Essay 5

Low birth weight in the Republic of Yemen: current situation, causes, and impact on later life

by

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Introduction

The Republic of Yemen, being one of the least developed countries in the world (number 150 out of 177 countries in the Human Development Index)\(^1\,^2\) and the poorest Arabian nation,\(^1\) is heavily affected by large numbers of low birth weight (LBW) infants (< 2500 g).\(^2\,^3\) According to UNICEF, WHO and the most recent national survey of 1997, the LBW rate is 32%.\(^2\,^4\) This places Yemen into the group of the four countries with the highest LBW rates (≥ 30%) worldwide, i.e. Bangladesh (36%), India (30%), Sudan (31%) and Yemen itself.\(^2\,^4\) With an annual number of 845000 births each year, this translates into 270000 neonates per year who are affected by LBW.\(^2\) To put it into a global perspective: this is a third of the total number of LBW infants who are born each year in all industrialized countries together.\(^2\)

Due to the fact that most births (73%) take place without skilled attendance and that 92% of all newborns are not weighed after birth, this figure carries a high degree of uncertainty.\(^2\,^4\) Still the extraordinarily high percentage indicates that LBW is indeed a serious problem in the country. Other reports give LBW rates of 19% and 35%, but the validity of these data must be questioned even more.\(^5\,^6\) In any case, LBW rates do not seem to have decreased over time and might even have increased. Because in general LBW infants have a higher risk of morbidity and mortality throughout infancy, childhood and their later life,\(^3\,^7\,^8\) it seems appropriate to analyze the reasons for this high incidence of LBW in Yemen, and to examine more thoroughly its effects on the nutritional and health profile of children and adults in the country.

Proximate and distant causes

The nutritional status of Yemeni women is a major area of concern. In general, short (indicator for a rather long-term effect) and undernourished (indicator for a rather short-term effect) women have a higher risk of getting LBW infants.\(^3\,^7\,^8\) If one looks at short stature (< 145 cm) in Yemen, the prevalence among women of childbearing age is 8.7%.\(^4\,^9\) This is only topped by some Asian (India, Bangladesh, Nepal) and Latin American (Guatemala, Peru, Bolivia) countries.\(^9\) If one looks at the body mass index (BMI) and takes a cut-off value of 18.5 kg/m\(^2\) for underweight, then Yemeni women have a prevalence of 26%, only topped by Eritrea, Nepal, India and Bangladesh, all countries with high rates of LBW, too.\(^2\,^4\,^9\) Thus it appears that the poor nutritional status of pregnant women is a major determinant for the high incidence of LBW in Yemen. Not surprisingly, maternal underweight is highest in rural areas (28% vs. 16% in urban communities), among the poor and the illiterate (27% vs. 15% in the literate).\(^4\)

\(^{\text{3}}\) LBW is caused either by prematurity (< 37 weeks of gestation), intrauterine growth retardation (< 10\(\text{th}\) percentile for gestational age) or both. Disaggregate data for these causes are not available for developing countries, because gestational age is not as easily obtainable as weight under the prevailing circumstances.
Anemia as one possible consequence of iron deficiency is very prevalent among pregnant women (29-47.5%), and has been described as a risk factor for LBW in studies from Yemen. Only 21% of pregnant women actually receive iron supplements. Concerning other micronutrient deficiencies which might have an impact on birth weight, the data are rare. Yemen was considered to have a severe iodine deficiency problem before 1996. After introduction of universal salt iodization, a survey, reported in 2000, showed quite low prevalences of iodine deficiency. It remains to be seen whether this improvement will have any effect on the level of LBW in the future. Data on zinc are not available at all.

Malaria is not uncommon during pregnancy in Yemen, so it contributes to some extent to the incidence of LBW. HIV/AIDS, another known risk factor for LBW, is still rare in the Yemeni society (at least according to official numbers). Data on syphilis in pregnant women are not available. Urinary tract infection was reported in one study as a significant risk factor for LBW.

In addition, Yemeni women have one of the highest fertility rates in the world (5.9 which equals rank 16), being higher by two more births per woman in the rural than the urban communities. This implies that a large number of women (37%) have birth intervals less than the recommended 24 months, and that many (up to 58%) get pregnant for the first time below the age of 20 years. Again, these risk factors are found more often among the rural poor and less educated. Taken together, these factors (too early, too frequent, too many pregnancies) contribute substantially to the high number of LBW infants - and to the poor nutritional status of the mothers as well (see above).

Reliable literature for the custom of down-eating during pregnancy, to keep the fetus small and thus to prevent delivery complications, could not be found for the Yemeni society, but a potentially similar custom, related to the Islamic faith in the country, was examined in one study. During Ramadan, eating and drinking is prohibited during daytime. Possibly this religious tradition could impair maternal and fetal well-being, thus increasing the incidence of LBW after Ramadan. In a study from Yemen, it could be demonstrated that this was not the case. This was explained by the fact that first pregnant women do not need to follow these rules strictly, and that second the women get more nutritious food in the late evening to make up for the loss during daytime.

On the Arabian peninsula and at the Horn of Africa there is the special custom of khat (or qat) chewing (a mild psychostimulant) which was originally confined to the male population, but is nowadays also used by women. The Yemeni society is particularly affected in that about 70-90% of men and 50-60% of women chew khat. Up to 40% of pregnant women report khat chewing during pregnancy,
especially the poor, less educated and rural women. Some authors reported lower birth weights in infants of khat-chewing mothers, but this view has been contested by others. Regardless of the direct effect of khat chewing on the weight of the offspring, khat consumption places an enormous financial burden on the families: it amounts to 28% of family income, a value which remains stable even during periods of economic hardship. In contrast, for purchasing food 41% of the income is spent, but is likely to be reduced during periods of increased poverty. Thus khat consumption competes directly with the provision of food, thereby contributing to malnutrition within the families, including young and pregnant women and consecutively their offspring.

The geography of Yemen may contribute to the high rate of LBW, too. The western part of the country is located at a high altitude, often more than 2000 m above sea level. A significant proportion of the people lives there, e.g. in the capital Sana’a and the surrounding area. Reports from other parts of the world could demonstrate that high altitude negatively influences birth weight.

Until 1990, Yemen was affected by a severe civil war, which added to poor nutrition and social insecurity. Thus at least in part this may have contributed to a poor nutritional status of pregnant women during the nineties of last century with consecutively a high rate of LBW in the offspring. On top of this, the health system is generally described as very poor. In part this is reflected by a rather low antenatal care attendance rate during pregnancy (41%) which may contribute to the level of LBW as well.

Typical underlying causes of LBW are widespread poverty, little or no maternal education, resulting poor knowledge about nutrition and health, rural residence and low social status, especially of women. In Yemen, about 42% of the population live below the national poverty line, and 18% cannot even afford the daily nutritional requirements. In addition, 25% are economically vulnerable and live near the poverty line. Poverty is typically a rural phenomenon, with 83-87% of the poor living there. The educational situation for women is not good either. Only 33% of women have some education, compared to 67% in men, hence there is also quite little knowledge on good nutritional and health care practices. In addition a high physical work load of women (up to 16 hours a day) contributes to poor maternal health and an increased risk of LBW. These factors are closely interconnected, thus it is very difficult to discern the importance of a single factor precisely.

Implications for child nutrition and health
With a neonatal mortality rate (NMR) of 37/1000 live births, Yemen belongs to the countries with a high NMR.\textsuperscript{2,25} No major decline has been noted over time which is partially attributed to the persistently high LBW rate, but also to poor, often non-existing neonatal health services throughout the country.\textsuperscript{5,18} This is documented by the low rate of deliveries with skilled attendance (27\%\textsuperscript{2,4}) and an absent rural-urban difference in NMR,\textsuperscript{4,6} which in contrast is present in the infant (IMR) and under-five mortality rates (U5MR).\textsuperscript{4,26} Although not well documented for the whole country, it is reasonable to assume that the high incidence of LBW contributes to this NMR substantially.\textsuperscript{26,27} The same probably holds true for the high number of stillbirths (stillbirth rate 17/1000 live births, perinatal mortality rate 44/1000 live births, early NMR 27/1000 live births).\textsuperscript{28} High rates of neonatal infections, facilitated by LBW,\textsuperscript{5,6,18,26} and low rates of initiating exclusive breast feeding\textsuperscript{2,29,30} contribute to the picture.

IMR is high in Yemen (76/1000 live births)\textsuperscript{2,4} and is caused partially by persistent low weight, but also the low rates of exclusive breast feeding (12\% for the first 6 months)\textsuperscript{2,29,30} and poorly functioning health services.\textsuperscript{5,18} Although the data are not longitudinal but cross-sectional, the fact that 75\% of the children under five die during infancy supports this view, as during the first year of life catch-up weight gain for LBW is not sufficient usually. As in neonates, infectious diseases are frequent causes of death in these malnourished babies.\textsuperscript{5,17,26,29,31}

In children under five the prevalence of moderate and severe underweight is 46\%, of moderate and severe stunting 53\%.\textsuperscript{2,4} Again rural areas are most affected (50\% vs. 36\% in urban areas; worst in the mountainous region, 52\%).\textsuperscript{4} These figures are among the highest in the world. Other countries with high prevalence rates of these indicators also have high rates of LBW, like Sudan, India, Bangladesh or Nepal.\textsuperscript{2} In addition most of these countries have high rates of U5MR – Yemen stands at 102/1000 live births - which makes it very likely that the effect of LBW persists throughout childhood,\textsuperscript{2} augmented by frequent infections like malaria, pneumonia or diarrhoea and poor nutrition,\textsuperscript{3,1} combined with poorly performing health systems. The long-term effect on physical and mental development and educational performance has not been examined in Yemen yet. But there are several reports which show high levels of malnutrition even among school-aged children.\textsuperscript{32,33} In these, besides poor nutrition several infectious diseases like intestinal parasitoses contribute to the situation.\textsuperscript{33}

In the wealthier, urban parts of society a rising prevalence of overweight and obesity in children is reported, although still at low levels.\textsuperscript{34} This is an indication that nutrition transition might only play a significant role in the wealthier segments of this age group.
Impact on adult nutrition and health

Recent reports clearly show that malnutrition is widespread in the Yemeni adult society.\textsuperscript{4,5,18} Especially rural areas are affected where the majority (74%), mostly the poor, illiterate people, live. Besides widespread household food insecurity, the consumption of \textit{khat} contributes much to this situation.\textsuperscript{5,18} As mentioned already above, the rate of underweight in adults, here in women, is very high (26%).\textsuperscript{4} Data on the weight of men are not so readily available. The rates of malnutrition among women are even higher than those of LBW in female neonates (32% : 2 = 16%). This indicates that LBW has a strong effect via the intergenerational malnutrition cycle, but other factors like poverty, poor nutrition, illiteracy, low social status, cultural customs, work load and so forth add to adult malnutrition during lifetime.\textsuperscript{5,18} These malnourished women carry a high risk of death in relation to pregnancy which is demonstrated by an officially reported maternal mortality ratio of 570/100000 live births.\textsuperscript{2,35} Other sources even give a figure of 1000-1400/100000 live births.\textsuperscript{36,37}

During recent years, some reports on adult obesity, diabetes, coronary heart disease and hypertension have been published from Yemen.\textsuperscript{38-40} These reports state a rising, but still quite low prevalence in comparison to the regional figures. Among the Arabian countries, Yemen has the lowest prevalence of overweight (15%) and obesity (4%), and only Bangladesh, Cambodia, India, Nepal and countries from sub-Saharan Africa have lower figures.\textsuperscript{38} For the age range 30–64 years the age-standardized prevalence was 9.75% for diabetes and 17.1% for hypertension.\textsuperscript{40} But all the reports from Yemen are from urban areas which have most likely a very different prevalence compared to the majority of people living in rural areas. And especially the figures on female obesity may still be biased upwards by cultural preferences as obese women are considered to be more beautiful than slim ones in many affluent parts of Arabian societies.\textsuperscript{41} None of these reports gives figures in relation to a birth history of LBW. Thus it is very difficult to ascertain whether the high rate of LBW has already had a relevant impact on adult chronic non-communicable diseases in Yemen as described in the epidemiological link between LBW (as an indicator of fetal programming) and adult chronic, non-communicable disease, first put forward by Barker and colleagues,\textsuperscript{42,43} and later verified by other groups from Europe and the United States.\textsuperscript{44,45} It rather appears that people suffer more from the consequences of longstanding malnutrition which is indicated also by a quite low life expectancy of 62 years in Yemen, which is equal for both sexes.\textsuperscript{2}
Conclusion

It appears that the high LBW rate is caused mainly by maternal, intergenerational malnutrition, high fertility rates, early and too frequent pregnancies, household food insecurity, illiteracy, low social status and poverty as such. The main impact on neonatal, infant and child health and nutrition is exerted via pathways of undernutrition, resulting in high rates of morbidity and mortality. Longitudinal data on the impact on adult health and nutrition are scarce, but in the case of women the high rate of malnutrition seems to be related at least in part to being LBW at birth. Chronic, non-communicable diseases of adults do not play a major role yet, and the nutrition transition has not taken place at a large scale yet. If this will become more prevalent, then a major impact of LBW on adult health status is to be expected. At present, it appears that the major task would be to break up the intergenerational cycle of malnutrition and to improve fertility patterns and the quality of health services so that healthier women will deliver healthier, heavier babies. This will require not only medical and economic changes, but even more so changes within the very fabric of society.
References


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