

that any belated intervention, from week 14 onwards, might have little or no effect on preventing fetal brain damage. Thus, maternal thyroid dysfunction should ideally be diagnosed well before the vulnerability period—ie, when pregnancy is ascertained, or ideally preconceptionally, because it takes 3–5 weeks for euthyroidism to be restored and few women receive obstetric care before 8–12 weeks of pregnancy.

Equally intriguing is the finding that similar brain abnormalities can be observed in association with maternal thyroid hyperfunction (mirrored by lowered TSH concentrations), because this condition is usually regarded as potentially harmful for pregnancy outcome but not likely to affect child neurodevelopment. Early experimental evidence demonstrates that thyroid hormone excess might disrupt neuronal migration and other developmental steps, which is in keeping with population-based findings suggesting a role for maternal hyperthyroxinaemia in determining low IQ, ADHD, and autism in offspring.⁸ The risk of brain damage associated with low TSH concentrations raises concerns about the potential for suboptimal neurodevelopmental outcomes in the offspring of mothers on levothyroxine treatment before pregnancy, who are currently advised to independently increase their daily dose of levothyroxine by 20–30% upon confirmation of pregnancy.⁹ This strategy, although effective in minimising the risk of maternal hypothyroidism during the crucial first trimester, results in a three-to-seven times increased risk of overtreatment in selected patients (ie, athyreotic women for thyroid cancer who often receive higher levothyroxine doses for suppression of serum TSH).¹⁰ In view of these findings, further studies specifically designed to assess the potential of levothyroxine treatment of causing meaningful intellectual effects are needed.

The curvilinear association between maternal thyroid status and fetal brain morphology should prompt

further investigations into quantitative and temporal connections between maternal thyroid hormone and developmental aspects of specific brain regions. Also, identification of gestational thyroid hormone reference ranges that are truly adequate for the developing fetal brain is crucial. Finally, the most effective strategy involving prenatal counselling should be identified, because seemingly a very narrow timeframe exists for action, and even small delays might irreversibly compromise the effectiveness of any intervention.

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Diabetes in humanitarian crises: the Boston Declaration

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Nearly three out of every four deaths worldwide in 2017 were caused by non-communicable diseases (NCDs).¹ Many countries have made progress reducing risk factors for NCDs such as tobacco use, hyperlipidaemia, and hypertension, but no countries have successfully reversed the increasing trends in diabetes prevalence

and mortality from diabetes.¹ This situation represents a massive global health failure, since type 2 diabetes is largely preventable with lifestyle modification and cost-effective treatments exist for both type 2 and type 1 diabetes.² Type 1 diabetes is of particular concern, since it is fatal in the absence of insulin treatment.

Panel: Priority agenda for addressing diabetes in humanitarian crises**Unified and strengthened advocacy**

- Produce a high-level declaration that insulin should be made available to all those in need in recognised humanitarian settings and during recovery after humanitarian crises
- Strengthen unified advocacy campaigns and global awareness, particularly among governments and donors, to ensure a right to insulin and inclusion of diabetes care in humanitarian responses
- Improve processes for dissemination of findings and publications about diabetes care and prevention in humanitarian crises to all audiences
- Advocate for the use of all available tools to reduce prices of essential medicines and diagnostics

Universal access to insulin and other essential medicines and diagnostics for glycaemic and blood pressure control

- Routinely include essential medications for diabetes and hypertension in humanitarian response systems, with insulin as an immediate priority
- Advocate for transparent procurement and prices for insulin used in humanitarian settings, reflecting the known cost of production (US\$2–4 per 100 IU 10 mL equivalent for human insulin)
- Improve availability, coverage, quality, and field suitability of diagnostic equipment (blood glucose meters and strips, HbA_{1c} testing, sphygmomanometers) in humanitarian settings
- Review currently available scientific literature, protocols of ongoing research, and operational practices and approach pharmaceutical and diagnostics companies, governments, academics, and intergovernmental organisations for further information, with the aim of developing a consensus statement and to identify needs for further research on insulin thermostability, to inform international guidelines on the storage of insulin and blood glucose test strips in humanitarian settings

Establishment of a unified set of clinical and operational guidelines

- Develop and test evidence-based clinical guidance and educational materials on diabetes care in humanitarian crises, including simple, appropriate, safe, and effective algorithms, diagnostic cutoffs, and treatment targets
- Develop and test different cost-effective models of care that take local health systems and food supplies into consideration and develop specific emergency preparedness plans
- Develop new tools and support innovation around treatment, monitoring, and education, including decision-support systems, low-cost medical delivery and diagnostic devices, patient-held medical records, and other standardised systems to facilitate care and coordination between humanitarian organisations
- Clarify the potential role of insulin analogues in humanitarian settings

Improved data and surveillance

- Develop and implement standardised indicators of the prevalence of diabetes, access to care, patient burden, and patient-centred outcomes in humanitarian crises for programme monitoring and evaluation, and make these data available to researchers, governments, and other stakeholders
- Expand the diversity of epidemiological studies of diabetes in humanitarian crises across regions, types of crises (eg, natural disasters, armed conflict, etc), and crisis stages
- Include crisis-affected populations in studies of the economic and social implications of diabetes in host countries
- Estimate the economic costs of diabetes care in humanitarian crises incurred by the health system and out-of-pocket expenditures, and the costs of inaction

In parallel, forced migration has reached a record high, with 68·5 million people displaced from their homes around the world—85% of whom are being hosted in low-income or middle-income countries such as Uganda, Lebanon, and Pakistan—and 65% occurring in protracted refugee situations.³ Additionally, there are more than 100 million conflict-affected non-displaced people and 175 million people who are affected by natural disasters annually.⁴ These individuals are particularly vulnerable in crises due to disrupted health services and unpredictable—and often unhealthy—food supplies, which might exacerbate chronic health conditions such as diabetes and lead to complications.

To date, diabetes and other NCDs have largely been underserved in humanitarian settings.^{5–7} The true scope

of the problem has not been established and it is not known which interventions are effective, feasible, and cost-effective in these contexts. With respect to type 1 diabetes, arguably the most immediately life-threatening NCD, the supply and cost of insulin, blood glucose monitoring, and diagnostic tools are barriers for both humanitarian responders and their host countries, as well as patient adherence, life expectancy, quality of life, follow-up, and provider training in diabetes care.

To begin to address these major gaps, Harvard University convened a meeting in Boston (MA, USA; April 4–5, 2019) of humanitarian and other actors in global health to discuss the immediate needs and barriers to tackling diabetes in humanitarian crises, and to adopt a unified, action-oriented agenda to address this

For more on the meeting in Boston see <http://globalendocrinology.bwh.harvard.edu/symposium/>

See Online for appendix

pressing global health issue. Although it was recognised that there are substantial gaps in care for diabetes in all low-resource settings,⁸ not only in humanitarian crises, and that many other NCDs (eg, cardiovascular disease, chronic obstructive pulmonary disease, and asthma) are also prevalent globally and inadequately addressed in humanitarian settings,⁹ we chose to prioritise efforts on diabetes in humanitarian crises for several reasons. First, because people with type 1 diabetes who cannot access insulin and continuity of care in a crisis are at acute risk of death. The principles of the Humanitarian Charter and UN Universal Declaration of Human Rights include the right to life with dignity.¹⁰ The human rights violations of people with diabetes that we have witnessed, including the most basic right to life, which is threatened by the barriers to accessing insulin and follow-up, are unacceptable and incompatible with these principles. Second, the management of diabetes requires an uninterrupted supply of essential medicines, field-based laboratory diagnostics, continuity of care, adoption of healthy lifestyle behaviours, cardiovascular risk reduction, management of comorbidities including depression and hypertension, and secondary prevention of complications. Thus, diabetes management requires a more complex health-system infrastructure than most other NCDs, but shares many characteristics and risk factors with other NCDs. Hence, the development of an effective diabetes programme could establish a strong platform for provision of high-quality care for other NCDs.

We have set four major targets to work towards over the next 3 years: unified and strengthened advocacy; universal access to insulin and other essential medicines and diagnostics for glycaemic and blood pressure control in humanitarian crises; establishment of a unified set of clinical and operational guidelines for diabetes in humanitarian crises; and improved data and surveillance (panel). We intend to hold annual meetings to monitor progress.

The health needs of crisis-affected populations are changing. We must uphold the humanitarian imperative, adapting to the needs of an ever-changing world, and collectively improve the delivery of diabetes care in crises

to save lives, reduce suffering and promote dignity, and reduce disability, while also working to strengthen the health-system response and resilience in low-income and middle-income countries affected by crises.

**Sylvia Kehlenbrink, Lindsay M Jaacks, on behalf of the Boston Declaration signatories*[†]

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