

Nutritional status and caloric consumption of school going children of Hyderabad, Pakistan having anemic features

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Objective: To investigate the nutritional status and caloric consumption of school going children having anemic feature and effect of heavy metal (Lead) in low status family using the contaminated water.

Methodology: The study has been conducted among the school going children of Hyderabad, Pakistan. The nutritional status of school children was examined through measuring their caloric input against recommended daily allowance (RDA) by Harris-Benedict Equation for Basal Energy Expenditure. The toxic metal was analyzed on Atomic Absorption spectrophotometer.

Results: Students were found mildly under nourished their caloric input was low as recommended due to low intake of protein in their

diet, which may be their family's economic status. Girls had less caloric input against their requirements as compared to boys, although controls were found to have good caloric input against their requirements. High levels of lead were found according to the WHO standards in students who used ground water for drinking purpose.

Conclusion: Both girls and boys had low nutritional intake. Students who used ground water for drinking purpose had higher lead concentrations that shows heavy metal contamination through ground water. (Rawal Med J 201;43:337-340).

Keywords: Tap water, ground water, nutritional status, RDA, calories.

INTRODUCTION

Anemia indicates poor health and poor nutrition.¹ Multiple studies have shown higher chances of child and of maternal mortality due to intense anemia.^{2,3} Numerous epidemiological studies described that under nutrition are strongly linked with various diseases in children.⁴ High percentage of stunting and low weight in school going children may be lead long term defect in physical development of the children and mental consciences.⁵⁻⁸ Significant population groups like adult males and elderly are not represented in most of the national prevalence available data.

Humans are consuming lead since the starting of their civilization in different industries and might be the cause of its ecological distribution in water, air, soil, plants and animals.⁹ Many areas of world still have trouble related with removal, smelting and refinement of lead, and also use in gasoline of motor

vehicles and generate the way to significant lead exposure.¹⁰ Lead is a predominantly destructive factor to iron metabolism resulting in multifaceted strike, which has extremely serious effects in children.^{11,12} Drinking water polluted with lead is frequent in new and old houses. Underground water in which heavy metals are often present is widely utilized as a source of drinking water in emerging states.^{13,14}

Approximately 99% lead is associated with erythrocytes of which 50% is bound to haemoglobin.¹⁵ In Hyderabad, there is little empirical data clearly outlining the causative aspects to the anemic burden at the district levels. The aim of this study was to investigate the nutritional status and caloric consumption of school going children having anemic feature and effect of Lead in low status family using the contaminated water.

METHODOLOGY

This study was performed on school children living in Hyderabad, Pakistan, which is a mini industrialized city previously known as Neroon Kot with two industrial zones (Hyderabad and Kotri industrial zone) and multiple unarranged mini industries. It is nearly 90 million populations. Adjusting for a non-response rate of 2%, with a confidence interval of 95%, the estimated sample size for the study using the formula $N = z^2pq/d^2$ was 200 study participants. Demographic data variables were collected through interview of study participants using a well-structured questionnaire.

The children were selected by an organized random sampling, having age between 10 to 16 years from both genders with must have one guardian present in respective city. Children of above 16 years or below 10 years were excluded from the study. A control group was chosen amongst those attending the clinic for assessing physical strength.

Questions were asked from school children regarding their age, height, weight, number of family members, father's occupation, monthly income and about their diet (breakfast, lunch & Dinner). Recommended daily allowance (RDA) was calculated by Harris-Benedict Equation for Basal Energy Expenditure (BEE).

To analyze the quality of drinking water, samples of water to be used for the drinking purpose were collected from both hand pump as well as tap water sources from different areas of the city for the assessment of lead level using the atomic absorption spectrophotometer (Graphite Furnace, Perkin Elmer HGA 700, Germany).¹⁶

RESULTS

Caloric mean values were found lower in girls (both groups) and intake of RDA was 83% in 10-13 years and 85% in 14-16 years, whereas control group had sufficient caloric mean values against RDA 97% (Table 1, 2). The caloric input was found lower in daily nutritional Menu of boys; 87% and 88% respectively against their RDA. Control subject were found sufficient (98%) (Table 3, 4).

Table 1. Nutrient and Caloric Consumption of girls in age range 10-13 years.

Category	Caloric Mean	RDA	% of RDA
Girls	1200	1450	83
Control	1400	1450	97

Table 2. Nutrient and Caloric Consumption of girls in age range 14-16 years.

Category	Caloric Mean	RDA	% of RDA
Girls	1700	2000	85
Control	1920	2000	96

Table 3. Nutrient and Caloric Consumption of boys in age range 10-13 years.

Category	Caloric Mean	RDA	% of RDA
Boys	1300	1500	87
Control	1450	1500	97

Table 4. Nutrient and Caloric Consumption of boys in age range 14-16 years.

Category	Caloric Mean	RDA	% of RDA
Boys	1740	2000	88
Control	1950	2000	98

Table 5. Mean values of Lead in children.

Lead	Cases	Controls	P value
	Mean + SD	Mean + SD	
Girls	10.815±30.47	4.095±31.04	0.0005
Boys	16.435±35.9	4.89±25.41	0.0001

Lead level was significantly higher in anemic children ($p=0.001$) than controls (Table 5). Lead levels in ground water were found to be 4.6ug/dl as well as 3.5ug/dl in tap water sources of respective areas.

DISCUSSION

In this study the nutritional status of school children's was examined through measuring their caloric input against RDA. Students were found mildly under nourished. Their caloric input was low as recommended due to low intake of protein in their diet, which may be their family's economic status. Girls had less caloric input as compared to boys,

which may be due to their activity, although students of controls were found to be good in caloric input against their requirements.

Hyderabad is a mini industrial city surrounded by the different crop fields, the people of this area often take different vegetables in their diets. The vegetable protein sources are often mixed with cereals for complementary feeding. Both contain high levels of phytic acid, which can inhibit trace element and mineral absorption. In children and adults, phytic acid has been reported to inhibit the absorption of iron, zinc, calcium and manganese but not copper.¹⁷ Another cross-sectional study showed higher prevalence of anemia in teenage students.¹⁸ Lead intake from water and other beverages is absorbed to a greater degree than lead in food and Lead ingested between meals is more absorbed than lead with meals, and increased food frequency intake minimizes lead absorption.¹¹

Investigated water samples were found to be permissible for drinking according to the EMH,¹⁹ as the lead level was lower than the permissible limit (5 µg/dl). However, WHO considered higher than the permissible limit to be 1 µg/dl. In Hyderabad, lead level in drinking water was higher than the permissible limit according to the WHO.²⁰ In Pakistan, the control of lead is not efficient, which causes high lead level in drinking water of some sporadic areas.²¹

From 2003 to 2004 Washington DC tap water went beyond the Environmental Protection Agency (EPA) regulations. It was due to the changing in water disinfection method that in turn increased the water capacity to leak Lead out of connection pipes between water mains and interior plumbing in houses.²²

These data recommend future studies to evaluate whether controlling lead-contaminated water supply and other sources improving chemical waste disposal conditions would reduce the ethnic inconsistency in children's blood Lead levels. Also further studies should investigate whether water control alone is linked with a consequential decline in Lead concentration in children blood.

CONCLUSION

Both girls and boys had low nutritional intake,

which in turn effect the trace elements levels in body. Lead level in drinking water showed high levels according to the WHO standards. Students who used the ground water for drinking purpose had higher Lead concentrations. To prevent childhood lead exposure, frequent water lead sampling and assessment of type and condition of water pipes and paint condition of interior components of older housing units are crucial.

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