Abstract

Adolescents are a group prone to iron deficiency. Lack of data on the prevalence of iron deficiency in a representative sample of school going adolescents in Sri Lanka and on the relationship between the iron status and the cognitive functions of adolescents, led to this particular study.

The first phase of the study assessed the distribution and the determinants of iron deficiency among 13 – 15 year old adolescents in the district of Kandy. Upon certain criteria, the state managed schools in the Kandy district were divided into 4 strata (urban big, urban small, rural and estate schools). The sample studied (n= 960) represented adolescents from all 4 strata of schools.

The haemoglobin (Hb) and the serum ferritin (SF) levels were assessed to determine the iron status. As SF is an acute phase reactant, the students having acute and chronic diseases were excluded from the study to minimize the number of false negatives. Cutoff points of 12 g/dl for Hb value and 12µg/l for SF value were considered to diagnose anaemia, iron deficiency (ID) and iron deficiency anaemia (IDA). An interviewer administered questionnaire was used to collect information on factors associated with the iron status.

The second phase of the study was carried out in a sample of students included in the phase one. The educational performance and the intelligence were compared between iron deficient and iron sufficient groups (n= 188). The students with a SF level between 13 – 30 µg/l were excluded from this phase of the study to avoid a misclassification in iron status. Each selected iron deficient student was matched with an iron sufficient student from the same school, same class and of same sex to control the effects of probable confounders. The educational performance was assessed based on the marks obtained for mathematics, science, social science and Sinhala language. The Raven's Standard Progressive Matrices was used to measure the intelligence. An interviewer administered questionnaire was used to collect details on factors that could be effect modifiers or confounders to the relationship

of the iron status with educational performance and the intelligence. The height and weight of the students were measured to assess the protein energy status.

In 25% of the sample, serum zinc level and the free thyroxin level were detected to determine whether these could be confounders in a study assessing the relationship between the iron status and the cognitive function. Home visits were carried out in a randomly selected sub sample to check the quality of data and to observe whether the home environment could influence the educational performance and the intelligence.

The overall prevalence of ID (with or without anaemia) among 13 – 15 year old adolescents in the district of Kandy was 20.5%. The prevalence of IDA was 9.9%. The girls had a significantly higher prevalence of ID (30.4%) and IDA (14.7%) when compared to boys (19.3% and 5.7% respectively). The prevalence of ID and IDA significantly differed among boys from the four strata of schools. The boys from the estate schools showed the highest prevalence of ID (29.8%) as well as IDA (12.5%). No statistically significant difference was observed in the iron status among girls from the 4 strata of schools.

Only 3.4% of the sample suffered from moderate to severe anaemia (Hb< 10 g/dl). Of the anaemics, only 39.2% had iron deficiency.

The father's occupation, the father's level of education, mother's level of education, haem iron consumption and the fruit consumption with major meals showed significant positive relationships with the IDA of boys. All the factors mentioned above and the de-worming status of boys were significantly related to their SF level. Father's occupation was the only factor that showed a significant association with the iron status of girls. The attainment of menarche and the time since menarche did not show a significant relationship with the iron status of girls.

Neither the educational performance nor the intelligence showed a significant association with the iron status of adolescents in the univariate analysis. However, 23 co-variables and 8 co-variables were significantly associated with the educational performance and the

8 co-variables were significantly associated with the educational performance and the intelligence respectively. The iron status did not show a significant relationship with the educational performance or with the intelligence even when the effects of all these variables were controlled in a multivariate analysis. Following a linear regression analysis; the intelligence, enthusiasm of the student towards learning, ambition, household possessions, problems at home and private tuition for mathematics were the key factors identified as predictors of educational performance. The educational level of the mother and the stunting were the most important factors influencing the intelligence. Further, the home visits revealed that the adolescents experiencing unsatisfactory home conditions had a significantly less educational performance.

Though the zinc deficiency and thyroxin deficiency were commoner among iron deficient students than among iron sufficient students, the differences failed to attain statistical significance probably due to the small sample size. Zinc deficiency did not show a significant association with the educational performance and the intelligence. Hence, it is unlikely that the zinc status would be a confounder in a study assessing the relationship between the iron status and the cognitive variables among Sri Lankan adolescents. As only 4 students had a low free thyroxin level, further analysis on this aspect was not possible.

The high prevalence of iron deficiency even among girls from the urban big schools is noteworthy. Intervention programmes to improve the iron status should target girls from all schools and especially the boys from estate and urban small schools. Several factors showed a significant relationship with the iron status of boys but not with that of girls.

Contribution from iron deficiency to anaemia of these adolescents was less than 50%. Hence, the usual practice of supplementing all anaemics with iron tablets is questionable.

According to the findings, the iron status does not play a major role in educational performance and the intelligence of school going adolescents in the district of Kandy. There is no reason why it should not be applicable for school going adolescents in Sri Lanka.