Low Birth Weight: The Indian Perspective

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The World Health Organization in 1995 on the basis of global data of perinatal and neonatal morbidity and mortality and subsequent growth and development defined two cut of points, namely, below 2500 gm to define a low birth weight (LBW) baby and below 1500 gm to define a very low birth weight (VLBW) baby. We must at this juncture clearly realize that birth weight is a crude proxy for fetal growth but at the same time it is the only measure available in this context in developing countries and that too not in all developing countries. Now currently therefore the focus from a relatively crude measure is shifting to one that defines optimal fetal development as opposed to size. Estimates indicate that half of the global LBW burden is in South Asia.

The presentation will cover the implications of low birth weight, the epidemiology in the country, the time comparison in prevalence estimates, the importance of body composition in LBW, the possibilities of some workable interventions, and finally public health issues including surveillance.

Why is LBW important? The morbidity and mortality is inversely linked to birth weight. The lower the birth weight, higher the mortality rising 3 to 4 times in newborns weighing less than 1500 gm. The subsequent development of these children is also less. The long-term growth is lower. The sinister implication that has been realized recently is the Barker’s Hypothesis or the link between low birth weight and the adult degenerative diseases of hypertension, diabetes, hyperlipidemia, and syndrome X. This slide illustrates our unpublished data documenting that lower birth weight tends to track right up till adolescence and even till adulthood. These children lack behind in weight as well as height.

Coming to the epidemiology, this is the South Asian region, where Bangladesh has the highest prevalence estimates. These are often cited in the publications like the UNICEF
publication, or the WHO publication. India is the third in ranking. These are the concise or average estimates presented for India, which I will dilate a little, while Sri Lanka and Pakistan have lower estimates. Just keep the trend in mind; I will refer to it later. What is the LBW prevalence in the country? To give a single estimate is difficult because there are a lot of regional variations - the birth weights in the Northern side of the country, are higher as compared to the Southern side. Similarly, the rich or relatively well off have higher birth weights and the rural population being relatively disadvantaged. The variation in LBW prevalence can range from 10% in the high socioeconomic strata to as high as 56% in the urban slums of Calcutta; correspondingly preterm births range from 7.1% to 22.3%. Do we have any multicentric data to give us average estimates, a ballpark figure that the policy makers would like to have? The National Neonatology Forum took an initiative in this direction. They did this exercise first in 1995 and then in 2002 where institutional data was collected first over 37,000 births and recently in almost 67,000 births throughout the whole of the country. The earlier LBW prevalence was 33.3% and now it is 31.6%, the decline in only a 7-year period is statistically significant. However, the VLBW prevalence is remaining the same while the preterm births have risen from 12.3% to 14.7%, which is about 2.4% rise, something like what the west has expected.

What is the reliability of these estimates? These could possibly be overestimates because they have been taken from the underprivileged segment and the high-risk population. Are there some other sources of multicentric data in the country? The Child Survival and Safe Motherhood program in 1995 collected 14 district-based data on over 27,000 births and the documented LBW prevalence was only 18.4%; almost half of what I told you in the preceding slide. Again, the reliability is questioned in this one because the traditionally poor performing states like Madhya Pradesh and Assam reported very low prevalence whereas the well performing states like Tamil Nadu had 25% prevalence. There is a third source of national data which has been corrected for the socioeconomic profile; the National Family Health Survey (1998-1999), which gives a prevalence estimate of 23%. Again here there may be a possibility of bias, because the newborn weight was recorded in only 30% of the 32,000 births. It was based on recall and there is a possibility that the figure might be slightly higher because you expect the higher socioeconomic population to be recording the information, but at the same time we must
keep in mind that various community surveys conducted in the country have given estimates only ranging from 8% to 19%. In summary, the ballpark figure often cited is 30% for India, initially it was 40% but 30% might be a realistic or a slight over estimate.

LBW is a heterogeneous population; a LBW newborn could either be born too small (intrauterine growth retarded or small for date, who are less than 2 standard deviations below their gestation expected weight) or they may be born too soon (preterm, less than 37 weeks gestation). In the developed countries, the overwhelming majority of the LBW babies are born preterm, but in the Indian scenario they are predominantly believed to be term intrauterine growth retarded. However, in the NNF data where gestation was more reliably recorded, two-thirds of them were growth retarded while one-third were premature. Thus prematurity, which has traditionally been relegated in the developing country scenario is also important for us. From the secular change which I showed you for the NNF data, the preterm births are rising. This is the slide comparing the intrauterine growth curve in various socioeconomic status groups. The western countries are right at the top and the higher SE status are comparable, while the slums are worst off. Thus intrauterine growth contributes in some measure to LBW. Similarly, if one compares the gestational distributions, the curve is shifted towards the left in our country as compared to the developed countries and more so in people who are socio-economically disadvantaged. To highlight that further, the pre-terms in India range from 7.1% to 22.3%, average figure of about 12.3% whereas in the developed country it is only 5% and what’s more interesting is that at 36 weeks only 2% of birth occur in the developed countries whereas in our setting these range between 3% to 12%. The maximum deliveries occur at 40 to 41 weeks in the Western setting as opposed to 39 to 40 weeks in India. The slight shift to the left of the gestation in our developing country scenario also contributes to the LBW prevalence.

It is often stated that nothing has happened to the LBW over the years, is it true? These statements are often made by comparing the ballpark figures without collecting the data from the same place over the same time. If one analyzes community and institutional based data in the latter format, the LBW prevalence has declined. The mean weight
change resulting in higher change in prevalence just ranges between 52 gms to 126 gms, which means that a substantial proportion of newborns are just sitting near about 2500 gm. Similarly, the gestation is shifted only slightly which results in bigger change in the preterm births from 21% to 16% and so forth. In our institution we measured the subscapular skin fold thickness a few years after an earlier publication. The data indicated that the triceps skin fold thickness in the children born at a poor hospital is increasing. This suggests that improvement is possible in the current scenario, and both intrauterine growth and gestation are contributing to the high LBW prevalence in India. What about the developed countries? We are often compared and it is concluded that the progress has not been good. Let us see what happened to the developed countries about 50 years ago when we were possibly at a comparable development status. There were only minor improvements in birth weight; either negligible or ranging from 40 to 100 gm but the improvement in LBW prevalence was minimal - 1% or so. Thus the change in mean birth weight was comparable to the Western setting about 50 years ago but the change in LBW prevalence was higher. Further, the differences in the LBW prevalence between the various countries in the developed world and between the black and white populations still persist.

Body composition is an important area in view of the recent association with the adult degenerative disease. Here is our 35 year longitudinal study which was published a couple of days ago in the New England Journal of Medicine. It shows that adult subjects (30 or 32 years old) who developed impaired glucose tolerance or diabetes were born slightly thin or with lower birth weight became thinner till 2 years of age and then started having a steady increase in body mass index till adulthood. It is therefore possible that the observed association between LBW and adult degenerative disease, which has been documented in several other countries, may reflect some changes, which are occurring in the body composition. Thus we should be focusing on body composition also apart from birth weight. This is an exercise we did in our institution based data and indeed if you regress the infant fat percentage with the birth weight, you see that as the birth weight rises the fat percentage rises. Thus a LBW baby has relatively less fat and if he/she gains fat steadily till adulthood, he/she might land into metabolic problem.
I will just quickly talk about a few interventions, which could improve the birth weight scenario in the country. To me the key issue is to delay the age of childbearing or to stop as far as or control as far as possible adolescent pregnancy. If you remember the earlier graph that I showed you, if you superimpose the mean marriage age, Sri Lanka with the lowest LBW prevalence has the highest mean marriage age. Adolescent pregnancies have an indirect influence because weight, height, and the nutritional status of adolescents are less. To illustrate this point further, in UP adolescent pregnancies, the LBW prevalence is 67% and preterm prevalence 33% - thus we should attack adolescent pregnancy first.

Often we advice or even public health actions consider giving food supplementation programs. Now does giving food supplementation to a pregnant women result in an improvement in birth weight. One does not deny the fact that food is necessary - a pregnant women needs food and adequate rest but over and above that, as a public health program, if we give food supplementation what happens. The Cochrane systematic documents that balanced protein energy supplementation in pregnancy barely results in an improvement of 30 gm in the birth weight with no improvement in length. Possibly we are just putting in fat in the baby, which may or may not be good. If you give high protein diet, which is often advised in pregnancy you actually reduce the birth weight. Also, the food supplement programs, which are going on in ICDS or other ones, do they reach the beneficiary? Only 3% women actually eat more than three-fourth of what they are supposed to eat, and 75% of them do not even receive the food supplements that are intended are for them. What about magic pills or magic micronutrients to improve the LBW scenario? Do they work? The systematic reviews here again do not document a beneficial effect of iron and folate, and zinc. But we are talking here of only birth weight as an outcome, we are not considering anemia as an outcome if we give iron and folate supplementation; that is a functional outcome may be different from size (birth weight) outcome. An important issue in our country is the practice of tobacco chewing or passive smoke from the chuhlas in the villages.

Now finally touching on what are the public health issues arising for a policy maker, a clinician, and for us. An important meeting was recently held in Geneva in November,
which I attended where the international thinking has also started shifting away from whether one birth size fits all populations, and all socioeconomic people. The international thinking is now shifting towards functional development or optimal fetal development as opposed to size. However, it important for us to get an estimate of the realistic LBW prevalence in the country and the time trends through surveillance. What are the possible methods of surveillance, especially in our resource starved setting. One is the NNF survey model, which the Indian Council of Medical Research is supporting. National surveys like the NFHS also provide additional data with scant additional expenditure. Simultaneously, we need to explore the possibility of setting up sentinel surveillance sites. ICDS is also a possibility but how many births are recorded there? Recording of birth weights has been a problem area and I don’t know whether it can be sorted out or not.

An important lesson from the review is that a mix of sustainable interventions and general overall development like socioeconomic status, sanitation, and delayed adolescent pregnancy are likely to have a bigger impact than isolated vertical magic pill supplementation or other food supplementation program efforts. Body composition should be focused on in the Indian setting because our newborns have relatively more fat as compared to the Caucasians. In contrast to developed nations, we have predominately growth retarded babies and since most of the nutrients are transferred to the baby in later gestation, we need to evaluate the western recommendations of nutrient supplementation in all LBW, irrespective of the gestational period. To me these appear to be important issues currently.