

Childhood cancers: Challenges and strategies for management in developing countries

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ABSTRACT

The developing countries bear the greatest burden of childhood cancers as over 90% of the world's children live in these countries. Childhood cancer in most instances is curable, but many children die from cancer because most children live in developing countries without access to adequate treatment due to high cost of treatment and poor organization in these countries. Initiatives to increase cancer care in developing countries would therefore include establishment of standard cancer care centres, manpower training, establishment of standardized management protocols, procurements of standard drugs and collaboration with international organizations.

Key words: Cancer, developing countries, management

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INTRODUCTION

Cancer is a major cause of morbidity and mortality not only amongst children, but also in adults. It is estimated that 8.1 million new cases of cancer occur annually, representing an annual increase incidence of 2.1% which is faster than the annual growth rate of 1.7%.^[1] In the developed world, cancer affects 1 in 600 children before their 15th birthday. Data on cancer incidence are scanty in developing countries. Most of them are hospital-based statistics and of little value due to inadequate cancer registry and records keeping in developing countries. Cancer is a major killer of children in developed countries probably being surpassed only by trauma. In developing countries, as significant progress is made in combating common childhood killers like malaria, measles, gastroenteritis, other infectious diseases and nutritional deficiencies,

cancer and trauma are emerging as major childhood killers.^[2] It is obvious that whatever strategies that are geared towards improving the health of people living in the developing countries must include strategies for the control of childhood cancers.

THE BURDEN OF CHILDHOOD CANCERS

With more than 90% of the world's children living in developing countries, these countries bear the greatest burden of childhood cancers. It is pertinent to note that childhood cancers in most instances are highly treatable and in established paediatric oncology centres in developed countries, more than 70% of these children can be cured of their cancers. Unfortunately, less than 20% of the world's children have access to and can afford these curative treatment services and therefore more than 80% of these children die because they live in developing countries and therefore have no access to or cannot even afford to pay for the treatment of their cancers. It has been estimated that US\$103,250.00 is needed to cure one child with leukaemia.^[3] More people today live in poverty than 20 years ago and it has been estimated that about 1.3 billion persons (one-fifth of the world population) live on less than US\$1 per day. With these staggering financial implications for the treatment of childhood cancers, it is obvious that there are very few families that would afford to pay for these costs in developing countries. Besides, other considerations such as scarcity of specialized centres and facilities, including personnel, definitely add to the misery of children living with cancer in developing countries. On the state level, the delivery of oncological services is challenging because it would have to compete with other services on the scarce resources available.

EPIDEMIOLOGY OF PAEDIATRIC NEOPLASIA

There are marked geographic variations in paediatric neoplasia worldwide.^[4,5] Biologic and clinical differences have also been reported by many workers in different parts of the world.^[1,2,4,5] These differences in the biologic behaviour may be responsible for the differences in

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the clinical presentation and response to treatment of these cancers.

Leukaemias

Unlike the developed world where leukaemias are easily the commonest childhood malignancy, in Africa they are much less common than lymphomas, especially Burkitt's lymphoma and other solid tumours such as nephroblastoma and retinoblastoma.^[6-9]

As elsewhere, most of the childhood leukaemias seen are of the acute lymphoblastic type.^[9] This accounts for about 75% of all cases of leukaemia seen in children. The myeloblastic leukaemias are much less common in children with the acute variety accounting for about 20% of cases. The remaining, 5% or so, are accounted for by chronic myeloid leukaemia. Chronic lymphocytic leukaemia is very rare in children.

Lymphomas

Burkitt's lymphoma (BL) undoubtedly accounts for the majority of solid tumours and of lymphoma cases seen in children in tropical Africa.^[7-9] At the University of Nigeria Teaching Hospital, Enugu, lymphomas accounted for 45% of the 201 solid tumours diagnosed in children over a 6-year period (1985-1990).^[9] Of these, BL alone accounted for 28% of all the solid tumours and 62% of the lymphomas. In contrast, other non-Hodgkin lymphomas (NHL) accounted for 13% and 28%, while Hodgkin's disease was responsible for 3.9% and 8.9% of all the solid tumours and the lymphomas, respectively.

First described by Dr. Denis Burkitt in Uganda in 1958, BL is known to be endemic in tropical Africa. Its area of endemicity is identical with that of malaria.^[9,10] An interplay between malaria, malnutrition and the Epstein-Barr virus has been the favoured hypothesis in its aetiology.^[9] More recently, exposure to the African milk bush plant *Euphorbia tirucalli* has been proposed to be a co-factor in the genesis of endemic BL.^[11] The latex of this plant, which children commonly play with and is often used as glue, has been shown to activate the EBV lytic cycle and thus trigger off the malignancy. Endemic BL typically affects the jaw and abdominal viscera but may occasionally also affect the central nervous system, peripheral lymph nodes, bone marrow, etc. Involvement of these other sites and older age are poor prognostic factors in endemic BL.^[9] In contrast, the non-endemic type that is seen in other parts of the world typically involves the peripheral lymph nodes. Endemic BL is highly responsive to chemotherapy, which forms the mainstay of treatment. Other modes of treatment are adjunctive and include surgery (debulking) and radiotherapy.

Brain tumours

Brain tumours are the most common solid tumours in children in developed countries.^[4,5] They are not commonly reported in developing countries. It is not clear whether this is due to biologic factors or due to unavailability of sophisticated diagnostic tools like CT scan and MRI in these countries. It seems to be more common in adolescents than younger children in developing countries.

Retinoblastoma

Retinoblastoma is a common childhood solid tumour in countries like Brazil and Pakistan.^[12] Quite a number are reported from Nigeria.^[13] It has a very poor prognosis because it presents frequently with extraocular dissemination.

Wilms' tumour

Reports on this from Africa are small, individual hospital series.^[14-16] It is quite common in our practice in Jos.^[14] It is one of the childhood solid tumours that have been well studied, and the outcome has improved tremendously over the years. This is due to collaborative studies of this tumour in North America (NWTS) and Europe (SIOP). These collaborative studies have led to a better understanding of the tumour behaviour and genetics and the use of drugs to combat micrometastasis leading to cure in a high proportion of patients. In some parts of Africa, the outcome of treatment of Wilms' tumour is approaching that of the developed world, though in Jos, the outcome is still poor.^[14,15]

Neuroblastoma

It is a common childhood solid tumour in developed countries; few cases are reported from developing countries. It is not a common tumour in our practice in Jos. It is one of the tumours where surgical resection plays a major role in the management.

Teratomas and other germ cell tumours

They are common in developing countries. Sacrococcygeal teratoma is probably the commonest in our practice in Jos. Malignant teratomas are seen especially in children presenting late. Gonadal tumours are reported, though not very common in our practice.

Other solid tumours

Malignant liver tumours are reported in many parts of Africa. Hepatocellular carcinoma seems to be commoner in Africa and Asia than in other parts of the world due to Hepatitis B infection. Hepatoblastoma is also reported in some parts of Africa. Kaposi sarcoma is common in East Africa,

and there is resurgence due to HIV/AIDS infection. Nasopharyngeal carcinoma is common in Sudan and North Africa and adrenocortical tumours are frequently reported from Brazil. Other tumours afflicting children from developing countries include Rhabdomyosarcoma and bone tumours especially osteogenic sarcoma.

MANAGEMENT PROBLEMS

There are peculiar problems of tumour management in developing countries, especially Africa.^[14-20]

Late presentation seems to be common to most parts of Africa. Most of our patients present with advanced diseases. Ignorance, poverty, lack of easy accessibility to hospitals and the consultation of traditional healers seem to be the main factors behind late presentation.

Poverty

This contributes to late presentation; however, majority of families are not able to take care of children with cancer due to poverty. Once the family is told by the medical staff that it is cancer, the family usually assumes that it is not curable and they should rather go home than waste their time in the hospital.

Personnel

A major problem in developing countries is that there are few specialists with in-depth knowledge of the management of children with cancer. Pathologists and other cancer care specialists are very few and so not many are dedicated to childhood cancer.

Investigative facilities

Lack of facilities for the accurate diagnosis of cancer generally adds to the problem. Most of the time, the biology of the tumour is not known because there are not enough diagnostic facilities. This leads to a delay in diagnosis and sometimes inability to make the accurate diagnosis.

Treatment problems

Lack of proper drug combinations, fake drugs and expensive drugs are frequent problems faced by staff caring for children with cancer in Africa. Radiotherapy and other forms of therapy are available in very few places in Africa.

Follow-up

Majority of the patients do not come back for follow-up especially children who have surgery as the primary mode of treatment. Hence statistics on long-term follow-up of survivors are lacking.

STRATEGIES FOR IMPROVING CANCER CARE FOR CHILDREN LIVING IN DEVELOPING COUNTRIES

To improve the lives of children living with cancer in the developing countries, a number of strategies have to be adopted. In recent years, there have been various individual, institutional, country, regional and global efforts at addressing the particular problems facing cancer patients from developing countries. Mention must be made of the leukaemia project in Yogyakarta, Indonesia, for which Sutaryo *et al.* received the SIOP award in 2003^[21] and Larry Hadley's key note address on the management of Wilms' tumour in Africans during the SIOP Meeting in Mumbai where he highlighted a number of strategies some of which are discussed below.^[22] The goals of managing childhood cancer in developing countries must increase the proportion of children having access to quality and modern treatment and define the minimal requirements for delivery of optimal care. Strategies to achieve the above goals would include the following:

Establishment of a paediatric cancer unit in every country which would co-ordinate a national oncology programme. This unit would co-ordinate registry, research, training and awareness. Since there is a problem of finance in most countries, such an institution could be part of an already established research institution or university hospital with an added responsibility and funding from the central or regional government. Countries or regions could seek the help and expertise of established agencies like UICC or SIOP for this purpose. Cancer registry is poorly developed or even lacking in most developing countries. This institution must co-ordinate this important aspect if data for research and vetting have to be made available for future referencing. Advances in paediatric cancer care has come from researches on children in developed or western countries with a different genetic background, environmental exposures and social setting from those of children in developing countries. It is known that responses to cancer treatment are influenced by the above-mentioned factors; therefore, it would be difficult to extrapolate these research findings from the developed world to children in developing countries. The oncology units must conduct research or the western research institutions should include children from developing countries in their researches. This could be done easily if these oncology units have a good cancer registry and the establishment of tissue banks for long-term data and tissue storage.^[23] The oncology unit should also be responsible for the education about and raising awareness of cancer in the society. As highlighted above,

most of the children present with advanced disease, and this is usually due to ignorance and poverty. If the awareness of cancer is raised in the society, the patients would present early and therefore they would benefit from whatever available treatment.

Another strategy for improving cancer care in children is the training of cancer care specialists of all cadres—from nursing staff to medical staff and other ancillary staff. A major problem facing developing countries is the problem of manpower. There is an acute shortage of trained oncologists, and the few specialists often migrate to developed countries because the grass is greener there, further aggravating the situation. To address this, there must be the political will to improve the living conditions of trained specialists by various governments in developing countries. In the hospital, a team effort must be the goal of any institution involved in the management of children with cancer. This team would include the oncologist, specialists from other departments or units, other staff involved in drug administration, other supporting services including palliation and the administrative staff.

The establishment of standardized treatment protocols for all the major paediatric solid tumours is another strategy that must be adopted by cancer care givers in developing countries. As mentioned above, treatment protocols extrapolated from developed countries may not work for children in developing countries. Treatment protocols are produced after exhaustive multi-centre studies of the various treatment modalities. This has been done successfully by the NWTs and SIOP group for the management of Wilms' tumour.

The establishment of supportive care and guidelines for supportive care in developing countries is required. Developed countries have gone far beyond supportive care and they are talking about problems facing long-term survivors as they become adults.

The establishment of quality palliative care and palliative care policies is more relevant to us as most of our patients present late and can benefit from only palliative care.

Drug pricing and availability initiatives are very important for any policy to improve care in children with cancer in developing countries.

Collaboration with international organizations and associations are paramount to the success of any national cancer program. The concept of 'twinning' in which a cancer centre from a developed country

collaborates with another centre in a developing country has been successful in some countries.^[24,25] This should form a model of co-operation not only between institutions but between countries, regions and associations and the co-operation could be at various levels from patient management to manpower training or even interchange of equipment and drugs between these institutions. Another aspect of collaboration is donations or aids for the free treatment of children with childhood cancers. Various social, religious and philanthropic organizations based in developed countries or even developing countries could give aid for the free treatment of cancer or organized outreach programmes aimed at treating children from poor families with cancer as is often done for congenital anomalies, like the Smile Train for craniofacial anomalies. This has been found to be effective in the treatment of childhood leukaemia in Indonesia.^[26] This would go a long way in improving the lives of children from developing countries with cancer.

CONCLUSION

Childhood cancer is easily curable with a cure rate of up to 70%, yet many children die from it because most of them do not have an access to organized, qualitative management. The aim of treatment strategies is to increase the number of children having an access to a specialized and modern treatment. While surgery may play a major role in the management of childhood, solid cancers, it is the organized multi-disciplinary oncology team that would give the optimum benefit to the child suffering from cancer.

REFERENCES

1. Parkins DM, Pisani P, Ferlay J. Estimates of the worldwide incidence of 25 major cancers in 1990. *Int J Cancer* 1999;80:827-41.
2. Margrath I, Shad A, Epelman S *et al.* Pediatric oncology in countries with limited resources. In: Principles and Practice of pediatric oncology. Pizzo PA, Poplack DG, editors. Philadelphia: JB Lippincott Co; 1997. p.1395-420.
3. Raihala J, Riikonen P, Kekalainen L, Perkkiö M. Cost analysis of the treatment of acute childhood lymphocytic leukemia according to the Nordic protocols. *Acta Paediatr* 2000;89:482-7.
4. Little J. Epidemiology of childhood cancer. Lyons, France: International Agency for Research on cancer; 1999. (Scientific publication no 149).
5. Parkin DM, Kramarova E, Draper GJ, *et al.* International incidence of childhood cancer. Vol. 2. Lyons, France: International agency for Research on cancer; 1998. (Scientific publication no 144).
6. Olisa EG, Chandra R, Jackson MA, Kennedy J, Williams AO. Malignant tumors in American black and Nigerian children: A comparative study. *J Natl Cancer Inst* 1975;55:281-4.
7. Williams AO. Tumors of childhood in Ibadan, Nigeria. *Cancer* 1975;36:370-8.
8. Onwasigwe CN, Aniebue PN, Ndu AC. Spectrum of paediatric malignancies in eastern Nigeria. *West Afr J Med* 2002;21:31-3.

9. Adimora GN, Ikefuna AN, Ejekam GC. Childhood tumours. In: Azubuikwe JC, Nkanginieme KEO, editors. Paediatrics and child health in a tropical region. 2nd ed. Owerri: African Educational Services; 2001. p. 658-66.
10. Burkitt D. A children's cancer dependent on climatic factors. *Nature* 1962;194:232-4.
11. MacNeil A, Sumba OP, Lutzke ML, Moormann A, Rochford R. Activation of the Epstein-Barr virus lytic cycle by the latex of the plant *Euphorbia tirucalli*. *Br J Cancer* 2003;88:1566-9.
12. Usmani GN. Pediatric oncology in the third world. *Curr Op Pediatr* 2001;13:1-9.
13. Ajaiyeoba IA, Akang EE, Campbell OB, Olurin IO, Aghadiuno PU. Retinoblastoma in Ibadan: Treatment and prognosis. *West Afr J Med* 1993;12:223-7.
14. Uba AF, Chirdan LB. Childhood Wilms' Tumour Prognostic factors in North Central Nigeria. *West Afr J Med* 2007;26:222-5.
15. Rogers T, Browley DM, Poole J, Swanepoel P, Wainwright J, Beale P, *et al.* Experience and Outcome of Nephroblastoma in Johannesburg 1998-2003. *Eur J Pediatr Surg* 2007;17:41-4.
16. Abuidris DO, Elimam ME, Nugud FM, Elgaili EM, Ahmed ME, Arora RS. Wilms Tumor in Sudan. *Pediatr Blood Cancer* 2008;50:1135-7.
17. Nkrumah FK. Paediatric Oncology in the developing world: An African Perspective. *Ann Trop Paediatr* 1987;3:155-8.
18. Craft AW. Childhood cancer-mainly curable so where next? *Acta Paediatr* 2000;89:386-92.
19. Barr RD. The challenge of childhood cancer in the developing world. *East Afr Med J* 1994;71:223-5.
20. Wagner HP, Antic V. The problem of pediatric malignancies in the developing world. *Ann N Y Acad Sci* 1997;17;824:193-204.
21. Sutaryo, Sumadiono, Veerman AJP. SIOP XXXV Meeting Cairo. Egypt October 8-11-2003 (SIOP Abstract).
22. Hadley "Larry" GP. Wilms tumour in countries with low resources. Key note address delivered during the 39th Congress of the International Society of Pediatric Oncology. Mumbai, India, 31 October-3rd November 2007 Available from: [http:// www.care4kids.org](http://www.care4kids.org) [last accessed on 2009 Feb 4].
23. Ribeiro RC, Pui CH. Saving the Children-Improving Childhood Cancer Treatment in Developing Countries. *N Engl J Med* 2006;352:2158-60.
24. Veerman AJ, Sutaryo, Sumadiono. Twinning: A rewarding scenario for development of oncology services in transitional countries. *Pediatr Blood Cancer* 2005;45:103-6.
25. Pui CU, Ribeiro RC. International collaboration on childhood leukaemia. *Int J Hematol* 2003;78:383-9.
26. Mostert S, Sitaresmi MN, Gundy CM, Sutaryo, Veerman AJP. Does aid reach the poor? Experiences of a childhood leukaemia outreach-programme. *Eur J Cancer* 2009;45:414-9.

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