Essential Elements in Improving Oncology in Low- and Middle-Income Countries (LMICs) and Examples for Their Implementation in Nigeria

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Introduction

The burden of cancer is increasing in LMICs due to higher life expectancy, westernization of lifestyle, and reduced childhood mortality (El Saghir et al. 2014). This is a source of great public health concern. There is poor uptake and implementation of preventive measures as well as poor access to early diagnosis and treatment. Together, these lead to a high proportion of patients presenting with advanced diseases. Outcomes of cancer treatment correlate with the degree of early detection and diagnostic efficiency paired with appropriate and timely management. Other factors that contribute to the poor outlook of cancer in LMICs include a lower level of education and awareness in lay and health-care communities, poor public awareness and information on cancer, poverty, weak health-care system, and death of cancer health-care personnel. There is also poor research output on preventive, diagnostic, and interventional methods relevant to the population taking into consideration, appropriate methods, and technology in fighting cancer. The aim of this chapter is to highlight essential elements needed to prevent cancer and improve care of cancer patients in LMICs.

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Prevention and Early Detection

The problem: Certain habits and lifestyles are known to predispose to some cancers. These include tobacco and alcohol use, intake of fatty foods, sedentary lifestyle, and obesity (Katzke et al. 2015). Reduction in the indulgence with these habits and lifestyles as well as control of obesity are essential as measures of primary prevention of cancer. Tobacco smoking is an important risk factor for cancers, especially cancers of lung, head, and neck region and esophagus and bladder cancer (El Saghir et al. 2014). More people in LMICs indulge in tobacco smoking more than before as a sign of new wealth or as part of westernized lifestyle (Editors The Lancet Respiratory Medicine 2019). Education and anti-smoking legislation/campaigns are relatively weak in LMICs. Strengthening these aspects including restricting smoking in public places and screen adverts on tobacco can reduce smoking habits especially among adolescents and young adults. Dietary factors are responsible for about 20% of cancers in LMICs (El Saghir et al. 2014). These can be reduced through intense and sustained public education on promoting healthy diets and increased physical activity as well as proper food storage.

Possible solutions: Education on healthy food habits and lifestyles starting in kindergartens, schools, and throughout all mass media can raise public awareness and introduce behavioral changes

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that will ultimately lead to the adoption of healthier habits. Alcohol and tobacco abuse education and tobacco cessation programs can help to drop these habits together with stress management programs for all ages and physical education.

In Nigeria, efforts are being made to enlighten the public on the need for healthy habits and lifestyles, but these efforts are sporadic and—so far—not consistent. Furthermore, such activities concentrate on cities and urban areas whereas the rural areas, where about 80% of the population live, are hardly reached. Primary prevention and education require more funding to be provided to support nationwide enlightenment campaigns on healthy living.

Control of Infections Associated with Cancer

The problem: Close to 30% of cancers in LMICs are associated with infections (Shah et al. 2019). The control of the spread of these infective agents constitutes a part of primary prevention of cancer. Notably among these infective agents are human papilloma virus (HPV), which is associated with the development of cervical cancer, and hepatitis B virus (HBV), which is associated with the development of hepatocellular carcinoma (Hussein et al. 2016). Even though effective vaccines are available for the prevention of these two infections, the uptake and coverage for these vaccinations are still low in LMICs. These are partly due to the lack of sustainable vaccination programs that enable eligible individuals free access to the vaccines and the lack of financial capacity for individuals to pay for the vaccines. The high prevalence of human immunodeficiency virus (HIV) in many LMICs is also a factor responsible for the high incidence of HIV-associated cancers in these countries. People living with HIV are vulnerable to AIDS-associated malignancies and other malignancies with poor treatment outcomes.

Possible solutions are prevention education, sex education starting in kindergarten and schools, empowering women econonomically, vaccination programs with widespread media coverage, and destigmatization of people living with HIV and cancer. In Nigeria, the coverage of HPV and HBV vaccination is quite low. This is largely due to poor access due to cost. The price reduction of HBV and HPV vaccines will greatly contribute to an increase in the uptake of the vaccine in LMICs. In addition, public education and campaigning on the usefulness of vaccination should be stepped up to improve uptake and support of vaccination programs.

HIV treatment is better because there were international donors that supported the diagnosis and treatment. Such aids are needed to make HPV and HBV vaccinations available to a larger population. Current efforts toward the control of HIV infections should be strengthened and sustained to reduce the incidence and morbidity associated with HIV infection to enlist a reduction in HIV-associated cancers.

Improving Cancer Screening and Diagnosis

The problem: Cancer screening has been reported to contribute significantly to the low cancer-related mortality in high-income countries (HICs) (Sankaranarayanan 2014). This is particularly true for cervical, breast, and colorectal cancers. Screening programs are nonexistent in most LMICs, and where available, they are at great cost and therefore not affordable by most patients, who pay out of pocket for these services. In addition to these, screening facilities are scanty and not close to where most people reside.

Possible solutions: Efforts towards the reduction of cost especially for the most prevalent cancers, namely, breast, cervical, prostate, and colorectal cancers, will improve uptake of screening tests thereby leading to early diagnosis and effective treatment. These cost reductions should be communicated together with the health benefits of the respective screening programs.

In Nigeria, there is no established program for cancer screening. Individuals pay for their screening, and screening centers are also not readily available as they are mostly located in tertiary hospitals. Primary health-care facilities should be

adequately prepared to take part in some aspects of screening such as taking samples in the case of cervical cancer screening and shipping them to the closest tertiary centers for processing and analysis. Mobile mammography vans and boats should be procured to visit primary health-care centers in remote areas including riverine communities at intervals to conduct screenings at subsidized rates. Clinical teams can also visit primary health-care centers at intervals to carry out screening activities and counseling.

Availability of Diagnostic Methods

The problem: Diagnosis plays an important role in the prevention and treatment of cancer. Communities with low-quality diagnostic infrastructure will underreport the cancer burden in their areas (Cazap et al. 2016). In most LMICs, diagnostic facilities are poor and most of them are in urban centers.

Possible solutions: The assessment of cancer burden in communities requires both the training of personnel and availability of equipment to provide these services. In particular, diagnostic facilities will improve cancer diagnosis and treatment.

In Nigeria, as an interim measure, centrally located diagnostic centers with optimal facilities could be established in districts, and samples could be collected and sent to such centers for analysis. With the availability of courier services and other means of transport and communication, samples could be transported to such centers and results sent to the requesting health-care facilities by secured emails or text messages. This arrangement could also be used for investigations such as genetic/genomic profiles that cannot be done in-country presently.

Optimizing Patient Management

The problem: Access to care is limited in LMICs. This is due to lack of enough cancer care facilities (Haier et al. 2019). Radiation therapy is an important modality of cancer treatment, and it contributes to the cure or palliation. About 50% of cancer patients will require radiation treatment at one time or the other during the course of their cancer care (Delaney et al. 2005). In Nigeria as in other LMICs, the availability of radiotherapy facilities is less than one machine to one million people compared with more than five machines to one million people in a developed country like Canada according to IAEA DIRAC database (Fig. 1) (IAEA 2021).

So far, facilities for cancer treatment are too few in LMICs, and where they are available, the cost is high. The various stages of cancer management, namely, diagnosis, staging, treatment, follow-up, and palliative care, require physicians who specialize in these aspects. According to a recent IAEA (International Atomic Energy Agency) report, there is a shortage of about 50,000 cancer care professionals in developing countries necessitating the need for institutions in the developed world to collaborate toward training of manpower for LMICs (IAEA 2020). These specialists are therefore few in most LMICs. In some instances, they may not be available. Early detection requires appropriate treatment for good disease control. Many patients travel far distances to access care, which is associated with high cost for them. Many of the patients cannot afford the financial demands needed to access care and therefore abandoned treatment at various stages.

Possible solutions: Introduction of universal health insurance to cover cancer services and generating funds to subsidize cancer treatments would substantially improve the uptake of services. Many governments and philanthropists can improve the uptake of complete cancer services. In addition, it will be in the interest of the entire population to create own sickness funds based on principles of solidarity and that every employer should contribute to these sickness funds.

Hostels with less expensive accommodation may offer their services near major cancer treatment centers to ease problems associated with lodging away from home to access treatment. Primary care must be made available through establishment of cancer centers in regions closer to the people. Outreach programs organized to reach rural populations may include some aspects of cancer services.

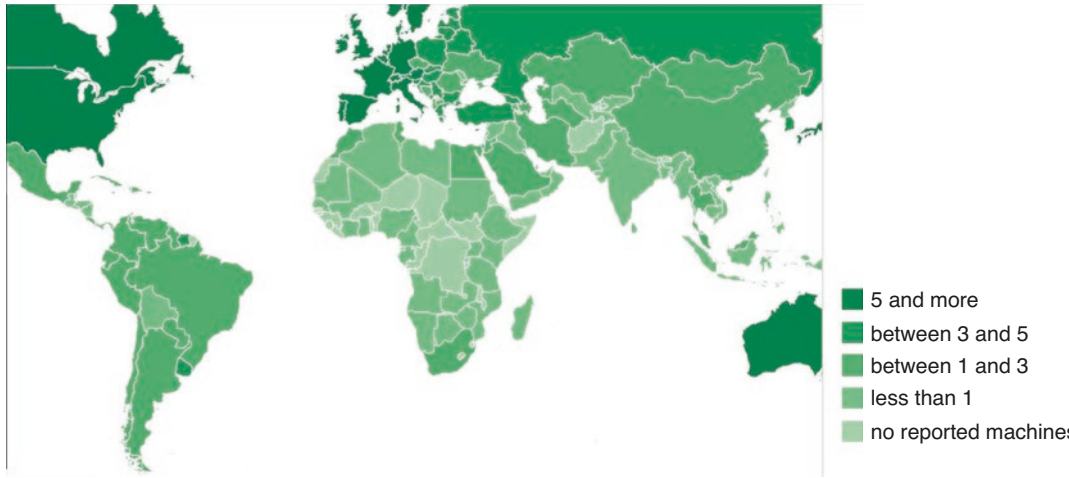

Fig. 1 Number of radiotherapy machines per million people (Source: IAEA Directory of Radiotherapy Centers (DIRAC) (IAEA 2021)

Following the diagnosis of cancer, resources should be available to address the treatment of the patient with the identified disease. Collaboration with HICs to support cancer care services through donations and other supports is important if services cannot—yet—be provided by the home country of the patient. There could also be a joint review of investigation results and management plans of patients between healthcare professionals in LMICs and HICs, as shown in the Cure4Kids initiative by St. Jude Children's Research Hospital (https://www.cure4kids.org/) in the USA or the Mayo and Cleveland Clinic outreach programs. These can be Internet-based to ensure optimal treatment and exchange between highly qualified professionals.

Research

1. Cancer research provides the way through which cancer care improved in HICs (Barrios et al. 2018). Through research, effective methods of diagnosis and treatment relevant to the population are being identified, developed, and put into practice.

   The problem: There is a low level of research in most LMICs. Little is budgeted for research leading to a low impact of research on cancer care. Research activities covering the assessment of the current status of cancer incidence (registries), clinical research with a focus on the population served, and behavioral research for the improvement of primary and secondary prevention are required for effective cancer control in LMICs.

   Possible solutions: One way of improving this is to form research collaborative groups involving researchers from LMICs and those from HICs. This will enable the researchers from LMICs to be mentored by researchers from HICs. Such collaborations should focus on identifying common malignancies where obvious improvements can be demonstrated. Senior and junior researchers should be involved in such collaborations, and each team should inculcate research methods, particularly good research practice and good governance, as well as generation of research ideas in LMIC members. There is also the need to improve funding for research to local researchers in LMICs so that they can build their research teams and improve facilities that will enhance research collaborations.
2. Clinical trials provide the main process by which new drugs are introduced into clinical care. There is a need to study individual drugs in target populations to ascertain activity and toxicity in populations because there might be ethnic differences in drug response.

Problem: Less than 2% of global clinical trials in oncology are conducted in sub-Saharan Africa.

In Nigeria, less than five oncology-related clinical trials have been conducted so far based on our search through major clinical trial registration websites. It is also noted that none of the antineoplastic drugs currently in use in Nigeria included indigenous participants in the trial that led to the approval of such agents for use in humans. This implies that the pattern of activity and toxicity of such agents on our population is unknown bearing with it risks for poorer performance and hence poorer acceptance of these drugs.

Solutions: There is a need for collaboration between researchers in HICs with LICs to improve expertise, infrastructure, and support for clinical trials that will involve indigenous populations. All experimentation involving humans must be held to the highest standards, and all principles of good clinical practice must be observed. This is achieved easiest when physicians learn the proper conduct of clinical trials from the best in their fields.

To improve this in Ibadan, we partnered with the University of Chicago, USA, building on a long-standing research collaboration, to improve oncology clinical trials in Nigeria. At the initial survey, there was low capacity of the personnel on the conduct of clinical trials as most of them never took part in a clinical trial before. There were no study monitors conversant with oncology clinical trials to provide regular monitoring of trials to ensure protocol and GCP compliance. There were regulatory bodies in place such as the institutional review boards (IRBs) and the Nigerian national regulatory body—the National Agency for Food and Drug Administration and Control (NAFDAC), but these bodies had limited experience in regulating oncology-related clinical trials. At the institutional levels, there was little experience on the part of the management team on the review and administration of oncology clinical trial contracts. There were also some inadequacies in clinical facilities to support oncology-related trials.

Personnel on all aspects of clinical trial were trained in good clinical practice and relevant areas on Nigerian regulations with respect to clinical trials. The facilitators included personnel from the University of Ibadan, Nigeria, the University of Chicago, and the Roche Pharmaceutical Company. The trained personnel included clinicians, pathologists, radiologists, pharmacists, study coordinators, psycho-oncologists, study nurses, statisticians, data managers, and patient navigators. There were no study monitors and study manager at our center, so six study monitors and one study manager were trained with the assistance of a clinical research organization (CRO) from the USA. During the training, the clinical personnel were able to develop standard operating procedures (SOPs) for their various services. Four centers in Nigeria, which had prior research collaborations with the University of Chicago, were involved in the project. Further details on preparing the sites for clinical trials were captured in our previous report (Ntekim et al. 2020).

To test run our oncology clinical research teams, the University of Chicago sponsored the phase II ARETTA study (ClinicalTrials.gov NCT03879577) to ensure the study teams can deliver. The study is ongoing as at the time of this report under the supervision of the University of Chicago.

There is scarcity of insurance companies in Nigeria with experience in underwriting oncology clinical trials. Therefore, this service was procured in the USA by the University of Chicago. We have, however, identified few indigenous companies in the meantime that have affiliations with US companies capable of providing this service.

Participants' engagement was an issue during the implementation of this trial. Most of the potential participants were not aware of the importance of clinical trials. Enlightenment campaigns were carried out among care groups and nongovernmental organizations to sensitize the populace on clinical trials. This paid off as we were able to enlist the support of these groups thereby improving study accrual.

Infrastructure and Human Resource Development

Infrastructure is crucial in improving oncology care in LMICs.

Problem: There is weak infrastructure for health-care delivery in LMICs including human resource development and retention. Constant overworking leads to a low personnel morale in addition to inadequate supplies of drugs and equipment resulting in brain drain from the subregion.

Possible solution: Part of the efforts by various governments of LMICs must go into upgrading health-care facilities and offering incentives to health-care workers to encourage them to stay. It would be desirable if high-income countries could be assisting by donating up-to-date health-care equipment to support cancer care in LMICs. Training positions can also be made available by high-income countries for oncology health-care personnel from LMICs to have exposure on various aspects of care. Likewise, participation in these pioneering activities might equip personnel from HICs with a unique skillset.

Multidisciplinary Management

Problem: Multidisciplinary management (MDM) is the recommended model for the management of patients with cancer for improved outcome. However, in most LMICs, this model is rarely adopted. This is partly due to inadequate personnel to cover relevant specialties and sometimes due to nonprofessional attitudes. Adoption of precision oncology, which is the current focus for effective cancer management, is currently out of reach in LMICs. This is also related to lack of personnel, infrastructure, and the high cost of targeted therapies that are unaffordable by most patients in LMICs.

Possible solutions: Adoption of multidisciplinary management of patients with cancer should be promoted in LMICs. Where specialists are scarce, mini-tumor boards made up of surgeons, clinical oncologists, pathologists, radiologists, and oncology nurses have been recommended, and virtual attendance should be enabled. This will improve chances of improved review of patients.

This method has been adopted in some centers in Nigeria in the form of site-specific tumor boards. However, few tumor sites, namely, breast, prostate, head, and neck cancers, are covered and even then only in few institutions. There could be linkages with established tumor boards locally and internationally for web-based review of patients to improve clinical management based on established guidelines. Promoting precision medicine in LMICs is possible through establishing partnerships with centers in high-income countries. Samples for molecular analyses could be shipped to centers with facilities and expertise either in-country or in high-income countries for profiling. However, efforts at improving expertise and facilities for precision oncology in LMICs should be pursued passionately. This could start with training on sample preprocessing for shipping to identified labs for analyses.

At present, it would be more feasible and cost-effective to promote early detection thereby enabling local treatment by surgery and/or radiotherapy, first and foremost. This would lead to more in-country competence and nondependence from costly drugs that are currently under scrutiny even in HICs because of their prohibitive cost.

Supportive and Survivorship Care

Palliative care is important in management of patients with cancer, especially in LMICs where most patients present late.

Problem: There is a need to improve pain management and general well-being of the patient as much as possible. These services are hardly available in LMICs.

In Nigeria, for example, palliative care clinics exist in very few centers with none having inpatient care facilities. There are no established training programs on palliative care. Access to pain management and opioid analgesics is still limited.

Possible solution: Training of palliative care experts and provision of palliative care for both inpatients and outpatients must be part of the regular curriculum of human medicine. Efforts should be made to ensure that opioid analgesics are available and affordable to those who need it. Collaboration with relevant institutions is required to upgrade training, infrastructure, and facilities for palliative care services.

There are particular issues associated with survivorship among cancer survivors. Survivors need information concerning their health and social conditions following cancer treatment. The formation of survivor self-help groups has been noted to assist patients greatly toward coping with life after cancer treatment. Such groups are rare in LMICs. Some members of such groups are usually willing to talk about their condition thereby assisting in enlightenment of the populace on cancer and discouraging stigmatization. The formation of survivorship and advocacy groups should be encouraged in LMICs where they can work with health-care personnel and policy makers to promote cancer education and uptake of preventive measures. It is important to change the narrative from one of despair and defeat into one of hope and conquerors.

In Nigeria, the National Cancer Control Plan (2018–2022) contains action plans to address most of the above problems. These include prevention, diagnosis and treatment, hospice/palliative care, and advocacy and mobilization (Federal Ministry of Health 2018). Implementation has, however, fallen short of projections. In the document, the objective was to attain 90% coverage for HPV and HBV vaccination among eligible Nigerians by the year 2022. As at the time of this report, which is about 8 months to the end of year 2022, there is no mass mobilization for HPV and HBV vaccination program in place. Screening of 50% of eligible population for eligible cancer was to be achieved by the year 2022. However, up till now, there has been no change on screening practice in the country. These lapses might relate to inadequate finance, technical capabilities, and perhaps lack of prioritization of cancer services among other economic, sociopolitical, and security challenges in the country.

Conclusion

This chapter described the various challenges associated with the delivery of effective cancer services in LMICs with a focus on Nigeria. Such issues include inadequacies in facilities for prevention, diagnosis, treatment, and follow-up of cancer patients. I highlighted other elements needed for improvement of cancer care such as research and adoption of personalized cancer care and described possible methods of overcoming some of the challenges. These are anchored mainly in collaboration with and support from high-income countries and donor agencies thereby creating also new markets and possibilities of growth within the countries, where these services are being established. Authorities of LMICs also must play important roles in providing infrastructure and formulation of cancer control policies that can be implemented toward improving the outcome of cancer management.

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