

Nutritional status-based verbal and performance intelligence of Lambani community school children of Karnataka

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ABSTRACT

The present study on verbal and performance intelligence based on nutritional status of 135 Lambani community school children was conducted at Hoovinahadagali Taluk, Bellary district during 2012-13. The children of 9-11 years of age studying in 4th and 5th standards were randomly selected from 5 government primary schools. Nutritional status was assessed through height and weight of students and academic achievement through previous year grades. Further the intelligence was assessed through WISC-III (Wechsler intelligence test for school children). The results revealed that there was highly significant differences in mean height and weight of children with respect to NCHS (national council for health statistics) norm values. It was noted that nutritional status was positively and highly significantly correlated and associated with intelligence quotient of school children. Among 75 Lambani children 40 per cent possessed normal nutritional category and 60 per cent exhibited other category of malnutrition (wasted, stunted, wasted and stunted). The total mean score of verbal intelligence was found highest (19.23 ± 3.96) in normal children followed by 13.6 ± 3.76 in stunted, 12.41 ± 2.65 in wasted and 11.34 ± 2.78 in wasted and stunted children. Normal children secured highest performance intelligence mean score (30.3 ± 16.31) followed by stunted (21.91 ± 16.60), wasted and stunted (17.7 ± 15.68) and wasted (16.78 ± 15.08) group of children. There was significant difference observed between the groups in each sub-test of verbal and performance intelligence which indicates that normal children performed better than malnourished children.

Keywords: Nutritional status; intelligence; WISC-III; NCHS

INTRODUCTION

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 capacity has

been attained and before thirteen years 92 per cent of adult intellectual capacity is attained. Early malnutrition among children has known to result in definite handicap because it may cause irreversible impact on the development. Physical retardation can be clearly visible but mental deficiency

caused by severe malnutrition during early life might not be so easily detectable. Optimum growth and development of school age children lay a sound foundation in the areas of health, nutrition, language development, personality building, socio-emotional adjustment and personality development. In this stage the emphasis is given on intelligence and personality development. The learning process of children is conditioned by multiple factors such as environment of child, his family and educational system. The effect of nutrition on cognitive development of children has been studied in different parts of the world. Toga et al (2006) stated that cognitive structure in a child comes out through the interaction between the brain and the environment over the course of the development. In the initial stages of the development of neural system in the foetus the physical characteristics of the brain are determined by genetic factors but immediately. The environment starts to influence this structure. After birth the variety of environmental factors increases but nutrition continues to be important throughout life in particular. It is now recognized that the brain development occurs over a much longer portion of the life span than originally thought.

Good nutrition during school age has impact on physical, mental and behavioural development of the children. Early malnutrition during childhood causes some degree of damage to brain and

neuromuscular system which leads to low IQ. Poor motivation and poor academic performance lead to problems in learning. It also results in low self-esteem and poor social relationship leading to further behavioural changes. The behavioural problem such as scholastic backwardness and social maladjustment may force the children to dropout from the school. Malnourished children join the school but less than 50 per cent are unable to complete their education (Udani 1991).

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 and productivity, health and well-being from the earliest stages of foetal development, at birth, through infancy, childhood, adolescence and into adulthood and old age.

The Lambani is one of the largest scheduled tribes which is called by the different names in different parts of the country. They are known as Banjara, Banjari, Lambada and Lambani. These migrated groups of the Lambani (Banjara) were exposed to different regional cultures and borrowed many cultural patterns from neighbors still retained their cultural identity despite living in the midst of other cultural groups. Today however 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).

Many research studies indicated that health problems due to miserable nutritional status in primary school-age children result in low school enrolment, high absenteeism, early dropouts and unsatisfactory classroom performance. The present scenario of health and nutritional status of the school-age children in India is very unsatisfactory. Poor growth is associated with impaired development which is apparent in the relationship between growth status, school performance and intellectual achievement. Malnutrition also increases a child's risk of contracting respiratory infections, diarrhoea, measles and other diseases that often kill children or permanently harm their physical, psychosocial and cognitive development (Srivastava et al 2012).

METHODOLOGY

The Huvinahadagali Taluk comprised of more number of Tandas hence the research study was conducted

here. There are totally 33 Tandas (tribes) around Huvinahadagali Taluk out of which 5 were selected representing four geographical locations. The Tandas selected were Sovenhallitanda, Kalvitanda, MudlapurHaletanda, MudlapurHosatanda and Mudlapursannatanda which are located at a distance of 20-25 km from Huvinahadagali. The children of 9-11 years of age and studying in 4th and 5th standard were selected for the study. The 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 children. Based on the anthropometric measurements and Waterlow 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 that included all wasted and wasted and stunted children. Therefore WISC-III was administered for 75 children representing normal (30), stunted (30), wasted (4) and wasted and stunted (11). The data were analyzed for calculating percentages, t-test, correlation and association between the variables.

RESULTS and DISCUSSION

The total population consisted of 135 school children out of which 27.40 per cent belonged to 9-10 years while 72.6 per cent to 10-11 years age group. Out of the 51.2 per cent boys and 48.8 per cent of girls included in the study 28.9 per cent boys belonged to younger while 36.29 per cent belonged to older age group of the total. Among girls 12.59 per cent belonged to younger while 36.29 per cent to older age group of the total (Table 1).

The nutritional status of school children can be quickly assessed by anthropometric measurements on large population. 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. In similar way weight in both the age groups was found lower than NCHS standard by 8.08 per cent in 9 year while 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 only 1.77 and 3.6 per cent respectively (Table 2). Highly significant differences were found in mean height and weight of children with respect to their NCHS norms value in both groups by age (22.72, 35.44 respectively) and (22.33 boys and 24.73 girls) and gender. 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.

It was highlighted that 48.2 per cent Lambani school children belonged to normal category followed by stunted (40.74%), wasted and stunted (8.2%) and wasted (2.96%) category (Fig 1). It indicated that long term malnutrition among tribal children than wasted and stunted and stunted (short and chronic and long type of malnutrition). Among the younger age group 22.22 per cent fell in normal category followed by stunted (3.70%) and wasted (1.48%) and none of them fell in wasted and stunted category. In older age group 37.03 per cent of children fell in stunted category followed by normal category (25.92%), wasted and stunted (8.14%) and only 1.48 per cent in wasted category. Among 75 Lambani children 40 per cent possessed normal nutritional category and 60 per cent exhibited other category of malnutrition (wasted, stunted, wasted and stunted) (Table 3). These results are supported by Medhi (2006) who revealed that mean height and weight were found lower in tea garden children when compared to NCHS standard. Prabhakar and Gangadhar (2009) indicated that high prevalence of mild (41.5%) and severe (6.7%) stunting among 135 Jenukurba tribal children of 6-10 age group.

Age-wise intelligence quotient ranges of Lambani children are presented in Table 4. It was highlighted that in 9-10

Intelligence of school children

Table 1. Demographic profile of Lambani children

Particulars		Age (years)		Total (n= 135)
		9 -10 (n= 37)	10-11 (n= 98)	
Gender	Boys	20 (14.81)	49 (36.29)	69 (51.20)
	Girls	17 (12.59)	49 (36.29)	66 (48.80)
Class	4 th	30 (22.2)	42 (31.2)	72 (53.30)
	5 th	7 (5.1)	56 (41.5)	63 (46.70)

Figures in parentheses indicate percentages

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

Aspect	Age		Gender	
	9 (n= 37)	10 (n= 98)	Boys	Girls
Height				
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				
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

Table 3. Nutritional status of selected children by age

Nutritional status	Age (years)		Total (n= 75)
	9-10 (n= 29)	10-11 (n= 46)	
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

year age group 22.66 per cent children secured average IQ followed by superior (12%) and low average (2.66%) and only 1.3 per cent secured high average IQ range. In 10-11 year age group more than half of the children possessed (60%) average IQ and only 1.33 per cent fell in low average IQ whereas none of the children possessed very superior, superior, high average, border line and intellectually deficient IQ range. It was interesting to note that overall 82.7 per cent children belonged to average IQ (90-109) followed by 12 per cent to superior (120-129), 4 per cent to low average (80-89) and only 1.3 per cent to high average (110-119) IQ range group. There was highly significant association found between age and intelligence quotient.

In Fig 2 nutritional status has been depicted category-wise with distribution of verbal intelligence which includes sub-tests. It was noted that none of children was able to solve all the items given in verbal intelligence tests viz information, similarities, arithmetic, vocabulary, comprehension and digit span. The highest mean score (20.0 ± 1.92) for information was observed in normal category of children followed by stunted (14.96 ± 2.48), wasted (12.54 ± 1.91) and stunted and wasted (12.5 ± 0.57) children. Similar trend was observed in arithmetic section also whereas for similarities highest mean score of 19.86 ± 4.38 was obtained by normal children followed by 11.25 ± 2.62 , 11.23 ± 4.16 and 9.3 ± 2.06 in wasted, stunted and wasted and stunted children

respectively. Similar trend was observed in digit span but in vocabulary and comprehension highest mean score was obtained by normal children followed by 16.36 ± 3.34 and 16.03 ± 2.96 , 14.5 ± 2.36 and 14.75 ± 2.36 , 12.4 ± 2.73 and 13 ± 3.37 in stunted, wasted, wasted and stunted children respectively. On the whole the total mean score of verbal intelligence was found highest (19.23 ± 3.96) in normal children followed by 13.6 ± 3.76 in stunted, 12.41 ± 2.65 in wasted and 11.34 ± 2.78 in wasted and stunted children. There was significant difference observed between the groups repeated in each sub-test of verbal intelligence. This indicates that normal children performed better than other 3 groups in each sub-test. The results are supported by Sen and Kanani (2006) who revealed that significantly lower score was obtained in digit span and visual memory test by anemic girls compared to non-anemic girls highlighting the impact of nutritional status on physical and cognitive performance.

Fig 3 shows the nutritional status category-wise distribution of performance intelligence which includes sub-tests. It was to note that none of the children was able to solve all items given in performance tests viz picture completion, coding, picture arrangement, block design, object assembly, symbol search and mazes. It can be observed from Table 5 that the mean score for picture completion of performance intelligence was found highest (22.7 ± 1.91) in normal while 16.73 ± 1.76 , 11.54 ± 1.43

Intelligence of school children

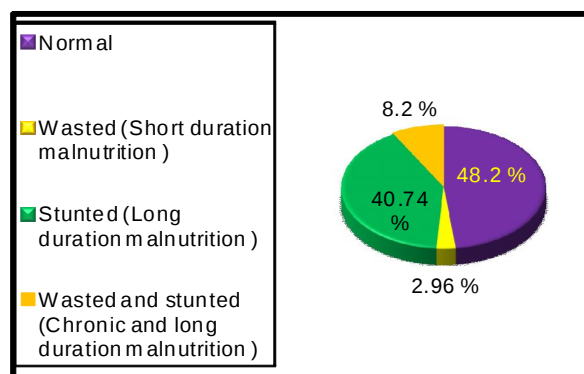


Fig 1. Nutritional status of school children by age

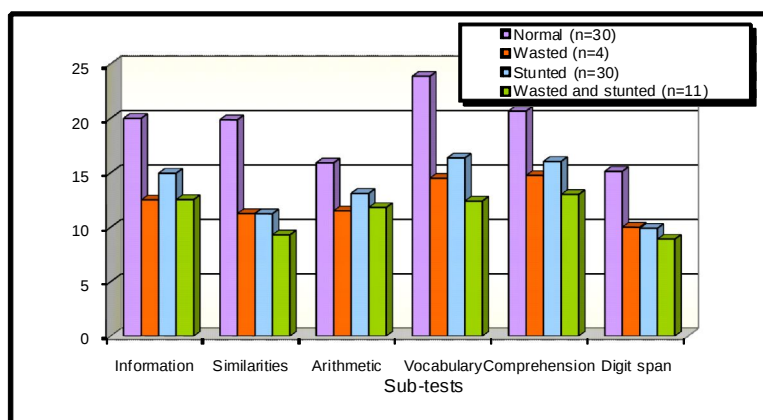


Fig 2. Distribution of children according to mean score of verbal intelligence and nutritional status

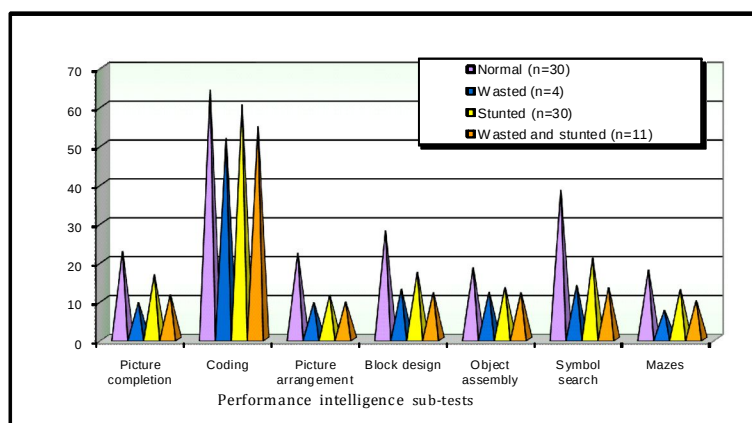


Fig 3. Distribution of children according to mean score of performance intelligence and nutritional status

Table 4. Association between intelligence quotient and age (n= 75)

IQ range	Age (years)		Overall
	9-10 (n=29)	10-11 (n=46)	
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 (70-79)	-	-	-
r-value		0.402**	
Modified χ^2 value		20.16**	

**Significant at 1% level

Figures in parentheses indicate percentages

and 9.5 ± 3.0 in stunted, wasted and stunted and stunted children respectively. Similar type of acquisition of mean score trend was observed in coding, picture arrangement and mazes. Highest mean score was noticed (28.3 ± 6.51 , 18.53 ± 3.0 , 38.43 ± 10.65) in block design, object assembly and symbol search respectively in normal children followed by 17.36 ± 7.05 , 13.96 ± 2.70 and 21.1 ± 2.44 in stunted. 13 ± 3.82 , 12.25 ± 1.89 and 14 ± 1.41 in wasted and 12.1 ± 3.28 , 12.1 ± 2.44 and 13.4 ± 3.20 in wasted and stunted children respectively. On the whole overall mean of performance intelligence indicated that normal children secured highest mean score (30.3 ± 16.31) followed by stunted (21.91 ± 16.60), 17.7 ± 15.68 in wasted and stunted and 16.78 ± 15.08 in wasted group of children. There was significant difference observed between the groups in

each sub-test of performance intelligence which indicates that normal children performed better than three groups in each sub-test. The results conducted by Halterman et al (2001) revealed that the average math score was lower for children with iron deficiency with and without anemia compared to children to normal iron status. Children with iron deficiency had more than twice risk of scoring below average in math than those with normal non-anemic children. Schoenthaler et al (2000) revealed that non-verbal IQ gain was observed in pre- and post-intervention samples. However 24 children taking supplements scored 16 points higher net gain in IQ than 19 placed in control. In overall relative increase of 2.5 IQ points in children receiving supplements existed that was statistically significant.

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