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Haemopoetic, Serum Minerals and Intellectual Status of Institutionalized and Non Institutionalized Boys

Rajbir Sachdeva, Simran Chug and Jaswinder Sangha

Department of Food and Nutrition, College of Home Science, Punjab Agricultural University, Ludhiana141 004, Punjab, India

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ABSTRACT A sample of 60 boys aged 10-12 years i.e. 30 living in institutions in Ludhiana and Amritsar (Group I) and 30 living in homes belonging to low socio economic group of Ludhiana (Group II) were selected. The average per capita income in group II was Rs. 437/- per month, whereas in the group I the authorities spent Rs. 500/- per month on each subject. The average Hb level in group I and II was 10.52 and 9.78 g/dl, respectively. The mean values of PCV, RBC count were higher in group I as compared to group II. The mean levels of serum iron, zinc in group I and II were 111.04±17.1 and 74.73±14.2 µg/dl and 127.62±53.4, 67.19±36.6 µg/dl, respectively. The intelligence quotient (IQ) level was intellectually superior in group I than group II. It was observed that IQ had significant ($P<0.05$) correlation to Hb and serum iron, the value of 'r' being 0.49 and 0.46 respectively. Better hematological profile and IQ in group I was due to higher intake of all essential food items provided by authorities and people as a charity. However, majority of the subjects in group II were undernourished as their parents were unable to provide food in adequate amounts due to poverty and big family size. Thus the study indicated that food and environment are the two basic factors which affected the overall development of the children. So attention should be given to improved nutrition and happy environment.

INTRODUCTION

School children constitute one of the important segments of the society and account for about 27% of the total population (Reddy et al., 1993). It is a dynamic period of growth and development as children undergo physical, social, mental and emotional changes. Nutrition is one of the major environmental factor responsible for the same. The elementary school years (10-12 years) are nutritionally significant because this is the prime time to built up stores of nutrients in preparation for the rapid growth of adolescence (Pai and Naik, 1989).

Minerals viz. iron, zinc and copper play a very important role in human nutriture. Iron deficiency has deleterious effects on neurologic functions as it adversely effects attention, intelligence, test performance and school achievements (Pollit and Lerber, 1986). Severe zinc deficiency cause neurophysical impairment, dwarfism and severe anaemia that result in impaired performance in school. Loss of copper during early life causes long term neuro-psychological disturbances (Standstead, 1986).

Intelligence is considered to be the highest mental ability of an individual. Poor families generally provide a home environment that is less supportive of child development than families enjoying adequate income. Together, under-nutrition and un-stimulating home environment can be seen as antecedants of physical and mental retardation (Garrett et al., 1994). Absence of parents, home and proper environment are the factors that effect nutritional status of these children. Hence, it is of paramount importance to assess the nutritional status of institutionalized children, taking this point in view, the present study was planned.

MATERIAL AND METHODS

Selection of Subjects: A sample of 60 boys aged 10-12 years were selected and equally divided into two groups viz. Group I and II. The 30 institutionalized children in Ludhiana and Amritsar (Group I) were compared with same age matched 30 children (Group II) of low socio economic status living with their parents.

Biochemical Assessment: A series of haemo-tological investigations of the subjects like Haemoglobin (Hb), Packed Cell Volume (PCV), RBC Count, Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) were carried during the study period. Blood samples were also analyzed for serum minerals (iron, zinc and copper) by Atomic Absorption Spectrophotometer (Piper 1950).

Intellectual Assessment: Raven's Colored

Progressive Matrix was used. The test consisted of three sets: A, AB and B with 12 illustrations in each test amounting to 36 scores in all. The respondents were explained that illustrations were a pattern with a piece cut out of it and matrix had to be completed. The respondents were supposed to complete 36 illustrations in 45 minutes.

Statistical Analysis: The results were statistically analyzed in the computer. For comparison of biochemical and intellectual status of the subjects, student 't test was used. Correlations were also computed.

RESULTS AND DISCUSSION

The demographic information of the subjects in the present study revealed that the average per capita income in the Group II was Rs. 437/- only per month, whereas the authorities of institutions spent Rs. 500/- only per month per child. Most of the subjects studied in IV and V standards. It was seen that more than half of the respondents in both the groups had family size of 3-6 members and approximately one third of parents were illiterate. Further 60% of children lived in institutions because of poverty and 26.7% due to having leprotic or handicapped parents and 13.3% due to death of parents.

Haemopoetic Status: Table 1 depicts mean Hb, PCV, RBC Count, MCV, MCH and MCHC, the values being 10.52±1.05, 9.78±1.05 g/dl and 36.55±3.68, 33.9±3.9% and 3.87±2.8, 3.50±4.3 $10^6/mm^3$ and 94.7±4.49, 96.6±2.49 and 29.48±0.62, 28.31±7.5 g/dl and 30.80±0.49, 27.3±1.01 pg in Group I and II, respectively. A significant ($P \leq 0.05$), ($P \leq 0.01$) difference with levels of Hb, PCV and RBC, MCH was observed in both the groups, respectively. According to NIN Classification (1986), it was observed that 35.0 and 66.7% of subjects in Group I and II were moderately anaemic. However, on the basis of WHO Classifications (1972), it was seen that only 15.0% of the subjects in Group I were non-anaemic while all the subjects in Group II were anaemic. The low values of MCH among the subjects of Group I is indicative of iron deficiency anaemia. A high incidence of anaemia was also observed by Saoti *et* al. (1988) in children (7-12 years) of different orphanges. Similarly, Saran et al. (1999) reported that 75% of children in an orphange in Delhi were anaemic.

Serum Minerals Status: The average level of serum iron in Group I and II was 111.04±17.1 and 74.73±14.2 µg/dl, respectively. A statistically significant ($P \leq 0.01$) difference was observed in Group I and II. Similarly Mittal (1998) also reported higher levels of serum iron in girls living in destitute homes as compared to those living in home environment. The average levels of serum copper and zinc in Group I and II were 98.85±41.5, 59.57±19.8 and 127.62±53.4, 67.19±32.6 µg/dl, respectively (Table 2).

Low serum iron and copper status may be

Table 1: Haematological profile of the respondents

Profile	*Group I(n=20)'X±SE*	*Group II(n=15)'X±SE*	*S tandard*	*t-value*
Hb (g/dl)	10.52 ± 1.05	9.78 ± 1.05	12-16"	1.87*
PCV (%)	36.55 ± 3.68	33.9 ± 3.9	36-47"	1.98*
RBC count ($10^6/mm^3$)	3.87 ± 2.8	3.50 ± 4.3	3.9-5.6"	2.88**
MCV (fl)	94.7 ± 4.49	92.6 ± 2.49	84-95$^+$	0.14
MCHC (g/dl)	29.48 ± 0.62	28.31 ± 7.5	33-38$^+$	0.49
MCH (pg)	30.80 ± 0.49	27.3 ± 1.01	28-32$^+$	1.97**

$^+$ Harper (1965)
" Davidson and Passmore (1987)
** Significant at 1 per cent level
* Significant at 5v per cent level

Table 2: Serum mineral level of respondents

Minerals (µg/dl)	*Group I(n=20)'X±SE*	*Group II(n=15)'X±SE*	*S tandard*	*t-value*
Serum iron	111.04 ± 17.1	74.73 ±14.2	75-175$^+$	6.39**
Serum copper	98.85 ± 41.5	59.57 ±19.8	130-230$^+$	3.27**
Serum zinc	127.62 ± 53.4	67.19 ±32.6	50-150$^+$	3.76**

$^+$ Harper (1965)
** Significant at 1 per cent level

causative factor for the prevalence of iron deficiency anaemia. The incidence being more in Group II.

Intellectual Status: The mean IQ scores of the subjects in Group I and II was 24.6±4.3 and 21.9±4.6, respectively. The difference between the two groups was highly significant (P≤0.01). Table 3 shows that 10% of resopndents of Group I fell in low intelligence category (0-18 scores) with mean scores of 15.9±0.83, while the corresponding figures in the Group II was 30% with mean scores 14.3±1.1. When subjects were classified according to Raven's Classification (1965), it was observed that in Group I and II, 0 and 20% of subjects were intellectually defective. Further, 40 and 26.7% of subjects fell in intellectually average category in both the groups. In above average category, higher percentage was observed in Group I when compared to Group II (Table 4).

Aboud et al. (1991) indicated that performance of orphange children was similar to that of children living in home. However, Mittal (1998) reported that subjects living in orphanges had better IQ scores than their counterparts living in home environment.

Interrelationship of Various Determinants: Intelligence Quotient (IQ) had a positive and significant correlation with Hb in Group I, the value of 'r' being 0.49. IQ also had positive significant (P≤0.05) correlations with serum iron, the value of 'r' being 0.46 and 0.45 in Group I and II, respectively. Pollit and Leiber (1986) and Stanstead (1986) also reported that serum iron, copper and zinc positively correlated to attention, IQ scores and school achievements.

It was observed in present study that majority of respondents in Group II were under-nourished due to nutritional deprivation as compared to subjects in Group I. The reason for better iron status in Group I was due to the intake of all essential food items provided by people, Red Cross and non-voluntary organizations as a charity. However, in case of subjects of home environment, their parents were unable to provide food in adequate amounts due to poverty. The IQ level showed higher mental efficiency of the subjects in Group I as compared to Group II. It was observed that environment in the institution was more conducive for proper intellectual development among children. The parents of Group II respondents spent very little time with the children and had negligible interactions with teachers in the school, whereas the institutionalized subjects used to study together and were guided in the evening by voluntary teachers. Thus the study indicated that food and environment are the two basic factors which affected the overall development of the children. So attention should be given to improved nutrition and happy environment.

Table 4: Raven's classification of intellectual level of respondents

Classification (percentile points)	*Group I (n=30)*		*Group II (n=30)*	
	Number	*Per-cent*	*Number*	*Per-cent*
Intellectually superior grade I (95th percentile or more)	-	-	-	-
Definitely above the average intellectual capacity grade II (75-95th percentile)	7	23.3	1	3.3
Intellectually average grade III (25th-75th percentile)	12	40	8	26.7
Definitely below the average intellectual capacity grade IV (5-25th percentile)	11	36.7	15	50.0
Intellectually defective grade V (5th percentile or less)	-	-	6	20.0

Table 3: Average intelligence level of the respondents

	IQ score 'X±SE	*t-value*	*Low intelligence score (0-18)*		*High intelligence score (19-30)*	
			No.	*('X±SE)*	*No.*	*('X±SE)*
Group I (n=30)	24.6±4.3	3.53**	3(10)	15.9±0.83	27(90)	25.5±3.6
Group II (n=30)	21.9±4.6		9(30)	14.3±1.1	21(70)	22.6±3.6

** Significant at 1 per cent level
Figures in parentheses indicate percentage

CONCLUSIONS AND RECOMMENDATIONS

It is recommended that nutrition and health education should be imparted to the children, wardens and parents pertaining to locally available cheap and nutritious food stuffs. The use of jaggery, *missi roti*, sprouted pulses, fermented foods and use of sundried green leafy vegetables in summers should be encouraged. Further, the number of children per care taker should be reduced in institutions and smaller family norms should be followed to take best care of the children.

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