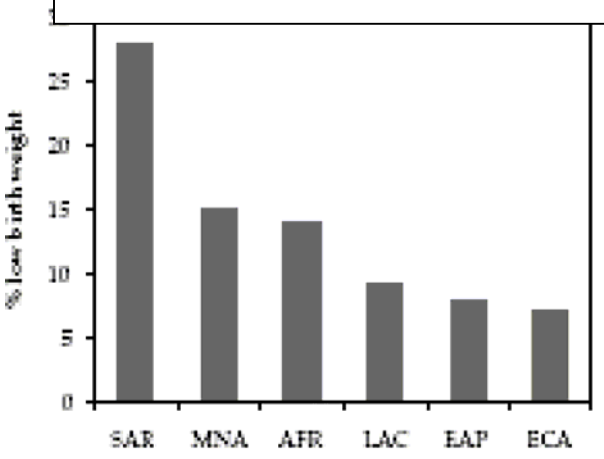
7.4 LOW BIRTH WEIGHT AND ITS CONSEQUENCES

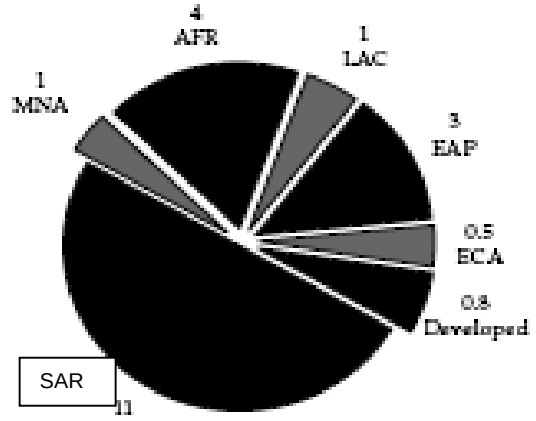
Figure 7.4.1 Prevalence of low birth weight



Source: Reference 7.4.14

Low birth weight is associated with high neonatal and infant mortality, lower trajectory of growth during childhood and adolescence, and increased risk of non-communicable diseases during adult life. Global data on low birth weight indicate that

Figure: 7.4.2 Burden of LBW in regions



Source: Reference 7.4.14

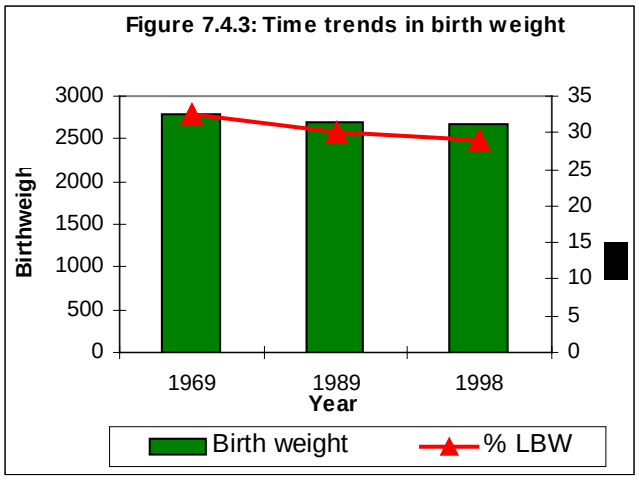
Table 7.4.1 % Low birth weight in 1984-2007

Countries	% Low birth weight	
	1984	2007
France	5.6	7
Swedon	4	4
U.k	7	8
Brazil	9	8
Guatemala	17.9	12
Mexico	11.7	8
Egypt	7	12
Tunisia	7.3	7
China	6	4
India	30	30
Indonesia	14	9
Japan	5.2	8

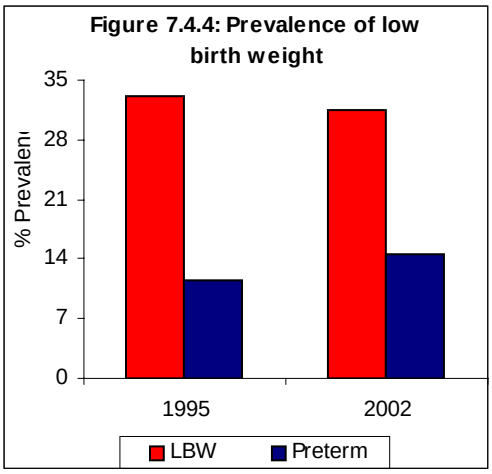
Source: Reference 7.4.13

The prevalence of low birth weight is highest in the South Asian region (Figure 7.4.1). As the region is populous nearly half of global low birth weight infants are born in this region (Figure 7.4.2). Inspite of ongoing efforts to reduce low birth weight there has not been a substantial reduction in low birth weight rate in any country in the last three decades (Table 7.4.1)

India, the most populous country in South Asia shares a very high prevalence of low birth weight (LBW). Currently nation-wide data on birth weight in different states and districts is not available because a majority of births occur at home and these infants are not weighed soon after and these infants are not weighed soon after birth. Estimates based on available data from institutional deliveries and smaller community- based studies suggest that nearly one-third of all Indian



Source: Reference: 7.5.7



Source: Reference: 7.5.6

infants weigh less than 2.5 kg at birth (Figure 7.4.3 and 7.4.4). There has hardly been any change in birth weight trends in the past three decades. There are differences in birth weight between economic groups; with incidence of low birthrate is highest in the low income groups (Table 7.4.2). A gender difference has been noted in mean birth weights, with female infants tending to weigh less than male infants.

Table 7.4.2: Birth Weight and Socio-economic Status

	Poor Income	Middle Income	High Income
Age (years)	24.1	24.3	27.8
Parity	2.41	1.96	1.61
Height (cm)	151.5	154.2	156.3
Weight (kg)	45.7	49.9	56.2
Hb (g/dl)	10.9	11.1	12.4
Birth weight (kg)	2.70	2.90	3.13

Source: Reference 7.5.8

Birth weight is influenced by the nutritional and health status of the mother. Numerous studies have clearly established that there is a good correlation between birth weights and maternal weight; poor pregnancy weight gain and maternal undernutrition are associated with low birth weight (Table 7.4.3).

Table 7.4.3 Effect of maternal body weight on birth weight

Mother weight (kgs)	No.	Mean birth weight (gm)
< 45	128	2639.6
45-54	251	2779.1
>=55	96	3009.41
Total	475	2788.0

Source: Reference: 7.4.8

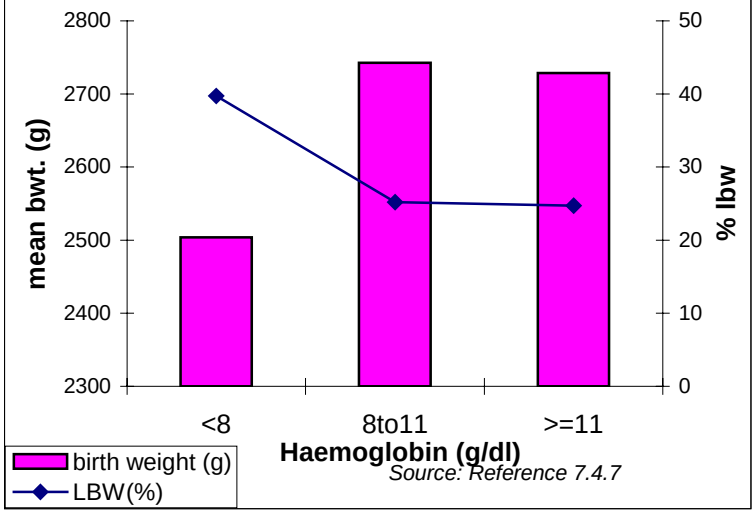
Text Box no. 7.4.1

- During the last three decades there has not been any major reduction in the proportion of low birth weight babies.
- In most states there has been substantial reduction in IMR even though there is no change in birth weight.
- Reduction in low birth weight is not an essential prerequisite for reduction in IMR

A significant reduction in birth weight has been reported in anaemic women; low birth weight rate doubles when Hb levels fall

below 8 g/dl (Figures 7.4.5). This is perhaps partly due to anemia per se and partly due to poor maternal nutrition and antenatal care in anemic women. There has not been any substantial decline in LBW deliveries over the last three decades. Some factors, which have significant influence on birth weight, such as the parents' build, are not amenable to short term corrective interventions. On the other hand, factors like anaemia, pregnancy induced hypertension and low maternal weight gain during pregnancy can be corrected; effective management of these problems could result in substantial reduction both in pre-term births and birth of small for date neonates. The National Rural Health Mission attempts to improve the coverage, content and quality of antenatal care and bring about a convergence with the efforts of the ICDS system to provide food supplements to improve maternal nutrition. Effective implementation of these interventions could result in some reduction in low birth weight rates.

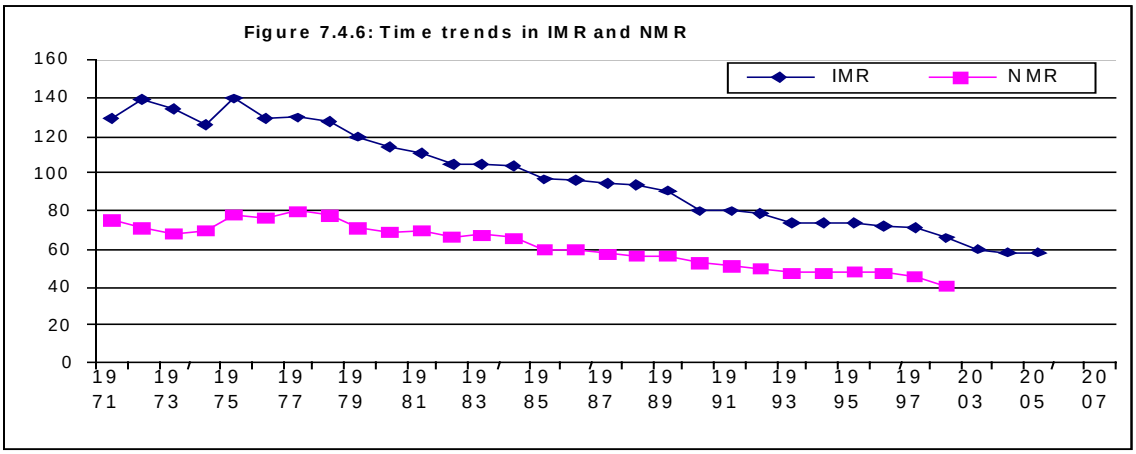
Figure 7..4.5: Effect of maternal Hb on birth weight



Source: Reference 7.4.7

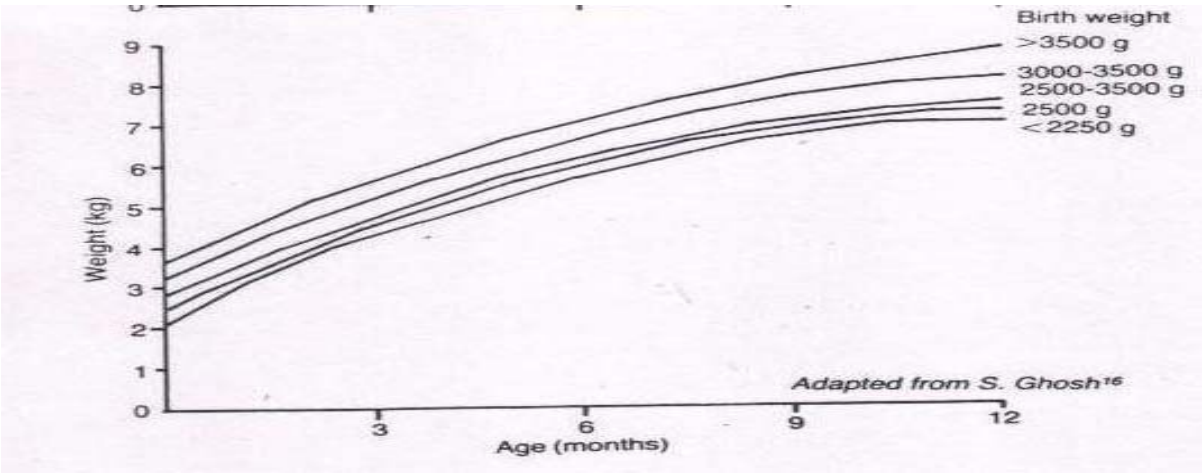
Studies on effect of birth weight on neonatal mortality carried out by Ghosh et al showed that majority of LBW babies in India are born at term but have intra uterine growth retardation; their survival chances are much better than the pre-term babies with similar birth weight. The demonstration that most term IUGR babies will survive they are exclusively breast fed, kept warm and free from infection, paved way for efforts to provide essential newborn care in primary health care settings. Inspite of the fact that there has been no decline in the

Figure 7.4.6: Time trends in IMR and NMR



Source: Reference 7.4.9

Figure 7.4.7: Growth in relation to birth weight



Source: Reference 7.4.3

prevalence of low birth weight, the country has achieved substantial decline in IMR and some reduction in NMR (Figure 7.4.6). In Kerala where nearly all deliveries occur in hospitals providing essential intrapartum and neonatal care, neonatal mortality rates are comparable to the developed countries inspite of the fact that over 20% of neonates are of low birth weight.

Under NRHM efforts are being made to:

- screen all pregnant women for undernutrition and anaemia and provide appropriate interventions so that LBW associated with these problems can be reduced ;
- advise at-risk individuals to have delivery in institutions, which can provide optimal intrapartum and neonatal care and improve neonatal survival even among low birth weight neonates ;
- have the anganwadi worker check the birth weight of babies as soon after delivery as possible in all home deliveries and refer those neonates with birth weight less than 2.2 kg to hospitals where there is a pediatrician available. So that these high-risk neonates get adequate care and there is reduction in neonatal mortality.

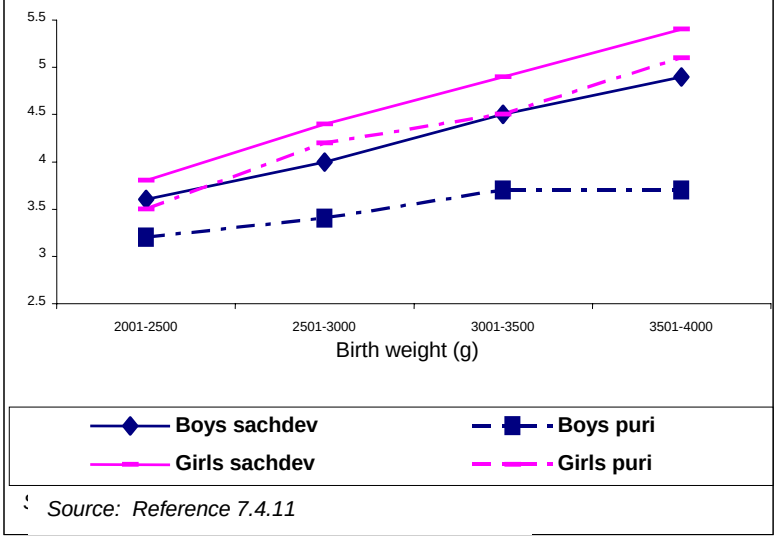
If these interventions are fully operationalised it will be possible to achieve some reduction in low birth weight and substantial reduction in the neonatal mortality rate within a short period.

With improving survival, the issues pertaining to nutritional and health status of surviving children are becoming major concerns. Studies carried out by Ghosh and co-workers in the seventies and later confirmed by other investigators have

shown that LBW children have a low trajectory for growth in infancy and childhood (Figure 7.4 7). The high low birth-weight rate in India is at least part responsible for the undernutrition in childhood and adolescence.

It is however important to remember that the seeds for obesity in adult life might also be sown during the intrauterine period. Studies on anthropometric parameters of neonates in a Delhi hospital showed that over the last two decades the birth weight of neonates had remained unaltered but there was an increase in fat fold thickness in all gestational age and birth weight categories (Figure 7.4.8). The implications of these findings are not clear; an increase in adiposity in neonates is a matter of concern and these children should be carefully followed up.

Figure7.4.8: Time trends in subscapular skinfold thickness (mm)



Source: Reference 7.4.11

Long-term consequences of low birth weight

It is possible that the risk factors of obesity in adult life might be present decades earlier. The thrifty gene hypothesis proposes that populations who had faced energy scarcity over millennia may evolve so that majority have thrifty gene, which conserves energy. If this population gets adequate or excess energy intake, they lay down fat, develop abdominal obesity, insulin resistance, which may progress to diabetes, and incur risk of hypertension and CVD. Barker's thrifty phenotype hypothesis shifts the evolution of thriftiness to intrauterine period. If this hypothesis of foetal origin of adult NCD is correct; Indians with one-third low birth weight rate may be at higher risk of metabolic syndrome because one third of them are born with LBW. Over the last decade several investigators have explored these possibilities.

Gupta et al showed that both the low birth weight neonates with intrauterine growth retardation and the high birth weight neonates (many of whom are born to mothers with IGT or gestational diabetes) may develop insulin resistance and are at risk of developing metabolic syndrome at later life.

Table 7.4.4: Birth weight, plasma glucose and insulin concentrations in 4-year old urban children

Birth weight (kg)	Number of children	Plasma glucose (mmol/l) at 30 min	Plasma insulin (pmol/l) at 30 min
=< 2.4		8.1	321
-2.6	36	8.3	337
-2.8	36	7.8	309
-3.0	44	7.9	298
=>3.0	42	7.5	289
All	43	7.9	310
P for trend	201	0.01	0.04

Source: Reference 7.4.12

Yajnik and co-workers in Pune explored the relationship between low birth weight and glucose. Insulin metabolism using oral glucose tolerance test (OGTT) in 477 children born in KEM hospital, Pune. They found that Indian neonates were small because they had poor muscles and small abdominal viscera. These neonates however had conserved their subcutaneous fat. At 4 years of age plasma glucose and insulin concentrations 30 minutes after glucose load were inversely related to birth weight (Table 7.4.4) but directly related to current weight and fatfold thicknesses. The relationship between glucose / insulin and birth weight was independent of current weight. Thus poor intra-uterine growth, but relatively excess growth later ('obesity') was associated with metabolic endocrine abnormalities, which could lead to diabetes in adult life. Adolescent obesity is a well-documented entity in both urban and rural areas and may form the stepping-stone for adult obesity and increase risk of noncommunicable disease risk.

Bhargava and co-workers have shown the adverse effect of life styles of urban Delhites in the nineties which rendered even low middle-income adults who were undernourished in infancy, childhood and adolescence, one to develop obesity-both general and abdominal hypertension and diabetes by the time they are thirty (Table 7.4.5). The study demonstrated the potential adverse consequences of rapid change in the dietary habits and life style of urban population in Delhi in the last decade.

These data suggest that the possibility that low birth weight and undernutrition in childhood may predispose to overnutrition and NCD in adult life, providing yet another rationale for energetic interventions to reduce low birth weight and undernutrition in childhood. Early detection and correction of undernutrition until children attain appropriate weight for their height is essential to promote optimal growth, nutrition and health.

Table 7.4.5: Time Trends in nutritional status of Delhi cohort

	Male		Female	
Age	No.	Weight (Kg)	No.	Weight (Kg)
At birth	803	2.89±0.44	561	2.79±0.38
2 yrs	834	10.3±1.3	609	9.8±1.2
12 yrs	867	30.9±5.9	625	32.2±6.7
30 yrs	886	71.8±14.0	640	59.2±13.4

Source: Reference 7.4.2

Table 7.4.6: Current Status of Delhi cohort

Characteristic	Men		Women	
	No.	Value	No.	Value
Weight (Kg.)	886	71.8±14.0	640	59.2±13.4
Height (m)	886	1.70±0.06	638	1.55±0.06
BMI	886	24.9±4.3	638	24.6±5.1
Waist:Hip ratio	886	0.92±0.06	639	0.82±0.07
BMI>_25	886	47.4	638	45.5
BMI>_23	886	66.0	638	61.8
Central Obesity (%)	886	65.5	639	31
Impaired GTT	849	16	539	14

Source: Reference 7.4.2

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