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Relationship between nutrition status, intelligence and academic performance of Lambani school children of Bellary district, Karnataka

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ABSTRACT

The study was conducted on the nutritional status and academic achievement of 135 students and randomly selected 75 students for assessment of intelligence on Lambani school children at Hoovinahadagali Taluk, Bellary district during 2012-13. In nutritional status the mean height of younger and older children was almost similar. In both the groups mean height was found lower than NCHS standard value by 6.87-11.78 per cent. Similarly weight in both age groups was found lower than NCHS standard by 8.08 per cent in 9 years and 9.76 per cent in older age group. More than 50 per cent of Lambani children were suffering from malnutrition. In verbal and performance tests in younger group majority (22.66%) fell in average IQ. Among the malnourished children 37.33 per cent average IQ students had stunted and 14.66 per cent had wasted and stunted malnutrition. Maximum students (17.03%) had stunted malnutrition and secured B followed by 8.88 per cent B^+ grade. Maximum B grade achievers (37.33%) followed by A grade achievers (17.33%) had average IQ in the range of 90-109. There was significant association between nutrition status and intelligence quotient and nutrition status and academic achievement of children. No significant correlation was observed between academic achievement and intelligence quotient. Significant association was found between academic achievement and intelligence quotient.

Keywords: Nutritional status; intelligence; academic achievement; school children

INTRODUCTION

Lambani is one of the largest scheduled tribes which is called by the different names in different parts of the country as Banjara, Banjari, Lambada and Lambani. Today they are experiencing many changes in their traditional culture due to exposure of younger generation and school children to urban areas and in turn undergoing considerable transformation. An increasing number of school children in tribal and total population brings demographic transitions that are affecting developing countries such as India. Increase in population affects Human

Development Index (HDI) which includes life expectancy, education, income and nutrition indices (Rathod 2007).

UNICEF report highlighted that nutrition was an important factor affecting growth, health and all round development of individuals mostly children. It also depicted that malnutrition caused approximately 50 per cent of child death worldwide making the UN's millennium development goal to eradicate extreme poverty and hunger by 2015 in developing countries (Jukes et al 2000). Nutrition is a fundamental pillar of human life, health and development across the entire life span. According to Anon (2000) proper food and good nutrition are essential for survival, physical growth, mental development, performance, productivity, health and well-being from the earliest stages of foetal development, at birth, through infancy, childhood, adolescence and into adulthood and old age.

Evidences have shown that physical growth and cognitive development in children are faster during early years of life and that by the age of four years 50 per cent of the adult intellectual and before thirteen years 92 per cent of adult intellectual capacity is attained (Toga et al 2006).

The studies of the effect of malnutrition on cognitive ability indicated that chronic under nutrition is associated with lower achievement levels in school children (Grantham-McGregor and Ani 2001). Good health and nutrition are needed to achieve one's full educational potential because nutrition affects intellectual development and learning ability (Anon 1990). Multiple studies report significant findings between the nutritional status and cognitive test scores of school performance. Studies have shown that children with more adequate diets score higher on tests of factual knowledge than those with less adequate nutrition (Levinger 1996, Pollitt 1990). Also nutritional anaemia particularly deficiencies of iron, iodine and vitamin A are major problems for school going children in low income countries. Such deficiencies can negatively impact growth, increase susceptibility to infection and also impair the mental development and learning ability of school children (Pollitt 1990).

In the light of above present study was conducted on nutritional status, intelligence and academic achievement of Lambani school children to assess nutritional status and intelligence to know the academic achievement of younger and older Lambani school children and to know the interrelation between nutritional status, intelligence and academic achievement.

METHODOLOGY

There are totally 33 Tandas (tribes) around Huvinahadagali Taluk, Bellary district out of which 5 Tandas were selected representing four geographical locations viz

Sovenhallitanda, Kalvitanda, Mudlapur Haletanda, Mudlapur Hosatanda and Mudlapursannatanda. The list of tribal government primary schools of surrounding areas of Huvinahadagali Taluk was obtained from the BEO office. All the children belonging to 9-11 years of age and studying in 4th and 5th standard were selected for the study. General instructions were given to the children before administering research tool. Initially anthropometric measurements were taken for selected 135 students and personal information was gathered by interviewing the child. Previous years academic grades and attendance of the respondents were also collected.

Based on the anthropometric measurements and Waterlow (1972) classification the children were classified into four categories of nutritional status viz normal, wasted (short duration malnutrition), stunted (long duration malnutrition) and wasted and stunted (current and long duration malnutrition). Further 75 children representing four categories of nutritional status were selected for assessing intelligence test. Normal and stunted children were randomly selected out of total sample in whcih all wasted and wasted and stunted children were included. Therefore WISC-III was administrated for 75 children representing normal (30), stunted (30), wasted (4) and wasted and stunted (11) groups. Each normal child required one and a half hours to complete the intelligence test whereas malnourished child required extra half to one hour time. The participation in extracurricular activities structured questionnaire was noted by interviewing the respective class teacher. The collected data were analyzed for calculating percentages, t-test, correlation and association between the variables.

RESULTS and DISCUSSION

The demographic profile of Lambani children covered under the study is presented in the Table 1 depicting different variables viz, gender, standard, socio-economic status and academic achievement. Out of 135 school children 14.81 per cent boys belonged to younger while 36.29 per cent belonged to older age group. Similarly among girls 12.59 per cent belonged to younger while 36.29 per cent to older age group. In case of standard-wise categorization 53.3 per cent children belonged to 4th standard and 46.7 per cent to 5th standard. Among 4th standard students 22.2 per cent fell in 9 years while 31.2 per cent to 10 years age group. Among 5th standard children 5.1 per cent belonged to 9 years and 41.5 per cent to 10 years age group. The academic achievement was noted by grading system viz A^+, A, B^+, B and C grades achieved by the children; 37.03 per cent children had secured B grade followed by A (28.14%), B^+ (16.29%), C (11.85%) and A^+ (6.7%) grades. In both 9 years and 10 years age groups maximum number of students secured B grade (8.88 and 28.14% respectively).

In nutritional status the mean height of younger and older children was almost similar. In both the groups mean height was found lower than NCHS standard value by 6.87-11.78 per cent. Similarly weight in both age groups was found lower than NCHS standard by 8.08 per cent in 9 years and 9.76 per cent in older age group. The height of boys and girls was found lower by 5.3 and 5 per cent while weight by 1.77 and 3.6 per cent respectively (Table 2). Highly significant differences were found in

Table 1. Demographic profile of Lambani children (n= 135)

Category	Particulars	Age (years)		
		9 -10 (n= 37)	10-11 (n= 98)	Total
Gender	Boys	20 (14.81)	49 (36.29)	69 (51.20)
	Girls	17 (12.59)	49 (36.29)	66 (48.80)
Class	4th	30 (22.2)	42 (31.2)	72 (53.30)
	5th	7 (5.1)	56 (41.5)	63 (46.70)
Academic	A+ grade	3 (2.22)	6 (4.44)	9 (6.70)
achievement	A grade	9 (6.66)	29 (21.4)	38 (28.14)
	B+ grade	7 (5.18)	15 (11.11)	22 (16.29)
	B grade	12 (8.88)	38 (28.14)	50 (37.03)
	C grade	6 (4.44)	10 (7.40)	16 (11.85)

Figures in parentheses indicate the percentages

Table 2. Height and weight of Lambani children by age and gender (n= 135)

Parameter	Age		Gender	
	9 (n= 37)	10 (n= 98)	Boys	Girls
Height (cm)	121.75±3.7	121.08±5.7	136±4.5	136±4.4
NCHS value	130	138	141.3	141.0
Difference	6.87	11.78	5.3	5.0
t-value	13.82**	27.96**	18.32**	18.32**
Weight (kg)	20.21±2.10	21.64±2.39	31.23±2.5	31.1±2.4
NCHS value	28.10	31.40	33	34.7
Difference	8.08	9.76	1.77	3.66
t-value	22.72**	35.44**	22.33**	24.73**

**Significant at 1% level

mean height and weight of children with respect to their NCHS norms value in both groups by age (22.72 and 35.44 respectively) and (22.33 boys and 24.73 girls) gender. It shows that they were unable to reach the optimum level of height and weight of NCHS standard norms. These results are supported by the study of Bharati et al (2005) which indicated that nutritional status of the school children from rural and urban areas was lower than NCHS standards; girls showing lower measurements than boys. Similar results were reported by Oninla et al (2006) who indicated that mean nutritional indices weight for height and weight for age were significantly lower in rural and urban children.

Studies have shown that malnutrition including weight, wasting and stunting constituted major health problems among school children. In present study 48.2 per cent fell in normal nutritional category (Table 3). This indicates that more than 50 per cent of Lambani children were suffering from malnutrition.

Among 75 children 40 per cent were in normal nutritional category and rest exhibited some category of malnutrition (wasted, stunted, wasted and stunted) (Table 4). These results are supported by the work of Medhi et al (2006) who revealed that mean height and weight were lower in tea garden children when compared to NCHS standard. Gangadhar and Prabhakar (2009) indicated thigh prevalence of mild (41.5%) and severe (6.7%) stunting among 135 Jenukuruba tribal children of 6-10 years age group.

In verbal and performance tests in younger group majority (22.66%) fell in average, 12 per cent in superior, 1.48 per cent in low average and only 1.3 per cent in high average IQ. In older group 60 per cent fell in average IQ (Table 5).

Among the malnourished children 37.33 per cent average IQ students had stunted and 14.66 per cent had wasted and stunted malnutrition. The positive and

Table 3. Nutritional status of school children by age (n=135)

Nutritional status	Age (years)		
	9 -10 (n=37)	10 -11 (n=98)	Total
Normal	30 (22.22)	35 (25.92)	65 (48.20)
Wasted (short duration malnutrition)	2 (1.48)	2 (1.48)	4 (2.96)
Stunted (long duration malnutrition)	5 (3.70)	50 (37.03)	55 (40.74)
Wasted and stunted (chronic and long duration malnutrition)	-	11 (8.14)	11 (8.20)

Figures in parentheses indicate percentages

Table 4. Nutritional status of selected children by age (n= 75)

Nutritional status	Age (years)		
	9-10 (n=29)	10-11 (n=46)	Total
Normal	23 (30.06)	7 (9.33)	30 (40.0)
Wasted (short duration malnutrition)	2 (2.66)	2 (2.66)	4 (5.3)
Stunted (long duration malnutrition)	4 (5.33)	26 (34.76)	30 (40.0)
Wasted and stunted (chronic and long duration malnutrition)	-	11 (14.66)	11 (14.7)

Figures in parentheses indicate percentages

Table 5. Association between intelligence quotient and age (n= 75)

IQ range	Age (years)		
	9-10 (n=29)	10-11 (n=46)	Overall
Very superior (>130)	-	-	-
Superior (120-129)	9 (12)	-	9 (12)
High average (110-119)	1 (1.3)	-	1 (1.3)
Average (90-109)	17 (22.66)	45 (60.0)	62 (82.7)
Low average (80-89)	2 (1.48)	1 (2.2)	3 (4.0)
Border line (69-79)	-	-	-
Intellectually deficient (<69)	-	-	-

r value= 0.402**, Modified χ^2 value= 20.16**

**Significant 1% level, Figures in parentheses indicate percentages

significance correlation and association were observed between nutrition status and intelligence quotient indicating that enhancement in nutritional status increases intelligence quotient of children (Table 6). Similar findings were reported by Ghazi et al (2012) who revealed that nutritional status, nutritional habits and breakfast intake were significantly associated with children's intelligence.

Table 7 exhibits that maximum students (17.03%) had stunted malnutrition and secured B followed by 8.88 per cent B^+ grade. There was significant relationship and association between nutritional status

Table 6. Relationship between intelligence quotient and nutritional status (n= 75)

IQ range	Nutritional status			
	Normal (n=30)	Wasted (n=4)	Stunted (n=30)	Wasted and stunted (n= 11)
Very superior (>130)	-	-	-	-
Superior (120-129)	9 (12)	-	-	-
High average (110-119)	1 (1.3)	-	1 (1.3)	-
Average (90-109)	20 (26.66)	3 (4.0)	28 (37.33)	11 (14.66)
Low average (80-89)	2 (1.48)	1 (2.2)	3 (4.0)	
Border line (70-79)	-	-	-	-
Intellectually deficient (<69)	-	-	-	-

r value= 0.430**, Modified χ^2 value= 23.3**
**Significant 1% level, Figures in parentheses indicate percentages

Table 7. Relationship between nutritional status and academic achievement (n=135)

Grade	Nutritional status			
	Normal (n= 65)	Wasted (n= 4)	Stunted (n= 55)	Wasted and stunted (n= 11)
A+	9 (6.66)	-	-	-
A	28 (20.74)	-	10 (7.40)	-
B+	9 (6.66)	-	12 (8.88)	1 (0.74)
B	19 (14.07)	2 (1.48)	23 (17.03)	6 (4.44)
C	-	2 (1.48)	10 (7.40)	4 (2.96)

r value= 0.49**, Modified χ^2 value= 45.82**
**Significant 1% level, Figures in parentheses indicate percentages

and academic achievement. As compared to this maximum (20.74%) normal category students got A grade followed by B grade (14.07%). Similar results were reported by Acham (2010) who revealed that a number of factors play a significant role in determining a child's educational outcomes. The study demonstrated that a child's health and nutritional status were the potential factors that influence educational achievement. Ross (2010) reported that there existed an

important link between nutrition and learning potential. Healthy eating is essential for students to achieve their full academic potential, mental growth and lifelong health and well being.

Table 8 shows the relationship between intelligence quotient and academic achievement of the respondents. Maximum B grade achievers (37.33%) followed by A grade achievers (17.33%) had average IQ in the range of 90-109. There was no significant relationship found between intelligent quotient and academic achievement but it was significant between academic achievement and intelligence quotient. Naderi et al (2010) observed no significant relationship between intelligence and academic achievement between males and females.

Table 8. Relationship between intelligence quotient and academic achievement (n= 75)

IQ range	Grade				
	A+	A	B+	B	C
Very superior (>130)	-	-	-	-	-
Superior (120-129)	1 (1.33)	2 (2.66)	-	6 (8.0)	-
High average (110-119)	-	-	1 (1.3)	-	-
Average (90-109)	4 (5.33)	13 (17.33)	7 (9.3)	28 (37.33)	10 (13.33)
Low average (80-89)	-	-	-	2 (2.66)	1 (1.3)
Border line (70-79)	-	-	-	-	-
Intellectually deficient (<69)	-	-	-	-	-

r value= 0.103**, Modified χ^2 value= 13.26**

**Significant 1% level, Figures in parentheses indicate percentages

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