Anthropometrically Determined Malnutrition Among Preschool Children in an Integrated Child Development Services Block of Gajapati District, Orissa

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INTRODUCTION

The preschool children constitute about 15% of total population and account for 40% of total deaths in India notoriously fraught with the risk of malnutrition (Gupta and Shukla, 1992). Their growth is an important indicator of child health and community's nutritional status. Growth failure is a common problem and is the first sign of protein- energy malnutrition (PEM) and poor health. One in every two or three children suffer from some degree of growth failure (UNICEF, 1991; NFHS-2, 2000). Nutritional adequacy is the key determinants of the quality of human resources everywhere. In order that this human resource reaches its optimum development, it is essential that every child gets adequate breast feeding and supplementary nutrition at the appropriate age (Gosh, 1992). Prevention of infant mortality and child mortality is perhaps the most commonly stated goal of national health policy and is a major focus of international bilateral aid in the health sector.

Orissa occupies the dubious distinction of being the poorest state in the country with half of its population is living below the poverty line (Mahapatra et al., 2000; Vijayaraghavan et al., 1996). The state is reported to be having highest infant and child mortality rates (IRMS, 1993; NFHS-2, 2000). The incidence of malnutrition in children under-five is continue to increase consistently since 1979 indicating a public health significance (NNMB, 1999). Promotion of nutritional well-being of preschool children is one of the essential objectives of primary health care to achieve Health for All by 2000 AD. National Nutrition Policy has been adopted in 1993 to combat the wide spread malnutrition and latter formulated the National Plan of Action on Nutrition (1995) to translate into action by identifying the areas of nutritional problems.

Following the adoption of National Policy for Children (1974), the scheme of Integrated Child Development Services (ICDS) was first initiated in 1975 which is the largest national community-based programme in the world. The target groups are children under-six years of age and pregnant and nursing mothers (15-44 years). The integrated package comprised of suppl-tary nutrition, immunization, health check-up, referral services, preschool non-formal education, health and nutrition education for mothers (Sachdev et al., 1996). It adopts a holistic approach to improve child development by reduced incidence of mortality and morbidity, malnutrition and school drop outs (MHRD, 1996). Each Aganwadi Centre (AWC) has an Anganwadi Worker (AWW) looks after a population of approximately 1000 in rural and 700 in tribal areas and serves as the central venue for health related activities carried out by the auxiliary nurse midwives. The scheme has completed 25 years of its operational age in Orissa when the first block of ICDS was established in Subdega block of Sunderagarh district. The scheme is gradually expanded its coverage and until 2000, 281 blocks/projects, 1525 supervisors and 28612 AWC are in operation. All the blocks of the state are currently covered under ICDS in which the supplementary nutrition programme of the children are taken care of keeping in view of alarming rates of infant and child mortality.

The present paper may therefore useful to study the children below six years covering under ICDS target supplementary feeding programme. Further, it relies upon whether the programme is yielding any positive results in lowering the incidence and severity of malnutrition. Such data will help to evaluate the impact of the programme in generating time trends of nutrition status and provide direction to programme planners and policy makers.

MATERIAL AND METHODS

Gajapati is one among 30 districts of Orissa situated in eastern part adjacent to the state of

Andhra Pradesh. It occupies rank first in terms of sex ratio (1027 females per 1000 males), however the population growth rate is lowest. Literacy rate is as low as 25% (male 34% and female 14%), it is being 13.0% during 1981-1991. As on 2001, all the seven revenue blocks of the district are covered under ICDS scheme having 37 supervisors and 631 AWC. This paper was part of Langia Saura primitive tribal project carried out during January 2002 in ICDS block of Gumma operating since 1983. This block is closest to the district head quarter (Parlakhemundi) selected purposively because of its socioeconomic backwardness comprises 19 Gram Panchayats, 184 villages and 70342 population. It has dubious distinction of having the lowest female literacy situated on the high plateau (500m-1000m) of Niamgiri hill range (84°05'E and 19°10'N) on the Eastern Ghats. The percentage of scheduled tribe (ST) population is extremely high (74.1%) in comparison to genral caste (18.8%) and scheduled caste (7.1%) population groups.

The data for the present study have been drawn from Child Development Project Office ICDS-monthly progress reports for the year 2001 collected by 92 AWW and 5 Supervisors. The data on growth charts of children 0-6 years for the entire block have been explored for assessing nutritional status. Cooperative for Assistance and Relief Everywhere (CARE) organization extends the food aid for ICDS in the form of corn-soya-blend (CSB) and vegetable oil. It contains a combination of cereals, pulses, oil, vegetables and sugar. Usually a hot meal is cooked and served to children and mothers belonging to low income group. The type of food served is in ready-to-eat form or often upma, roti or blend form. Each supplementary meal contain an approximate quantity of 65g of CSB and 8g of oil in order to meet the daily requirement of 300 calories and 8-10g protein to children, and double the quantity of meal (130g CSB and 15g oil) and nutrients (600 calories and 20g proteins) to severely malnourished children (grade-III and IV) and mothers. Information on breast feeding and supplementary feeding recorded from local mothers. The coverage of supplementary nutrition, immunization, distribution of vitamin A, iron folic acid tablets and treatment of minor ailments and first aid are enlisted.

Growth chart is a graph on which a child's weight is shown at different ages to assess the impact of health and nutrition-related services. Accurate age of each child is maintained by AWC on the growth monitoring chart. Under or over estimation of age leads to biased calculation in nutrition grade. Children were weighed every month in the last week by AWW using knickers and spring balances. Weight of each child is marked against corresponding the month of the year horizontal line on the growth chart. The horizontal line represents age in months and vertical lines form 12 columns for each year corresponding to the month of the year and across the graph are printed four growth reference lines. Nutritional grade of children from birth to 6 years is assessed by plotting the weight against age on the chart printed with four growth reference lines. Top line is 80% of weight-for-age of reference child followed by 70%, 60% and 50% of weight-for-age and children falling above top line of 80% are considered as normal. Besides frequency distribution of nutritional grades, percentages and test of significance have been calculated for respective age and sex groups. The difference in the prevalence of malnutrition grades is compared among the sex and age groups using Chi-square test. The level of statistical significance is kept constant at 5% ($P<0.05$).

RESULTS AND DISCUSSION

Anthropometrics provide relatively simple and convenient indicators of PEM status of children (Johnston, 1981). Measurement of growth has always been an important tool for assessing the nutritional status of children which involves the use of reference standards. The use of American National Centre for Health Statistics (NCHS) reference is recommended worldwide based on the well-nourished children in all population groups follow very similar growth pattern (Hamill et al., 1978; Rao et al., 1976; Agarwal et al., 1991). In Gomez classification, weight-for-age (under-nutrition) is commonly used to classify children in to nutrition grades; normal >90% of the standard, grade-I or mild 75-90%, grade-II or moderate 60-74% and grade-III or severe <60% of the standard of NCHS (Gomez et al.,1956). It is a composite index that reflects a combination of stunting (low height-for-age) and wasting (low

weight-for-height), accepted widely as the reflective of current nutritional deficits (Kielmann and McCord,1978; WHO, 1983). Although Z-score of anthropometric indicators are preferred over the percent of median system for some application, both the systems produce highly similar results with regard to child morbidity and mortality predictions (Sachdev et al., 1992).

The percentage distribution of infants by body weight expressed as percentage of NCHS standards based on Gomez classification for the period January to December 2001 is shown in Table 1. The percent of infants with normal nutrition status is ranged between 55.4% during February and 43.4% in October while malnutrition is between 44.6% and 56.6% during the same period. The difference between percent of normal and malnourished infants during the 12 months period is statistically significant. Grade-I malnutrition is greater than grade-II and grade-III&IV malnutrition. Studies on infants in developing countries show that during the first six months of life, growth rates in height and weight are very close of technologically developed countries (WHO, 1983). The birthweight doubles by five to six months and triples by one year of age. In general, children with low-birth weight (LBW) show slackening in their growth rate as compared to those are heavier at birth show fair growth. Infants with LBW succumbed

to diarrhoeal and respiratory infections because of immunodeficiency. The recorded incidence of LBW in this area is as low as 2%, however, the etiological determinants attributable to LBW are strong (socioeconomy, maternal age, height, birth spacing, place of residence, antenatal care and nutrition during pregnancy). This could be the under-reporting system of AWW. Because recent data on the incidence of babies with LBW in India is accounted for 28.2% (Gopalan, 1996) in comparison to 4% in developed countries (Kamaladoss et al., 1992).

It is seen from the Table 2 that the proportion of children (aged 1-3 years) with normal nutrition grade (34.5%-37.4%) outnumbered the malnourished children (62.6%-65.5%). Grade-I malnutrition (having body weight deficit <20%) is almost twice the grade-II (weight deficit <30%) and less than 2% are having grade-III&IV (weight deficit <40%) malnutrition. Considerable slackening of growth rates are observed after the age of one year. The prevalence of undernutrition is significantly higher in girls as compared to boys. Similar gender bias is observed for nutrition status of preschool children (NNMB, 1999). The growth chart adopted for ICDS scheme is slightly lower than malnutrition (5% to 10%) grades of Gomez standard for normal (>=80%), grade-I (70-80%), grade-II (60-70%) and grades III&IV (>60%) of NCHS standard, while the standard for severe

Table 1: Percentage distribution of infants by nutritional status according to Gomez claffification during 2001

Month of year (2001)	Number	Nutritional grade (Weight-for-age % of NCHS standards)			
		Normal >80%	Grade-I 70-79%	Grade-II 60-69%	Grade-III &IV <60%
January	2179	46.2	32.7	19.6	1.5
February	2083	54.4	22.6	20.8	2.2
March	2149	49.4	32.3	16.2	2.1
April	2087	45.1	35.8	16.9	2.2
May	1917	45.2	34.5	18.4	1.9
June	1994	47.7	34.0	16.6	1.6
July	1992	46.7	33.9	17.6	1.8
August	2053	43.9	34.1	20.3	1.7
September	2053	45.2	33.4	19.7	1.7
October	2056	43.4	34.6	20.4	1.6
November	2096	45.1	34.4	19.2	1.3
December	2098	44.6	34.7	19.6	1.0

Difference between normal and malnourished infants is significant. $\chi^2=76.8727$(d.f=11) P<0.005.

Table 2: Distribution of children (1-3 years) according to Gomez grade malnutrition during 2001

Month of year (2001)	Number	Weight-for-age % of NCHS standards)			
		Normal >80%	Grade-I 70-79%	Grade-II 60-69%	Grade-III &IV <60%
January	3304	36.2	40.7	21.3	1.8
February	3172	37.4	40.3	20.4	1.9
March	3304	35.4	40.0	22.6	2.3
April	3172	35.9	40.2	21.7	2.1
May	3304	35.6	39.0	22.8	2.6
June	3339	34.9	40.4	22.2	2.5
July	3335	35.1	40.2	22.2	2.5
August	3305	37.3	38.2	22.0	2.5
September	3366	35.8	38.4	23.3	2.5
October	3345	34.9	39.6	23.4	2.1
November	3353	34.5	41.4	22.5	1.6
December	3376	36.2	39.9	22.4	1.5

Difference between normal and malnourished children is insignificant. $\chi^2=15.4524$(d.f=11) P<0.05.

grade of malnutrition is comparable. The rate of malnutrition for children 1-3 years found almost similar in neighbouring districts of Orissa (Vijaya-raghavan et al., 1996).

Distribution of children (3-6 years) according to nutritional grade by period is shown in Table 3. It is observed that nearly one-thirds of children in the age 3-6 years are normal followed by children with grade-I (40.3% to 46.3%), grade-II (18.0% to 23.3%) and grade-III&IV (0.4% to 0.7%). Bisexual difference between normal and malnourished children is found significant.

Table 4 shows the percent of preschool children (0-6 years) in different grades of malnu-

Table 3: Distribution of children (3-6 years) according to Gomez grade malnutrition during 2001

Month of year (2001)	Number	Weight-for-age % of NCHS standards)			
		Normal >80%	Grade-I 70-79%	Grade-II 60-69%	Grade-III &IV <60%
January	4304	30.5	46.3	22.6	0.5
February	4173	37.7	42.7	19.0	0.6
March	4385	36.9	43.8	18.9	0.4
April	4173	34.5	43.0	20.9	0.5
May	4452	35.5	44.1	22.0	0.4
June	4552	34.4	44.2	20.9	0.6
July	4176	36.3	41.0	22.1	0.6
August	4228	35.5	42.0	21.2	0.6
September	4249	34.9	41.9	22.7	0.5
October	4248	35.9	40.3	23.3	0.6
November	4344	34.8	41.7	22.9	0.7
December	4236	36.4	42.2	20.9	0.5

Difference between normal and malnourished children is significant. $\chi^2=76.956$(d.f.11) P<0.005.

trition according to sex and age for the month of December 2001. It is seen that of the 9710 children, 38.1% are normal, while 61.9% are in different grades of malnutrition; 39.8% children grade-I, 21.3% grade-II and 0.8% grade-III&IV malnutrition. The corresponding figures obtained for a primitive tribal group in the same revenue block are much greater (normal 12.2%, grade-I 52.7%, grade-II 33.9% and grade-III 1.2%) during the year 1989 (Rao et al., 1989). Age-wise prevalence showed a consistence increase in malnutrition with concomitant decrease in normals from the age 0-1 year to 3-6 years. The extent of malnourishment is shifting towards grade-I and grade-II. The proportion of normal children is higher (63.8%) in 0-1 year as compared to 1-3 years, 3-6 years and

Table 4: Nutritional status of preschool children (0-6 years) according to age and sex

Age year	Sex (Number)	Nutritional grade (Weight-for-age % of NCHS standards)			
		Normal	I	II	III&IV
0-1	Boys (1073)	47.2	34.5	17.7	0.6
	Girls (1025)	42.0	34.9	21.7	1.4[*]
	Pooled(2098)	44.6	34.7	19.7	1.0
1-3	Boys (1753)	38.1	39.4	21.6	0.9
	Girls (1623)	34.0	40.4	23.3	2.3[*]
	Pooled(3376)	36.2	39.9	22.4	1.6
3-6	Boys (2207)	37.5	40.7	21.4	0.4
	Girls (2029)	35.3	43.8	20.3	0.6[NS]
	Pooled(4236)	36.4	42.2	20.9	0.5
1-6	Boys (3960)	37.8	40.1	21.5	0.6
	Girls (3652)	34.8	42.3	21.6	1.3[**]
	Pooled(7612)	36.3	41.2	21.6	0.9[@@]
0-6	Boys (5033)	39.8	38.9	20.7	0.6
	Girls (4677)	36.3	40.7	21.9	1.1
	Pooled(9710)	38.1	39.8	21.3	0.8[@@]

Difference between boys and girls is statistically significant. *P<0.05, **P<0.01, NS-not significant. Difference between age groups is statistically significant. @@P<0.01

1-6 years in the pooled sample. The difference in nutritional grades between the three age groups is found significant. Prevalence of grade-II and grade-III&IV malnutrition increased age upto 3 year of life, after which observed a slight decline. The prevalence of malnutrition is greater among females in each age group as compared to their male counterpart children. The disparity is statistically significant. The present study is therefore is in conformity with the results obtained by Tandon (1989). However, no gender bias is seen in growth indicated by weight in children of affluent India and America (Hamill et al., 1978; Banerjee, 1998). Hence both by extent and type of malnutrition, these children (1-5 years) are comparable to those of their counterparts of rural and tribal Orissa carried out surveys during 1979-1999 (NNMB, 1999).

The nutrition of young children, their immunization, vitamin A, and iron and folic acid coverage has recorded a significant increase over the past 10 years in the state. Between 1990 and 2001, the immunization coverage of under-5 children for polio, BCG, DPT was increased to 60-65% as a result of giving health education and motivation to mothers. This is due to control of childhood infectious diseases as a result of intensive door-

to-door immunization campaign which was very successful over the years (Das, 2001). The duration of breast feeding observed to be more than one year. An increased trend of breast feeding is seen in multiparous mothers in comparison to primiparous mothers. As far as weaning food is concerned, mothers said they started the feeding between 5-8 months. Sanitation-linked closely to both shelter and water supply seems to be very poor in this area. Therefore, more attention and better impetus are required to be given to improve the nutritional status of preschool children in socially isolated areas.

SUMMARY AND CONCLUSION

It is evident from the present data that the prevalence of malnutrition is widespread problem among preschool children and girl children suffer more than boys. Therefore, special attention is needed to be given to improve the nutritional status of girl child keeping in view of their later physiological stress and demands. The impact of supplementary feeding seems to be unsatisfactory after infancy. The rate of normal children decreased with concomitant increase in malnutrition form 1 to 6 years age. Other factors linked with poverty, poor environmental hygiene, health care services, worm infestations, healthy child feeding practices and illiteracy are some of factors for improving the child's survival, growth and development. There is an urgent need for conducting studies with a view to find out bio-social factors which may help to understand the problems of undernutrition, which enable to strengthen the counselling skills of ICDS providers. The scheme infrastructure should be strengthened especially in tribal blocks where the communication facilities are poor for the holistic development of children which is one of the eight essential objectives of primary health care.

LIMITATION OF THE STUDY

Nutrition status of children evaluated by ICDS growth monitoring chart is presented in this paper. The monthly data collected by each AWW and procedures used for weighment of children is debatable. The rates of LBW babies, neonatal mortality, infant mortality and child mortality in this area clearly reflect an under reported system of ICDS when compared to the state figures. Moreover, the referral services provided to children with severe clinical signs of malnutrition (marasmus and kwashiorkor) is not reflecting. Further no scientific data is available for the state on logistic problems of ICDS (supplementary food supply, storage, delivery, attendance of AWW, supplementary feeding, coverage and acceptance) for comparison.

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ABSTRACT The purpose of this paper was to assess the growth and nutritional status of infants and school children fed ICDS diets and children of whom received ICDS supplementary nutrition. AWC were established with a view to increase the nutritional status among preschool children aged below 6-years. For this study, data has been collected from ICDS Centre in Gumma block of Gajapati district for the year 2001. The data was analyzed statistically and compared with the data available from the state of Orissa. The results indicate that 38.1%, 39.8%, 21.3% and 0.8% of children are normal, grade-I, grade-II and grade-III&IV malnutrition respectively. Out of total 55.6% and 66.7% of infants and preschool children respectively suffer from varying grades of malnutrition. The prevalence is consistently increased with increase in age from 0-6 years. Female children are behind their male peers. Malnutrition among preschool children continue to be the wide prevalent problem and comparable to those of their rural counterparts. The impact of supplementary nutrition programme on young children seems to be negligible in an area with socially deprived groups. In order to achieve the national goals adopted for child development, there is a definite need to further strengthening the existing ICDS system with targeted time-bound objectives.

REFERENCES

Agarwal, K.N., Agarwal, D.K., Benakappa, D.G., Gupta, P.C., Kanduja, P.C., Khatua, S.P., Ramachandran,

K., Udani, P.M. and Gopalan, C.: *Growth Performance of Affluent Indian Children (Under-Fives): Growth Standard for Indian Children.* Nutrition Foundation of India, New Delhi (1991).

Banerjee, A.: Epidemiology of under-five malnutrition: sex difference in health care and nutritional status. *Med.J.Armed Forces Ind.,* **54:**119-20(1998).

Das, S.P.: O*rissa Reference. Glimpses of Orissa.* Techno CAD Systems Ltd, Bhubaneswar 99-201 (2001).

Gomez, F., Galvan, R.R., Frenk, S., Munoz, J.C., Chavez, R. and Vazquez, J.: Mortality in second and third degree malnutrition. *J.Trop.Pediatr.,* **141:** 531-534 (1956).

Gopalan, C.: Low birth weight. In: *Nutrition Research in South-East Asia, The Emerging Agenda of the Future* WHO. A.I.T.B.S.Publishers & Distributors, Delhi, 13-31 (1996).

Gosh, S.: *The Feeding and Care of Infant and Young Children.* Voluntary Health Organization of India, New Delhi, 11-15 (1992).

Gupta, V.M. and Shukla, K.K.: Epidemiological correlated of protein energy mal-nutrition in preschool children. *Ind.J.Prev.Soc.Med.,* **23:** 26-32 (1992).

Hamill, R.V.V., Drizd, T.A., Johnson, C.L, Reed, R.B. and Roche, A.F.: *NCHS Growth Curves for Children. Birth to 18 Years.* United States Vital and health Statistics. National Centre for Health Statistics, DHEW Publication. 78-1650 (1978).

IRMS: Institute for Research in Medical Statistics. *Causes of Infant Deaths in Orissa.* Indian Council Medical Research, New Delhi (1993).

Johnston, F.E.: *Anthropometry and Nutritional Status. Assessing Changing Food Consumption Patterns.* National Research Council. National Academic Press, Washington DC, 252-264 (1981).

Kamaladoss, T., Abel, R. and Sampathkumar, V.: Epidemiological correlates of low-birth weight in rural Tamil Nadu. *Ind. J. Pediatr.,* **59:** 299-304(1992).

Kielmann, A.A. and McCord, C.: Weight-for age as an index of risk of death in children. *Lancet,* **1:** 1247 -1250 (1978).

MHRD: Ministry of Human Resource Development, Department of Women and Child Development. *Annual Report 1995-96 Part IV,* Government of India Press, New Delhi 5-6 (1996).

Mahapatra, A., Geddam, J.J.B., Marai, N.S., Murmu, B., Bulliyya, G., Acharya, A.S. and Satyanarayana, K.: Nutritional status in preschool children in drought affected Kalahandi district of Orissa. *Ind. J. Med. Res.,* **111:** 90-94(2000).

NFHS-2: *National Family Health Survey India 1998-99.* International Institute for Population Sciences, Mumbai (2000).

NNMB: National Nutrition Monitoring Bureau. *Report of Second Repeat Survey- Rural.* National Institute of Nutrition, Hyderabad, 1-23 (1999).

Rao, D.H., Satynarayana, K. and Sastry, J.G.: Growth pattern of well-to-do Hyderabad preschool children. *Ind. J. Med. Res.,* **64:** 629-636 (1976).

Rao, D.H., Brahmam, G.N.V., Reddy, C.G., Rao, K.M. and Rao, N.P.: *Health and Nutrutional Status of Langia Saoras of Ganjam District-Orissa.* National Institute of Nutrition, Hydedrabad, 1-23 (1989).

Sachdev, F.P.S., Satyanarayana, L., Kumar, S. and Puri, R.K.: Classification of nutritional status as Z-score or percent of reference median-does it alter mortality prediction in malnourished children. *Int. J. Epidemiol.,* **21:** 916-921 (1992).

Sachdev, Y., Tandon, B.N., Gandhi, N. and Dasgupta, J.: *Integrated Child Development Services, Survey, Evaluation and Research 1975-1995,* Central Technical Committee-Integrated Mothers and Child Development, New Delhi, 149-152 (1996).

Tondon, B.N.: Nutritional intervention through primary Health Care: Impact of ICDS projects in India. *W.H.O.Bull.,* **67:** 77-80 (1989).

Vijayaraghavan, K., Rao, D.H., Brahmam, G.N.V., Radhaiah, G., Rao, K.M., Sagar, P.V. and Mohanram, M.: *Household Food Security in Wester Orissa.* National Institute of Nutrition, Hyderabad, 19-34 (1996).

UNICEF: *Children and Women in India: A Situation Analysis.* UNICEF, New Delhi (1991).

WHO: *Measuring Change in Nutritional Status. Guidelines for Assessing the Nutritional Impact of Supple-mentary Feeding Programmes for Vulnerable Groups.* World Health Organization, Geneva (1983).

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