

# Nutritional Status and Autism Manifestations Improvement: The Effect of Educational Program on Cognition and Behavior for Caregivers Children with Autism



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## Abstract

**Background:** Research hypothesis: The researcher's hypothesized that, an improvement in the caregivers' cognition and behaviors after implementation of the nursing educational program intervention. Therefore, the study aimed to design, plan, implement and evaluate the effect of educational program on cognition and behavior for care givers of children with autism regarding relation between nutritional status and autism manifestations improvement.

**Design:** Aquasi-experimental research design was carefully selected for the current study. The study sample. A convenience sample including all available care givers (100) of children with autism students attended about patient students' Health Insurance Clinic. They are affiliated to Eltarbeha Alfkriah School in Beni-Seuf institutional.

**Data collection tools:** A structured interview questionnaire sheet for care givers part (1) Socio-demographical data of the caregivers, part (2) It used to assess caregivers' knowledge regarding autism part (3) It used to assess caregivers' knowledge and attitude regarding treatment and relation between nutritional status and autism symptoms improvement.

**Results:** The findings revealed that there was highly significant difference in pre and post-intervention program and their cognition and behavior, the study stated that there was improvement in their cognition and behavior, towards relation between nutritional status and autism symptoms improvement.

**Conclusion:** Educational intervention had significant role in increasing cognition and behavior of universal precautions among caregivers.

**Recommendations:** More efforts in developing and applying similar educational endeavors for parents 'children with autism these educational initiatives need to be improved periodically to ensure sustainability of their positive effects on cognition and behavior.

**Keywords:** Autism; Caregivers; Nutritional status; Educational program; Cognition and behavior

## Introduction

Autism spectrum disorder (ASD) is characterized by deficits in social communication skills and the occurrence of repetitive or limiting behaviors [1], the incidence of ASD is found almost five times in boys more than girls (1 in 54 compared to 1 in 252) [2]. The symptoms severity of ASD varies widely among affected individuals clinically. The incidence of ASD between 2000 and 2012, ASD diagnosis have doubled from 8.2 to 24.6 per 1000 children aged 8 years [3]. In United States were diagnosed one in 68 children with ASD in 2012 [2,3]. The economic costs for a

child with ASD are 6 times higher than that for a healthy child [1].

The autism is genetically and environmentally determined, genetic factors might explanation for only 10% to 20% of the observed ASD cases and have been shown to be complex and unclear whether, it is because of gene mutation or multi-gene interactions [1], ASD may be caused by contribution of a vital environmental elements in ASD development [4]. Prenatal and perinatal environmental exposures (eg, dietary factors,

maternal diabetes, stress, medications, heavy metals, alcohol, smoking, drugs and vaccinations or infections) are linked with an increased risk of ASD [5].

Generally, there appear in two forms of development and onset for children with autism. In some children, development seems uncommon in some esteem right from birth. Often, the children with autism do not sound, form words and use signs such as pointing with the predictable occurrence this is through parents observation. In other children, development seems near normal through 12-18 months. These children cooperate with adults in the surroundings, use some language to interconnect, and expression an interest in their social environments, but they may be a little behind their age. Then, at about 18 months of age, the alteration in their capabilities turn out to be evident. In some cases, an event in their environment appears to cause a loss in the acquired abilities such as speech and interaction from what we have detected [2].

Moreover, A collection of microbes, including bacteria, viruses, and fungi (micro- biota) gut-brain axis has been defined as a way of message between the gut micro-biota and the brain. Functional and inflammatory gastrointestinal (GI) diseases participate in high comorbidity (94%) with psychiatric diseases, such as depression or anxiety [6].

Also, microbial fermentation of carbohydrates end-products in the colon such as (Short-chain fatty acids (SCFAs), acetate, propionate, and butyrate) have several health benefits to the host (related to, for example, weight control, lipid profiles, and colon health) [7]. High levels of SCFAs and accumulation of SCFAs have comprehensive effects on the function of nervous system, causing developmental delay or seizures and bad effect on neurotransmitters such as (serotonin, or 5-hydroxytryptamine (5HT), which concentrations in stool and serum of children with ASD and SCFAs are producing bacteria, eg, Clostridia, Desulfovibrio, and Bacteroides, are raised in feces of children with ASD [8,9]. Thereby, translocation through the blood-brain barrier by transporters existing on the blood-brain barrier or by passive diffusion might reason of potential effects on the brain and cause development of ASD symptoms [10].

Children with ASD are more probable to suffer from food allergies, and parental states of allergies contain milk/dairy, nuts, and fruits [11]. Picky eating, food refusal, and food selectivity are most common associated with higher rates of ASD symptoms of problematic eating behaviors in autistic children [9]. Food selectivity is according to color, shape, texture, or temperature of the food and may be found a rejection of fruits, vegetables, or protein, is most common in autistic children [12]. The parents 'children with autism observed increase consumption of snack foods and calorie-dense foods can result in extreme weight gain, and research suggests higher rates of obesity in autistic children than in natural off spring and can lead to obesity complications (e.g., hypertension, diabetes and metabolic syndrome)[13], are also more prevalent among adults with ASD. In some studies of

autistic children have been reported an improvement of ASD symptoms after probiotic treatment of potential gut micro-biota to guidance the behavioral consequences and, potentially, the etiology of ASD [14].

Wherever, a number of nutrition intervention strategies including gluten-free/casein-free diets, ketogenic diets, or supplementation with n-3 fatty acids, minerals, or multivitamins have been suggested a therapeutic measure for ASD symptoms and one-third of children have been improved with some dietary intervention at time of ASD diagnosis. [15,16], it has been explored to treat behavioral symptoms and comorbid GI dysfunction. Some types of diets (e.g., gluten-free/casein-free diet, antioxidant diet, ketogenic diets) have resulted in an improvement of symptoms related to ASD, but others caused no behavioral changes compared with control diets or uniform due to inadequate or extreme nutrient intake in response to interventions [17,18].

Health education of parents about the feeding life styles and problems, relation between nutritional status and autism improvement, food types should be given and food types should be avoided for autistic children or dietary interventions, including FODMAP (fermentable oligo-di-mono-saccharides, polyols), crunchy foods or nourishments that have a slick mouth feel and food smells) diet, elimination diets, avoidance of food coloring/food additives, or specific carbohydrate diet is the main role of the researcher in educational program, Specific considerations are necessary when dealing with autistic children due to higher prevalence of food selectivity and general feeding problems. For example, if constipation has been suffered by children, the diet must be evaluated for the types of fruits, vegetables, and whole grains that the child will accept [15] and other subjects may occur in the area of sensory processing. For example, if children with ASD are hypersensitive to sounds, they may not can to eat in a noisy region or with others involved in discussion. If they have visual sensitivities, they may agree to take foods only of assured colors. They also may not be able to eat foods that are touching each other on their plate [2].

### Significance of the Study

Autism is noticed firstly within the first few years of life, it is considered a complex developmental and functional disorder. Among children with developmental disorders the incidence of autism spectrum disorders in Egypt and Tunisia were documented to be 33.6% and 11.5% respectively [2]. Through assessment, the researcher noted that, feeding difficulties, with highly restricted rang of food choices, gastrointestinal discomfort, food selectivity and picky eating patterns problems have been increased among many autistic children and youngsters have an extremely limited food repertoire. Eating habits patterns are often unusual and have effect on family life. Less attention directed to study relation between nutritional status, eating problems, social and behavioral aspects of children with autism which contribute autism modulation symptoms recovery. So the

clarify of the systematically review specific patterns and area of concern regarding effect of educational program on cognition and behavior for care givers of children with autism regarding relation between nutritional status and autism symptoms improvement is the main aim of the study.

The study aimed to design, implement and evaluate the effect of educational program on knowledge and behavior for care givers of children with autism regarding relation between nutritional status and autism manifestations improvement.

### Hypothesis

The research hypothesis was that the caregivers of children with autism who will attend the educational program will have an improvement better knowledge and behavior towards relation between nutritional status and autism manifestations improvement.

### Research design

A quasi-experimental design was utilized in this study.

### Subject and methods

**Setting:** The study was conducted at outpatient students' Health Insurance Clinic and Eltarbeha Alfkriah School at Beni-Seuf, which has 290 students and it contain 23 class (primary education, preparatory education and secondary education) and another part of school for administration, activity, art and daily living of autistic students in three level.

**Subjects:** A convenience sample including all available caregivers of children with autism students attended at outpatient Students' Health Insurance clinic and Eltarbeha Alfkriah School at Beni-Seuf Institutional, (100) caregivers (75 males and 25 mothers), all of caregivers are willing to participate in the study with the following criteria: includes (all children's parents who are autism diagnosed) in previous mentioned setting.

**Sample size:** sample size was detected based on the last numbers of previous setting students was 290. Sample size was calculated utilizing the following formula [19].

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n= sample size

N= population (290)

e= margin error (0.05)

A total of sample size was 168 caregivers.

### The inclusion criteria

The inclusion criteria set for sample selection were as follows:

A. Caregivers' students who teaching in previous setting.

B. Caregivers' students were willing to participate in the study.

C. Caregivers' students all children's parents who are autism diagnosed.

D. Caregivers' students were aged 6-18 years.

### Exclusive criteria

A. Caregivers' students not available at the time of data collection.

B. Caregivers' students who not consented to participate in the study.

### Tools of data collection

**Tool 1:** A structured interview questionnaire sheet developed by the researchers to assess adolescent students' knowledge about relation between nutritional status and autism manifestations improvement. It based on recent literature review and adolescent student needs. This tool was divided into 3 parts;

A. Socio-demographical data of the care givers studied sample, including (age, education, residence, training course and caregiver's occupation).

B. It used to assess caregivers' knowledge regarding autism (definition, causes, types, clinical manifestations, high risk factors and groups, diagnostic tests, treatment method of autism and sources of information).

C. It used to assess caregivers' knowledge regarding treatment and relation between nutritional status and autism symptoms improvement such as (type of favorite dietmetabolic or feeding problems with autistic children, aims of treatment, new technology of autism treatment, nutrition and its relation with autism symptoms improvement, methods of how to dealing with autism, complications, preventing method and their opinion about the educational program) [20].

**Tool 2:** Caregivers' behavior like scale developed by the researchers to assess caregivers' behavior related to relation between nutritional status and autism manifestations improvement (nutritional treatment program, difference of child condition during nutritional treatment program, punishment behavior toward her or his child, set a feeding schedule and routine, avoid all day eating, provide comfortable and supportive seating, limit mealtime, presentation, minimize distractions, get your child involved, practice pleasant and healthy eating behaviors) [21].

### Scoring System

**Scoring system was followed to gain the conclusions of student' knowledge**

A. Knowledge subjects were divided into 21 questions and each question was assigned a score and three score level

if the participant final score obtained is considered complete and/or correct answer was scored (3), Incomplete correct answer was scored (2), while don't know or wrong answer was scored (1).

B. The total score was 100% calculated as: Satisfactory  $\geq 70\%$  of the total score and unsatisfactory  $< 70\%$  of the total score.

### Scoring system was followed to obtain the outcomes of caregivers' behavior

A. Behavior contents were divided into 16 items and each item was assigned. It was used twice for evaluation first in the base line assessment & second after program. Participants were asked to grade each question on a scale of 0-5, 0 meaning strongly disagree, (1) meaning disagree, (2) meaning somewhat disagree, (3) meaning somewhat agree, (4) meaning agree and (5 )meaning strongly agree Average Scores  $\geq 4.00$  were determined to be positively associated. Those  $< 4.00$  were determined to have a negative association.

B. The total score of attitude' questionnaire responses was 100%, accordingly more than or equal 70% was considered positive, less than 70% was considered negative.

### Educational Program

A. The program content was reviewed & tested for content validity by five experts from pediatric nursing professor, community health nursing professor and medical physiology department professor.

B. This program was planned to increase care givers' cognition and behavior regarding relation between nutritional status and autism manifestations improvement.

### Program Implementation

The program was conducted through five sessions the time of each session was be verified between 30-45 minutes according to the caregivers' needs and condition in groups. At the beginning of the first session, students concerned about the program content and its goal. Students were knowledgeable about the date of the next session at the end of the setting.

Each session was in progress by a summary about what has been discussed in the previous one and giving the aims of the new session, using simple Arabic language, also the session ended by a summary of its content and feedback from the others was obtained to ensure that they acquired the maximum benefit.

Validity of tool was estimated by 5 experts in pediatric, community health nursing field and medical physiology department professor and its result was 95%. Reliability was estimated by Alpha Cronbach's test for tool one and its result was  $R = 0.83$ .

### Pilot Study

The pilot study was conducted on 10% (10) of the total sample to test the feasibility and the applicability of the tool, find out the possible obstacles and problems that might face the researcher and interfere with data collection, detect any problems peculiar to the statements as sequence of questions and clarity and estimate the time needed for data collection. The samples of the student included in the pilot study were excluded from the main study sample.

### Implementation Phase

The total number of the sample 100 caregivers, they was distributed into 8 groups 12-13 caregivers in each group. The program was offered to each group separately 2 sessions/week (Sundays and Wes days), each session is ranged from 30-45 minutes for the content of cognition include items about meaning. In the first session pre-test was obtained and aim of the program were explained to the caregivers. The teaching methods used were the teaching strategy includes lectures, discussion, role play and demonstration and re-demonstration using real objects and brainstorming. Also, handouts of the educational program, was given to caregivers about relation between nutritional status and autism manifestations improvement.

### Program Evaluation

The effect of the program on students were approved through comparing the pre and post assessment score of caregivers' knowledge and behavior towards relation between nutritional status and autism improvement.

### Procedure

A. This study was showed in five separate steps: developing interview questionnaire sheet, pilot study, assessment of baseline knowledge of caregivers (pre-test), implementation of educational program, and finally, evaluation of knowledge and attitude of caregivers.

B. The study tool was revised & tested for content validity by five experts from pediatric nursing professor, community health nursing professor and medical physiology department professor.

C. The data were finished by the researcher during the period of 12 months from the start of March 2016 up to the end of February 2017.

D. Purpose of the study was simply explained to studied students prior to any data collection:

a) The researcher interviewed care givers at outpatient Students' Health Insurance clinic and Eltarbeha Alfkriah School in Beni-Seuf institutional.

b) Each caregiver was questioned individually by the researcher. The mean time required for each sheet was about 25-35 minutes to fill a questionnaire.

c) The researcher in progress to gather data and knowledge about caregivers after clearing up the study aim. She started each phase of the educational program with a summary about what has been communicated in the previous one and giving the aims of the new session.

d) The educational program plan was applied on 3 phases through demonstration. Each phase required between 30-45 minutes for prolongation of the plan. Teaching sessions were conducted two days/week. They were carried out using different teaching strategies, (lectures, discussion, role play and demonstration and re-demonstration using real objects and brainstorming).

### First phase

This phase encompassed assessment of care givers cognition and behavior about relation between nutritional status and autism symptoms improvement through using the established tools as a pre -test.

### Second phase

This encompassed analysis of the pretest findings and identification of caregivers` knowledge and behavior towards relation between nutritional status and autism symptoms improvement educational program was designed.

### Third phase: (program planning and implementation)

Based on the results from the an organized interview questionnaire sheet, literature review and educational health program regarding relation between nutritional status and autism symptoms improvement educational program was established by the researcher.

A. The training was planned based on analysis of the actual educational requirements assessment pre training by using the pre-constructed tools and consistent with related literature. In addition, meeting nurses level of understanding.

B. Beginning of training included classification of the studied nurses into groups, each group consisted of 12-13 caregivers, then orientation of the caregivers about training objectives, outline, schedule, expected outcomes and benefits.

C. Questionnaire sheet regarding caregivers` cognition and behavior about relation between nutritional status and autism improvement about care givers` knowledge regarding autism (definition, causes, types, clinical manifestations, high risk factors and groups, diagnostic tests, treatment method of autism and sources of information), caregivers` knowledge regarding treatment and relation between nutritional status and autism symptoms improvement. such as (type of favorite diet metabolic or feeding problems

with autistic children, aims of treatment, new technology of autism treatment, nutrition and its relation with autism symptoms improvement, methods of how to dealing with autism, complications, preventing method and their opinion about the educational program) and caregivers` behavior related to relation between nutritional status and autism manifestations improvement (nutritional treatment program, difference of child condition during nutritional treatment program, punishment behavior toward her or his child, set a feeding schedule and routine, avoid all day eating, provide comfortable and supportive seating, limit mealtime, presentation, minimize distractions, get your child involved, practice pleasant and healthy eating behaviors.

D. Conduction of theoretical part was preformed through lectures and group discussions using data show and pictures as media. It was taken in 8 hours for 4 sessions, which were covered on two weeks. First session: primary assessment. Second session: educational program (definition, causes, types, clinical manifestations, high risk factors and groups, diagnostic tests, treatment method of autism, type of favorite diet metabolic or feeding problems with autistic children, aims of treatment, new technology of autism treatment, nutrition and its relation with autism symptoms improvement, methods of how to dealing with autism, complications, preventing method and their opinion about the educational program). Third session: caregivers` behavior related to relation between nutritional status and autism manifestations improvement (nutritional treatment program, difference of child condition during nutritional treatment program, punishment behavior toward her or his child, set a feeding schedule and routine, avoid all day eating, provide comfortable and supportive seating, limit mealtime, presentation, minimize distractions, get your child involved, practice pleasant and healthy eating behaviors. Fourth session (secondary assessment).

E. Evaluation of the training was done through pre/post tests using previous tools to measure the change in caregivers` knowledge and behavior towards relation between nutritional status and autism improvement.

### Administrative Design

An official approval was obtained from dean of faculty of nursing to the administrators of the study setting to carry out the study. A clear explanation was given about the nature, importance and expected outcomes of the study.

### Ethical and legal considerations

A. The researcher explained the study aim before applying the tools to gain confidence and trust of the caregivers who participated in the research.

B. The researcher obtained oral consent from each subject who participating in the program, informing them that they

have the right to withdraw at any time without giving any reason.

- C. The study was conducted in a safe place for caregivers.
- D. Data were collected and treated confidentially.

### Statistical Data Analysis

The data were computerized and analyzed using the statistical package for social science (SPSS), version 16.0 Data were presented using:

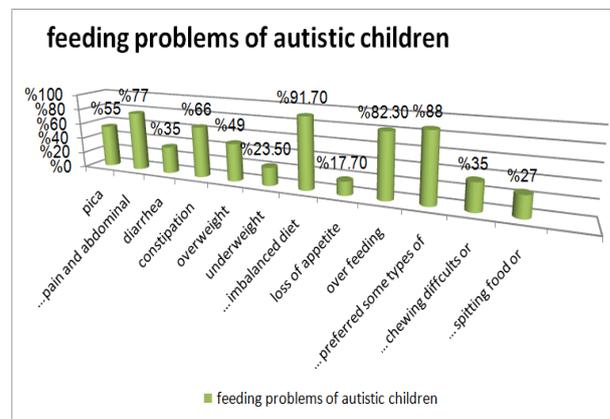
- A. Descriptive statistics in the form of number, percentages means and standard deviation
- B. Statistical tests included: Chi-square ( $\chi^2$ ) test for analysis of qualitative variables.
- C. The graphical presentation included pie and column chart diagrams.
- D. Statistical significance was considered at P -value <0.05.

**Table 1:** Socio demographic characteristics of children’s parent with Autism No=100.

	Frequency	%
<b>Age in Years</b>		
Less than 20	0	0
20-	23	23
25-	43	43
≥30	24	24
Mean±SD	26.37±2.08	
<b>Educational Level</b>		
illiterate & primary	13	13
Secondary & technical institute	37	37
University, Master and doctor degree	50	50
<b>Residence</b>		
Urban	40	40
Rural	60	60
<b>Training Courses of Care Givers</b>		
Yes	30	30
No	70	70
<b>Father’s Occupation No=75</b>		
Working	75	100
Not working	0	0
<b>Mother’s Occupation No=25</b>		
Working	8	32
Not working	17	68

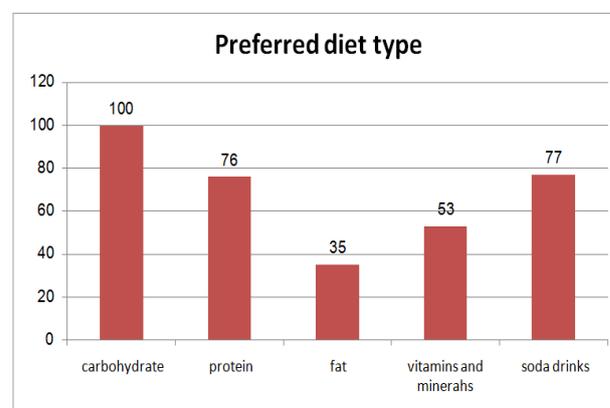
Table 1 The demographic data of students indicated that, 43.0% of the studied caregivers age ranged between 25-30 years with mean age 26.37±2.08years. The majority of them (41%) were married. Regarding the level of education, half (58.3%) of the caregivers had university, master and doctor degree. As regards residence of caregivers, this Table 1 shows that 60% of them from rural community. As regards experience years of caregivers, this Table1 shows that less than three quarters 70% of them don’t take any training courses, while according to father’s and mother’s occupation 68% of mothers not working and 100% of fathers are working .

Figure 1 indicated that, the majority 91.7% of autistic children have imbalanced diet and do not follow ideal autistic nutrition according to the care givers observation and the health problem effect on their children appetite as 17.7% of children had loss of appetite.



**Figure 1:** Distribution of common feeding problems among of autistic children.

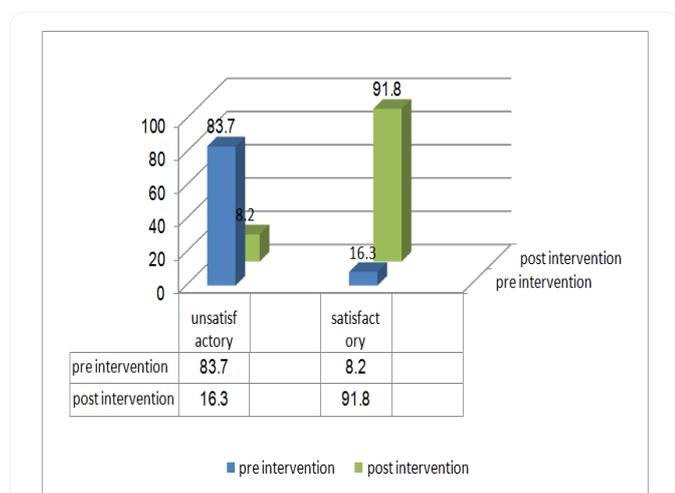
This Table 2 shows that there is an improvement in caregivers’ cognition immediately after program mean scores and there were highly statistically significant differences (P<0.001) between before and immediately after program intervention (Figure 2).



**Figure 2:** Distribution of the current type of favorite diet behavior among autistic children.

**Table 2:** Percentage distribution of caregivers' cognition regarding relation between nutritional status and autism recovery educational program.

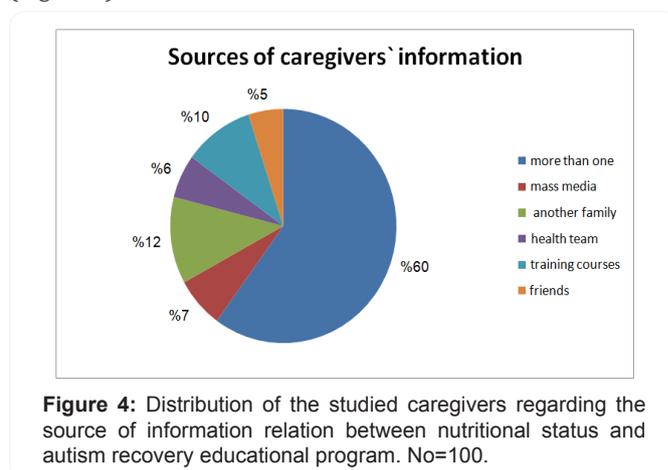
	Pre-Intervention		Post-Intervention		Chi Square Test(1)	P Value
	Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory		
	%	%	%	%		
	Definition of autism	92	8	100		
cause of autism	60.3	39.7	100	0	16.77	<0.001**
Risk factors of autism and the main systematic affections	25	75	98	2	4,75	<0.001**
Autism`s manifestations	30	70	96	4	118	<0.001**
Types of autism	10	90	92	8	114.76	<0.001**
Diagnostic test of autism	20	80	88	12	17.82	<0.001**
Common treatment methods and main goals of treatment	35	65	95	5	109.76	<0.001**
New technology method of autistic children treatment (Management of autism by stem cell)	0	100	94	6	6,75	<0.001**
Nutritional status and autism symptoms improvement and its role in autism treatment	12	88	95,0	5,0	15.72	<0.001**
Meaning of gluten-free/casein-free diets	15	85	96	4	109.76	<0.001**
Methods of autism precaution and preventing	0	100	89.5	10.5	110.74	<0.001**
Methods of how to dealing with autistic children	40	60	98	2	6,55	<0.001**
Health and nursing care of autistic children	20	80	95	5	113.66	<0.001**



**Figure 3:** Percentage distribution of total cognition score of the studied caregivers pre and post phases of intervention about relation between nutritional status and autism symptoms recovery educational program. No=100.

Figure 3 Showed that 83.7% had unsatisfactory in their total scores of cognition followed by 16.3% had satisfactory level before program intervention. While the same figure displayed that, more than three quarters of the studied caregivers (91.8%) had satisfactory level in their scores of cognition followed by

8.2% had an unsatisfactory level after program intervention (Figure 4).

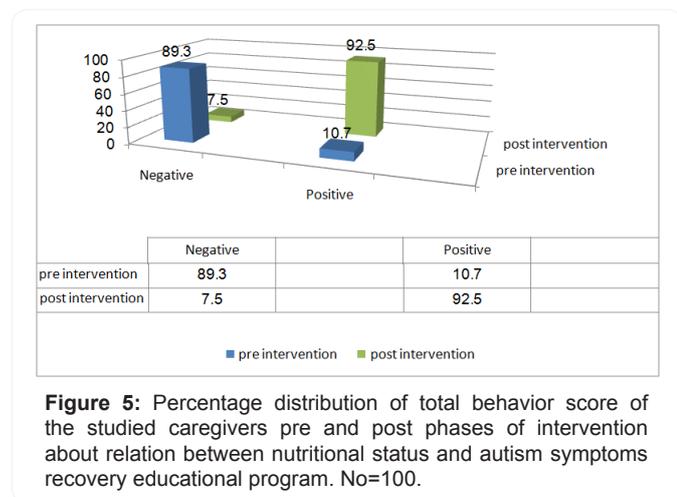


**Figure 4:** Distribution of the studied caregivers regarding the source of information relation between nutritional status and autism recovery educational program. No=100.

Table 3 points out that there are highly statistically significant differences ( $P<0.001^{**}$ ) between cognition score and their socio demographic characteristics about pre and post-intervention program in educational level, residence, training courses and mother occupation. While there are no statistically significant differences ( $P<0.001^{**}$ ) between cognition score and their socio demographic characteristics about pre and post-intervention program in father's occupation and age in years.

**Table 3:** Relation between cognition or knowledge score and their demographic characteristics about relation between nutritional status and autism recovery educational program No=100.  
<0.001\*\* highly statistically significant.

	Total Cognition								Chi Square Test(1)	P Value
	Pre-Intervention				Post-Intervention					
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory			
	No	%	No	%	No	%	No	%		
Age in years	0	0	100	100	90	90	10	10	2.4	>0.05
Educational level	5	5	95	95	95	95	5	5	4.28	<0.001**
Residence	8	8	92	92	88	88	12	12	0.557	<0.001**
Father's occupation	12	12	88	88	95	95	5	5	2.91	>0.05
Training courses	15	15	85	85	95	95	5	5	2.87	<0.001**
Mother occupation	5	5	95	95	95	95	5	5	4.28	<0.001**



**Figure 5:** Percentage distribution of total behavior score of the studied caregivers pre and post phases of intervention about relation between nutritional status and autism symptoms recovery educational program. No=100.

Figure 5 Showed that 89.3% had unsatisfactory in their total scores of cognition followed by 10.7% had satisfactory level before program intervention. While the same figure displayed that, more than three quarters of the studied caregivers (92.5%) had satisfactory level in their scores of knowledge followed by 7.5% had an unsatisfactory level after program intervention.

Table 4 points out that there is highly statistically significant differences (P<0.001\*\*) between behavior score and their socio demographic characteristics about pre and post-intervention program in educational level, years of experience, training courses and mother occupation, while there is no statistically significant differences (P>0.05) between behavior score and their socio demographic characteristics about pre and post-intervention program in residence.

**Table 4:** Relation between behavior score and their demographic characteristics about relation between nutritional status and autism recovery educational program No=100.

	Total Behavior								Chi Square Test(1)	P Value
	Pre-Intervention				Post-Intervention					
	Positive		Negative		Positive		Negative			
	No	%	No	%	No	%	No	%		
Age in years	10	10	90	90	90	90	10	10	1.33	>0.05
Educational level	8	8	92	92	95	95	5	5	4.28	<0.001**
Residence	11	11	89	89	92	92	8	8	0.557	>0.05
Father's occupation	20	20	80	80	97	97	3	3	2.91	<0.001**
Training courses	5	5	95	95	96	96	4	4	2.87	<0.001**
Mother's occupation	18	18	82	82	95	95	5	5	4.28	<0.001**

**Table 5:** Correlation coefficient between total caregivers' cognition or knowledge and behavior scores during pre/post discharge program implementation No=100.

Variable		Cognition Pre	Behavior Pre	Cognition Post	Behavior Post
Cognition Pre	Pearson Correlation		0.018	0.226*	0.126
	Sig. (2-tailed)		0.642	0.246*	0.155
Behavior Pre	Pearson Correlation	0.06		0.112	0.004
	Sig. (2-tailed)	0.74		0.09	0.285*
Cognition Post	Pearson Correlation	0.233*	0.38		0.06
	Sig. (2-tailed)	0.367*	0.09		0.598

Behavior Post	Pearson Correlation	0.240*	0.006	-0.405	
	Sig. (2-tailed)	0.347*	0.655	0.467	

Table 5 shows a statistically significant positive correlation between students' total cognition scores after program implementation and their attitude immediately after program implementation. Table 5 shows that more than 90% of the studied caregivers had positive opinion and satisfactory about relation between nutritional status and autism symptoms recovery educational program.

**Discussion**

ASD considered a permanent developmental disability well-defined by diagnostic criteria that comprise dearth in social communication and social contact and limited, repetitive forms of behavior, interests, or activities [22].

Foods choosing to add and take away from their diet is the road to autism symptoms improvement and the diet considered the first step to improving the health and well-being of children with autism. Gluten and casein are certain food substances should be avoided because of problematic for the child with autism and other foods rich in curative nutrients are useful when added to children's diets. Attention to these factors is anticipated to benefit balance biochemistry, affect systemic curative, and be responsible for release of autism symptoms [23].

Teaching program management for caregivers about relation between nutritional status and autism symptoms recovery. is concentrated on nursing teaching and support, as well as actual treatment diet of autistic children and certain foods must avoided to reach autism symptoms recovery and prognosis or at least prevent autistics complication.

The goal of the study to explore the food preferred, health problems and nutrition elements which affect the eating patterns symptoms recovery of autistic children and their growth and give the caregivers educational program about relation between nutritional status and autism symptoms recovery. As regarding the distribution of the studied sample with socio demographic characteristics of the caregivers of autistic children, it was found that more than one quarter of studied caregivers (43%) their ages ranged from 25-30 years with mean age 26.37±2.08. Regarding the level of education, more than half (58.3%) of the caregivers had university, master and doctor degree and according to father's and mother's occupation 68% of mothers not working and 100% of fathers are working. It is agree with [2] who found that the majority of parent were highly educated and more than half of mothers were house wife sin her study about study of eating habits for children with autism at Assiut city. As regards residence of caregivers, this Table 6 shows that 60% of them from rural community, additionally [24] who stated that more than two fifths of parents were high level of education. As well, more than two thirds of mothers were housewife and less than three quarters of them reside urban areas in his study

about counseling for mothers to cope with their autistic children journal of American science,. As regards experience years of caregivers, this table shows that less than three quarters 70% of them don't take any training courses about how to deal with autistic children. Therefore, the role of the high level of education of their caregivers leads to early detection and diagnoses, treatment and culture of follow up, also, working parents extra time outside home and leave alone in house for extended time without care and guidance. Therefore refer their children to special care schoo

**Table 6:** Caregivers' opinion of educational program about relation between nutritional status and autism symptoms recovery educational program. No=100.

Items	Post Program			
	Unsatisfactory		Satisfactory	
	NO	%	NO	%
Cognition of program	0	0	100	100
Time of program	5	5	95	95
Language of program	4	3.3	96	96
Discussion method of program	0	0	100	100
Place of program	10	10	90	90

Concerning the feeding problems among of autistic children the present study indicates that more than three quarter of autistic children have imbalanced diet, do not follow ideal autistic nutrition, pica, pain and abdominal discomfort (constipation and diarrhea), preferred some types of food and over feeding according to the caregivers stated that the health problem effect on their children appetite as 17.7 of children had loss of appetite. According to Kirsten Berding et al. [1,12] who stated that Food selectivity, food neophobia, and "picky eating" were prevalent among children with ASD and could contribute to the development of nutrient deficiencies. In addition to unusual microbial conformation and variations in metabolites, GI distress, such as diarrhea, constipation, or abdominal pain, is prevalent among children with ASD and has been suggested to contribute to behavioral problems and to associate with symptom severity in their studies about micro biome and nutrition in autism spectrum disorder: current knowledge and research needs and asthma and allergies in children with autism spectrum disorders: results from the charge study. Autism.

Regarding to the studied caregivers' cognition and behavior for autistic children about definition, causes, clinical manifestation, types, risk factors diagnostic test, treatment method and nutrition program, the present study showed (Table 2), that there is an improvement in caregivers' cognition and behavior post-program mean scores and there were highly statistically significant differences (P <0.001) between pre and immediately after program implementation. According to El-Mowafy et al. [25]; who found that there were an improvement

in patient knowledge, cognition and practice post-program mean scores and there were highly statistically significant differences ( $P < 0.001$ ) in her study.

In the present study all studied children preferred a lot of carbohydrates and (77%) of children take soda drink and protein [2] supported the result in her study who found all studied children eat a lot of carbohydrates and (64.3%) of children take soda drink in her study about study of eating habits for children with autism at Assiut city. The ideal diet of autistic children must be avoided gluten-free casein-free diet (GFCF), gluten is the protein found in wheat, rye, barley, spelt, kamut, and commercial oats, and casein, the protein found in dairy (milk and its content) and food additives and ingredients to avoid.

According to parents surveyed by Autism Research Institute, a gluten- and casein-free diet is useful for 65% of children with ASD, more than a food sensitivity piece may or may not have revealed a response to these foods. Therefore, Matthews [23] who recommend a gluten- and casein-free trial period-often beginning the diet by eliminating first one, then the other in his study about the first step to biomedical intervention and autism recovery autism nutrition specialist defeat autism now.

The Specific Carbohydrate Diet (SCD) is considered the second most commonly carried out autism diet treatment program, and 66% of parents state it is helpful for their child. It is very helpful children with inflammatory bowel conditions and chronic diarrhea, even though it can benefit constipation too, SCD goals to decrease gut inflammation and help healing by "starving out" the bad gut bugs and avoiding carbohydrate foods that need to digesting enzymes Because of gut system of children with autism are routinely attacked by pathogenic bacteria such as clostridia, they often require specific nutrition and diet support. By eliminating problematic foods, the microbes cannot remain to feed, and they die out [1] in her study about micro biome and nutrition in autism spectrum disorder: current knowledge and research needs.

On the same line, more than three quarters of the studied had unsatisfactory and negative in their total scores of cognition and behavior followed by less than one quarter had satisfactory and positive level before program intervention. While the same figure displayed that, more than three quarters of the studied caregivers nearly all most had satisfactory level in their scores of cognition and behavior followed by less than one quarter had an unsatisfactory and negative level after program intervention. In agreement with Loutfy et al. [26] who found that, nurses' knowledge scores were generally low in her study about quality of nursing care providing for preterm infants suffering from respiratory distress syndrome in Port Said. While after program implementation, the current study shows an improvement in level of nurses' knowledge and practice. This study supported by Shrestha [27] who found an improvement in level of nurses' knowledge and practice after educational program implementation in her study about impact of

educational intervention on knowledge and practice of universal precautions among at Patan Academy. The researcher stated that, the unsatisfactory and negative behavior before program implementation due to lacking of workshop and training courses for the parents and satisfactory and positive behavior or an improvement after program due to program implementation.

According to source of students' information the current study illustrated that the caregivers had more than half of their information from more than one source and the minority having their information from friends, (Figure 3). This incongruent with Wahba et al. [28], who reported that media have a profound impact on young people's knowledge, beliefs, and attitudes related to reproductive health in his study about the need for reproductive health education in schools in Egypt. And three out of five female respondents considered their mothers as their main source of information about puberty. This may be explained that female blinded adolescents students, had closed social relation only with friends in institute, their families, teachers, and media and supported by Emad et al. [2] who revealed that more than three quarters of their knowledge gaining from more than one source and the minority from mass media in her study about study of eating habits for children with autism at Assiut city. The researcher found the percentage of health team is 6% according to source of students' information about autism knowledge and relation between nutritional status and autism symptoms improvement educational program very low. More over must be give training program to the parents, teachers and increase nurse and health care team role.

The present study showed that, there was highly statistically significant differences ( $P < 0.001^{**}$ ) between cognition or knowledge score and their socio demographic characteristics about pre and post-intervention program in educational level, residence, training courses and mother occupation. While there was no statistically significant differences between cognition or knowledge score and their socio demographic characteristics about pre and post-intervention program in father's occupation and age in years  $p > 0.05$ . More than the current study stated that there was highly statistically significant differences ( $P < 0.001^{**}$ ) between behavior score and their socio demographic characteristics about pre and post-intervention program in educational level, years of experience, training courses and mother occupation, while there was no statistically significant differences ( $P > 0.05$ ) between behavior score and their socio demographic characteristics about pre and post-intervention program in residence and age in years. This finding supported by Ahmed [29] who found a statistical significant relation between nurses' knowledge and their level of education with  $p < 0.001$  in her study about compliance of nurses with neonatal care protocol regarding feeding in neonates, in other hand this study unsupported by El sayed et al. [30] who stated that nurses with a diploma degree had higher performance than the bachelor degree in her study about establishing basic standards of nursing care protocol at neonatal intensive care unit. While, there was

no statistical significant relation between total studied nurses' practice and their years of experience characteristics about intervention program. This would be correlated to acquiring more cognition experience through in the bachelor degrees' curriculum which educating new behavior because of positive relation between level of education and ability of acquiring newly cognition and behavior and interaction between family with autistic children and long term period of dealing with autistic children.

Regarding the correlation coefficient between total caregivers' cognition or cognition and behavior scores during pre/post discharge program implementation. The current study showed that, there was a statistically significant positive correlation between students' total cognition scores after program implementation and their attitude immediately after program implementation. This finding supported by Abd Elfattah et al. [31] who found positive correlation coefficient between student total knowledge and attitude before and after counseling regarding premarital genetic counseling and

their age and residence in her study about premarital genetic counseling among female adolescents students.

Moreover, according to caregivers' opinion of educational program about relation between nutritional status and autism recovery educational program, the present study result showed that more than 90% of the studied caregivers had positive opinion and satisfactory about cognition, place, time, language and discussion method of educational program.

**Conclusion**

Educational intervention had significant role in increasing the level of cognition and behavior of relation between nutritional status and autism manifestation improvement (Appendix).

**Recommendations**

It is recommended to exert more efforts in developing and applying similar educational endeavors for parents 'children with autism. These educational initiatives need to be improved periodically to ensure sustainability of their positive effects on cognition and behavior.

**Appendix**

**Appendix:** Grading pre & post, beliefs and attitudes survey.

Items	Strongly Disagree(0)	Disagree(1)	Somewhat Disagree(2)	Somewhat Agree(3)	Agree(4)	Strongly Agree(5)
1-Nutritional status is considered treatment method						
2- Using nutritional treatment program						
3-Through observation, there is difference in child condition during nutritional treatment methods						
4-All times her child refuse of some nutritional types						
5-If child refuse food the punishment is the only way with her child						
6-Set a Feeding Schedule and Routine. Have your child eat at the same place and follow the same mealtime schedule and routine						
7-Avoid All Day Eating. Do not allow snacking all day or have food/drink available for your child all day						
8-Provide Comfortable and Supportive Seating. Place your child in a high chair, booster or at a child-size table so that he or she is able to sit upright without leaning, swaying or dangling his or her feet						
9-Limit Mealtime. Even picky eaters do most of their eating in the first 30 minutes						
10-Presentation. Present new foods in small bites and in fun or familiar ways to make it more likely that your child will eat it.						
11-Minimize Distractions. Distractions such as the TV can take the focus off the food and the task at hand						
12-Get Your Child Involved. Allow your child to help with the selection and creation of meals						
13-Practice Pleasant and Healthy Eating Behaviors. Children learn by observing. During family mealtimes, parents and other children can model good eating behavior for the child						

14-Reward Positive Behaviors. Offer praise when your child approaches or tries new foods. Immediate rewards						
15-Ignore Negative Behaviors. When possible, ignore your child when he or she is doing things such as spitting, throwing or refusing food						
16-Remember the Rule of 3. It is important to offer foods your child already likes, as well as foods your child does not yet like. A good rule of thumb is to only offer three foods at a time. Include one to two foods your child already likes and one food your child does not yet like						

Questionnaire for caregivers for children with autism

No: Private data providers

1. Code number :
2. Age:
  - a. Less than 20 years
  - b. From 20 - less than 25
  - c. From 25 - less than 30 percent
  - d. 30 percent
3. Marital Status Married Single Divorced/Widowed
4. Academic qualification:
  - a. Diploma
  - b. Institute
  - c. BA
5. Years of Experience
  - a. Less than one year
  - b. One year - less than 5 years
  - c. More than 5 years
6. Have you attended any special training program for children with autism?

Yes ( ) No ( )

7. If yes, mention it
  - a. Sponsors' information on autism
8. What is Autism?
9. What are the causes of autism?
10. What is the likely age at which autism occurs?
11. What are the signs that appear on the autistic child?
12. What are the ways of diagnosing autism
13. Is there a cure for autism?

Yes( ) NO( )

14. If yes, what is the treatment of autism?
15. What are the ways to treat autism?
16. How does food cause autism?
17. What is the role of nutrition in the treatment of autism?
18. What is the role of nutrition in the treatment of autism?
19. What is the forbidden and permissible food for patients with autism?

20. How can we protect our children from autism and help improve the condition?
21. What is the health care of autistic children?
22. How to deal with children with autism?

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