and post nutrition program (31.83 and 20.66) was highly significant ($p < 0.001$), drinks average pre and post nutrition program (31.33 and 17.00), was significance ($p < 0.05$), cereals and cereals products group before and after (31.62 and 22.87) was significance ($p < 0.05$), fruit and vegetables average before and after was (15.5 and 23.57) with highly significance ($p < 0.001$).

This result showed that the symptoms of autism were reduced due to eating gluten free and casein free meals and supported in omega-3.

This result agrees with that of Elder *et al.*, 2006, Christison and Ivany, 2006 and Bent *et al.*, (2011).

After a month of the beginning of nutrition program teachers and mothers noticed good

improvement in children's attention and concentration, but hyperactivity decreased relatively in few children. Nutrition program didn't affect hyperactivity in other children; this could be attributed to family use of chips, sandwiches and biscuits contain casein and gluten as rewards for their children. Nevertheless; a teenager in the sample (Efat) (10years old) was excessive in hyperactivity, as she was stubborn as a main characteristic of this lifetime. That's why her hyperactivity didn't reduced obviously. Furthermore, improvement also noticed in other symptoms like: problem solving, eye contact, pronunciation of word syllables, understanding teachers' and mothers' orders and response to different orders. All these notes lead the a necessity of training the mothers and teachers to be aware of suitable nutrition for autistic children.

Table (6): The food history from autism children.

Variable	Before M.	After M.	\pm SD	T.test	Sig.
Dairy product	31.83	20.66	3.06	8.93	0.000
White and Red meat	18.90	18.80	7.14	0.04	0.96
Eggs	18.00	21.66	8.73	0.727	0.543
Herbs	18.00	28.20	2.16	10.52	0.000
Drinks	31.33	17.00	5.03	4.93	0.039
Cereals and cereals products	31.62	22.87	7.30	3.38	0.012
fruit and vegetables	15.50	23.57	4.87	6.19	0.000
Fats	17.00	18.60	11.2	0.317	0.761

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