

Global Health for the Paediatric Endocrinologist

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I am delighted to present this new chapter in the 2016 edition of the Yearbook. The creation of GPED, as well as increasing numbers of training programmes, publications and awards directed at paediatric endocrinologists in low-income countries, reflect the commitment of regional societies in paediatric endocrinology and diabetes towards improving global paediatric endocrine care. It seems only natural to acknowledge the interest of the paediatric endocrine and diabetes community for global health with a section of the Yearbook dedicated to this topic.

How does paediatric endocrinology and diabetes fit in the global initiatives?

Noncommunicable diseases

Boerma T, Mathers C, AbouZahr C, Chatterji S, Hogan D, Stevens G; World Health Organization

In: *Health in 2015: from MDGs to SDGs*

WHO Press, World Health Organization, Geneva, Switzerland

<http://www.who.int/gho/publications/mdgs-sdgs/en/>; ISBN 978 92 4 156511 0

Noncommunicable diseases (NCD) are included as a specific target of the Sustainable Development Goals (SDG) (reducing premature mortality from NCDs by one third) and are part of several other health targets [1]. In 2012, an estimated 52% of all deaths under age 70 were due to NCDs, and two thirds of those deaths were caused by cardiovascular diseases (CVD), cancer, diabetes and chronic respiratory disease (CRD).

Premature mortality rates due to NCD declined globally by 15% between 2000 and 2012. A major factor is the decrease in CVD mortality, driven by population-level blood pressure improvements, declines in tobacco use and advances in medical treatment. Declines have been greater in high-income countries than in the low- and middle-income countries.

Achieving the SDG target for NCDs will require major interventions to deal with a context characterised by ageing populations, rapid unplanned urbanisation and globalisation of markets that promote inactivity and unhealthy diets, and will focus on the development and implementation of strong national plans that emphasise prevention and treatment access for all.

The United Nations (UN) Political Declaration on NCDs adopted at the UN General Assembly in 2011 and the UN Outcome Document on NCDs adopted at the UN General Assembly in 2014 include a roadmap of commitments made by governments.

The WHO Global Action Plan for the Prevention and Control of NCD 2013–2020 endorsed by the World Health Assembly in May 2013 sets priorities and provides strategic guidance on how countries can implement the roadmap of commitments. The Global Action Plan includes voluntary targets that focus on risk factors such as tobacco use, high blood pressure, high salt intake, obesity and physical inactivity, as well as targets on access to essential NCD medicines and technologies, and drug therapy and counselling.

In September 2000, the Heads of State signed the UN Millennium Declaration, which contained eight goals. Millennium Declaration Goal 4 (MDG 4) was to reduce the under-five (U5) mortality rate by two-thirds between 1990 and 2015. In 2015, the UN convened to prepare a post-2015 development agenda. It contains 17 very ambitious SDG that cover most aspects of sustainable living. Importantly, while MDG did not focus specifically on NCDs, these are now a specific SDG target and the goal is to decrease by one-third mortality due to CVD, cancer, diabetes and CRD, which account for two-thirds of NCD mortality.

Paediatric endocrine conditions and type 1 diabetes mellitus (T1DM) represent, of course, a very small part of the global NCD mortality. However, the inclusion, for the first time, of NCD in the SDG is

important for two reasons: first, it officially acknowledges the importance of NCDs in the overall strategy for better health. Second, it specifically mentions type 2 diabetes mellitus (T2DM) (which is expected to be highly prevalent in low-income settings over the next 20 years) and its predisposing factors (excess body weight and insufficient physical activity, which have their roots in childhood and adolescence).

The target for NCD is mostly discussed under SDG 3 (to “ensure healthy lives and promote wellbeing for all at all ages”) [1]. As capacity in paediatric endocrinology and diabetes is increasing, we are starting to understand the consequences of suboptimal management of paediatric endocrine conditions and diabetes in low-income settings. It is suggested that paediatric endocrinologists should ride the SDG wave and participate to the global effort of betterment of health in children by advocating for better recognition, diagnosis and treatment of paediatric endocrine conditions and diabetes.

Report of the commission on ending childhood obesity

World Health Organization, Geneva, Switzerland

WHO Press, World Health Organization, Geneva, Switzerland

<http://www.who.int/end-childhood-obesity/final-report/en/>; ISBN 978 92 4 151006 6

The prevalence of infant, childhood and adolescent obesity is rising around the world. Although rates may be plateauing in some settings, in absolute numbers there are more children who are overweight and obese in low- and middle-income countries than in high-income countries. The SDG, set by the UN in 2015, identify prevention and control of NCD as core priorities. Among the NCD risk factors, obesity is particularly concerning and has the potential to negate many of the health benefits that have contributed to increased life expectancy.

The Commission on Ending Childhood Obesity was established in 2014 to review, build upon and address gaps in existing mandates and strategies. It has developed a set of recommendations to successfully tackle childhood and adolescent obesity in different contexts around the world.

Many children today are growing up in an obesogenic environment that encourages weight gain and obesity. Energy imbalance has resulted from the changes in food type, availability, affordability and marketing, as well as a decline in physical activity, with more time being spent on screen-based and sedentary leisure activities. The behavioural and biological responses of a child to the obesogenic environment can be shaped by processes even before birth, placing an even greater number of children on the pathway to becoming obese when faced with an unhealthy diet and low physical activity.

The Commission acknowledges that no single intervention can halt the rise of the growing obesity epidemic. Addressing childhood and adolescent obesity requires consideration of the environmental context and of three critical time periods in the life-course: preconception and pregnancy; infancy and early childhood; and older childhood and adolescence. In addition, it is important to treat children who are already obese, for their own wellbeing and that of their children.

The Commission calls for governments to take leadership and for all stakeholders to recognise their moral responsibility in acting on behalf of the child to reduce the risk of obesity. The recommendations are presented under the following areas: promoting intake of healthy foods, promoting physical activity, preconception and pregnancy care, early childhood diet and physical activity, health, nutrition and physical activity for school-age children and weight management.

Paediatric endocrinologists are commonly asked to see overweight and obese children for evaluation, weight management and treatment of metabolic complications. This is due: 1) to the widely held – but inaccurate – belief that endocrine conditions are a frequent cause of excessive weight gain, and 2) to the correct assumption that weight excess has metabolic consequences (including T2DM) that are relevant to the practice of paediatric endocrinology. The recognition by the WHO of the importance of obesity in paediatrics, and the inclusion of paediatric obesity among the major risk factors for NCD, which are now included as targets in the recently released SDG, are positive and important developments. As capacity in paediatric endocrinology is increasing in low-income settings, there is an opportunity for paediatric endocrinologists, together with other stakeholders (media, patients and families, health authorities, nongovernmental organisations [NGO], family doctors, paediatricians and allied health professionals), to play a major role in supporting government policies that will promote healthy lifestyles for children and adolescents in their country. I encourage GPED members to join this fight and to become advocates for change in their own countries.

The impact and successes of a paediatric endocrinology fellowship program in Africa

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Background: The prevalence and distribution of endocrine disorders in children in Africa is not well known because most cases are often undiagnosed or diagnosed too late. The awareness of this led to the launch of the Paediatric Endocrinology Training Center for Africa (PETCA) designed to improve quality and access to health care by training paediatricians from Africa in paediatric endocrinology.

Methods: The fellowship is undertaken over an 18-month period: six months of clinical and theoretical training in Kenya, nine months of project research at the fellow's home country and three months of consolidation in Kenya. Upon completion, certified paediatricians are expected to set up centres of excellence.

Results: There have been two phases, phase I from January 2008 to October 2012 and phase II from January 2012 to April 2015. 54 fellows from 12 African countries have been certified, 34 (phase I) and 20 (phase II). Over 1,000 patients with wide ranging diabetes and endocrine disorders have been diagnosed and treated and are being followed up at the centres of excellence.

Conclusion: The successes of the PETCA initiative demonstrate the impact a capacity building and knowledge transfer model can have on people in resource-poor settings using limited resources.

This unique initiative, initially in East Africa and then in West Africa, was sponsored by the World Diabetes Foundation. Thanks to tutors mainly (but not only) from ESPE and ISPAD who volunteered their time, it has resulted in the training of fellows who are from such different countries as Botswana, Congo, Ethiopia, Ghana, Kenya, Mauritius, Nigeria, Rwanda, Sudan, Tanzania, Uganda and Zambia. In addition to the direct effect of the programme (training of high quality paediatric endocrinologists), there are multiple indirect benefits to the PETCA program. These include a marked improvement in access to appropriate clinical care, a dramatic increase in the number of research papers published in the field of paediatric endocrinology and diabetes by trainees in Africa, the development of fruitful collaborations between African centres and academic centres within and outside Africa and the establishment of the African Society for Paediatric and Adolescent Endocrinology (ASPAE). Another PETCA programme is now active in Lagos, Nigeria. We should not underestimate the challenges faced (and met) by the fellows once back in their country. They often were the first fully trained paediatric endocrinologists in their community and, as such, had to not only educate other health professionals in order to initiate referral of suitable patients, but also advocate for their specialty until the importance of their contribution was acknowledged by their hospital leaders and by their health authorities!

Successes and challenges in the management of diabetes in low-income settings

Constraints and challenges in access to insulin: a global perspective

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Background: Although insulin was discovered in 1921, access to this medicine is insufficient to many globally.

Methods: The authors reviewed the available literature analysing the issues behind the lack of universal access to insulin.

Results: The authors highlight the range and complexity of factors that contribute to this unattainability. Manufacturers' selling prices of various insulin formulations and presentations, duties, taxes, mark-ups and other supply chain costs affect the price of insulin and hence the drug's affordability to health

systems and individuals. Unlike drugs for HIV and AIDS, the production of generic or biosimilar insulin has not had an effect on the overall market. Other factors contributing to poor availability of insulin include its quantification at the national level, in-country distribution and determination of needs at lower levels of the health system.

Conclusion: Although insulin is essential for the survival of people with T1DM and is needed for improved management of diabetes for some people with T2DM, very little has been done globally to address the issue of access, despite the UN's political commitment to address NCD and ensure universal access to drugs for these disorders.

This review highlights the many reasons why insulin is not readily available to all who need it and provides useful suggestions on various ways access could be improved. The authors emphasise two major issues. Firstly, insulin procurement and supply is only one of 11 points (proposed by Dr Beran in previous publications) that need to be taken into account when discussing global diabetes management (the 10 others are: organisation of the health system; prevention; data collection; diagnostic tools and infrastructure; accessibility and affordability of medicines and care; training and availability of health-care workers; adherence issues; patient education and empowerment; community involvement and diabetes associations; and positive policy environment). Secondly, there are multiple reasons why insulin is not available to the patient and each country is different in this regard, suggesting that an array of solutions will be needed to solve the problem. The article is well researched and is illustrated by many country-specific data. It also highlights the excellent work performed by international organisations such as the International Diabetes Federation Life for a Child Program (see below) to promote insulin access to the patient.

The IDF Life for a Child Program Index of diabetes care for children and youth

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Background: Care for children and youth with diabetes varies markedly around the world. The authors developed a standardised, reproducible measure that can be used to document and compare critical factors influencing treatment outcomes.

Methods: The authors sent a questionnaire consisting of 36 multiple-choice questions covering major components of care (such as insulin therapy, blood glucose monitoring and so on) to 75 countries: 43 under-resourced countries where the International Diabetes Federation's Life for a Child Program operates and 32 others (mainly developed nations). Results for each country were scaled to a score with a range of 0–100.

Results: Responses were received from 71 countries. Scores varied widely and were highly correlated to per capita gross domestic product ($r^2 = 0.72$; $P < 0.001$) and health expenditure ($r^2 = 0.77$; $P < 0.001$). For the 37 low- and lower-middle-income countries, only two had complete government provision of human insulin and none of blood glucose test strips. Marked differences according to income were also found for access to home refrigeration; usage of insulin pens, multiple daily injections, pumps, glucagon and ketone strips; HbA_{1c} testing; and complications screening.

Conclusion: The index is a comprehensive, easily administered survey instrument. It demonstrated stark differences in access to numerous components of care necessary in achieving good outcomes for children and youth with diabetes.

This article is of interest to paediatric endocrinologists as it focuses on the paediatric population and on young adults (up to 25 years of age). The index that was developed ranges from 0 to 100, a higher number corresponding to better availability of care components. Not surprisingly, the authors found a strong positive correlation between the gross domestic product/health expenditure per person and this novel index of diabetes care. Several results are worth highlighting. In 16 of 71 countries surveyed, twice-daily premixed insulin was the most common regimen. In addition, the 37 low and lower-middle-income countries surveyed here had characteristics that suggested suboptimal diabetes care: first, virtually all insulin injections were performed using a syringe (instead of using a pen); second, access to glucagon or provision of test strips by the government, two important

components of comprehensive diabetes care, were virtually non-existent; and thirdly, death from unrecognised diabetes was felt to be very likely. Although the index did not directly demonstrate that a higher number (closer to 100 on the index scale) was associated with better glycaemic control, this assumption is very likely to be true as the index covers the essential components of diabetes care that influence outcomes for children and youth with diabetes. At a time when programs such as the PETCA (see above) are successfully increasing capacity in paediatric endocrinology, and, as a consequence, appropriate diagnosis of diabetes, this index can be used to identify the areas of diabetes care that would most benefit from additional resources in a given setting.

Glycemic control in Kenyan children and adolescents with type 1 diabetes mellitus

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Background: While data on the prevalence, treatment, and complications of T1DM are recorded in many countries, few data exist for sub-Saharan Africa, including Kenya.

Methods: To assess the degree of control in patients with T1DM in Nairobi, the authors investigated 82 children and adolescents with T1DM aged 1–19 years over a six-month period in three outpatient clinics. They also sought to determine how control was influenced by parameters of patient and treatment. Clinical history regarding duration of illness, type and dose of insulin and recent symptoms of hypoglycaemia/hyperglycaemia were recorded. Glycaemia, HbA_{1c} and ketonuria were tested. HbA_{1c} of 8.0% and below was defined as the cutoff for acceptable control.

Results: The median HbA_{1c} for the study population was 11.1% (range: 6.3–18.8). Overall, only 28% of patients had reasonable glycaemic control as defined in this study. 72% therefore had poor control. It was also found that age above 12 years was significantly associated with poor control.

Conclusion: African children with T1DM are poorly controlled, particularly adolescents. Our data strongly support the necessity for Kenyan children to receive more aggressive management and follow-up.

These results reported by Ngwiri et al highlight the issues discussed by David Beran and Graham Ogle in the first two articles of this section. Indeed, metabolic control of children and adolescents with T1DM in Nairobi remains poor. Reasons include insufficient or irregular access to insulin, poor storage of insulin, use of premix insulin, distance from the diabetes centre, insufficient number of trained allied health professionals, absence of regular blood glucose determination and wide fluctuations of blood glucose (at least according to the symptoms reported by the patients). However, the authors do not highlight the major positive changes that are humbly hidden in this article. Until 2007, there was only one paediatric endocrinologist in Kenya. Thanks to the Paediatric Endocrinology Training Centre for Africa (PETCA) (see above), there are now eight, including seven PETCA graduates. The authors should be commended for their candid analysis of the reasons for this suboptimal outcome and for the recent steps (such as increased training and number of allied health professionals) taken to improve the situation. While the management of T1DM remains suboptimal, it is improving slowly but surely despite the many practical barriers encountered by the health professionals.

Subcutaneous regular insulin for the treatment of diabetic ketoacidosis in children

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Background: Although diabetic ketoacidosis (DKA) treatment protocols vary, low-dose intravenous administration of regular insulin is the standard care for replacing insulin in most centres. Few studies, the majority in adults, demonstrated that subcutaneous injection of rapid-acting insulin every 1–2 hours can be a valid alternative.

Methods: In this retrospective study, the authors aimed to evaluate the efficacy and safety of subcutaneous regular insulin administered every four hours in paediatric DKA in a clinical setting. They performed a chart review of all children treated with subcutaneous regular insulin for DKA and pH ≥ 7.0 , between 2007 and 2010. 76 DKA episodes in 52 patients were included. Data regarding clinical characteristics, response to treatment and the occurrence of complications were analysed. DKA episodes in patients with new-onset diabetes and in those with established diabetes were compared.

Results: Mean age was 11.6 ± 4.0 years. 18 episodes occurred in children with new-onset diabetes. In all episodes, the protocol resulted in recovery from DKA. Median time to DKA resolution (pH >7.30 , $\text{HCO}_3^- >15$) was 10.3 hours. The median total insulin dose was 0.05unit/kg/hour. During DKA treatment, hypoglycaemia occurred in one episode and hypokalaemia, mostly mild, was documented in 14. No cardiac arrhythmias, incidents of cerebral oedema or mortality occurred.

Conclusion: Subcutaneous regular insulin administered every four hours is an effective and safe alternative for the insulin treatment of DKA with pH >7.0 in children. Such treatment has the potential to simplify insulin administration when compared to either intravenous regular insulin or q1–2 hour subcutaneous rapid insulin and reduce both patient inconvenience and admission costs.

This report published by researchers in Israel, a high-income country, is relevant to the management of DKA in low-income settings. Although the results were not directly compared with outcomes obtained through the more invasive protocols commonly used in high-income settings, they clearly show that the combination of a relatively simple fluid protocol, subcutaneous administration of regular insulin every four hours and infrequent laboratory tests (except of course for blood glucose) is safe and well tolerated. This approach is particularly suited to settings where cost and availability of trained staff are major issues. It is suggested that this protocol may need to be further adapted to the capacity of the local setting. For instance, in settings where repeated measurement of electrolytes is not possible, evidence of dyskalaemia can be ascertained by electrocardiogram and potassium supplementation initiated in the absence of blood potassium results. Indeed, we know that a net deficit in potassium is systematically present in patients with DKA and that supplementation will be needed until oral nutrition is restarted to prevent hypokalaemia resulting from an intracellular shift of potassium. If intravenous access or intravenous solutions of potassium are not available, potassium-containing oral solutions such as the oral rehydration solution (ORS) can be considered. Useful recommendations can be found in the *Pocketbook for management of diabetes in childhood and adolescence in under-resourced countries* [2].

Optimising growth and development in low-income settings

Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect

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Background: The importance of breastfeeding in low- and middle-income countries is well recognised, but less consensus exists about its importance in high-income countries.

Methods: Review and meta-analysis.

Results: In low-income and middle-income countries, only 37% of children younger than six months of age are exclusively breastfed. With few exceptions, breastfeeding duration is shorter in high-income countries than in those that are resource-poor. Our meta-analyses indicate protection against child infections and malocclusion, increases in intelligence, and probable reductions in overweight and diabetes. We did not find associations with allergic disorders such as asthma or with blood pressure or

cholesterol, and we noted an increase in tooth decay with longer periods of breastfeeding. For nursing women, breastfeeding gave protection against breast cancer and it improved birth spacing, and it might also protect against ovarian cancer and T2DM.

Conclusions: The scaling up of breastfeeding to a near universal level could prevent 823,000 annual deaths in children younger than five years and 20,000 annual deaths from breast cancer. Recent epidemiological and biological findings from during the past decade expand on the known benefits of breastfeeding for women and children, whether they are rich or poor.

In 2012, the 56th World Health Assembly set as a target for 2025 to “increase the rate of exclusive breastfeeding in the first six months up to at least 50%”.

In this review and meta-analysis, the authors highlight the importance of ‘society’ in the epidemiology of breastfeeding: in high-income countries, rich mothers breastfeed more often than poor mothers, while the reverse is found in low-income countries. This is very relevant to child health because breastfeeding has a protective effect on infant mortality and morbidity not only in low-income settings but also in high-income settings. In low-income settings, the risk of death of exclusively breastfed infants is 12% of the risk of death of nonbreastfed infants. Similarly, boys and girls younger than six months who were not breastfed had 3.5–4.1 times higher mortality compared with those who received any breastmilk. In high-income settings, there is a decrease in sudden infant death and in necrotising enterocolitis in breastfed compared to nonbreastfed infants.

One of the aspects of breastfeeding that is most relevant to the paediatric endocrinologist is the relationship between breastfeeding and being overweight (OW) or obese (OB). Most meta-analyses find that the odds of becoming OW or OB are lower (-26%) in those who were breastfed as infants. However, the vast majority of the studies are cross-sectional. Interestingly, a large prospective, cluster randomised study performed in Eastern Europe failed to find a protective effect of breastfeeding on OB/OW [3]. Therefore, at this time, we should keep in mind that the role of breastfeeding in the prevention of OW and OB is not fully demonstrated. However, considering the many positive effects of breastfeeding, in particular in low-income settings, it is clear that it should be promoted.

In the same issue of the *Lancet*, another article on breastfeeding focuses on determinants of breastfeeding and on the effectiveness of promotion interventions. It discusses the role of breastfeeding in HIV transmission and examines the role of the pharmaceutical industry in the promotion of breastmilk substitutes, the environmental role of breastfeeding and its economic implications.

Childhood stunting: a global perspective

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Childhood stunting is the best overall indicator of children’s well-being and an accurate reflection of social inequalities. Stunting is the most prevalent form of child malnutrition with an estimated 161 million children worldwide in 2013 falling below <2 standard deviations (SD) from the length-for-age/height-for-age World Health Organization Child Growth Standards median. Many more millions suffer from some degree of growth faltering as the entire length-for-age/height-for-age z-score distribution is shifted to the left indicating that all children, and not only those falling below a specific cut-off, are affected. Despite global consensus on how to define and measure it, stunting often goes unrecognised in communities where short stature is the norm, as linear growth is not routinely assessed in primary healthcare settings and it is difficult to visually recognise it. Growth faltering often begins in utero and continues for at least the first two years of postnatal life. Linear growth failure serves as a marker of multiple pathological disorders associated with increased morbidity and mortality, loss of physical growth potential, reduced neurodevelopmental and cognitive function and an elevated risk of chronic disease in adulthood. The severe irreversible physical and neurocognitive damage that accompanies stunted growth poses a major threat to human development. Increased awareness of the magnitude

and devastating consequences of stunting has resulted in its being identified as a major global health priority and the focus of international attention at the highest levels with global targets set for 2025 and beyond. The challenge is to prevent linear growth failure while keeping child overweight and obesity at bay.

These authors emphasise the severe negative consequences of stunting on infant and child development. They remind us that the majority of stunted children (161 million in 2013) live in Asia and Africa. While the global prevalence of stunting decreased from 40% in 1990 to 25% in 2013, more needs to be done to reach targets set by the World Health Assembly in 2012. Importantly, addressing child stunting is now included as a target of the recently released SDG (SDG 2, “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”) [1].

Of particular relevance for the paediatric endocrinologist, the authors emphasise that childhood stunting is the best overall indicator of children’s wellbeing and that assessing growth velocity (both weight and height) should be standard practice. The practice of measuring children’s height is, however, virtually unknown in many low-income countries and are not part of public health recommendations. In our experience, most children referred to the PETCA programme (see above) had no previous height measurement, and therefore, height velocity was not available.

We should not forget that in Europe, improvements in living conditions (decrease in infections and improvement in nutrition) between the 1870s and the 1980s has led to a decrease in stunting and to an 11cm increase in the average height of men. Additional articles on the same topic can be found in the same issue of *Maternal & Child Nutrition* (2016; 12 Suppl 1).

Using growth velocity to predict child mortality

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Background: Growth assessment based on the WHO child growth velocity standards can potentially be used to predict adverse health outcomes. Nevertheless, there are very few studies on growth velocity to predict mortality.

Methods: The authors aimed to determine the ability of various growth velocity measures to predict child death within three months and to compare it with those of attained growth measures. Data from 5,657 children, five years old who were enrolled in a cohort study in the Democratic Republic of Congo were used. Children were measured up to six times in three-month intervals and 246 (4.3%) children died during the study period.

Results: The authors showed that children had an exponential increase in the risk of dying with decreasing growth velocity for length and weight velocity z-scores and for changes in mid-upper arm circumference (MUAC) z-scores and absolute values (1.2- to 2.4-fold for every unit decrease). A length and weight velocity z-score of <-3 was associated with an 11.8- and a 7.9-fold increase, respectively, in the relative risk of death in the subsequent three month period. Weight and length velocity z-scores had better predictive abilities than did weight-for-age and length-for-age z-scores. Among wasted children (weight-for-height z-score <-2), weight velocity z-scores were even better predictors. Absolute MUAC performed best among the attained indexes, but longitudinal assessment of MUAC-based indexes did not increase the predictive value.

Conclusion: Repeated growth measures are slightly more complex to implement, their superiority in mortality-predictive abilities suggests that these could be used more for identifying children at increased risk of death.

Paediatric endocrinologists are very familiar with the concept of growth monitoring as it is a pillar of our specialty. Systematic growth monitoring can lead to earlier diagnosis of a serious condition and, as a consequence, to earlier access of an infant to appropriate nutritional, social, psychological and/or medical care.

Systematic growth monitoring has been shown to increase the use of primary healthcare services. Despite a report by the United Nation's Subcommittee on Nutrition in 1990 emphasising that "Concern is not with whether a child is on a given centile at one point in time, but whether its pattern of growth falls along the same centile band as age increases" there is little information on the impact of systematic growth monitoring on infant morbidity/mortality. Here, the authors support the concept that weight and height velocity z-scores obtained through repeated growth measures are "superior in [overall] mortality-predictive abilities and could be used more for identifying children at increased risk of death". This article emphasises the importance of including length determination and growth chart interpretation as part of the training of health professionals in low-income countries. Because length and height measures are less reliable than weight measures, particular attention needs to be paid to the robustness, precision, maintenance and calibration of the anthropometric equipment, the quality of the training of the health professionals, the measurement techniques and the establishment of data quality procedures.

On the need for national-, racial-, or ethnic-specific standards for the assessment of bone maturation

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In an attempt to overcome ethnic and racial differences in skeletal maturation, the use of ethnic-specific standards has been suggested. Do we need such standards? Based on a fundamental understanding of phenotypic plasticity and an individual's ability to respond to environmental cues, the author argues that we do not need ethnic-specific standards for bone maturity. The author suggests that a unified international standard of bone maturity be used for comparing the health, nutrition and quality of life of all children, regardless of their race, nationality and ethnicity.

In this thoughtful review, the author concludes that variations in bone age assessment, one of the pillars of paediatric endocrinology, are less likely to reflect ethnic differences and more likely to reflect environmental differences such as constitutional delay of growth, malnutrition, chronic illness, high altitudes and hormonal deficiencies, which are all known to affect bone maturation. A parallel can be drawn with the development of the WHO Child Growth Standards. When strict inclusion criteria are applied (for example, prolonged breastfeeding, satisfactory socioeconomic status, good maternal nutrition), infants and children from countries as different as Ghana, Oman, USA, Brazil, Norway and India reach similar heights and weights by the age of five years. This suggests that environmental factors are more important than small genetic differences in explaining population-level differences in growth patterns between the various human ethnic groups. Until international standards for assessing bone maturity are developed and validated, paediatric endocrinologists should feel comfortable using the Greulich and Pyle atlas and the TW3 tables, the current gold standards, to assess the bone maturity of children of all nationalities, races and ethnicities.

Case report: the specter of untreated congenital hypothyroidism in immigrant families

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Background: In low-income nations where newborn screening programs for congenital hypothyroidism (CH) do not exist, untreated CH remains a significant health and societal challenge.

Methods: The authors report three siblings of Somali descent with CH who started treatment with levothyroxine at age 0.5 years, 7.7 years and 14.8 years and were followed for eight years.

Results: This case series demonstrates a spectrum of severity, response to treatment, and neurocognitive and growth outcomes depending on the age at treatment initiation. Patient 1, now 22 years old, went undiagnosed for 14.8 years. On diagnosis, his height was -7.5 SD with a very delayed bone age of -13.5 SD. His longstanding CH was associated with empty sella syndrome, static encephalopathy and severe musculoskeletal deformities. Even after treatment, his height (-5.2 SD) and cognitive deficits remained the most severe of the three siblings. Patient 2, diagnosed at 7.7 years, had moderate CH manifestations and thus a relatively intermediate outcome after treatment. Patient 3, who had the earliest diagnosis at 0.5 years, displayed the best response, but continues to have residual global developmental delay. *Conclusion:* Untreated CH remains an important diagnostic consideration among immigrant children and the authors wish to alert healthcare providers about the potential of undiagnosed CH in unscreened immigrant children.

In developed countries, screening for CH has been systematic since the 1970s–1980s. It has succeeded in preventing the severe and irreversible complications caused by CH. This article has implications for both high- and low-income countries. In high-income countries, the authors emphasise the importance of considering CH in immigrants from countries where systematic screening is not routinely performed. As the number of refugees to high-income countries increases dramatically, it is suggested that paediatric endocrinologists should advocate for systematic thyroid-stimulating hormone (TSH) determination by primary healthcare professionals (with appropriate referral to the paediatric endocrinologist) in recent immigrants or at the very least in infants and young children in whom CH is often difficult to recognise on clinical grounds.

In low-income countries, as capacity in paediatric endocrinology is increasing, there is an opportunity for paediatric endocrinologists to advocate for a screening programme that will take into account the local needs (such as point of care testing) and resources. This process will, however, take time. In the meantime, how can we promote earlier recognition of CH in settings where access to a physician is difficult and where even the most basic neonatal physical examination is not systematically performed? One option is to take advantage of the early postnatal growth failure (length) which is characteristic of severe untreated CH. In settings where there is no easy access to TSH determination, the addition of length measurement to body weight measurement (which is routinely performed during the regular immunisations visits in many low-income settings) and training allied health professionals in the use and interpretation of a WHO growth curve might enable earlier recognition of CH.

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