PUBLICATIONS
Nutritional and socioeconomic factors in motor development of Santal children of the Purulia district, India

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ABSTRACT

Aims: The aim of this study was to characterize the motor development of 5-12 year-old Santal children of the Purulia district of West Bengal, India. The effect of socioeconomic and nutritional status on motor development was also examined.

Study design: 841 (427 boys and 414 girls) Santal children were examined in this cross-sectional study. The nutritional status of each child was assessed by height-for-age z-score based on WHO reference data. Socioeconomic status (SES) was measured by the updated Kuppuswamy scale. Motor development was measured using the Bruininks-Oseretsky Test of Motor Proficiency-Second Edition, Short Form (BOT-2).

Results: Sex had a significant (p<0.05) effect on children's score of running speed and agility, upper-limb coordination and strength with higher scores for boys than girls. Children with a height-for-age z-score of —2 or less were significantly more likely to have a total BOT-2 z-score of —2 or less compared with children at a healthier height-for-age range (χ2 = 271.136, p<0.0001). Well-nourished children scored significantly higher (p<0.05) than undernourished children in total BOT-2 score and in all individual motor subtests. Regression analysis showed that nutritional status, socioeconomic status and height have a significant impact on total BOT-2 score (p<0.001). Age and sex were found to be influencing factors in motor development.

Conclusion: Santal children's motor proficiency is around the 1st percentile when compared with normative BOT-2 data. This may be, in part, a result of nutritional and economic disparities between children on who the BOT-2 was normed and Santal children, supporting the role of nutrition in motor development. Additionally, Santal children with lower SES and poorer nutritional status have lower motor proficiency compared with Santal children with comparatively higher SES and nutritional status.

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1. Introduction

Children's brain development is closely related to their nutritional status. Undernutrition during early childhood may affect the growth and development of the brain [1] as well as somatic growth [2] resulting in reduced motor performance [3]. Motor development in early years of life is an important determinant of motor skill in later life [4]. Poorer motor development has been reported in undernourished children of different countries [5-7]. Some studies have also shown that energy and micronutrient supplementation in undernourished children improved their motor functions [8,9]. Undernutrition has an important effect on motor development but its effect may vary according to the severity, duration and the timing of nutritional deprivation [10]. Motor development may be influenced by other factors such as socioeconomic status, body dimension and gender.

The Santals are the largest tribe in eastern India and especially in West Bengal where they represent 54.27% of the total tribal population. This tribe lives in remote places and is characterized by poverty, illiteracy and nutritional problems [11]. Recent research has demonstrated a high percentage of undernutrition in this tribal population on the basis of anthropometric measurements [12] and that more than 84% of the Santals are unskilled workers [13]. Study on the motor development of this tribe may provide information regarding the role of nutritional, socioeconomic status and other factors in motor development. The contribution of these factors on motor development may also be assessed from such study. Therefore the purpose of this study was to characterize the motor development of Santal children aged 5-12 years of the Purulia district and to investigate the contribution of nutritional and socioeconomic status on motor development.

Abbreviations: SES, socioeconomic status; WHO, World Health Organization; BOT-2, Bruininks-Oseretsky Test of Motor Proficiency-Second Edition; ANCOVA, analysis of covariance.

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166
RESEARCH ARTICLE

Nutritional and socioeconomic status in cognitive development of Santal children of Purulia district, India

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Abstract

Background: Cognitive development of children depends on nutritional and socioeconomic factors.

Objectives: The objectives of the present study were to assess the cognitive development and to investigate the relationship of nutritional and socioeconomic status (SES) to cognitive development in 5–12 year old Santal children of Purulia district of West Bengal, India.

Methods: The nutritional status of each child was assessed by z-score of height-for-age, weight-for-height and weight-for-age parameters. SES was measured using the updated Kuppuswamy scale. Cognitive development was measured by Raven's Coloured Progressive Matrices (RCPM).

Results: The growth curve of RCPM scores of Santal children remained around the 5th percentile values of British children. The RCPM scores of the adequately nourished children and upper-lower SES were significantly higher (p < 0.05) than the children with lower SES and nutritional status. About 42.96% and 27.69% of Santal children were found to be in the intellectually deficient and below average groups, respectively. RCPM scores of Santal children were significantly correlated with nutritional status and socioeconomic factors (p < 0.01).

Conclusion: The surveyed children showed poor cognitive functions. The vulnerable nutritional and socioeconomic statuses of Santal children are the major causes for their poor cognitive development.

Keywords: Cognitive development, nutritional status, under-nutrition, cognitive function

Abbreviations: WHO, World Health Organization; RCPM, Raven's coloured progressive matrices; SES, Socioeconomic status

Introduction

Santals are described as the third largest, most integrated and possibly the most resilient tribe in India. This tribe lives in remote areas and is characterized by poverty, illiteracy and nutritional problems. Santals are different from other tribes in their social structure and customs (Bagchi 1994). It has been reported that this tribe is genetically different from other tribes (Saha et al. 1992). The nutritional status of Santal children in some areas of Purulia district of West Bengal has been measured on the basis of their height and weight.
The upper arm muscle and fat area of Santal children: an evaluation of nutritional status

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INTRODUCTION

The most primitive of India, Santals live in remote places and is characterized by poverty, illiteracy and nutritional problems. The growth, development and nutritional status of children can provide good information about the health status of a community. The growth and nutritional status of Santal children has not been investigated excepting few studies (1,2,3). Height-for-age and weight-for-age parameters have been used to assess the growth and nutritional status of Santal children in most of the studies. Some authors opined that these methods are not effective for accurately distinguishing truly malnourished child from simply underweight child especially in children of moderately underweight range (4). As alternative parameters upper arm muscle area (UAMA), upper arm fat area (UAFA) and upper arm muscle area by height (UAMAH) have been found to be reliable indices of growth and nutritional status in children (4,5,6). It was reported that UAMA is linearly correlated with total body mass and it may be a good indicator of the protein malnutrition (7,8). UAMA, UAFA and UAMAH were considered sensitive for assessing the nutritional status of children (4,9). These parameters were not used in practical analysis to assess their sensitivity. We have used these methods in Santals after this community was found to be in undernutrition by other methods (2). In the present study, the growth pattern of these parameters in 5- to 12-year-old Santal children of Puruliya district has been studied and these parameters are used to estimate the true status of undernutrition in these children.

METHODS AND MATERIALS

Study population

The study was conducted on 890 (473 boys and 417 girls) Santal children aged 5–12 years. The age of each child was verified from the school records. The subjects were taken from primary and secondary schools of Balarampur and Bagmundi areas of Purulia district of West Bengal. Data were collected after obtaining the necessary approval from children, parents and school authorities. Child suffering from any systemic disease or with major surgical operations was excluded from the study. The protocol and procedure employed was according to the human ethical guidelines of Helsinki Declaration (10).

Anthropometric measurements

The anthropometric measurements like height, weight, mid-upper arm circumference (MUAC) and triceps skinfold (TRSF) of each child were measured using standard techniques (11). Triceps skinfold was measured using the Harpenden skinfold caliper with a constant spring pressure of 10 g/mm². All sites were measured on the right side of the body. Mean of the three reading in single location was accepted.
Prevalence of Undernutrition in Santal Children of Puruliya District, West Bengal

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ABSTRACT

This study was carried out to determine the prevalence of undernutrition among the Santal children of Puruliya district of West Bengal. 442 Santal children (216 boys and 226 girls) aged 5-12 years were taken from randomly selected schools of Balarampur and Baghmundi areas of Puruliya. Nutritional status was analyzed by Z-score values according to the height-for-age, weight-for-age and weight-for-height reference data of National Center for Health Statistics (NCHS). The prevalence of undernutrition among Santal children was as follows: stunting (17.9%), underweight (33.7%) and wasting (29.4%). Severe (below -3 Z-score) stunting, underweight and wasting were found in 4.98%, 7.92% and 9.51% of Santal children, respectively. In girls, prevalence of stunting (21.7%) and wasting (35.8%) was higher in comparison to boys (13.8% stunting and 22.7% wasting).

Key words: Bengal, Santal, Tribal, Undernutrition.

INTRODUCTION

Santal, the third largest tribe in India, lives in many states including Bihar, Jharkhand, Orissa, Tripura etc. In West Bengal, Santals represent 54.27% of total tribal population and they are spread over in vast areas of Purba and Paschim Medinipur, Bankura and Purulia(1). This tribe lives in remote places and is characterized by poverty, illiteracy, and nutritional problems. The health status of this community remains unreported excepting few studies(2,3). The prevalence of undernutrition in children is an indicator of community health status. The nutritional status of Santal children has not been investigated recently in West Bengal. The present study was undertaken to assess the severity of undernutrition in Santal children of 5-12 years of age of Puruliya district of West Bengal.

METHODS

The study was conducted on 442 Santal children (216 boys and 226 girls) aged 5-12 years from four primary schools of Balarampur and Baghmundi area of Puruliya district of West Bengal. The socio-economic status of each subject was assessed by modified Kuppuswamy's scale(4). The study was carried out in accordance with the revised ethical guidelines for human experimentation of Helsinki Declaration of 2000(5). The anthropometric measurements including height and weight of each subject were measured using standard techniques(6) by trained investigators. The nutritional status of Santal children was evaluated using age specific values of height and weight from the National Center for Health Statistics (NCHS) reference data(7). The indices of undernutrition such as stunting, underweight and wasting were calculated by Z-score using the reference values of height-for-age, weight-for-age and weight-for-height of NCHS standards, respectively. The severity of undernutrition was assessed by Z-score according to the classification of World Health Organization(8). Children with Z-score below -2 of any indices were...
Fat Patterning of Santhal Children—a Tribal Population of West Bengal, India

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Summary
A cross-sectional study was undertaken to examine the body composition including fat patterning among 1012 Santal children, aged 5–12 years, in Puruliya district of West Bengal, India. The anthropometric variable measured included height, weight and skinfold thickness of triceps and subscapular. The body mass index (BMI) was also calculated. The measurements were used to estimate body fat percent (%BF) and fat-free mass (FFM) from skinfolds. Fat mass and FFM were each divided by height squared to produce the fat mass index (FMI) and fat-free mass index (FFMI). Maximum gaining of %BF and FFM was found at ages 11–12 years in both sexes. Difference of FFM between 5 and 12 years of age was found to be highest in girls (18.7 kg) than in boys (14.92 kg). Body fat percentage of girls was significantly (p < 0.05) higher (except in 8 and 9 years old) than that of boys. FMI and FFMI of girls showed different pattern than that of boys. FFM and %BF showed significant (p < 0.01) relationship with all anthropometric variables. Results suggest a clear evidence of sexual dimorphism in fat patterning: girls showing a greater subcutaneous adiposity in comparison with boys. FMI and FFMI, both indices indicate an age-and sex-related variation among Santal children. The data of the present study could be serving as reference data in other studies of Santal children.

Introduction
Body composition is a useful marker for assessing the adiposity of individual. The amount of body fat differs with age, sex, environmental conditions and genotype, and is a good indicator of health and nutritional status of a community [1]. There are several socially disadvantaged communities in India, among which tribal populations are the most deprived ones. India has a tribal population of over 84 millions, which constitutes 8.2% of its total population [2]. Santal, the third largest tribe in India, live in many states including Bihar, Jharkhand, Orissa, Tripura, etc. In West Bengal, Santal represents 54.27% of the total tribal population and they are spread over in vast area of Purba and Paschim Medinipur, Bankura and Purulia [3]. This tribe lives in remote places and is characterized by poverty, illiteracy and nutritional problems. Some earlier studies give a brief description about their culture [4], economy [5] and nutrition [6]. But, there is completely no representative data on the fat pattern of Santal children. So, the present study has been undertaken to examine the body composition characteristics including fat distribution among Santal children living in Puruliya district of West Bengal, India.

Materials and Methods

Study population
A cross-sectional design was used for the study. The study was conducted on 1012 Santal children (463 boys and 549 girls) aged 5–12 years. The age of each child was verified from the school records. The subjects were taken from randomly selected primary schools of Balarampur and Baghmundi areas of Purulia district of West Bengal. Data were collected after obtaining the necessary approval from the school authorities. Children suffering from any systemic disease or have undergone any major surgical operation were excluded from the study.

Socioeconomic status
The socioeconomic status (SES) of the surveyed children was measured by revised Kuppuswamy scale [7]. The scale considers monthly family income,
NUTRITIONAL STATUS OF SANTAL GIRLS OF PURULIA DISTRICT

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To assess the physical growth status, a cross-sectional study was made on 226 Santal school girls, aged 5 to 12 years, in the Purulia district of West Bengal. Anthropometric parameters include height, weight, and circumferences of mid-upper arm, head and medial calf. Body mass index was calculated as the ratio of [weight (kg)/height (m)^2]. According to the modified Kuppaswamy scale, all surveyed girls were under lower socio-economic status. All anthropometric parameters, except head circumference, show progressive increase with age. Height, weight and mid-upper arm circumference of Santal girls were significantly higher than that of Sugalis girls, but growth pattern of Santal girls were far below the median values of NCHS reference. According to the classification of Gomez, Waterloo, Jelliffe and Shils, 69.92%, 41.59%, 70.36% and 58.85% Santal girls are undernourished, respectively. Poor growth pattern of this tribe may be due to their poor socio-economic status and deprived nutritional condition. We found a superior growth pattern of Santal girls in comparison to Sugalis girls. Undernutrition was found to be widely prevalent among the Santal girls of Purulia district.

The growth pattern of children provides good informations about the health and nutritional status of a community. Obviously the growth study is used as a powerful tool to assess the health and nutritional status of any community. There are several socio-economic backward communities in India, among which tribal populations are the most deprived ones. Though growth pattern of children of rural (Chatterjee and Mondal, 1991; Gupta et al. 1990) and urban (Hauspie et al. 1980; Currimbhoy, 1963) population of India has been investigated by many workers but the information about the tribals in this regard is very limited (Mitra et al. 2002; Bose and Chakraborty, 2005). India has a tribal population of over 84 millions which constitutes 8.2% of its total population (Census, 2005). Santal, the third largest tribe in India, live in many states including Bihar, Jharkhand, Orissa, Tripura etc. In West Bengal, Santal represents 54.27% of total tribal population and they are spread over in vast area of Purba and Paschim Medinipur, Bankura and Purulia (Bagchi T, 1981). This tribe lives in remote places and is characterized by poverty, illiteracy, and nutritional problems. But, there is no recent information about the growth pattern of Santal children in West Bengal. In the present study some anthropometric parameters have been measured in Santal girls of Purulia district of West Bengal to assess their growth pattern.

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