

EFFECTS OF IODINE DEFICIENCY GOITER ON ACADEMIC PERFORMANCE OF GIRLS

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ABSTRACT

Background: Iodine is an essential micronutrient and is essential in minute amounts for the normal physical and mental growth, development and well being of all humans. The objective of this study was to determine the effects of iodine deficiency Goiter on academic performance of girls and to compare these effects between Grade I and Grade II goiter.

Methods: The study was conducted in different schools of Wah Cantt and Abbottabad from 1st February 2011 to 30th June 2011. This is a descriptive / School based observational study. To assess the effects of iodine deficiency Goiter on academic performance of girls, 300 girls (10 – 19 years of age) were interviewed. A pre-tested closed ended questionnaire was designed. Different variables were included in the questionnaire regarding the subject. Results were summed and statistically analyzed using SPSS 10.0.

Results: Of the total number of girls interviewed 38 percent belong to 10 – 14 years and 62 percent belong to 15 – 19 years age group. In 18% subjects goiter was present since birth, 23% were having goiter for the last 5 – 10 years, while in 59% girls the duration of illness was less than 5 years. Academic performance was poor in 11%, satisfactory in 49%, good in 30% and excellent in only 2%. School attendance was poor in 18%, satisfactory in 34%, good in 34% and excellent in only 6%. The main reasons for absence from school were continuous illness and lack of self interest.

Conclusion: It can be concluded from our study that iodine deficiency Goiter can affect the academic performance of girls. The academic performance was better among girls with Grade I goiter as compare to girls with Grade II. Academic performance of girls, with duration of illness < 5 years, was better as compared to those who were having goiter for longer than 5 years because cognitive functions deteriorate with increasing duration of illness. Emphasis should be on health education regarding the use of iodized salt to prevent iodine deficiency Goiter.

Key Words: Iodine deficiency, Goiter, Academic performance, Iodized salt.

INTRODUCTION

Endemic goiter is an enlargement of the thyroid gland caused by the intake of inadequate amounts of dietary iodine.¹ Iodine is an essential micronutrient. It is required for the synthesis of the thyroid hormones, thyroxin (T₄) and triiodothyronine (T₃). Iodine is essential in minute amounts for the normal growth, development and well being of all humans.² Iodine deficiency is a global health problem and 2.2 billion people (38 percent of the world's population) live in areas with iodine deficiency and risk its complications.³ In Pakistan 135 million people are having insufficient iodine intake.⁴ According to National Nutrition Survey, 2001-2002 in Pakistan palpable goiter was found among 4.4 percent school age children and visible goiter was present among 2.3 percent of such children.⁸ The best sources of iodine are sea foods (e.g., sea fish, sea salt) and cod liver oil.² The main factor responsible for iodine deficiency is a low dietary supply of iodine. When

Iodine requirements are not met, thyroid hormone synthesis is impaired, resulting in hypothyroidism and a series of functional and developmental abnormalities grouped under the heading of "Iodine Deficiency Disorders (IDD)". Goiter is the most visible manifestation of IDD.⁴ The most damaging disorders induced by iodine deficiency are irreversible mental retardation and cretinism.³ Of considerably greater significance are the most subtle degrees of mental impairment leading to poor school performance, reduced intellectual ability, impaired work capacity and vitality. Iodine deficiency disorders can also take their toll socio-economically, with lower work output and per capita income.⁴

Wah Cantt and Hazara Division are included in goiter endemic belt, but very little work has been done on this aspect. By using the indicator of academic performance we could find a link between low IQ level and iodine deficiency, so this study will be helpful in highlighting and focusing this issue in future.

MATERIALS AND METHODS

This is a school based descriptive study. The study was conducted in conveniently selected sample of adolescent girls with Grade I and II goiter (having normal or low levels of serum T_3 , T_4 and raised TSH levels) in different schools of Wah Cantt and Abbottabad, from 1st February 2011 to 30th June 2011. Goiter was screened by palpation method and was graded as per definition provided by WHO / UNICEF/ ICCIDD₁. The grading is described as Grade – 0, no palpable or visible goiter; Grade – 1, goiter that is palpable but not visible when the neck is in the normal position; and Grade – 2, visible when the neck is in the normal position.⁵ To study the effects of iodine deficiency goiter on academic performance of girls, 300 girls (10 – 19 years of age) were interviewed after taking their willingness to participate. Girls with monstrous goiter, cretinism and having high levels of serum T_3 , T_4 and low TSH levels were excluded. Pre-tested structured questionnaire was used to collect data on socio-demographic factors and information on girls' academic performance was obtained from the school record. Data was entered and analyzed in Statistical Package for Social Sciences (SPSS) version 10.0. Descriptive statistics i.e. frequency and percentage were calculated for categorical variables. A comparison of academic performance was made between Grade I and grade II goiter. Chi-square test was used to find out the significance of results. P-value < 0.05 was considered as significant.

RESULTS

Of the total number of girls interviewed 114 (38 percent) belong to 10 – 14 years and 186 (62 percent) belong to 15 – 19 years age group. 150 (50%) girls had Grade I and 150 (50%) had Grade II goiter. Out of 300 subjects 39 (13.0%) belong to lower social class (< 6,000 monthly income), 139 (46.3 %) belong to middle class (6000 – 10,000 monthly income), and 122 (40.7%) had family monthly income > 10,000. In 54 (18%) subjects goiter was present since birth, 68 (23%)

were having goiter for the last 5 – 10 years, while in 178 (59%) girls the duration of illness was less than 5 years. Academic performance was poor in 37 (12%), satisfactory in 158 (53%), good in 98 (33%) and excellent in only 7 (2%). The main reasons for absence from school were continuous illness and lack of self interest.

School attendance was poor in 59 (20%), satisfactory in 114 (38%), good in 107 (36%) and excellent in only 20 (6%).

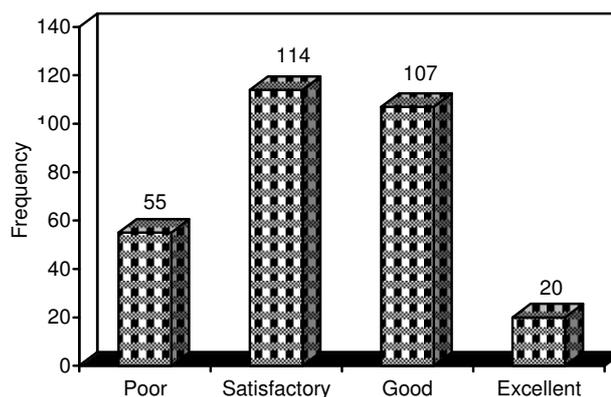


Fig. 2: School attendance.

Grade – I goiter was more prevalent in subjects of 10 – 14 years, while Grade – II goiter was more among subjects of 15 – 19 years of age (P-value 0.001). In low socioeconomic group more girls had Grade – II goiter, while in middle social class Grade – I goiter was more prevalent (P-value 0.011). The academic performance and school attendance was better among girls with Grade – I goiter as compared to girls with Grade – II (P-value 0.000) (Figure 3 and 4).

The academic performance and school attendance showed deterioration with increasing duration of illness (P-value 0.000) (Table 1). No significant difference was observed among girls of different age group regarding academic performance and school attenda-

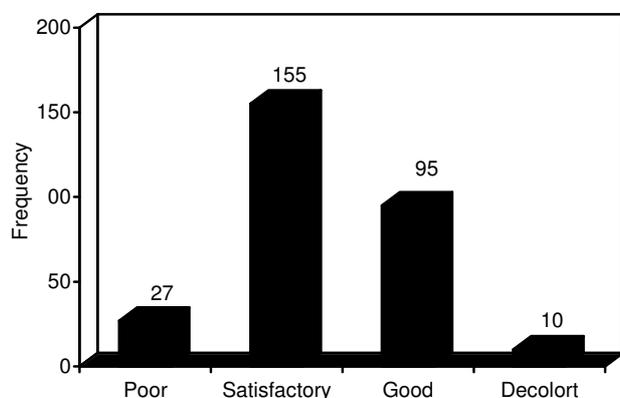


Fig. 1: Academic performance.

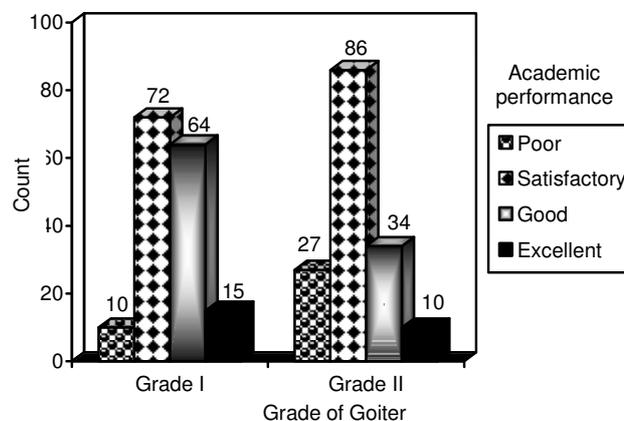


Figure 3: Academic performance and Grade of goiter.

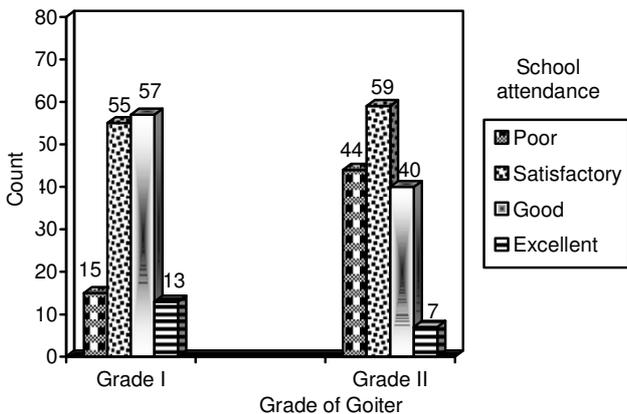


Figure 4: School Attendance and Grade of goiter.

nce (P-value 0.076). The academic performance and school attendance showed better results with increasing monthly income (P-value 0.000) (Figure 5).

Table 1: Academic performance and duration of illness.

Academic performance	Duration of Illness			Total	P-value
	Since Birth	< 5 yrs	5-10 yrs		
Poor	17	14	6	37	0.000
Satisfactory	26	90	42	158	
Good	9	70	19	98	
Excellent	2	4	1	7	
Total	54	178	68	300	

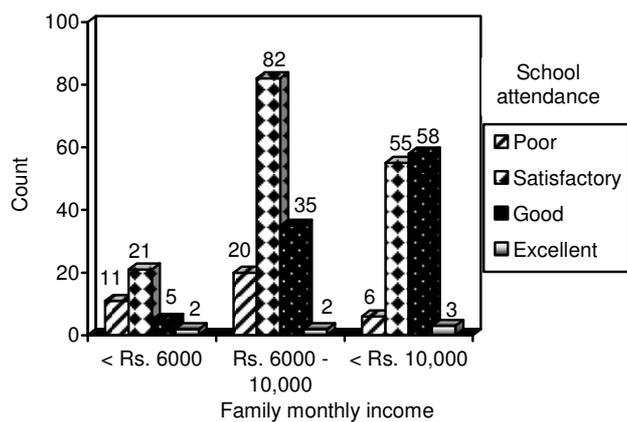


Figure 5: Academic performance and monthly income.

DISCUSSION

Iodine deficiency is now accepted as the most common cause of preventable brain damage in the world. According to the WHO, iodine deficiency disorders (IDD) affect 740 million people throughout the world and nearly 50 million people suffer from some degree of IDD

related brain damage.⁶

Iodine deficiency is a major public health problem in Pakistan and is a threat to the social and economic development of the country.⁴ Because impaired learning and reduced school performance adversely affect a region’s development, productivity, and economic potential, these findings have particular relevance for policy makers and governments.⁷ According to Pakistan’s National Nutrition Survey, 2001 – 02, on the basis of urinary iodine excretion, 22.9 percent of school aged children, and 36.5 percent of mothers of children under five years are severely iodine deficient and household level is 17 percent.⁸

It is evident from the results that iodine deficiency goiter can affect the academic performance of girls. Academic performance and school attendance was poor in 11% and 18%, satisfactory in 49% and 34%, good in 30% and 34% and excellent in only 2% and 6% respectively. These results are in concordance with most of the other national and international studies. A study in Tanzania revealed a link between baseline iodine deficiencies and decreased female secondary schooling. It was also found that early salt iodization had a positive effect on female primary schooling attainment. The girls attain fewer years of schooling due to the extremely low rate at which girls pass the national secondary school qualifying exam.⁹ A meta-analysis of research transcripts that the school performance is reduced in children with iodine deficiency. This analysis revealed that the mean score for the iodine deficient group was 13.5 IQ points below that of the non-iodine deficient groups.¹⁰ Among adolescent girls, iodine deficiency may cause mental impairments, impede physical development, and harm school performance.¹¹ School children in iodine deficient areas have poor school performance, lower IQs, and a higher incidence of learning disabilities.¹²

Observational studies of children living in iodine-deficient areas have generally found evidence of impaired intellectual function and fine motor skills as compared with those in children in iodine – sufficient areas.⁷ Impairments of memory, mental ability, intellectual function and visual motor coordination were found in the subjects with severe iodine insufficiency.¹³

The manifestations of iodine deficiency range from small neurological changes, to impaired learning ability and under performance in psychometric tests.¹⁴ Populations with even mild iodine deficiency result in reduction in children’s IQ of 10 – 15%. Decreased intellectual capacity leads to lower educational status, and hypothyroidism reduces an individual’s vitality, work capacity, and earnings.¹⁵

Some limitations should also be considered when interpreting the results of the present study. In this study convenient method of sampling was used, therefore this is not a representative study for the general population. Also the information on confounders like

parent's education, occupation and monthly income could not be taken because of the dearth of reliable information in schools' record and also due to difficulty in obtaining more detailed data from such children.

It can be **concluded** from our study that iodine deficiency Goiter can affect the academic performance of girls. The academic performance was better among girls with Grade I goiter as compared to girls with Grade II. Academic performance of girls, with duration of illness < 5 years, was better as compare to those who were having goiter for longer than 5 years. Emphasis should be on early detection and prompt treatment and also on health education regarding the use of iodized salt to prevent iodine deficiency Goiter.

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