

Impact of a Childhood Cancer Awareness Program in Kenya: Sociodemographic Insights, Referral Trends, and Barriers to Care for Newly Diagnosed Children

Larissa Klootwijk

L.Klootwijk@prinsesmaximacentrum.nl

Vrije Universiteit Amsterdam

Lilian Apadet Osamong

Academic Model Providing Access to Healthcare (AMPATH)

Sally Kimaiyo RN

Academic Model Providing Access to Healthcare (AMPATH)

Terry A. Vik

Indiana University School of Medicine

Steven Vijver

Amsterdam University Medical Center

Gertjan Kaspers

Princess Máxima Center

Festus Njuguna

Moi Teaching and Referral Hospital

Research Article

Keywords: awareness, childhood cancer, low- and middle-income countries

Posted Date: August 27th, 2025

DOI: <https://doi.org/10.21203/rs.3.rs-7326216/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Introduction

Children in low- and middle-income countries face barriers to timely access cancer care. Between January and June 2023, an awareness campaign in Bungoma County, Kenya, aimed to address this issue. This study describes sociodemographic and clinical characteristics of children diagnosed with cancer after the campaign, explores health-seeking behaviors and delays, and compares cancer referrals pre- and post- campaign.

Methods

Parental interviews were conducted for all children newly diagnosed with cancer from Bungoma County at Moi Teaching and Referral Hospital between January 2023 and December 2024 using semi-structured questionnaires. Hospital registry data from January 2014 to December 2024 were analyzed to compare referrals pre- and post-campaign.

Results

Following the campaign, 30 children were diagnosed with cancer (40% female, median age 5.5 years). Diagnoses included hematological cancers (23%), solid tumors (60%), rare solid tumors (7%), and brain tumors (10%), with 57% of solid tumors presenting at advanced stages. Delays were substantial: median patient-, physician-, diagnosis-, treatment-, health system- and total delay were 30, 104, 114, 6, 114 and 146 days respectively. Barriers included use of traditional medicine, cultural beliefs, financial strain, travel costs, lack of insurance, income loss, and fear. Mean annual referral rate showed no notable change (14.5 [7.6] pre- vs. 15 [0.7] post-campaign).

Conclusion

The campaign did not increase cancer diagnoses, highlighting ongoing barriers in timely accessing childhood cancer care. Addressing these barriers is essential for improving access to childhood cancer care. Factors such as healthcare worker strikes, supply shortages, and treatment seeking at other facilities may have contributed to the lower-than-expected numbers.

Introduction

Childhood cancer affects more than 400,000 children worldwide annually. Most of these children live in low- and middle-income countries (LMICs).(1) Nearly half of Kenya's population is aged below 18, this means that it is estimated that about 4000 children develop cancer annually (prevalence 0.002%).(2) It is, however, projected that only a minority of these children are diagnosed and initiated on treatment in a referral hospital.(3, 4) Accessing comprehensive childhood cancer care remains one of the biggest challenges when addressing childhood cancer outcomes in LMICs.(5) The World Health Organization (WHO) Global Initiative for Childhood Cancer (GICC) was launched in 2018. It aims for a survival rate above 60% for children with common and curable types of cancer.(6) However, as long as only a minority of children with cancer receive a diagnosis resulting in adequate treatment, this goal will never be achieved.

The reason many children with cancer in LMICs, such as Kenya, will never be diagnosed is multifactorial. Contributors consist of both patient-related factors and healthcare worker-related factors that threaten timely access to care.(7) Parents' healthcare needs may not always be identified in a timely manner, which can be influenced by varying levels of health literacy and a preference for traditional, complementary, and alternative medicine (TCAM) alongside or prior to engaging with conventional healthcare services.(8–11) Additionally, parents may not be able to afford to pay for healthcare services.(12) Regarding healthcare worker-related factors, a primary healthcare provider might not recognize childhood cancer upon first presentation in its early stages.(13) Since the disease is rare, many healthcare workers are not experienced in suspecting the disease. Moreover, many common childhood cancers resemble other more prevalent infectious diseases. For example, leukemia can easily mimic malaria or a viral infection.(14) A swollen lymph node can be confused for an infection rather than, for instance Hodgkin lymphoma. Strange behavior and headaches can be mistaken for mental disorders instead of brain tumors.(15) The Kenyan national cancer control strategy strongly emphasized the importance of early detection and referral of children with cancer and specifically stressed the importance of capacity building in primary care facilities and training.(16)

A childhood cancer awareness campaign to train primary healthcare workers on early recognition and adequate referral was implemented in Bungoma County in Western Kenya in January 2023, aiming to increase early referrals of children with cancer.(17) Posters and radio messages were distributed to raise awareness amongst the general public.(15) An extensive training program training all primary healthcare workers of affiliated community health units, dispensaries and health centers was conducted.

The aim of this study, therefore, is to evaluate newly diagnosed children with cancer from Bungoma County after the implementation of the awareness campaign. The study aims to 1) describe sociodemographic and clinical characteristics of children newly diagnosed with cancer after the implementation of the childhood cancer awareness program from Bungoma County, 2) explore health-seeking behavior and delays in access to childhood cancer care amongst newly diagnosed children with cancer and 3) compare referrals of children with cancer before and after implementation of the childhood cancer awareness campaign.

Methods

Study setting

This study was conducted at a tertiary care hospital, Moi Teaching and Referral Hospital (MTRH), in Eldoret Kenya. Kenya is a lower-middle-income country in Africa. The country is split into 47 counties inhabited by over 42 tribes. The population was estimated to be 54,027,887 people, according to the 2019 census.(18, 19) Approximately 24,428,416 are under 18 years. Bungoma County, where the childhood cancer awareness campaign was implemented, is a county in Western Kenya that hosts a population of 1,786,973 people, of which approximately 800,000 are children below 18 years of age. The majority are Christians and belong to the Bukusu, a sub-tribe of the Luyha community. Around 87% live in

rural areas and 13% in urban areas. The main source of income is farming and business. The majority registers for primary school, and half of the schooling population enrolls in secondary school.(20–22)

Healthcare services are offered by primary- and secondary care facilities. The Kenyan healthcare system is supervised by the National Ministry of Health.(23) Health insurance is offered through the Social Health Insurance System (SHIF) that offers coverage for childhood cancer care. There is a decentralized system in place providing increased authority for decision-making, resource allocation, and management of health care to the county authorities. The Kenyan healthcare system consists of six different levels. The first three levels entail primary healthcare and include community health units (level 1), dispensaries (level 2) and health centers (level 3). Community health volunteers are affiliated with community health units and conduct health promotion in their respective communities. Secondary care consists of subcounty hospitals (level 4) and county hospitals (level 5). Tertiary care is offered in national referral hospitals (level 6). Two level 6 hospitals, MTRH and Kenyatta National Hospital, offer comprehensive childhood cancer care in Kenya.(24, 25) Annually, around 140 children from Bungoma County would be expected to develop cancer based on the global incidence 15 per 100.000.(26)

The Awareness Campaign

Between January and June 2023, a childhood cancer awareness campaign was implemented in Bungoma County. The campaign included training for all healthcare providers in the level 2 and 3 facilities and their affiliated community health volunteers. The training focused on how to recognize the six common and curable types of cancer as defined per the GICC(27), treatment modalities, the importance of early detection, the importance of health insurance registration, and finally, how to refer children suspected of cancer timeously. The program focused on the GICC-prioritized common and curable cancers, as these represent the most frequently occurring cancers with high potential for successful treatment when detected early.(27)

After the live training session, an additional self-paced learning program was offered to the healthcare workers through SMS-learning.(17) This SMS-learning program delivered seven modules per SMS, on the same topics as the live training session. Upon completing both the live-training session and the seven SMS-learning modules, healthcare workers could obtain a certificate.

Additionally, posters with early signs and symptoms of childhood cancer were distributed to all primary care facilities and pasted in waiting rooms for both patients and healthcare providers to be reminded of the signs.(28) Phone numbers of the pediatric oncology team at MTRH were written on the posters for easy communication on referrals. Finally, a radio campaign was conducted to reach the communities of Bungoma County.

Study design

This was a mixed-methods study that used both a prospective and retrospective approach to evaluate the impact of the awareness campaign. The prospective approach included parental interviews with the parents of children from Bungoma County at MTRH who were newly diagnosed with cancer after the start of the implementation of the childhood cancer awareness campaign in Bungoma County. Parental interviews were conducted using a semi-structured questionnaire developed by a panel of Kenyan, American, and Dutch experts in pediatric oncology, informed by a review of literature on delays in access to childhood cancer care.(29–36) (Supplementary file 1). Additionally, retrospective data were obtained from the hospital registry at MTRH to compare the number of referrals of children with cancer before and after the start of the awareness campaign.

Parental interviews

All children up to 14 years of age, referred from Bungoma County, confirmed to have childhood cancer, were eligible for inclusion starting from January 2023 up until December 2024. The research nurse monitored all referrals arriving from Bungoma County at MTRH and proceeded to an informed consent procedure prior to the parental interview. The interview was conducted in Kiswahili and consisted of a semi-structured questionnaire collecting the following data: socio-demographic data, clinical data, delays, usage and perception of both conventional medicine as well as TCAM, and barriers in referral. Regarding delays, we defined six different types of delays: patient delay, physician delay, diagnosis delay, treatment delay, health system delay, and total delay.(36) Clinical data included sex, age, type of cancer, stage of cancer, and early death. Early death was defined as death within 42 days after diagnosis.(37) Stage of cancer was defined as low in solid tumors stage 1 or 2 and as high in stage 3 and higher. Socio-demographic variables such as parental age, ethnicity, religion, occupation, and income were gathered to evaluate the representativeness of the referred patients in relation to the broader population of Bungoma County. Regarding the different types of delays, several questions were included on the causes for each type of delay. For patient delay: onset of symptoms, action upon onset of symptoms, usage of conventional medicine and TCAM, transportation challenges, health insurance status, beliefs upon cancer. For physician delay: treatment for other illnesses, counseling on cancer, appropriate referral, counseling on SHIF. For diagnosis delay: action upon first presentation at MTRH. For treatment delay: time to start treatment after diagnosis.

Comparison of referrals before and after the awareness program

Annual numbers of referrals to MTRH from Bungoma County of newly diagnosed children with cancer, were extracted from the MTRH data registry from 2014 till 2022. These referrals were compared to the number of referrals after implementing the awareness program.

Statistical analysis

Data management and analysis were conducted using *SPSS* version 26.0. Frequency distributions, medians, means, and standard deviations were calculated from the dataset to describe the data obtained from parental interviews on the characteristics of newly referred children with cancer.

Ethics

This study was approved by the Institutional Ethics and Research Committee (IREC) at MTRH with reference number IREC/2021/216 and approval number 0004060.

Results

Characteristics of newly referred children with cancer

In total, 30 children were referred from Bungoma County in the two years after the start of the campaign, between January 2023 and December 2024. Indicating in a mean of 15 new patients per year. The patient characteristics are displayed in Table 1. In total, 12 (40%) were females. The median age was 5.5 years (0–10). Cancers included hematological cancers (7, (23%)), solid cancers (20, (67%)), brain tumors (3, (10%)). High-stage cancer was reported in 17 out of 23 (74%) solid-type cancer cases and was unknown in 4 (14%). This distribution is comparable to the population of children with cancer presenting at MTRH.(36) Eight children (27%) died during this follow-up period. All these eight children (100%) died within 42 days after diagnosis and are therefore early deaths. Table 2 displays the socio-demographic characteristics of the parents of the 30 newly diagnosed children with cancer. The majority were from the Luyha tribe and Christians by religion. In 11 (37%) families, there was a stable income, in 63%, the main income provider was the father. The median income was 20.000 Kenyan shillings (= 145 euros) monthly. Parents had 3.6 children on average, ranging from 1–9 children per family. No families reported to have any deceased children. These socio-demographic are in line with the county data for Bungoma. (21) Regarding SHIF, 18 (60%) reported having SHIF before arriving at MTRH. This is higher compared to historical data on health-insurance on arrival for children with cancer.(38) In total, 28 (93%) families reported losing income when having to come to MTRH, and 24 (80%) reported losing profits from farming when coming to MTRH. The family often had to travel far to reach MTRH, with a mean distance of 106 (24 *SD*) kilometers. Families reported that transportation was difficult (90%), time-consuming (90%), and expensive (97%).

Table 1
Patient clinical characteristics of newly
diagnosed children with cancer from
Bungoma county (n = 30).

Patient characteristics	N = 30
Sex	
Male	18 (60%)
Female	12 (40%)
Age at diagnosis	
Below 5 years	14 (47%)
5–10 years	9 (30%)
> 10 years	7 (23%)
Diagnosis	
Nephroblastoma	6 (20%)
Acute lymphoblastic leukemia	6 (20%)
Burkitt lymphoma	3 (10%)
Brain tumor	3 (10%)
Rhabdomyosarcoma	3 (10%)
Nasopharyngeal carcinoma	2 (7%)
Retinoblastoma	2 (7%)
Yolk sac tumor	2 (7%)
Acute myeloid leukemia	1 (3%)
Hodgkin lymphoma	1 (3%)
Neuroblastoma	1 (3%)
Stage for solid cancers	
Low stage	2 (7%)
High stage	17 (57%)
Unknown	4 (14%)
Hematological cancer	7 (23%)
Outcome	

Patient characteristics	N = 30
Sex	
Alive	22 (74%)
Dead	8 (26%)

Table 2
Socio demographic characteristics of newly diagnosed children
with cancer from Bungoma county (n = 30).

Main caregiver in hospital	N = 30
Mother	17 (56%)
Other	8 (27%)
Father	5 (17%)
Parental information when caregiver was a parent	N = 22
Highest level of caregiving parent	
Secondary school/high school	12 (54%)
Primary school	7 (32%)
Diploma/university	3 (14%)
No education	0 (0%)
Tribe of caregiving parent	
Luyha	15 (68%)
Saboti	2 (9%)
Bukusu	2 (9%)
Teso	1 (4%)
Other	2 (9%)
Religion of caregiving parent	
Christian	21 (96%)
Muslim	1 (4%)
No religion / Other religion	0 (0%)
Occupation caregiving parent	
Farmer	8 (36%)
Business	7 (32%)
No occupation	4 (18%)
Teacher	2 (9%)
Househelp	1 (4%)
Transportation	N = X (%)

Main caregiver in hospital	N = 30
Distance from MTRH (Mean (<i>SD</i>))	106 (24)
Distance from MTRH classified	
0-15km	0 (0%)
15-30km	0 (0%)
30-50km	1 (3%)
50-100km	11 (37%)
> 100km	18 (60%)
Type of transport used	
Public transport	17 (56%)
Hospital Ambulance	10 (33%)
Walking	2 (7%)
Private car	2 (7%)
Taxi	0 (0%)
Time to travel to MTRH	
< 1 hour	0 (0%)
1–3 hours	24 (80%)
> 3 hours	6 (20%)

Delays of newly referred children with cancer

Median (range) patient delay was 30 days (0-364), median (range) physician delay was 104 days (4-440), median (range) diagnosis delay was 113 days (30–472), median (range) treatment delay was 6 days (-11–71), median (range) health system delay was 114 days (8-436) and median (range) total delay was 146 days (35–468). (Fig. 1) The negative value minimum range for treatment delay was related to the initiation of nephroblastoma treatment on presumptive diagnosis in two patients. The rather long maximum range value for diagnosis delay is caused by long delays in three patients with a yolk sac tumor, a nephroblastoma, and a Burkitt lymphoma. The largest contributor to the total delay is diagnosis delay, mainly due to long physician delays.

Patient Delay

Regarding patient delays, we explored several factors that could contribute to such delays: actions taken upon the onset of symptoms, parental beliefs about childhood cancer, TCAM usage, and transportation challenges. Symptoms reported by parents at onset varied and included swelling at the affected site, loss of appetite, fevers, headaches, general body weakness, pain, and bleeding. As an initial response to these symptoms, 29 (97%) reported visiting a health facility, 19 (63%) prayed, 15 (50%) sought advice from relatives, 10 (33%) consulted an herbalist, and 1 (3%) chose to watch and wait. Reasons for TCAM usage prior to diagnosis are shown in Table 3. The most common forms of TCAM utilized were: prayer (30, 100%), visits to an herbalist (12, 40%), consultations with a traditional healer (4, 14%), special dietary intake (4, 14%), and witchcraft (1, 4%). Recommendations for TCAM usage came from relatives (60%), friends (53%), grandparents (50%), religious communities (43%), spouses (40%), and village communities (23%). Additionally, relatives (17%), friends (14%), village communities (7%), spouses (3%), religious communities (3%), and grandparents (3%) advised against seeking conventional care. In 20 (67%) cases, families were encouraged to go to MTRH, while in 8 (27%) cases, they were discouraged from going to MTRH. Two (7%) reported that some people in their environment encouraged them, while others discouraged them from going to MTRH. In terms of beliefs and fears regarding surgical management of their child's condition, parents reported the following perceptions: frightening (20, 67%), necessary (20, 67%), helpful (19, 63%), spreads the cancer (9, 30%), and causes death (4, 13%). Regarding the awareness program posters and radio campaign, only 7 (23%) families reported seeing a poster about childhood cancer symptoms, and of these 7 cases, only 1 was alerted to the symptoms and urged to seek care. For the radio campaign, 13 (43%) families reported hearing a message about childhood cancer symptoms. In one of these cases, this alerted them to the symptoms, and in two cases, it motivated them to seek care.

Table 3. Reasons for traditional alternative and complimentary usage prior to diagnosis.

Reasons for TCAM	
Hope for improvement	28 (93%)
Hope for cure	28 (93%)
Helpful	26 (87%)
Certainty of cure	26 (87%)
Easily accesible	20 (67%)
Cheap	18 (60%)
Recommended by others	16 (53%)
At a short distance available	14 (47%)
Other patients look healthy after taking it	11 (37%)
Fear of surgery in hospital	6 (20%)
No discomfort	4 (13%)
Child will not be detained in the hospital	4 (13%)
No side-effects	4 (13%)
No health insurance	3 (10%)
Conventional treatment has not certainty of cure	1 (4%)
Child can stay in the family	1 (4%)

Physician and Diagnosis Delay

The first point of contact with a conventional healthcare provider usually was a dispensary (12, (40%)). Other first contact healthcare facilities included: health centers (6, (20%)), private hospitals (8, (27%)), sub-county hospitals (2, (7%)), county hospitals (1, (3%)) or a mission hospital (1, (3%)). Most commonly, the child was seen by a nurse (13, (43%)) or a clinical officer (8, (27%)). Upon this first contact, 22 (73%) children were first managed for another disease than the later diagnosed cancer. These other conditions ranged from malaria to pneumonia, typhoid, pain control, or other infectious diseases. The median duration of management for this other condition was 13.5 days (range 1–60 days). In 11 (37%) of children, the healthcare provider referred them to another doctor. In 2 (7%) this was directly to MTRH. During this referral, in 2 of 11 referred children, the healthcare provider mentioned cancer as a potential diagnosis. In one of these two cases, the healthcare provider mentioned the curability of cancer, the affordability of cancer treatment, and the importance of conventional medicine to cure it. In 10 (33%) children, the healthcare worker advised the family to register for SHIF. Reasons for delay in going to MTRH after referral are displayed in Table 4. The majority of the parents had heard of cancer in children (20, (67%)) and did not think childhood cancer was curable (25 (83%)) or affordable 27 (90%). Upon arrival at MTRH, most children were seen at the Sick Child Clinic (27, (90%)). In total 6 (20%) children were already diagnosed in another facility upon presentation. The newly diagnosed children at MTRH were commonly seen by a clinical officer (16, (53%)), doctor (4, (14%)) or other healthcare provider (1, (3%)), and 9 (30%) parents did not know which type of healthcare provider attended to them. All 30 (100%) children were admitted for investigations on childhood cancer at MTRH after consultation.

Table 4. Reasons for delayed presentation at Moi Teaching and Referral Hospital after referral.

Referral Pathway	N = X (%)
Difficulties in first visit healthcare provider	
Hospital costs	22 (73%)
Travel costs	23 (77%)
Loss of daily wages	19 (63%)
Distance from clinic	17 (57%)
Fear of surgery	16 (53%)
Fear of cancer treatment	15 (50%)
Hospital procedure to clear the bill	17 (57%)
Not satisfied with care in the past	11 (37%)
Detention of child in hospital	11 (37%)
Poor transport facilities	11 (37%)
Disease of my child may not be curable	10 (33%)
No NHIF	11 (37%)
Fear of side-effects cancer treatment	8 (27%)
Reputation of long delays in public hospital	7 (23%)
Reputation of corruption in public hospital	6 (20%)
Going to work	5 (17%)
Time clinic appointment is inconvenient	4 (14%)
Nobody to look after children at home	4 (14%)
Child appears ill	3 (10%)
Too busy	2 (7%)
Nobody to look after the land	1 (3%)
Do not see benefit of hospital visit	0 (0%)

Comparison of referrals before and after the start of the implementation of the awareness campaign

Between 2014 and 2022 in total 153 children from Bungoma County newly diagnosed with cancer were referred to MTRH (Table 5). The lowest number of referrals documented in the registry was in 2015 and 2017 with 9 children referred to MTRH. The highest number of referrals was in 2020 with 28 newly diagnosed referred children. Between 2014 and 2022 there were 17 (6.2) children referred annually on average from Bungoma County. A comparison of referrals from Bungoma County between the 9 years before the intervention and 2 years after the intervention does not show an evident difference ($n = 15$ (1.4)) (Table 5).

Table 5. Overview of referrals from Moi Teaching and Referral Hospital and proportion of referrals from Bungoma County.

Year	Total newly diagnosed at MTRH (N=X)	Total newly diagnosed from Bungoma County (N=X)	Proportion from Bungoma at MTRH (N=X%)
2014	149	16	11%
2015	150	9	6%
2016	164	13	8%
2017	161	9	6%
2018	244	18	7%
2019	250	23	9%
2020	287	28	10%
2021	280	18	6%
2022	274	19	7%
2023	284	14	5%
2024	268	16	7%

Discussion

This study evaluated newly diagnosed children with cancer from Bungoma County following the implementation of an awareness campaign. Over two years, 30 children were referred from Bungoma, far below the expected 140 annual cases.(26) No significant increase in referrals was observed compared to historical data. Lengthy delays in accessing care at MTRH were attributed to multiple factors: the financial burden of travel and hospital services and the complexity of referral systems between primary and tertiary healthcare. Most parents lived over 100 km from MTRH, relied on public transport, and faced financial challenges such as travel costs, hospital fees, and lost wages. Delays were further influenced by parental engagement with TCAM, often grounded in cultural or spiritual beliefs, as well as concerns about conventional cancer treatment and the comparatively greater accessibility and affordability of

traditional care options. These findings highlight the complexity of accessing childhood cancer care and the continued need for targeted actions to ensure timely diagnosis and treatment.

This study found that the awareness campaign did not increase the number of referrals in the 2 years after the start of the implementation of the awareness program. This shows that the majority of the estimated 140 children from Bungoma County with cancer annually do not manage to reach a comprehensive childhood cancer care facility. Other outcomes such as increased knowledge amongst healthcare providers after the training is reported in another publication.(39) Finding adequate measures to report the impact of awareness programs is challenging and often limited to the observed increase in (early) referrals, the knowledge of healthcare providers and the feasibility of implementing the intervention.(40) Further qualitative research investigating the barriers and facilitators to adequate referrals could enhance the design and implementation of future awareness campaigns. Moreover, longer follow-up monitoring of the program's impact is advisable.

Findings from parental interviews suggest that various factors—including financial barriers, culturally influenced health-seeking behaviors, use of TCAM, and challenges in the referral process—may contribute to delayed or missed diagnoses in children with cancer despite the awareness campaign. However, other studies that looked at the impact on referral rates of awareness and early detection programs for childhood cancer, report increased referral rates.(40, 41) Interventions in these studies differed from ours as some only focused on retinoblastoma campaigns.(40, 42) The impact of the interventions in these studies was measured over longer periods of time and therefore also includes a natural trend of increase that is a consequence of the evolution of health literacy, healthcare seeking, and universal health coverage after the intervention.(40) Additionally, the lower-than-expected numbers of referrals from Bungoma County after the campaign, could be contributed to several confounding factors—such as healthcare worker strikes, shortages of medical supplies at the referral hospital, and patients seeking treatment at other facilities.

This study revealed that children who were newly diagnosed after the implementation of the awareness program still arrived late. The long total delays found in this study caused a majority to present with advanced stages, resulting in lower chances of survival. The parental interviews highlight the financial and cultural factors that influence conventional healthcare-seeking behavior. Studies conducted in LMICs have found that TCAM is commonly used in the context of childhood cancer, reflecting its important role in local health beliefs and care practices.(8–10, 30, 34) Given that TCAM is deeply integrated into community healthcare systems, it is important to acknowledge its role and explore opportunities for respectful collaboration, as some complementary practices may enhance or support conventional medical care and could improve mutual trust in both types of medicine.

Physician delay was the main contributor to total delays in this study. This could be linked to lower self-reported patient delay. Interestingly, this physician delay persisted after the awareness campaign's training for primary healthcare workers in Bungoma County. This could be related to referral policies requiring patients to pass through level 4 and 5 facilities before reaching level 6 hospitals like MTRH

cause delays. This is evidenced by the parental interviews that show an average of four clinic visits before arriving at MTRH. Engagement and training with level 4 and 5 facilities might address this. Additionally, parents might be reluctant for referral based on the expected costs, lack of health insurance and low trust in public facilities. Referral practices and health insurance have been indicated to influence delays in access to childhood cancer care.(4, 30, 34, 36) It is therefore important for healthcare workers not only to recognize childhood cancer, but also to promptly refer to a comprehensive childhood cancer care facility.(43) Finally, the integration of TCAM and the varied health beliefs among healthcare providers in Bungoma County may shape referral behaviors, highlighting the need for continued dialogue and collaboration, especially in the context of ongoing training.(44) Physician delays are one of the components that delay access to care as addressed in several studies included in the systematic review of Cotache-Condor et al.(30)

Strengths and limitations

This study is one of the few that investigates the impact of an awareness program through referral monitoring and thoroughly analyzes the patient journey concerning delays. Due to the rarity of the disease, the sample size of this study is low. The relatively short follow-up period after the intervention did not allow for assessing long-term trends or delayed effects of the intervention. However, the main effect of the intervention was expected within the first 24 months after the start of the training sessions. A longer follow-up is recommended to further explore the potential long-term or delayed effects of the intervention.

Conclusion

This awareness program in Bungoma County highlights that improving early detection of childhood cancer requires a multifaceted and sustained approach. Efforts must go beyond one-time interventions, with consistent community engagement, health system strengthening, and long-term investment in awareness. In addition to education and training, national advocacy for expanded health insurance coverage for childhood cancer is essential to address financial barriers that often delay or prevent families from seeking timely care. Moreover, given the significant role of TCAM within community health systems, it is vital to promote respectful collaboration between conventional and traditional healthcare providers. Such partnerships can help bridge gaps in understanding, enhance trust, and ultimately support better outcomes for children with cancer.

Abbreviations

LMIC

Low and middle income country

HCP

Healthcare provider

GICC

Declarations

Data availability statement

The data generated by this study will be made available upon reasonable request.

Funding statement

The Awareness Program in Bungoma County was funded by AFAS foundation, the Netherlands.

Conflict of interest disclosure

The authors declare no conflict of interest.

Ethics approval statement

This study was conducted in accordance with the local guidelines and as such approved by the Institutional Ethics and Research Committee (IREC) at MTRH with reference number IREC/2021/216 and approval number 0004060.

Patient consent statement

All patients participated in this study were enrolled only after an informed consent procedure in Kiswahili.

Permission to reproduce material from other sources

Not applicable.

Clinical trial registration

Not applicable.

CONFLICT OF INTEREST

The authors state not conflicting interests.

ACKNOWLEDGEMENTS

We would like thank all parents of patients from Bungoma County that participated, for their time and effort to participate in the interviews. Moreover, we thank AFAS foundation who funded this program. We appreciate the help of Saskia Mostert in the interview design.

References

1. WHO Global Child Health Initiative [Internet]. [cited 2020 Mar 2]. Available from: <https://www.who.int/activities/improving-childhood-cancer-cure-rate>
2. Ward ZJ, Yeh JM, Bhakta N, Frazier AL, Girardi F, Atun R. Global childhood cancer survival estimates and priority-setting: a simulation-based analysis. *Lancet Oncol*. 2019;20(7):972–83.
3. Severance TS, Njuguna F, Olbara G, Kugo M, Langat S, Mostert S, et al. An evaluation of the disparities affecting the underdiagnosis of pediatric cancer in Western Kenya. *Pediatr Blood Cancer*. 2022;69(10):e29768.
4. Klootwijk L, Langat S, Njuguna F, Kimaiyo S, Vik T, Kaspers G, et al. Delays in accessing childhood cancer care in western Kenya: A single-center, retrospective study. *Pediatr Hematol Oncol J*. 2024;9(3):143–50.
5. Stefan C, Bray F, Ferlay J, Liu B, Maxwell Parkin D. Cancer of childhood in sub-Saharan Africa. *Eccancermedicalscience*. 2017;11:755.
6. WHO global childhood cancer initiative [Internet]. [cited 2022 Oct 24]. Available from: <https://www.who.int/docs/default-source/documents/health-topics/cancer/who-childhood-cancer-overview-booklet.pdf>
7. Levesque JF, Harris MF, Russell G. Patient-centred access to health care: Conceptualising access at the interface of health systems and populations. *Int J Equity Health*. 2013;12(1).
8. Diorio C, Lam CG, Ladas EJ, Njuguna F, Afungchwi GM, Taromina K, et al. Global Use of Traditional and Complementary Medicine in Childhood Cancer: A Systematic Review. *J Glob Oncol*. 2017;3(6):791–800.
9. Afungchwi GM, Kruger M, Hesseling P, van Elsland S, Ladas EJ, Marjerrison S. Survey of the use of traditional and complementary medicine among children with cancer at three hospitals in Cameroon. *Pediatr Blood Cancer*. 2022;69(8):e29675.
10. Afungchwi GM, Hesseling PB, Ladas EJ. The role of traditional healers in the diagnosis and management of Burkitt lymphoma in Cameroon: understanding the challenges and moving forward. *BMC Complement Altern Med*. 2017;17(1):209.
11. Ladas EJ, Marjerrison S, Arora B, Hesseling PB, Ortiz R, Antillon F, et al. Traditional and Complementary Medicine in Pediatric Oncology and Low-Middle Income Countries: Recommendations from the International Society of Pediatric Oncology (SIOP), T&CM Collaborative. *J Natl Cancer Inst Monogr*. 2017;2017(52):lgx014.
12. Afungchwi GM, Kruger M, Hesseling P, van Elsland S, Ladas EJ, Marjerrison S. Survey of the use of traditional and complementary medicine among children with cancer at three hospitals in Cameroon. *Pediatr Blood Cancer*. 2022;69(8):e29675.
13. Radhi M, Fulbright JM, Ginn KF, Guest EM. Childhood cancer for the primary care physician. *Prim Care*. 2015;42(1):43–55.
14. Rugwizangoga B, Niyikora N, Musabyimana A, Izimukwiye AI, Aurelius J, Martner A, et al. Experience and Perception of Patients and Healthcare Professionals on Acute Leukemia in Rwanda: A Qualitative Study. *Cancer Manag Res*. 2022;14:1923–34.

15. Abdelkhalek E, Sherief L, Kamal N, Soliman R. Factors associated with delayed cancer diagnosis in egyptian children. *Clin Med Insights Pediatr*. 2014;8:39–44.
16. NCCP Cancer Control Strategy Kenya.
17. Klootwijk L, Osamong LA, Langat S, Njuguna F, Kimaiyo S, Vik TA et al. Childhood Cancer Awareness Program in Bungoma County, Kenya. *J Cancer Educ*. 2024;1–11.
18. World Bank Data. Population per Country [Internet]. [cited 2023 Aug 1]. Available from: <https://data.worldbank.org/indicator/SP.POP.TOTL>
19. Unicef Data Under. 18 population per Country [Internet]. [cited 2023 Aug 1]. Available from: <https://data.unicef.org/>
20. Bungoma DHS. program [Internet]. Available from: [GF57Bungoma.pdf](#) (dhsprogram.com).
21. Geographical and economical. information Bungoma County [Internet]. [cited 2021 Sep 1]. Available from: <https://bungoma.go.ke/background/>
22. Bungoma County Ministry of Health [Internet]. [cited 2021 Sep 1]. Available from: <https://bungoma.go.ke/ministries/>
23. Ministry of Health Kenya [Internet]. [cited 2022 Nov 9]. Available from: <https://www.health.go.ke/about-us/organizational-structure/>
24. MTRH [Internet]. [cited 2021 Sep 1]. Available from: <http://www.mtrh.go.ke/>
25. Kenyatta National Hospital [Internet]. [cited 2023 Sep 13]. Available from: <https://knh.or.ke/>
26. Ward ZJ, Yeh JM, Bhakta N, Frazier AL, Atun R. Estimating the total incidence of global childhood cancer: a simulation-based analysis. *Lancet Oncol*. 2019;20(4):483–93.
27. WHO global childhood cancer initiative [Internet]. [cited 2022 Oct 24]. Available from: <https://www.who.int/docs/default-source/documents/health-topics/cancer/who-childhood-cancer-overview-booklet.pdf>
28. SIOP early warning signs poster [Internet]. [cited 2023 Feb 9]. Available from: https://siop-online.org/wp-content/uploads/2015/07/ChildCancerLayouts_FA_A3_English.pdf
29. Dang-Tan T, Franco EL. Diagnosis delays in childhood cancer: a review. *Cancer*. 2007;110(4):703–13.
30. Cotache-Condor C, Kantety V, Grimm A, Williamson J, Landrum KR, Schroeder K, et al. Determinants of delayed childhood cancer care in low- and middle-income countries: A systematic review. *Pediatr Blood Cancer*. 2023;70(3):e30175.
31. Stefan DC, Siemonsma F. Delay and causes of delay in the diagnosis of childhood cancer in Africa. *Pediatr Blood Cancer*. 2011;56(1):80–5.
32. Larissa Klootwijk MD, Festus Njuguna MDPD, Bsc SL, Kimaiyo S. Terry Vik MD PhD, Gertjan Kaspers MD PhD SMMP. Impact of delay on access to childhood cancer care and treatment outcomes in Western Kenya. 2023.
33. Howard SC, Wilimas JA. Delays in diagnosis and treatment of childhood cancer: where in the world are they important? *Pediatr Blood Cancer*. 2005;44(4):303–4.

34. Geel J, Eyal K. Measuring vulnerability to childhood cancer treatment delays in low-income and middle-income countries. *Lancet Glob Health*. 2023;11(4):e476–7.
35. Brand NR, Qu LG, Chao A, Ilbawi AM. Delays and Barriers to Cancer Care in Low- and Middle-Income Countries: A Systematic Review. *Oncologist*. 2019;24(12):e1371–80.
36. Njuguna F, Martijn H, Langat S, Musimbi J, Muliro H, Skiles J, et al. Factors influencing time to diagnosis and treatment among pediatric oncology patients in Kenya. *Pediatr Hematol Oncol*. 2016;33(3):186–99.
37. van Weelderen RE, Wijnen NE, Njuguna F, Klein K, Vik TA, Olbara G, et al. Treatment outcomes of pediatric acute myeloid leukemia in Western Kenya before and after the implementation of the SIOP PODC treatment guideline. *Cancer Rep (Hoboken)*. 2023;6(8):e1849.
38. Langat S, Njuguna F, Olbara G, Martijn H, Sieben C, Haverkort M, et al. Influence of health-insurance on treatment outcome of childhood cancer in Western Kenya. *Support Care Cancer*. 2023;31(8):467.
39. Klootwijk L, Apadet L, El Salih I, Dandis R, Vik T, van de Vijver S et al. Innovative Training to Improve Childhood Cancer Knowledge Among Primary Health Care Providers: Evaluating a Blended Learning Program in Kenya. *JCO Glob Oncol*. 2025.
40. Zabih W, Thota AB, Mbah G, Freccero P, Gupta S, Denburg AE. Interventions to improve early detection of childhood cancer in low- and middle-income countries: A systematic review. *Pediatr Blood Cancer*. 2020;67(12):e28761.
41. Poyiadjis S, Wainwright L, Naidu G, Mackinnon D, Poole J. The Saint Siluan warning signs of cancer in children: impact of education in rural South Africa. *Pediatr Blood Cancer*. 2011;56(2):314–6.
42. Wilimas JA, Wilson MW, Haik BG, Barnoya M, Fu L, Castellanos M, et al. Development of retinoblastoma programs in Central America. *Pediatr Blood Cancer*. 2009;53(1):42–6.
43. Howard SC, Wilimas JA. Delays in diagnosis and treatment of childhood cancer: where in the world are they important? *Pediatr Blood Cancer*. 2005;44(4):303–4.
44. Lilian Apadet L, Klootwijk F, Njuguna T, Vik S, Kimaiyo S, Mostert et al. 1. Exploring Access to Childhood Cancer Care in Western Kenya: Primary Healthcare Providers’ Perspectives on Childhood Cancer, Traditional Medicine, Referral Practices and Health-Insurance. Unpublished. 2024.

Figures

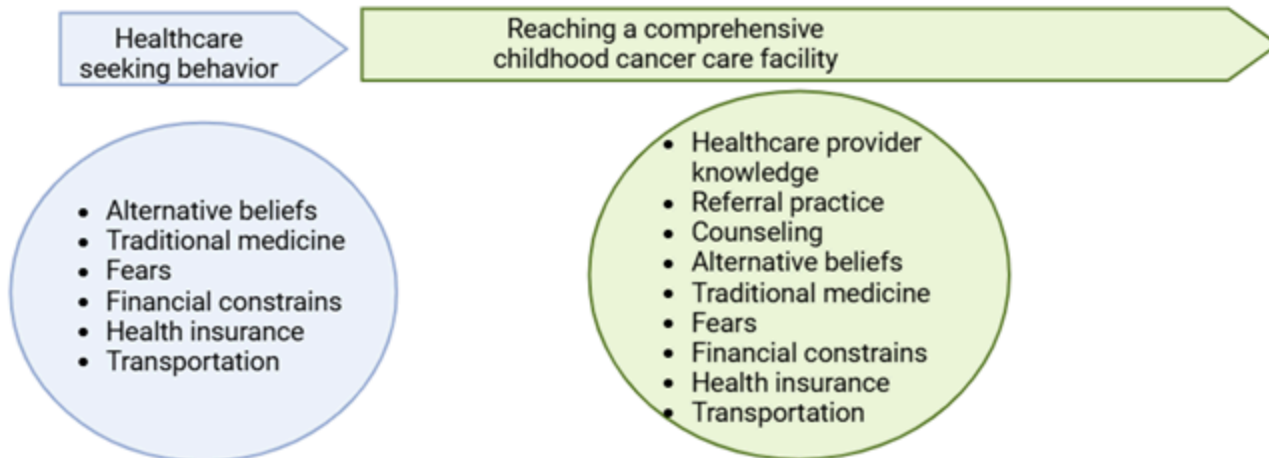
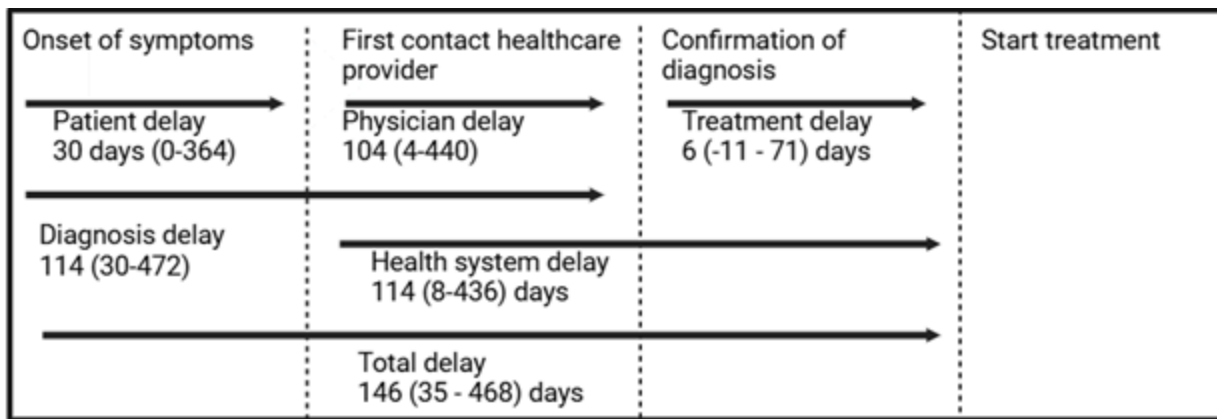


Figure 1

Overview of different types of delays and causes.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Supplementaryfile1.docx](#)