

## **Children with Leukaemia in Conflict Zones**

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The current cure rate for children with leukaemia in developed countries has reached 80% for some forms of leukaemia such as ALL. For children in developing countries, the prospects are much poorer and the cure rate is often less than 10%. Among the most disadvantaged groups of children with leukaemia are children in conflict zones. These children face multiple risks, all of which hazard their survival. Risks include physical and mental illness, trauma, disability, disruption of environment and social circumstances together with loss, imprisonment or torture of parents or family members. Often in conflict zones, there is violence, poverty, malnutrition, poor standards of water and sanitation and lack of access to healthcare. Lack of medicines, medical equipment, trained medical staff and concomitant security threats compromise diagnosis and treatment for those in conflict zones. For children with leukaemia in these circumstances, prospects of diagnosis and treatment are restricted at the time when their disease makes them vulnerable to problems, such as susceptibility to infection.

Additional hazards may occur in conflict zones which may increase the risks of childhood leukaemia. Such hazards should be identified as this would facilitate diagnosis and treatment, aid understanding of causal relationships in childhood leukaemia and allow removal/decontamination of hazardous substances. Carcinogenic agents have been used in a number of conflicts where exposure to genotoxic compounds has increased risks of haematological malignancies and cancers. Uses of leukaemogenic agents in conflict have included those of ionising radiation from the atomic bombs in Hiroshima and Nagasaki, mustard gas in WWI, Iran-Iraq war, attacks on Kurdish civilian population in Northern Iraq (including Halabja), manufacture and testing of poison gas and use of agent orange/dioxin in Vietnam and South-East Asia. Other agents developed for conflict include mycotoxins (known to be highly carcinogenic). Agents may be weaponised and used directly in munitions, but also can be utilised in more insidious ways (such as contamination of food and water supplies).

Conflicts are currently occurring in over 70 countries, so the scale of the problem is very great. Millions of children are at risk. Examining possible options for diagnosis and treatment and carry out research on contributing factors and causal factors for these malignancies has relevance for the prospects for children with leukaemia in many parts of the world today.

For the past six years, as a collaborative consortium for treatment and research, we have been studying the large civilian population in Northern Iraq where children and adults were directly exposed to Weapons of Mass Destruction (WMD) by attacks by the former Government of Iraq in the late 1980s. The attack on Halabja is one of the most infamous of these attacks where 5,000 died immediately and many thousands more were exposed to the effects of mustard gas. There were over 120 attacks on civilian villages using WMD that included mustard gas, an alkylating agent which is a powerful carcinogen and mutagen. We have been undertaking a programme to develop systems for diagnosis, treatment, research, epidemiology

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and environmental testing that include assessment of genotoxic effects: conditions include cancers (haematological malignancies and solid tumours) and birth defects. The cancer rates are high and this is compounded by the fact that there is virtually no cancer diagnosis or treatment available in many parts of Iraq at present and tragically, little palliative care is available. The work in Iraq over the last 6 years has been conducted in the face of major security risks, dangers for medical staff and the population they treat and desperate shortages of medicines and medical equipment

The problems that exist in conflict regions include:

- Lack of medicines and medical equipment/resources for diagnosis, treatment
- Lack of trained medical staff and lack of facilities/resources for training
- Lack of laboratory facilities, especially those for haematology
- High infection rates, few medicines, lack of clean water, sanitation
- Overload on medical services by trauma, infection etc
- High mortality rates, especially childhood mortality
- Poor nutrition
- Security threats
- Lack of cancer or congenital malformation registries to allow monitoring and alerts to allow recognition of risk factors

For childhood leukaemia, options for providing help are limited. These include:

1. Bringing children from conflict zones for treatment abroad. Taking children away from parents, family and home environment when they have a life threatening disease is difficult, particularly if this involves travel to a foreign country and involves problems of language. No one would ever want to deny life-saving treatment to any child with leukaemia, but it is important to make efforts to provide help and support for children from conflict zones and their families when malignancy is diagnosed. Bringing the child together with one or more family members abroad for treatment would be ideal in terms of support, but is clearly more expensive and may thus deny the possibility of treatment to other sick and deserving children.
2. Providing facilities for diagnosis and treatment in conflict zones includes the core elements of hospital and clinic facilities for treatment, medicines and medical equipment and training in haematology and oncology. Providing good facilities for effective diagnosis, treatment and research for children with leukaemia is challenging even in advanced countries. In conflict zones, few groups have sufficient resources to mount even the most basic approaches to the problems of malignancy and few International Organisations have even contemplated this, because of the problems

We suggest new collaborative efforts are needed to help children with leukaemia in conflict and environmental disaster zones. This is important as a means of developing humanitarian initiatives, and offers the possibility of examining aetiological and risk factors that may play a role in the genesis of some cases of leukaemia in these populations. The new techniques for the recognition of specific molecular changes associated with leukaemia have revolutionised diagnosis, prognosis and treatment for children with leukaemia. These techniques have the potential to identify the specific changes that occur with each carcinogen or genotoxic agent. This could benefit these populations by shedding light on the aetiology of these specific forms of leukaemia and identifying the dangers, with the potential for identifying, removing or

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decontaminating harmful agents. Environmental and toxicological testing is important, nowhere more so than where risks are high, such as conflict regions.

Almost everyone has expertise that could contribute to the development of such a programme. Those apprehensive about visiting conflict regions could help through the provision of textbooks, training films, distance learning or developing new initiatives for diagnosis, treatment research, strategic planning or resource provision. The great advances that have improved the prospects for children with leukaemia in developed countries today, have the potential to improve the lives of many thousands of children in conflict zones who would otherwise die, and also to shed light on aetiological factors in childhood leukaemia. These include:

### **Diagnosis & Treatment**

- Training in haematology, oncology, oncology nursing
- Networking system to develop expertise in treating malignancies in conflict and conflict recovery zones
- Network to facilitate risk assessment, toxicity/genotoxicity measurements and epidemiology
- Molecular oncology, genomics, proteomics to characterise specific genetic changes and underpin identification of causal relationships.

The development of active networks to help children with leukaemia in conflict regions could create new initiatives. There are opportunities for collaborations with other groups, particularly those providing humanitarian aid, emergency medicine and conflict relief specialists who provide medical help for conflict populations, refugees and those in IDP camps. Immediate and urgent medical needs in conflict zones (from trauma, (land mines, bullets, grenades), infection, haemorrhage, obstetric emergencies (such as obstructed labour) take precedence and often overshadow diagnosis and treatment of conditions such as leukaemia or cancer. Unless groups with knowledge and expertise in children's leukaemia are proactive in bringing their specialist skills and innovation into this field, many thousands of children, who could otherwise be saved, will continue to die.

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