Effects of chemotherapy on the oral health in paediatric oncology patients at the Kenyatta National Hospital
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Abstract

Aim: To determine the most prevalent oral adverse effects faced by children undergoing chemotherapy treatment.

Study design: A descriptive cross-sectional study, conducted at the Kenyatta National Hospital.

Materials and methods: A total of 42 paediatric oncology patients at the Kenyatta National Hospital wards and oncology out-patient clinics were included in the study. The principal investigator conducted a clinical examination and collected data using a questionnaire.

Results: Majority of the patients examined were male, and the predominant cancer was acute lymphocytic leukemia with a prevalence of 28.6%. This finding contradicts a previous study, which mentions Burkitts lymphoma to be the most prevalent cancer among children around this region. The oral diseases which were most prevalent were dental caries (45%), followed by ulceration (40.5%) and mucositis (33.3%). Vincristine, cyclophosphamide, adriamycin and methotrexate are the drugs which cause the most adverse effects in the oral cavity.

Conclusion: Thus, it is necessary that patients are educated on the importance of oral hygiene. Further studies need to be carried out regarding the high prevalence of dental caries and the predominance of acute lymphocytic leukaemia among the children at the Kenyatta National Hospital.

Introduction

Chemotherapy is one of the main treatment modalities indicated for cancer. The development of targeted therapies has assisted in the minimization of chemotherapy-induced complications 1, but most established regimens still consist of agents that non-selectively disrupt essential functions such as the cell cycle. In general, chemotherapy causes acute toxicities that resolve following discontinuation of therapy. Many children receive combination chemotherapy which is the use of two or more cancer-fighting drugs, with or without other treatment modalities such as radiation therapy and surgery. This strategy reduces the chance of the child becoming resistant to a particular drug, but increases the cumulative risk for chemotherapy-induced complications 2.

Current research indicates that the side effects of these chemotherapeutic agents are different in each child depending on the type of drugs used, its dosage and the child’s general health 3. The oral complications could be caused by direct damage to oral tissues, attenuation of immune and other protective systems, and interference with normal healing 4. The oral side effects associated with chemotherapy include mucositis, stomatitis, viral, fungal and bacterial infections, bleeding of gums, increased tooth decay, taste changes pain and damage to ameloblasts and odontoblasts. Estimated frequencies of oral complications vary by cancer therapy: 10% is thought to be related to adjunctive chemotherapy, while 40% is associated to primary chemotherapy 4,5.

The mucosal lining of the gastrointestinal tract, including the oral mucosa is a prime target for treatment related toxicity due to its rapid cell turnover rate. Younger patients appear to have a greater risk of chemotherapy-induced stomatitis, probably due to a more rapid epithelial mitotic rate or the presence of more epidermal growth factor receptors 6. These complications can lead to secondary complications such as dehydration, dysgeusia and malnutrition. Severe oral toxicities can compromise delivery of optimal cancer therapy protocols, resulting in treatment interruptions or discontinuation 7.

In a research done at Rift Valley Provincial General Hospital in Nakuru, it was found that the most common tumour in children was Burkitts lymphoma accounting for 33.5% of tumours, followed by non-Hodgkins lymphoma which accounted for 21.8% of tumours 8. The aim of this study was to identify the most common oral conditions affecting children undergoing chemotherapy and hence educate them and their
parents on how to alleviate the suffering caused by this through the help of a dentist.

Materials and Methods

This was a descriptive cross sectional study conducted at the Kenyatta National Hospital (KNH) which is located in the city of Nairobi. KNH is the largest referral hospital in Eastern and Central African region. Ethical clearance and approval was sought and granted by the KNH and University of Nairobi (UoN) Ethics, Research and Standards Committee for this research to be conducted at the institution. A convenience sample of 42 paediatric patients undergoing chemotherapy in wards 1E, 3A, 3B, 3C, 3D and 9B and the oncology out-patient clinics was studied. Convenience sampling was used due to the short duration of the data collection period and the small numbers of potential study participants. As the study was going to be conducted on children, consent was sought from the parent/guardian. Those who did not give consent and those who were undergoing combined chemo- and radio-therapy treatment regimens were excluded. The results obtained were analysed and major trends were presented using the Statistical Package for Social Sciences (SPSS) programme (version 12.0).

Results

Demographic characteristics and types of neoplasms 42 patients in total were examined at the Kenyatta National Hospital in oncology, ophthalmology and paediatric wards; and the paediatric oncology outpatient clinic. Of these patients, 23 were male and 19 were female (Figure 1). There were 10 patients aged 2-4, 19 patients aged 5-7, 9 patients aged 8-10 and 4 patients aged 11-14. The mean age was 6.29 + 3.006 years, while the mode age was 5 years.

An assessment of the neoplasms being treated revealed that the patients suffering from acute lymphoblastic leukaemia (ALL) were 12 (28.6%); neuroblastomas were 4 (9.5%), nephroblastomas were 6 (14.3%), Burkitt’s lymphoma were 6 (14.3%), retinoblastomas were 3 (7.1%), sickle cell disease (SCD), Hodgkin’s lymphoma and acute myeloid leukaemias (AML) were 2 (4.8%), germ cell tumour, neurofibrosarcoma, rhabdomyosarcoma, neuroectodermal tumour and chronic myeloid leukaemias (CML) were 1 (2.4%).

Side effects of chemotherapeutic agents and oral hygiene habits. The frequency of patients who had ulceration was 17(40.5%), mucositis was 14 (33.3%), (Figure 3). 11 (26%) patients never brushed their
Figure 2: Distribution of conditions treated by chemotherapeutic agents

Figure 3: Conditions observed in the oral cavities of children on chemotherapeutic medications.

candidiasis was 9 (21.4%), xerostomia was 2 (1.8%), caries was 19 (45%), erythema was 3 (7.1%), stomatitis was 4 (9.5%) and enamel discolouration was 3 (7.1%) teeth, 20 (48%) patients brushed their teeth once only, 9 (21%) patients brushed their teeth twice only and (5%) patients brushed their teeth thrice (Figure 4).
Adverse oral effects were observed for all the major medications; in most cases the patients reported more than one symptom. The proportions of oral side effects associated with specific medications are summarized in Figure 5. Only 1 patient was on allopurinol and oral ulceration was observed in this patient. A total of 3 patients consumed folic acid or pallidrine without any oral complaints. The number

of patients taking procarbazine was 2; both reported ulceration and stomatitis, as well as caries, erythema and mucositis. The sole patient on hydroxyurea suffered from oral ulceration. Ulceration, candidiasis and caries, and mucositis were reported by the six patients taking actinomycin D. Durations of the different chemotherapy cycles were variable.
Discussion

The majority of the children in the wards and clinic were suffering from acute lymphocytic leukaemia, which is in contrast to a research done at Rift Valley Provincial General Hospital, which gave Burkitt's lymphoma to be the most common malignancy in children within that region. This could be due to the fact that the research was done in a different area and over a longer period of time, compared to the one done at Kenyatta National Hospital. There could also have been a shift in the pattern of prevalence of cancers n children experienced in this region.

Cyclophosphamide, vincristine and Adriamycin were the drugs which were most frequently administered. All drugs consumed for chemotherapy by the children, except for folic acid and pallidrine were found to cause an effect in the oral cavity. This finding complies with the documented side effects of chemotherapeutic agents, including alkylating agents, anthracyclines, antimetabolites, antibiotics and vinca alkaloids, which have a high potential for precipitating oral mucosal damage.

The most prevalent effect observed in the oral cavity was dental caries, followed by ulceration, mucositis, candidiasis, stomatitis, enamel discoloration, erythema and xerostomia. Similar studies showed that patients who had undergone chemotherapy had a significantly higher plaque index.

This may explain the high prevalence of caries observed in children at the Kenyatta National Hospital. The high plaque index may be attributed to the poor oral hygiene observed in children: 26% never brushed their teeth and 48%, only brushed their teeth once daily.

Previous studies have not mentioned dental caries as an adverse effect of chemotherapy. They have however, mentioned conditions such as mucositis, candidiasis and ulceration to occur as an adverse effect to chemotherapy. Younger patients do however have an established high risk of chemotherapy induced stomatitis, due to a rapid epithelial mitotic rate or presence of more epidermal growth factor receptors. Furthermore, immune suppression caused by the chemotherapy drugs has been shown to cause uncontrolled herpes, candidiasis and pseudomoniasis, although these conditions were not observed in the present study.

Given the high potential for development of oral complication during the course of chemotherapy, patients and their families should be educated on the importance of maintaining good oral hygiene when undergoing treatment. This would reduce the high prevalence of dental caries observed. They should also be educated on the importance of regular dental checkups, to maintain optimal oral hygiene.

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References
