Pakistan J. Sci. Ind. Res, Vol. 28, No. 3, June 1985

LOW BIRTH WEIGHT: CRITICAL REVIEW OF A NEW DEFINITION

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(Received January 3, 1985)

Cumulative frequency curves were plotted for 9248 live-born Hausa children including 6873 full term singletons to test the validity of a new definition of low birth weight put forward by Rooth. The cumulative frequency for total live births as well as full term singletons showed two clearly defined populations, one a large population showing a Gaussian distribution and the other a smaller portion falling apart from normal distribution. The mean birth weight and proportion of children weighing 2. 5 kg or below derived from cumulative frequency curves, were similar to those reported earlier. However by using Rooths definition (Mean minus 2 Standard Deviations), there was a sharp decline in the number of low birth weight children ($P < 0.001$). This new cut-off point seems to corroborate the clinical observations better than the old international definition of 2.5 kg or below.

INTRODUCTION

The first World Health Assembly in 1948 defined prematurity as any birth of 2.5 kg or less and the same definition was endorsed by WHO'S Expert Group on Prematurity (WHO, 1950). However in 1961, the Expert Committee on Maternal and Child Health, after considering a large volume of data from various countries, realized that the concept of prematurity in the earlier definition should give way to that of low birth weight (WHO 1961). Thus the international definition of low birth weight, i.e., a birth weight of 2.5 kg or less became synonymous with the cut-off point which a Finnish Paediatrician YIpo had suggested about fifty years ago (Rooth, 1980). He is supposed to have reached this figure on the basis of his vast experience saying that smaller were abnormal and down to 2.5 kg it was "within reasonable normal range" (Rooth, personal communication) on this international standard, WHO made various recommendations to set up a special care systems for low birth weight children (WHO, 1961). Establishing such a special care system poses a lot of logistic problems for developing countries, which are unable to provide even the most simple kind of medical care for their ever-increasing populations. Moreover the clinical observations of many paediatricians from developing countries have shown that a large number of these infants do fairly well without any special care [2]. The mean birth weight varies from country to country depending upon many socio-biological factors like nutritional status of the community, maternal age, parity, maternal height, diet during pregnancy and the socio-cultural environment as defined by WHO in 1978 [4]. These factors sometimes differ within various regions of the same country. Such differences among the populations of various parts of this country have already been pointed out [6, 8]. Thus to adopt a numerically fixed cut-off point for all countries will not be justified and in some cases may even be detrimental to realistic health planning. What should then be the dividing line between normal and low birth weight? If individual countries are to develop their own standards, then comparative studies will only be possible if a uniform cut-off point is agreed upon. Rooth [11] using a large amount of data from Sweden has shown that the cumulative birth weight distribution of all births in Sweden in 1973, when plotted on probit scale, showed that about 95% of all live births were part of a weight group which had a normal (Gaussian) distribution. He obtained similar results by analysing Swedish data from 1974 to 1978 and the data from six other countries, i.e. Austria, Cuba, Hungary, Japan, New Zealand and USA mentioned in WHO's "Report on Social and Biological Effects of Perinatal Mortality" [15]. He points out that cumulative distribution of birth weights for every country shows a mixture of two populations, one being depicted by a straight line and the other showing a skewness to the left. He, therefore, concludes that since in all these data, the population covered by mean minus 2 standard deviations (Mean − 2 S.D.) which in biological statistics represents 95% confidence interval, approximates a straight line, This level (Mean − 2 S.D.) should be taken as a cut-off point to calculate the low birth weight for any population. This should give a more realistic estimate of low birth weight than the old international definition.

Since this idea was quite appealing and seemed to have a more practical approach, it was decided to duplicate the experiment and test the validity of Rooth; results.

SUBJECTS AND METHODS

From the records of all children born alive in the Maternity Hospital, Katsina, between 1st January 1974 and 31st December 1981, the data about their birth weights and gestational ages were collected. In all cases the birth weight was recorded before the first feed using a metric scale. To obtain a homogeneous study of the population, all non-Hausa births were excluded. Hausa is the name of the largest ethnic group of Nigeria, which forms the majority of the population of northern states. Detailed descriptions of the Hausas and Katsina town have appeared in our earlier papers [6, 7, 8, 9, 10].

The birth weights were arranged in the intervals of 500 g and a cumulative frequency curve was plotted on probit scale as suggested by Rooth [11].

RESULTS

Fig. I represents the cumulative frequency of birth weights of 6873 full-term singleton neo-nates, whereas Fig. 2 shows the cumulative frequency curve for all 9248 Hausa children born alive during the period of study.

Each figure shows two clearly defined populations: one a large one with Gaussian distribution and the other a smaller portion, falling apart from the Gaussian distribution. The mean birth weight in Fig. I (full-term singletons) was 3.03 kg and mean minus 2 S.D was 2.08 kg, whereas the corresponding values in Fig. 2 (total live births) were 2.9 kg and 2.05 kg. Fig. I shows that 16% children were below 2.5 kg and 3.7% below 2.08 Kg. The corresponding values in Fig. 2 were 21% and 7% respectively.

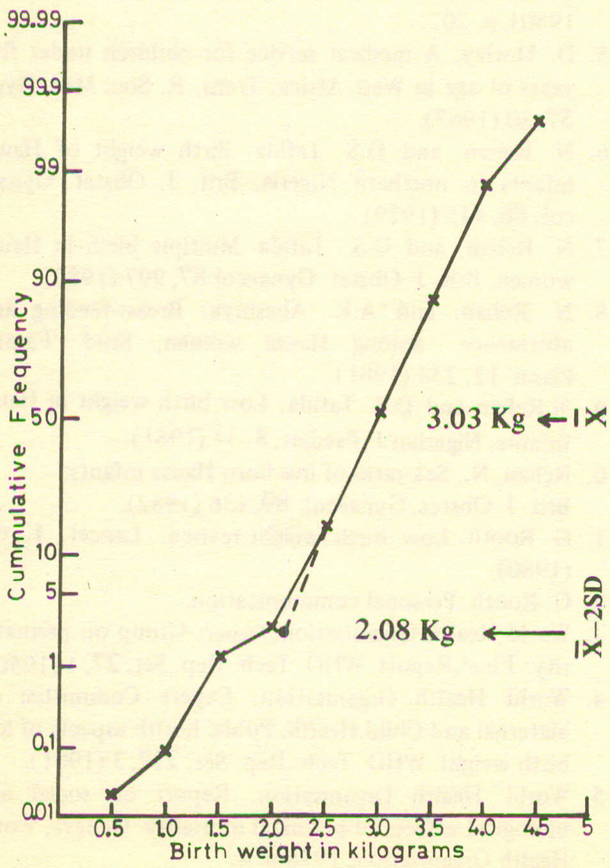

Fig. 1. Cummulative weight distribution of single ton births.

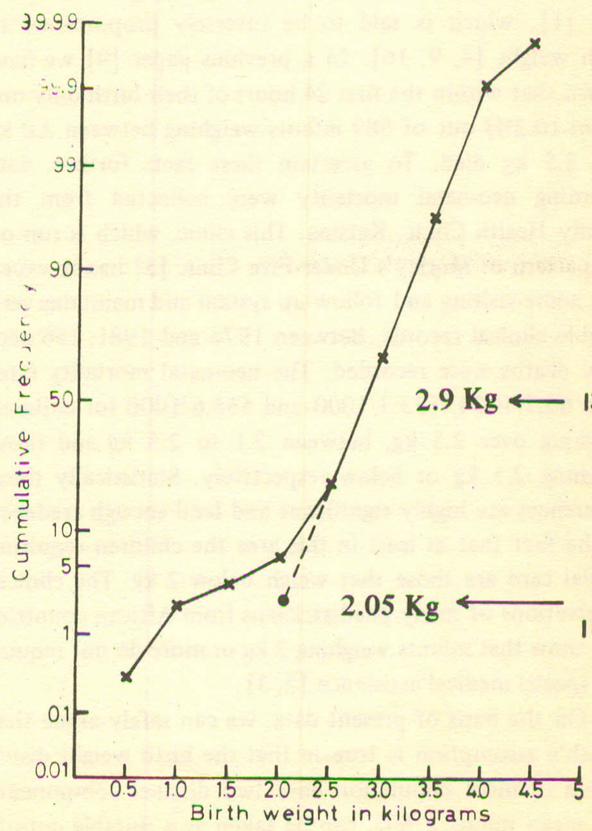

Fig. 2. Cummulative weight distribution of total line births.

DISCUSSION

The mean birth weight and the percentage of children weighing below 2.5 kg derived from Fig. 1 and Fig. 2 are almost the same as reported earlier [6, 9]. However if we follow Rooth's definition of low birth weight (Mean minus 2 S.D.), then there is a sharp decline in the incidence of low birth weight, which falls to 3.7% among full-term singletons and to 7% among all live-births, whereas in our previous reports the corresponding figures were 15.8% and 21.3% respectively [6, 9]. This great reduction in the number of infants requiring special care seems gratifying, provided these findings could be corroborated by clinical observations. In his original report Rooth [11] has not commented upon the clinical aspect of this problem. He seems to have based his arguments purely on statistical calculations. Unfortunately we too may not be able to provide any direct clinical evidence to support our point, because the majority of the children delivered at our Maternity Hospital are discharged with in 24 hours of delivery and are often lost for follow-up purposes. However, indirect evidence does support the hypothesis.

One of the major reasons put forward for providing special care for children below 2.5 kg is higher mortality rate [1], which is said to be inversely proportional to birth weight [4, 9, 16]. In a previous paper [9] we have shown that within the first 24 hours of their birth only one infant (0.2%) out of 589 infants weighing between 2.0 kg and 2.5 kg died. To ascertain these facts further, data regarding neo-natal mortality were collected from the Family Health Clinic, Katsina. This clinic, which is run on the pattern of Morley's Under-Five Clinic [5] has an excellent home-visiting and follow-up system and maintains very reliable clinical records. Between 1976 and 1981, 156 neonatal deaths were recorded. The neo-natal mortality rates were 66.7/1000, 133.3/1000 and 555.6/1000 for children weighing over 2.5 kg, between 2.1 to 2.5 kg and those weighing 2.5 kg or below respectively. Statistically these differences are highly significant and lend enough credence to the fact that at least in this area the children requiring special care are those that weigh below 2 kg. The clinical observations of many paediatricians from African countries also show that infants weighing 2 kg or more do not require any special medical assistance [2, 3].

On the basis of present data, we can safely argue that Rooth's assumption is true in that the birth weight distribution of most population have two distinct components and mean minus 2 S.D. can be taken as a suitable cut-off point for low birth weight. This can eliminate a lot of unnecessary expenditure, both of money and manpower, which is now being incurred to provide special care for groups of children who really do not need it. However further confirmation through long-term studies and data from more countries, particularly the developing ones, should still be awaited.

Acknowledgements. We are grateful to the Senior Consultant Gynaecologist, Maternity Hospital, Katsina for permitting an access to maternity records; to Dr. A.K. Bhatnagar, Paediatrician General, Hospital Katsina, for a critical review of the manuscript and Mrs. Priscilla Onwunali for secretarial help.

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