Study Of Growth Pattern In Varanasi Infants And Its Comparison With Reference Standards

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ABSTRACT

Background: The present study involves an investigation of the growth and development of infants during the first year of life. It attempts to compare the observed physical growth of infant with recommended standards and other studies carried out on Varanasi infants.

Methodology: Sample of 200 infants (104 males and 96 females) at age group 3-12 months were taken from the paediatrics Out Patient Department (OPD), Sir Sunderlal Hospital, Banaras Hindu University (BHU), Varanasi. General information were recorded with the help of pretested questionnaire from the mother/guardian of the infants and body weight and length of the infants was recorded by standard techniques (Jelliffe, 1968). The results were compared with reference standards such as World Health Organisation (WHO), National Centre for Health Statistics (NCHS) and Indian Council of Medical Research (ICMR) and the other studies on Varanasi infants.

Results: The 50th percentile value curves of both weight and length of male and female infants run below the 50th percentile of reference standards but they run parallel to other studies of Varanasi. It shows that from last several years the growth pattern of the studies on Varanasi infants were almost same.

Conclusion: It is concluded that before declaring our infants as malnourished through comparing with reference standards even if the developmental milestones of the infants were normal, they were having no any past history of diarrhoea or respiratory diseases and fever, further researches should be done to know how far these standards are applicable on infants in various states of India where the racial and cultural differences are one of the major factors. Therefore regional and state wise standards should be constructed.

INTRODUCTION

Nutritionists in India seem to have failed to grasp fully the reason for the lower level of body weight of Indian infants in comparison with standards. Nutrition experts become confused as they desperately try to locate an explanation for the small size of infants in the deficiencies of nutritional intake. Nutritionists presume that Indian babies are undernourished if they are below the lowest level of normalcy of growth standards. They have tried to find ways and means to push in more nutrition.

Malnutrition is a major non communicable disease worldwide. Whole world is struggling with this in which India is one of the countries fighting against malnutrition. Several studies has been carried out on malnutrition among infants and children but it still persists in our country and different organisations like WHO, NCHS, ICMR, United Nations Children's Fund (UNICEF) etc are working on it. How could we then able to get rid of this major problem? It is a big question? Several workers have carried out comprehensive studies covering most aspects of infant growth and development, feeding patterns and nutritional intake, and other socioeconomic factors which normally influence the health of infants. These studies need to be supported by investigations in other regions of the country also. In India R Kumar, Udani, Raghavan and others did deep studies on the infants growth and they concluded that after adaptation of reference standard of growth, there is a problem about the dividing line between an abnormal or an undernourished child and the one who is normal or well nourished. There are standards laid down, both clinical and to some extent biochemical through which a decidedly undernourished child could be separated from a well nourished child. But what about those who are born genetically as small or thin build? We cannot accept the western anthropometric measurements for the infants growth pattern of India especially the weight, chest circumference, thickness of muscle mass and subcutaneous tissues. People of different countries have different life style, feeding pattern and body stature. They all are genetically different from each others. In India ignorance of health, poverty, lack of knowledge about nutrition and bad sanitary practices all these leads to malnutrition among infants. Micronutrients deficiency like deficiency of Zinc, Iron or Copper may also be one of the aspect of malnutrition among Indian infants and this is one of the important part of the present study on which further work is going to be done especially on the level of Zinc, Iron and Copper among blood of Indian infants. So, one of the other important question is that where our infants stand in between the reference standards because as we know that an infant is said to be normal if he is cheerful, happy, has a steady weight gain, his developmental

milestones are fulfilled, has been free from physical or emotional illness and nutritional deficiencies and who is breastfed at least up to six months before introduction of mixed feeding in their diet.

The present study involves an investigation of the growth and development of infants during the first year of life. It attempts to compare the observed physical growth of infant with recommended standards and other studies carried out in Varanasi infants.

METHODOLOGY

Present study was a hospital based cross sectional study conducted for two years in paediatric OPD, Sir Sunderlal Hospital, BHU, Varanasi. Extensive literature search was done during initial period of the study. The study protocol was approved by the Institutional Ethical Committee. Hospital based prospective sampling was done to collect the information regarding nutritional status of the infants of 3-12 months of age attending OPD in Sir Sunderlal Hospital, BHU, Varanasi. Sample size was calculated by using the formula:

$$n = \frac{Z^2 pq}{L^2}$$

Where: n: is the required sample size, Z: is the value of the standard normal variable corresponding to 95% level of significance, P: estimated prevalence of malnutrition in the area (p = 0.1) and (Q = 1-p), L: marginal of error at 10%.

A total of 200 infants at age group 3-12 months participated in the present study from which 104 were male and 96 were female. A structured questionnaire was used for the pilot study on 20 infants to pre test the same. These were analysed and necessary modifications were made in the questionnaire. The results of the pilot study were not included in the final analysis. The mother or the guardian was then interviewed with the help of pre tested questionnaire. General information, body weight (Kg) and height (cm) of the infants were recorded by standard techniques. (Jelliffe, 1968). The exact age of the child was computed from the child's date of birth. When data on the exact date of birth was not available, the age as told by mother to nearest month was used. The infants were suffering from diarrhoea, cold, cough, or fever at that time and their physical appearance and developmental milestones were looking healthy. Their mothers were also reported that their baby don't have any past history of diarrhoea or respiratory problems. Different standards were used for comparison of body weight and height of the infants. They were also compared with the other studies of Varanasi. Infants were then categorized as normal, underweight and overweight respectively with the help of the Body Mass Index (BMI) given by the WHO standard. Data was then

fed in Microsoft Excel and analysis of data was done by using the statistical tools in Excel software. Percentile values were calculated by the formula:

$$P_\alpha = l + \frac{P_N - F}{f} \times i$$

RESULTS

Between 2012-2014, data were collected from the mother/guardian of the infants attending paediatrics OPD in Sir Sunderlal Hospital, BHU, Varanasi. The infants were classified under three age groups 3 to 6 months, 6 to 9 months and 9 to 12 months respectively. The mean body weight of male and female infants were compared and the result came that the mean body weight curve of male infants were running above the female growth curve in the age groups 3 to 6 months and 9 to 12 months respectively, but it was running below the body weight curve of female infants in the age group of 6 to 9 months. (Graph 1.)
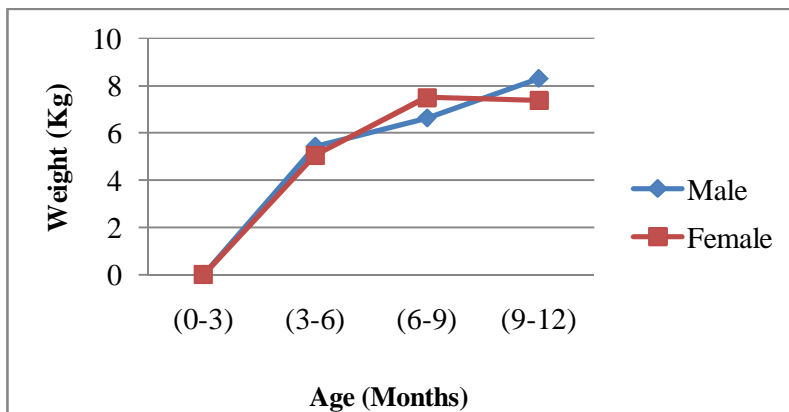

Graph 1: Mean body weight of male and female infants
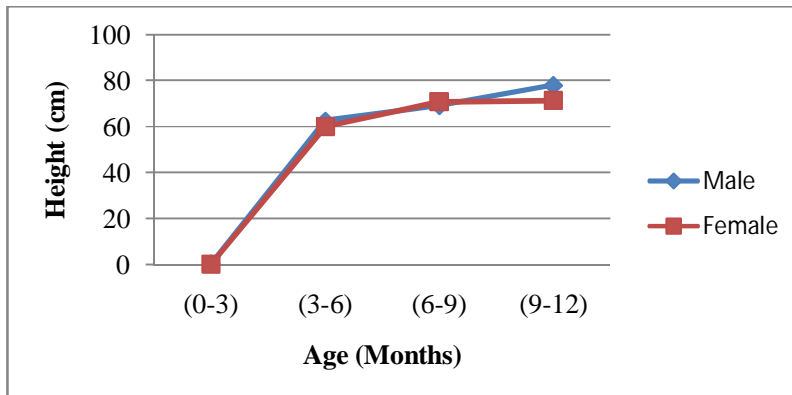
Graph 2: Mean length of male and female infants

When the mean length of the infants were compared it was shown that the length curves of both male and female infants were almost running parallel in the age group of 3 to 6 months and 6 to 9 months but in 9 to 12 months male infants were having sudden increase in length in comparison to female infants. (Graph 2)
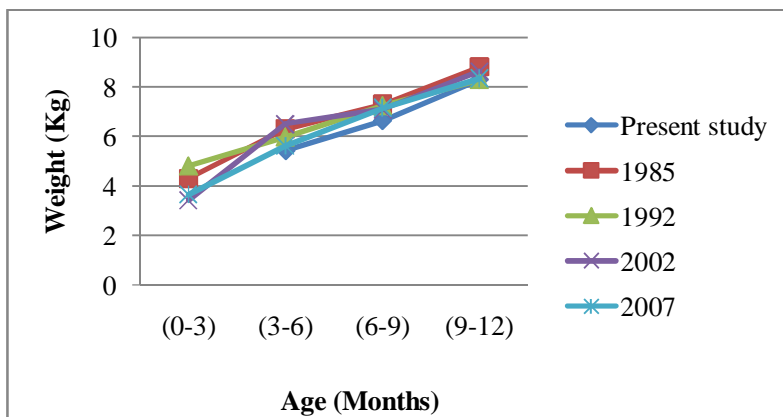

Graph 3: Comparison of body weight of male infants in present study with other studies of Varanasi.

After that it was seen that the pattern of growth curve was almost running parallel when all the other studies of Varanasi infants from the period of 1985 to 2007 were compared. In those studies there were infants of overweight, normal and underweight of both urban and rural areas. They were showing normal milestones development and not showing any symptom of malnutrition even when they were underweight. (Graph 3,4)
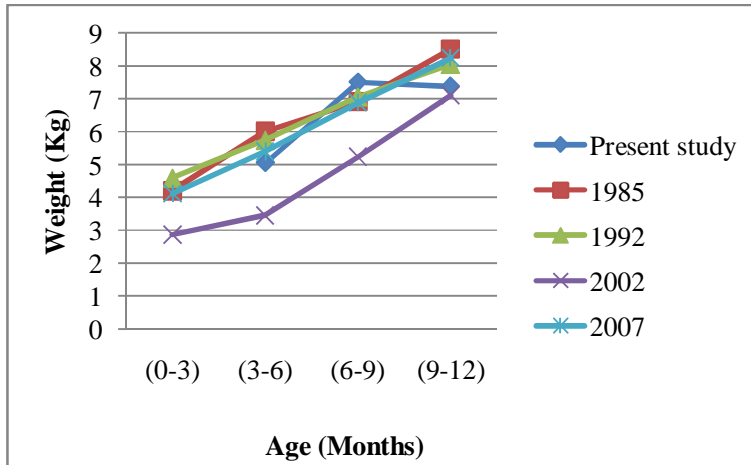
Graph 4: Comparison of body weight of female infants in present study with other studies of Varanasi
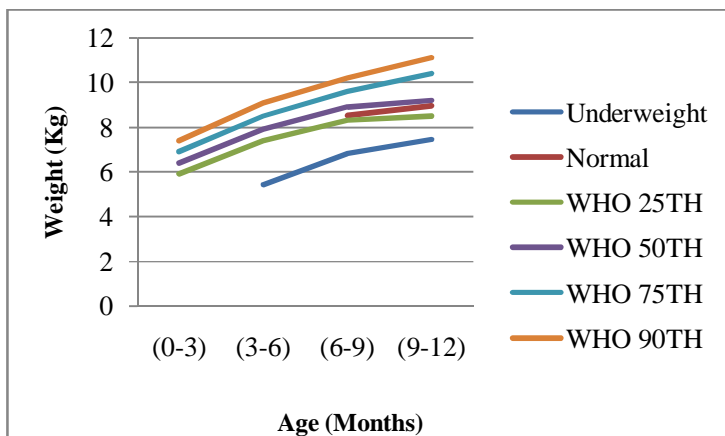
Graph 5: Distribution of overweight, underweight and normal male infants of present study over percentile curves of WHO standard

After the classification of infants of present study as underweight, normal and overweight when they were distributed over the percentile values of WHO standard, it was seen that normal infants curve was running in between the 25th and 50th percentiles of WHO. There were no overweight in males and underweight curve was running below the 25th percentile of WHO standard.(Graph 5)

Graph 6: Distribution of overweight, underweight and normal female infants of present study over percentile curves of WHO standard

In female infants it was observed that the underweight and normal curves were running below the 25th percentile of reference standard . Curve for overweight was running between 25th and 50th percentile but little much parallel to 50th percentile of WHO standard. (Graph 6)

DISCUSSION

The validity of growth standard has been debated by several workers in India and other countries also. The question needs to be faced: Are these standards appropriate for Indian infants where state wise cultural, racial and genetic factors are important points for consideration while comparing our infants with these standards? The studies carried out on infants in Varanasi (both rural and urban infants), it was observed that their growth curves for weight and height show same pattern. (Graph 3,4)
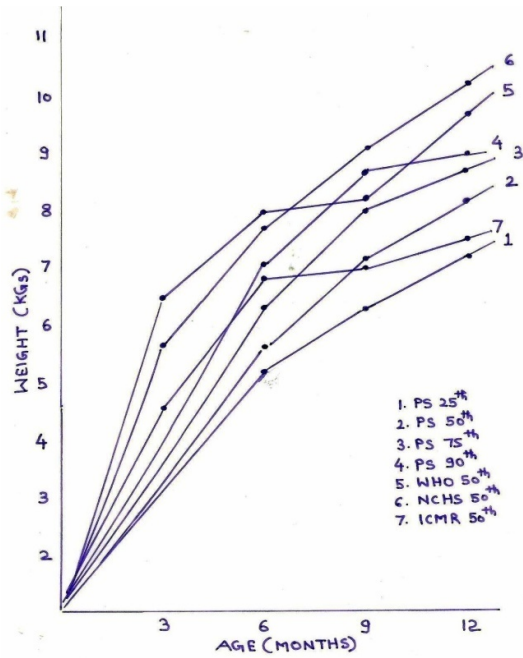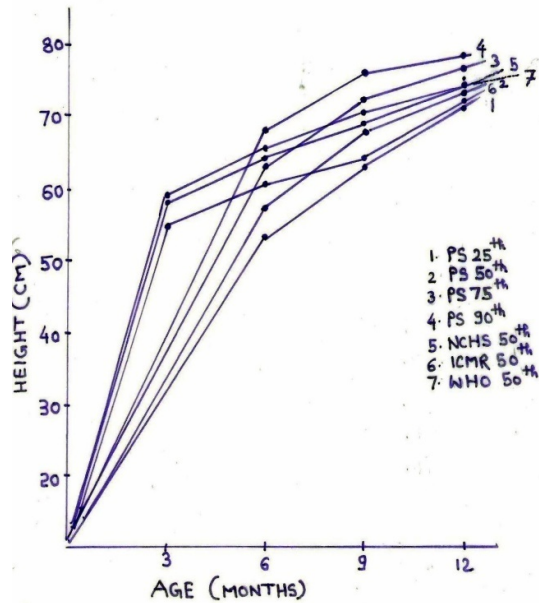
Graph 7: Percentile values of body weight of male infants of present study with reference standards
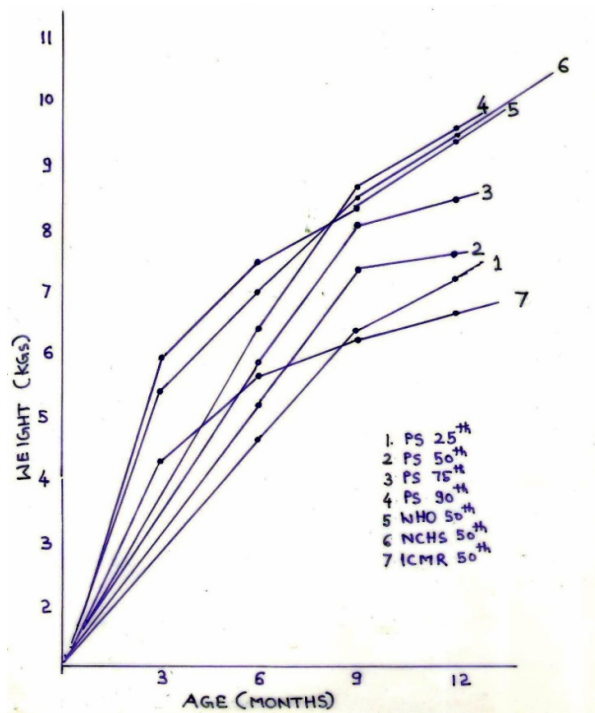
Graph 8: Percentile values of body weight of female infants of present study with reference standards
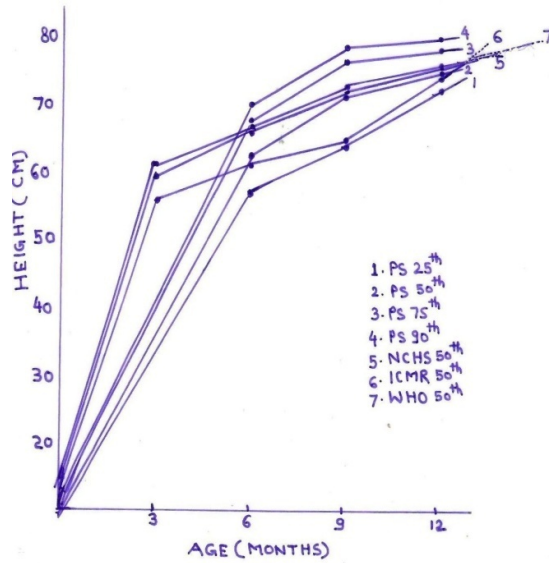
Graph 9: Percentile values of length of male infants of present study with reference standards

Graph 10: Percentile values of length of female infants of present study with reference standards

In present study it was observed that the percentile value curves for weight of girls and boys infants of Varanasi run below the 50th percentile curves of WHO and NCHS standards whereas curves of 50th and 75th percentile in present study run below but parallel with ICMR 50th percentile curve up to

3-6 months but at the age group of 6-9 months and 9-12 months ICMR curve run below the 50th percentile of present study (Graph 7,8). Same pattern was also observed in the percentile value curves for height of the male and female infants (Graph 9,10). After the classification of infants of present study into overweight , normal and underweight, it was found that the body weight curves for these infants was running below the curves of WHO standards. If the 50th percentile of present study is running lower than WHO standards, is it means that the Varanasi babies are malnourished? But according to study carried out by Shukla A (1972) on British babies, the curve for overweight babies ran parallel to and slightly above the 97th percentile. It was pointed out by Shukla et al that if the 90th and 97th percentiles are equivalent to overweight and obese weights, it may be misleading to maintain these lines as part of the upper range in reference growth curves for normal children. Dashputre A (1985) in Varanasi infants found that 50th percentile curve of the Varanasi babies run smoothly and uniformly but slightly lower than the curve of normal babies in the U.K. study. Dashputre concluded that since the survey carried out in Varanasi was on normal babies, percentile curves of the sample were lower not because the Varanasi infants were undernourished, but because reference standards were higher. And reference standards were higher because of the presence of significant numbers of overweight and obese babies and not because normal babies actually have higher weights.

In present study it was observed that the developmental milestones of the infants were normal, they were having no any past history of diarrhoea or respiratory diseases and fever even though they were having low body weight. So how they can be treated as underweight? It is a big question.

The new WHO standards are based on data from predominantly breastfed infants of a heterogeneous sample of children from developing and developed countries, whereas Indian Academy of Paediatrics (IAP) standards are based on Harvard unisex tables of height and weight for age derived from predominantly formula-fed infants of North European descent. The use of new WHO standards resulted in a higher prevalence of underweight in the first half of infancy which correlates with the 26% rate of low birth weight infants in their study. (Garza C et al.) A review of data from the district level household survey in India shows that the reported 10% rate of undernutrition in the 0-3 months age group as assessed by IAP norms is unrealistically low considering the 30% prevalence of low birth weight in the country. Thus the new WHO growth standards are more accurate than IAP standards for the period of infancy. De Onis M et al, reported that healthy breastfed infants followed the WHO standards weight for age mean z-score,

while appearing to falter on the NCHS standards from age 2 months onwards. Underweight rates increased during the first 6 months and thereafter decreased when based on the new WHO standards. Deshmukh PR et al, concluded that the prevalence of underweight by WHO standards was significantly lower (47%) compared to NCHS references (53%). Prinja et al, compared WHO chart used in ICDS (Integrated Child Development Services) programmes which is based on Harvard growth standards and concluded that the prevalence of underweight was 1.4 times higher with Harvard standards, except in first 6 months of life where it was 1.6 times higher with WHO standards. The new WHO growth standards confirm earlier observations that there is the effect of ethnic differences on the growth of infants and young children in populations is small compared with the effects of the environment. So, if the environmental condition will be increased automatically the growth will also improve. Growth tracking with the new WHO standards is far superior to the current practice of using IAP standards especially in the first six months of life. Many studies can be done to pool out correction factor to find out the difference between WHO and IAP standards. Those studies which were earlier done with using IAP standards can be reviewed with using correction factor and making it to the level of WHO standards as these standards are used globally and have advantage over

IAP standards. Professional bodies such as the IAP, The Indian Association of Preventive and Social Medicine, The Indian Public Health Association and The Indian Medical Association endorse the use of the new WHO child growth standards for the monitoring of the growth and development of infants and children in clinical and public health practice in India. LL Hui et al (2007) concluded that according to WHO study group there was a striking similarity in length among different populations, but the Hongkong Chinese toddlers are on average, shorter. Epigenetic constraints on growth coupled with the rapid epidemiological transition in Hongkong may not have allowed sufficient generations for infants and children to reach their full genetic height potential, and with it the WHO standards. A universal infant growth standard may not be appropriate across all populations.

On the basis of the above results of 1972 and 1985, in WHO standards there must be the classification of infants as underweight, normal, overweight and obese and then their normal infants should be compared with the normal of other studies and it should be judged. It is sure that their curves for normal infants will run parallel with the present study curves of normal infants. Before working on the present study, past studies of Udani, R Kumar, Raghavan etc was thoroughly reviewed. According to WHO, if our infants are coming undernourished then should they be pushed to take extra

nutrients to become giants, even if they are genetically thin and small built. After reviewing the other studies on growth pattern carried out in India, it is planned to estimate the zinc, iron and copper level in blood of infants and the nutrient intake will be calculated to find out the reason for the lower level of growth curves compared to WHO standards. But it should be remembered that if the child is happy, healthy and cheerful and having normal milestones and not showing any deficiency or clinical symptoms of malnutrition even their weight and height are low, we will never consider them as malnourished.

We are not sure about our goals in growth potentialities. Should this goal be "To produce muscle men, geniuses, giants, dwarfs or Methuselah?" Only the growth studies, on the children of our future generations will be able to answer this question. (Barness et al, 1962).

SUMMARY AND CONCLUSION

The present study is an investigation of the growth and development of infants during the first year of life. It attempts to compare the observed physical growth of infants with recommended standards and other studies carried out on Varanasi infants. Shukla, Dashputre, Udani and Raghavan has carried out extensive studies covering most of the aspects of growth and development of the Indian infants. These studies need to be supported by investigations in other regions of the country also. A cross sectional study was carried out on 200 infants (104 males and 96 females) attended paediatrics OPD in Sir Sunderlal Hospital, BHU, Varanasi by pre tested questionnaire and standard anthropometry techniques (Jelliffe,1968). The infants were suffering from diarrhoea, cold, cough, or fever at that time and their developmental milestones were normal and they don't have any past history of diarrhoea or respiratory problems. It was observed that the percentile value curves for weight and length of male and female infants were running below the reference standards but they were showing almost same pattern of growth when compared with other studies carried out on Varanasi infants. From the above findings it should be remembered that we don't have to make Indian infants giant by pushing them to extra nutrition if the child is happy, healthy and cheerful and having normal milestones and not showing any deficiency or clinical symptoms of malnutrition even their weight and height are low, we will never consider them as malnourished.

It is concluded that before declaring our infants as malnourished through comparing with reference standards even if the developmental milestones of the infants were normal, they were having no any past history of diarrhoea or respiratory diseases and fever, further researches should be done to

know how far these standards are applicable on infants in various states of India where the racial and cultural differences are one of the major factors. Therefore regional and state wise standards should be constructed.

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