

Original Article

Nutritional Status of Autistic School Children: An Evidence from Rajshahi City in Bangladesh

Sabbir Khan^{1,2}, Md Nuruzzaman Haque^{2*}, Md Shamim Hossen²¹HR Administrator, Jan De Nul Group, Jan De Nul NV, Nur Empori, Road 11, Plot 77 – Block M, Banani C/A, 1213 Dhaka, Bangladesh²Department of population Science and Human Resource Development, University of Rajshahi, Rajshahi-6205, Bangladesh***Corresponding author**

Md Nuruzzaman Haque, Department of population Science and Human Resource Development, University of Rajshahi, Rajshahi-6205, Bangladesh, Tel: +8801556621599; Fax: +880721750064; E-mail: nzaman_pop@ru.ac.bd

Submitted: 31 July 2021

Accepted: 22 August 2021

Published: 24 August 2021

ISSN: 2578-3203

Copyright

© 2021 Khan S, et al.

OPEN ACCESS**Keywords**

• Autistic Children, BMI, Neurotypical Children, Nutritional Status

Abstract

Nutritional needs for promoting the health of school children is getting priority at all policy levels worldwide. Assessment of nutritional status for under-five children is important, but research and intervention of malnutrition of school aged children are also important. Among the school aged children, the autistic children are more vulnerable for facing nutritional problems. As the nutritional status of children represents the countries overall nutritional scenario and Bangladesh government is planning to integrate autistic children to the mainstream population in the development process, assessment of nutritional status of autistic children is needed to be performed. Therefore, this study was conducted on 295 school children (143 autistic and 152 neurotypical) in the Rajshahi City Corporation area of Bangladesh. Using nutritional assessment approaches with clinical signs and weight-status, attempts have been executed to assess the nutritional status of autistic children and to compare with the status of neurotypical children. Highlighted findings of this study indicate that autistic children are more prone to poorer nutritional status compared to neurotypical children. A significant proportion of autistic children are critically over-weighted (30.8%) and under-weighted (9.1%); the male autistic children are at risk of poorer nutritional status compared to the female autistic children. These study findings will help nutritional analysts and policy-makers to come up with adequate policy formations for improving the nutritional status of autistic children in the study area.

INTRODUCTION

Malnutrition is absolutely a problem and concerning issue of health policies and strategies, which affects millions of people especially in under-developed world. Women and children are more vulnerable for facing nutritional problems. Assessment of nutritional status for under-five children is important because it represents the nutritional status of the entire population [1]. But research and intervention of malnutrition of school aged children are being also important because these age groups are potential for experiencing 'catch up' growth [2]. Half of the world's malnourished children have been found in three countries, Bangladesh, India and Pakistan [3, 4]. Among the school aged children, the autistic children (i.e. the children with autism spectrum disorders (ASDs)) are more vulnerable for facing nutritional problems. It has been well known that children with ASDs are at risk of developing many nutritional deficiencies as they have food selectivity [5, 6]. There is scarce of research on children with ASDs in Bangladesh. Also, there is a contradiction for the prevalence of children with autism, but it is assumed that more than 300 thousand children are affected with autism in Bangladesh [7]. In addition, with nutritional deficiency, children with ASDs are also at risk of becoming overweight or obese [5]. Autism is one of the most important health issues for the Bangladesh government [8] and government has focused on the wellbeing of autistic children. Also government of Bangladesh

is aimed to integrate autistic people to the mainstream of the developmental process of the country. For inclusion of autistic people in the mainstream of the society and for their well-being, it is necessary to reduce their nutritional problems in the early stage of life. The overall prevalence of child malnutrition in Bangladesh doesn't so low compare to other developing countries [9]. But nutritional status and nutritional needs of autistic children, specifically, in Bangladesh is unknown, so far in knowledge. There is scarce of research on assessment of nutritional status of autistic children in Bangladesh. So, for the well-being of autistic people and for inclusion of the autistic people to the developmental process of the nation as well, it is important to assess the nutritional status of autistic school children in Bangladesh. Assessment of nutritional status of school children is urgent in Bangladesh to identify the nutritional needs of autistic children in Bangladesh.

This paper intends to help associated parents (and other family members who care of children), nutritionists, and researchers for getting an overall idea about the nutritional status of autistic school children in the study area.

Research Questions and objectives

Based on the above discussions the following research question may be asked:

Does nutritional status of autistic children inferior than normal children?

The main objective of the study is to assess the nutritional status of autistic school children in the Rajshahi city in Bangladesh. The specific objectives of the study are to:

- (i) assess the nutritional deficiencies through clinical signs
- (ii) explore the nutritional status differential according to the type of children and gender

MATERIALS AND METHODS

Data

This study used data from a cross-sectional research project entitled “NUTRITIONAL ASSESSMENT OF AUTISTIC SCHOOL CHILDREN AT RAJSHAHI CITY IN BANGLADESH” conducted at the Department of Population Science and Human Resource Development, University of Rajshahi, Bangladesh. In the research project, study participants, divided into two groups as Autism group and Comparison group (neurotypical school children), have been recruited from six (03 specialized schools have been randomly selected from a list; and 03 normal schools have been selected from list of normal schools) randomly selected schools at Rajshahi city corporation area in Bangladesh. A total of 295 school children (Autism group: 143 (Male: 86, Female: 57); Neurotypical group: 152 (male: 104, Female: 49) aged 6-16 years were included in the research project. A structured questionnaire was used in direct interview method for collecting data on dietary behavior and clinical signs from selected school children. Responses to questions in the questionnaire obtained from guardians/parents for autism group and neurotypical children themselves responded to the specific question. Data regarding body weight and height of selected 295 school children were measured by using measuring tools of weight (in kilogram) and height (in centimeter).

Ethical Consideration

This study used data from a research project entitled “NUTRITIONAL ASSESSMENT OF AUTISTIC SCHOOL CHILDREN AT RAJSHAHI CITY IN BANGLADESH” and ethical approval has been collected for the mentioned research project from the Institutional Animal, Medical Ethics, Biosafety and Biosecurity Committee (IAMEBBC) of Institute of Biological Sciences (IBSc), University of Rajshahi (Memo No. 76/320/IAMEBBC/IBSc, Date: 22 February 2017). Moreover, consent forms have been sent to the parents/guardians of all selected school children for their permission to collect data from their child (ren).

Assessment of nutritional status

For getting an overall approximate idea about the nutritional status of school children, Clinical nutrition survey chart can be used to assess nutritional deficiencies. Another widely used method for assessing nutritional status is to categorize individuals in different nutritional group (underweight, healthy weight — normal, overweight, obese — critically-overweight) depending on weight status by using height and weight of selected children.

Assessment of nutritional deficiencies through clinical signs

Clinical examination is relatively a simple method and commonly used in nutritional surveys for revealing physical changes due to nutritional deficiencies which can be observed with open eyes (without any equipment). Clinical signs are used because of to find out any kind of nutritional deficiency. According to World Health Organization (WHO), there are some clinical signs and symptoms by which we can easily realize the nutritional deficiency condition. Some important clinical signs (considered as clinical variables in this study) for finding a nutritional deficiency are as follows: General appearance, Eye discharge, Eye contact, Hair condition, Lips, Gums, Teeth, Skin, Bones, speaking problem, listening problem, walking problem, can regular exercise and play, can take meal by his/her own hand [10]. Some selected clinical variables and their coding used in this study are provided in (Table 1).

Assessment of nutritional status through weight status

Population or individual can be divided into different groups (e.g. underweight, healthy weight-normal, overweight, and obese-critically-overweight) by examining the weight status of the population or the individual. Body Mass Index (BMI) – measured as a person’s weight in kilograms divided by the square of their height in metres- is a widely used measure for examining weight status and hence the nutritional status of children [11]. The nutritional status indicators for the CDC Growth Charts include obesity, overweight, underweight, and short stature. Percentiles are used to rank an individual or a group on a growth chart and indicate where either fits in the context of the reference population. Individuals can be ranked/positions in the percentiles category (and hence the nutritional status category) depending on their age specific BMI compared with BMI cutoff values in CDC growth charts [12].

“Overweight” rather than obesity is the term preferred for describing children and adolescents with a BMI-for-age equal to or greater than the 95th percentile of BMI-for-age or weight-for-

Name of the variable	Coding
General appearance	1= Healthy appearance, 2= Good, 3=Poor
Hair condition	1= Normal, 2= Loss of hair, 3= Discolored and dry, 4= Sparse and brittle
Eye discharge	1= Normal, 2= Comeliness absent, 3= Watery, 4= Mucopurulent
Eye contact	1= Good, 2= Poor, 3= No contact
Lips	1= Normal, 2= Mild, 3= Marked, 4= Cut
Gums	1= Normal, 2= Bleeding, 3= Pyorrhea, 4= Retracted
Skin	1= Normal, 2= Loss of luster, 3= Dry and rough
Hand and foot nail	1= Firm pink, normal, 2= Brittle, 3= Ridged nail
Bone	1= Normal, 2= Rickets
Listening condition	1= Good, 2= Average, 3= Poor

length. The 85th percentile is included on the BMI-for-age and the weight-for-stature charts to identify those at risk of overweight. The cutoff for underweight of less than the 5th percentile is based on recommendations by the World Health Organization Expert Committee on Physical Status [13] and individual with BMI-for-age lies between 5th percentiles to 85th percentile is termed as normal in nutritional status. So, individual can be categorized in nutritional status depending on his/her position of observed BMI in reference growth chart. The categorization method of individual's nutritional status is summarized in (Table 2).

RESULTS AND DISCUSSION

Nutritional deficiency of school children through clinical signs

Distribution of children (autistic and neurotypical) according to clinical signs is provided in (Table 3). The results presented in (Table 3) depicts that autistic school children are poor in nutrition (more nutrition deficiencies exist) compared to neurotypical school children. The percentage distribution of both autistic and neurotypical school going children for various clinical signs, presented in the (Table 3), shows autistic children are comparatively more vulnerable and significantly at risk of developing nutritional deficiency than neurotypical children. The General appearance of autistic and neurotypical school going children, in contrast, is almost similar for both groups- good (52.4% and 64.5%) and fair (38.5% and 35.5%), but only autistic children (9.1%) were exposed to poor general appearance. It can be observed that 97.4% of neurotypical children have a normal hair condition and only a few of the neurotypical children have other problems with their hair like loss of luster, discolored and dry, whereas 62.2% of autistic children can be found in normal hair condition, and the rest of the autistic children e.g. 23.1%, 9.8% and 4.9% respectively have various hair problems e.g. loss of luster, discolored and dry, and sparse and brittle. Observed clinical signs of eye e.g., eye discharge and eye contact is poor for autistic children as compared to neurotypical children. Poor nutritional status among autistic children develops a significant eye discharge and poor eye contact. More than half of children with autism had eye discharge related problems whereas very low percentage of neurotypical children had these problems. Again, 42.7% autistic children's eye contact is good, 18.2% children's eye contact is poor and a large portion (39.2%) of children with autism has no eye contact. Autistic children can be identified through observing the clinical sign of lips. Children both autistic and neurotypical may have experienced different problems with their lip in shape (e.g., mild, marked and cut), as a result of acute or mild nutritional deficiency. Results revealed that neurotypical children have healthy lips than autistic

Table 2: Categories of child nutritional status based on body mass index (BMI).

Position of observed BMI in reference growth chart	Nutritional Status
<5 th percentile	Underweight
5 th to <85 th percentile	Normal
85 th to <95 th percentile	Overweight
>95 th percentile	Critically-overweight

Table 3: Percentage distribution of children according to clinical signs.

Clinical signs	Category	Autistic n (%)	Neurotypical n (%)
General appearance	Good	75(52.4)	98(64.5)
	Fair	55(38.5)	54(35.5)
	Poor	13(9.1)	0(0.0)
Hair condition	Normal	89(62.2)	148(97.4)
	Loss of Luster	33(23.1)	2(1.3)
	Discolored and dry	14(9.8)	2(1.3)
	Sparse and brittle	7(4.9)	0(0.0)
Eye discharge	Normal	66(46.2)	124(81.6)
	Comeliness absent	25(27.5)	7(4.6)
	Watery	28(19.6)	6(3.9)
	Mucopurulent	24(16.8)	15(9.9)
Eye contact	Good	61(42.7)	152(100.0)
	Poor	26(18.2)	0(0.0)
	No contact	56(39.2)	0(0.0)
Lips	Normal	99(69.2)	140(92.1)
	Mild	28(19.6)	7(4.6)
	Marked	12(8.4)	5(3.3)
	Cut	4(2.8)	0(0.0)
Gums	Normal	101(70.6)	142(93.4)
	Bleeding	21(14.7)	7(4.6)
	Pyorrhea	1(.7)	1(0.7)
	Retracted	20(14.0)	2(1.3)
Skin	Normal	111(77.6)	138(90.8)
	Loss of luster	14(9.8)	11(7.2)
	Dry and rough	18(12.6)	3(2.0)
Hand and foot nail	Firm pink normal	126(88.1)	147(96.7)
	Brittle	11(7.7)	5(3.3)
	Ridged nail	6(4.2)	0(0.0)
Bone	Normal	106(74.1)	152(100.0)
	Rickets	37(25.9)	0(0.0)
Listening condition	Good	61(42.7)	144(94.7)
	Average	56(39.2)	8(5.3)
	Poor	26(18.2)	0(0.0)

Table 4: Distribution of school children according to nutritional status and their type.

	Autistic n (%)	Neurotypical n (%)	χ^2 statistic (d.f, sample size) p value
Underweight	13(9.1)	12(7.9)	15.91 (3, 295) p<0.05
Normal	61(42.7)	90(59.2)	
Overweight	25(17.5)	31(20.4)	
Critically-overweight	44(30.8)	19(12.5)	

children have, a remarkable proportion of autistic children have their lip problems. Gums problem among children is very common due to unhealthy food behavior and is significantly associated with nutritional status and needs. Children with autism are most vulnerable to developing gums problem. Due to nutritional deficiency, gum problem retracts comparatively more among autistic children than neurotypical children. Nutritional deficiency affects the skin of the body and the skin

loses luster and/or it could be dry and rough. It is evident that autistic children are malnourished and underprivileged of nutritional needs compared to neurotypical children. Therefore, the prognosis of losses of luster and having dry and rough skin among the autistic children is higher. Against 90.8% neurotypical children, only 77.6% autistic children have normal skin. Besides these, nutritional deficiency among children is also measured through clinical sign and symptoms of hand and foot nails, bone, listening capability etc. From the observed prevalence value of associated problems and difficulties of nail, bone and listening, it is evident that autistic children are most vulnerable and at risk of developing nutritional deficiency. Neurotypical children have a healthy and normal bone, but a large percentage (25.9%) of autistic children have rickets bone. Listening difficulties are very common and major problem for children with autism. From this study, it can be observed that a noticeable portion of autistic children (18.2%) is listening problem, whereas neurotypical children do not have any listening problem.

Nutritional status of children (based on weight status)

Distribution of school children, according to nutritional status and type of children, is provided in (Table 4). Depending on results and calculated χ^2 statistic (for testing H_0 : there is no association between nutritional status and type of children (autistic or neurotypical)) presented in (Table 4), this study revealed that there exists significant difference in nutritional status for two types of children. The proportion of autistic children in the normal nutritional category is only 42.7 %, whereas nearly 60% of neurotypical children are in the normal nutritional category. Also, a significant proportion of autistic children were more prevalent in critically-overweight category compare to neurotypical school children. These may be happening due to lower physical activities along with the food selectivity among the autistic school children.

For finding association between gender and nutritional status of school children, the distribution of children according to nutritional status and gender is provided in Table 5 including the values of separate χ^2 test statistic (for testing H_0 : There is no gender difference in nutritional statuses) for both type, autism and neurotypical children respectively. From the results portrayed in (Table 5), it is observed that among the children (both types), the proportion of underweight and normal (both genders) were 8.5% and 51.2%, respectively; for the case of male children that were 10.6% and 48.1%, respectively; for the female that were 4.7% and 56.6% respectively. Results show that there is no gender difference in nutritional statuses of school children in the study area.

CONCLUSION

The main objective of this study was to find nutritional deficiencies through clinical signs and to find the nutritional status of children with autism aged 6 to 16 years along with comparison with neurotypical children with same ages. Nutritional deficiency through clinical signs was observed more marked in autistic children than neurotypical children. The neurotypical children's clinical signs indicate a normal appearance; no evident nutritional deficiencies through clinical signs were seen among neurotypical children.

Results revealed that autistic children are significantly more prone to be in lower nutritional status compare to neurotypical children. For example, in case of normal nutritional status, the proportion of autistic school children and neurotypical children is 42.7% and 59.2% respectively. But on the other hand, this study found no significant gender difference in nutritional statuses of school children in the study area.

This study also found that a significant proportion of autistic children is critically-overweight category compare to neurotypical school children. This research finding also clarifies

Table 5: Distribution of school children according to nutritional status and gender.

Nutritional status	Both gender n (%)	Male n (%)	Female n (%)	χ^2 statistic (d.f, sample size) p value
Both Autism and Neurotypical				
Underweight	25(8.5)	20(10.6)	5(4.7)	3.89 (3, 295) $p > 0.05$
Normal	151(51.2)	91(48.1)	60(56.6)	
Overweight	56(19.0)	36(19.0)	20(18.9)	
Critically-overweight	63(21.4)	42(22.2)	21(19.8)	
Autism				
Underweight	13(9.1)	9(10.5)	4(7.0)	2.05 (3, 143) $p > 0.05$
Normal	61(42.7)	33(38.4)	28(49.1)	
Overweight	25(17.5)	17(19.8)	8(14.0)	
Critically-overweight	44(30.8)	27(31.4)	17(29.8)	
Neurotypical				
Underweight	12(7.9)	11(10.7)	1(2.0)	5.28 (3, 152) $p > 0.05$
Normal	90(59.2)	58(56.3)	32(65.3)	
Overweight	31(20.4)	19(18.4)	12(24.5)	
Critically-overweight	19(12.5)	15(14.6)	4(8.2)	

that autistic male children are at risk of poorer nutritional status category than female counterparts. So, focus should be given to both male and female, obviously but priority should be given to male autistic children for improving their nutritional status.

For generalizing results and formulating proper policies and programs for improving nutritional status of children, further research needs to be conducted on a large scale and investigation should be performed to identify other influencing variables (e.g., diet quality, nutritional supplements and their quality) that are significantly important for the nutritional status of autistic children. Moreover, nutritional status of children should be analysed according to age and severity of autism spectrum disorders for future studies on nutritional assessment of autistic children.

ACKNOWLEDGEMENT

The authors are thankful to the Ministry of Science and Technology of the Government of Bangladesh for providing financial support as research grant (GO No. 39.00.0000.09.02.069.16-17/11, SL. No. 248; Gr. SL. 8 MEDIS; Date: 15 January 2017) for data collection and analysis for a research project from which this study has used data for analyses.

REFERENCES

1. Centre for Disease Control & World Food Programme (CDC & WFP). A Manual: Measuring and Interpreting Malnutrition and Mortality. Center for Disease Control and World Food Program. 2005.
2. Standing Committee on Nutrition. School Age Children their Health and Nutrition. SCN News. 2002; 25: 1-78.
3. Rattan V. Women and Child Development: Sustainable Human Development. 1997.
4. Siddiqi MNA, Haque MN, Goni MA. Malnutrition of Under-Five Children: Evidence from Bangladesh. Asian Journal of Medical Science. 2011; 2: 113-119.
5. North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. Nutrition and Autism. 2016.
6. <https://pubmed.ncbi.nlm.nih.gov/25194628/>.
7. Autistic Children's Welfare Foundation, Bangladesh (ACWFB). FREQUENCY OF Autism. 2011.
8. Centre for Injury Prevention, Health Development and Research, Bangladesh (CIPRB). Study on Prevalence of Autism in Rural Bangladesh. News and Events. 2014.
9. Das S, Hossain MZ, Islam MA. Predictors of Child Chronic Malnutrition in Bangladesh. Proc. Pakistan Acad. Sci. 2008; 45: 137-155.
10. Expert Committee on Medical Assessment of Nutritional Status [meeting held in Geneva from 21 to 27 August 1962]: report. WHO Tech. Rep. Ser. 1963; 258.
11. Dinsdale H, Ridler C, Eells LJA. Simple guide to classifying body mass index in children. Oxford: National Obesity Observatory. 2011.
12. The National Center of Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion. 2000.
13. World Health Organization (WHO). Physical Status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee, WHO Technical Report Series 854, World Health Organ Tech Rep Ser. 1995; 854: 1-452.

Cite this article

Khan S, Haque N, Hossen S (2021) Nutritional Status of Autistic School Children: An Evidence from Rajshahi City in Bangladesh. *JSM Nutr Disord* 3(1): 1010.