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Perspectives and View Points

Artificial Intelligence and Cancer Control in Low-middle Income Countries- relevance in the COVID-19 Era

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In view of limited resources and financial constraints, overburdened cancer services in low-middle income countries struggle to provide timely interventions in patients with cancer. Cancer services have been severely affected during the Coronavirus disease 2019 pandemic. Many patients are being deprived of timely screening and treatments have been delayed owing to resource reallocation and funding constraints. Artificial intelligence shows considerable promise in reducing screening, treatment, and patient waiting times; it also increases departmental throughput and improves the cost-benefit ratio of treatment. In limited resource settings, the reallocation of saved costs may be used to improve care services. In view of the disruption caused by the pandemic, greater use of artificial intelligence for cancer screening and care may reduce the burden on existing facilities in low-middle income countries. This may aid early diagnosis and treatment, prevent the need for prolonged and intensive treatments, and improve patient outcomes at this difficult time.

Introduction

Cancer is a leading cause of death worldwide, and low middle income countries are the major contributors to global cancer mortality. In view of limited resources, the provision of timely cancer care remains a major challenge in these countries; the rising burden of cancer further aggravates the impact of existing constraints. Health emergencies such as the coronavirus disease 2019 (COVID-19) pandemic have demonstrated the critical need for public health preparedness. The impact of the pandemic on cancer services is expected to create a tsunami of cases in low-middle income countries, which are already in urgent need of newer strategies for providing timely and adequate cancer care.

The cancer problem in low middle income countries

Most global cancer deaths continue to occur in low-middle income countries [1]. Limited resources, poor accessibility, socioeconomic disadvantages, and inequitable healthcare in these settings have been major contributors to the increased mortality from the disease. Although the cancer incidence in these regions is lower than that of many other regions worldwide, a larger proportion of patients present at locally advanced stages, worsening prognosis. Financial toxicities and the lack of widespread availability of cancer facilities have further impact on the prognosis.

In view of the limited resources and inadequate spending on cancer care in many of these countries, the existing treatment facilities continue to struggle to deliver timely care in many cases. In addition, owing to poorer spending on healthcare in general, facilities such as home-based care and nursing care in the community are non-existent; this has a definite adverse impact on treatment compliance and patient outcomes.

Impact of the pandemic on cancer care in these settings

The global outbreak of COVID-19 has made considerable impact on cancer care worldwide, with many regions reporting delays in diagnosis and treatment. In low-middle income regions, where public health care expenditures are low in many countries, the pandemic has clearly exposed the weaknesses of the healthcare systems. Although cancer centres in these regions are endeavouring to improve treatment delivery and access, delays in diagnosis and treatment are expected to have considerable impact on survival in cancer patients for years to come [2].

Reports from these countries, which have the largest burden of certain preventable cancers, suggest that screening facilities have been hit drastically by the pandemic [3]. Many patients have therefore been deprived of early diagnosis and treatment; countless others are still waiting to be diagnosed. Countries from Southeast Asia are major contributors to the global burden of cervical and head and neck cancers, and although mortality from these cancers continue to be the highest in the world, screening has made a noticeable difference. Reports have suggested a decline in the number of cancer diagnoses and treatments during the pandemic. Although cancer services have gained momentum, and vaccination has brought much needed respite, a post-pandemic tsunami of cases is expected to hit treatment facilities in these countries [4]. A rise in cancer mortality in the aftermath of the pandemic therefore remains inevitable.

Cancer treatment facilities in these countries have been working to improve workflow and the number of completed treatments; many centres have implemented the use of shorter treatment regimens to ensure that the number of completed treatments can be feasibly increased in the setting of limited resources. Nevertheless, shortages in healthcare personnel and infrastructure hinder efficient use of the existing resources, thereby reducing the cost-benefit ratio.

Artificial intelligence in cancer care

Artificial intelligence (AI) has shown considerable promise in various aspects of cancer care including screening, diagnosis, and treatment delivery. AI-related improvements in the efficiency of cancer care can also reduce healthcare costs considerably [5]. In the limited resource scenario, the costs saved can be used for improving accessibility, affordability, and quality of healthcare, thereby saving more lives.

AI has shown tremendous potential in the genomic characterisation of cancer; the early diagnosis of genetic mutations and aberrant protein interactions may prevent the development of many cancers, thereby reducing the burden on treatment services. It has also shown remarkable potential in the improvement of cancer surveillance [6]. Pathology and radiology services, the backbone of cancer screening, face several challenges related to financial constraints and shortages of staff and infrastructure in these settings. These major obstacles hinder throughput, reducing the number of early diagnoses.

Why cancer care policies in these countries should consider incorporation of AI

The promise shown by AI in improving turnover in cytopathology, histopathology, and radiology services necessitates its incorporation into screening facilities in these regions. As the population eligible for screening is larger in these countries, screening services struggle to cope with the routine workload. The greater burden on the staff following the pandemic is likely to increase the probability of human error, and consequently the numbers of false negative cases. In the field of radiology, AI-based systems obtain all visible and non-visible image features to provide more accurate results compared to conventional computer-aided systems; diagnosis is thereby improved without increasing the burden on the existing staff. Computational pathology has also demonstrated major improvements in cancer diagnoses, including confirmation of diagnoses in ambiguous cases. Reports indicate the feasibility of using advanced digital microscopy diagnostics with AI support in rural resource-limited settings [7]; AI could therefore make a major difference to

screening in these regions, reducing the numbers of waiting patients and facilitating treatment in earlier stages.

In the clinic, AI has shown considerable promise in improving real-time lesion detection during colonoscopy and image-guided biopsy assistance. The improvement in diagnostic accuracy has also reduced the likelihood of unnecessary extensive surgery in patients with cancer, thereby improving patient turnover. For patients receiving chemotherapy and immunotherapy, AI has improved understanding on resistance to anti-neoplastic agents. The development of resistance can be identified earlier and unnecessary treatments avoided. It also enables the effective identification of newer tumour antigens, thereby improving efficacy of immunotherapy.

Despite certain limitations, AI has been found to offer advantages in decision-making and predicting response to therapy. In the context of radiation therapy, studies have found definite reduction in the burden on radiation planning staff, who may refocus on other tasks; this would improve the throughput of radiation facilities with limited resources. The improvement in timelines for radiation planning also shortens waiting times for initiation of treatment [8]; a reduction in delays lowers the risks of spread, which can potentially affect tumour control.

AI and cancer control in these settings

In view of the undeniable advantages, the integration of AI may improve cancer control in these settings. As it confers considerable cost benefits by reducing the number of unnecessary treatments and procedures, the incorporation of AI is expected to optimise the use of available resources [9].

The benefits offered in terms of better and more efficient screening, cost-effective treatment, and better departmental throughput are of particular value in institutions with staff shortages and limited infrastructure. Its incorporation into cancer services may therefore serve to be a major game-changer in limited resource settings. Appropriate allocation of funds for the incorporation of AI may improve patient and healthcare outcomes in these settings, and thereby improve cancer control. In view of the post-COVID surge in cases, expeditious planning and phased implementation of AI-based cancer control warrants urgent consideration.

In conclusion, AI has shown considerable promise in improving healthcare systems in various settings. The benefits offered in terms of diagnosis, treatment planning, and triage are expected to have considerable impact on cancer care availability and delivery in LMICs. It is therefore essential that measures are taken to increase the implementation of AI-based applications in cancer care. These include improvement of user-friendliness, comprehensive evaluation of context-specific tools, improvement of data availability, and appraisal of reliability and effectiveness in different real-world settings. Increasing funding for the use of AI-based tools in areas with considerable infrastructure limitations may expedite diagnosis, allow for better patient triage, and reduce treatment waiting times. Planning and policy-making in LMICs should therefore prioritise the incorporation of AI in cancer care.

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