Using flow cytometry to improve paediatric leukaemia diagnosis in Mozambique.

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BACKGROUND

Routine leukaemia diagnosis is through microscopic identification of pathological blood cells in patients with abnormal Full Blood Count (FBC)
scattergrams and severe leucocytosis. Accuracy and timeliness of results is prone to many variables that could lead to incorrect diagnosis and delayed treatment initiation. Mozambique has a significant burden of paediatric cancers accounted for by high frequency of HIV-associated cancers. Improved diagnostic access and
leukaemia surveillance are thus needed. Flow cytometry was implemented to improve acute paediatric leukaemia differential diagnosis linked with timely
treatment initiation due to limitations of microscopic diagnosis. The implementation was to determine the feasibility of flow cytometry in leukaemia diagnosis instead of only microscopy with the aim of scaling the diagnostic approach without incurring additional costs. Mozambique already uses flow cytometry laboratory equipment for CD4 testing that could be used for this purpose.

DESCRIPTION

Instituto Nacional de Saúde (INS) introduced flow cytometry for leukaemia differential diagnosis using the BD FacsCanto II equipment in 2020. Clinical and technical trainings on identification of suspected leukaemia cases were conducted in 7 of the 11 provinces namely Inhambane, Nampula, Zámbezia, Tete, Cabo Delgado, Maputo City and Sofala. Clinical staff at the regional referral hospitals were trained by the the Paediatric Oncologist from Maputo Central Hospital and laboratory staff were trained on pathological cells' identification and interpretation of FBC scattergrams by biomedical scientists from INS. Suspected paediatric leukaemia cases
(0 – 14 years) had samples collected at regional hospitals and sent to INS for flow cytometry testing. Results were available to the Oncologist within 24hours of reaching the INS laboratory enabling timely leukaemia-type specific treatment of cases.

LESSON LEARNED

171 suspected cases were tested between January 2020 and December 2022. 89 patients were male and 82 were female. Of these patients 88 (51.5%) had leukaemia (42 female and 46 male). Two patients with leukaemia (2.27%), were HIV-1 infected. Three years mortality was highest (53%) among children aged 5-10 years. Mortality was highest among acute myeloid leukaemia cases (52%) although B acute lymphoblastic leukaemia was the most common cancer (45%). Other leukaemia namely T acute lymphoblastic leukaemia and mixed phenotypes were also diagnosed. There was a better survival rate in the age group of <5years compared to other groups as shown in the graph below implying the benefit of early diagnosis.

CONCLUSIONS/ NEXT STEPS

Flow cytometry for leukaemia differential diagnosis is feasible in Mozambique enabling linking leukaemia-specific cases to specific treatment with potential improved survival. Flow cytometry could revolutionise leukaemia diagnosis especially among paediatric HIV patients and is more accurate in diagnosis compared to microscopy alone. Building differential diagnosis using existing laboratory flow cytometry equipment is key to ensuring scalability and sustainability.

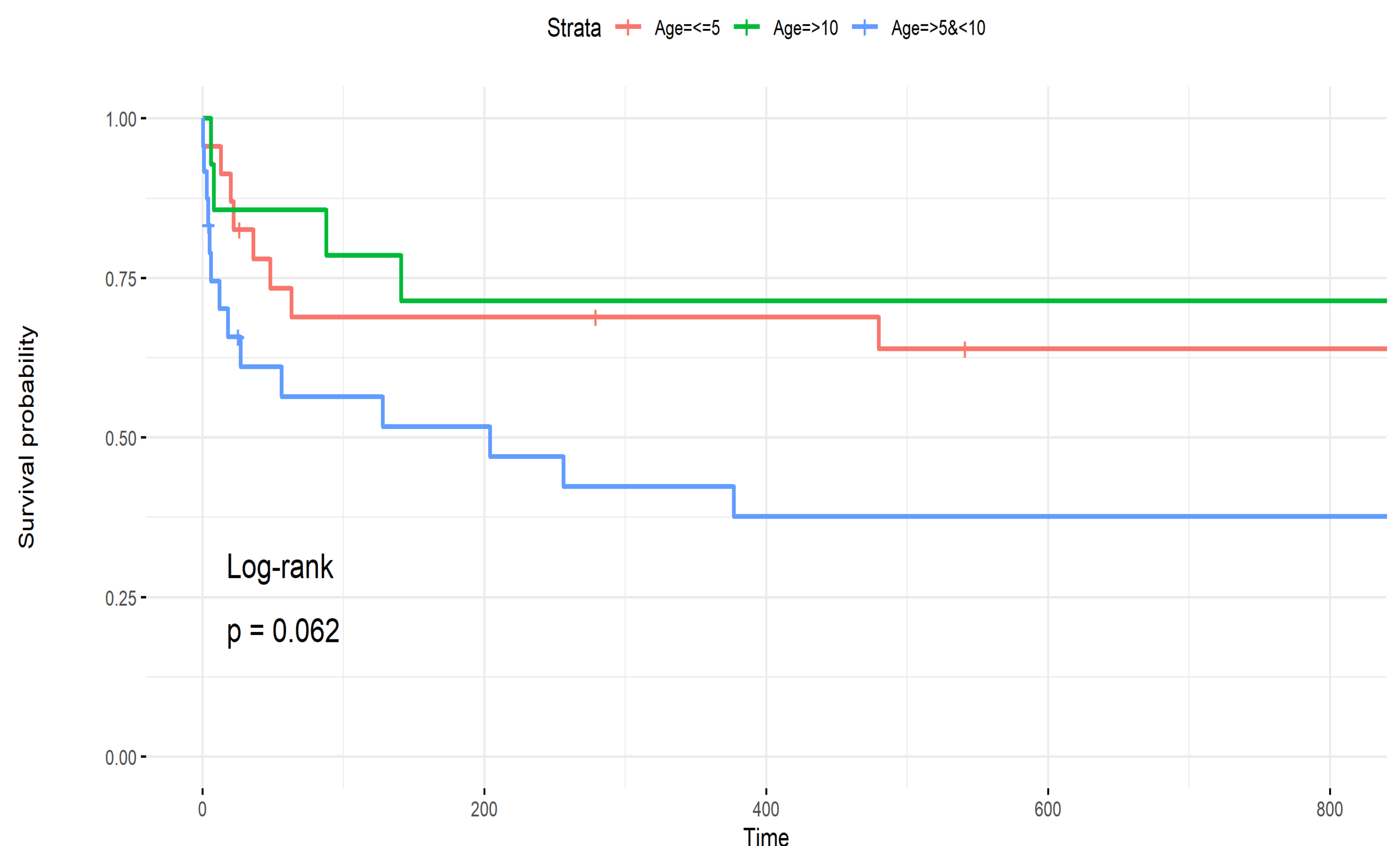Figure 1: BD FAcsCanto II used for flow cytometric differential diagnosis of leukaemia

Figure 2: Survival rate of leukaemia patients based on age at diagnosis

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