Unmet Needs in Nutritional Care in Paediatric Oncology Units in Africa: A report from the International Society for Pediatric Oncology (SIOP) PODC Nutrition Working Group.

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ABSTRACT

BACKGROUND:

Up to 50% of children diagnosed with cancer in low-middle income countries are malnourished and more likely have poor outcomes.

SUBJECTS AND METHODS:

An online survey to paediatric oncology units (POU) in Africa collected information about nutritional supportive care.

RESULTS:

Sixty Six surveys were received from POU in 31 countries. Only 44.4% had a dedicated dietician for nutritional assessment and support and 29.6% did routine nutritional assessment during treatment. None reported defined criteria for nutritional intervention. Total parenteral nutrition (TPN) was not available for 42.6% of the POU, 51.8% did not have access to commercial enteral nutrition for inpatietns, while 25.9% of the hospitals couldn't supply any nutritional supplements home.

CONCLUSION:

Nutritional assessment in POUs in Africa are not routinely undertaken, nor are there defined criteria to initiate nutritional interventions. Standardised nutritional guidelines for nutritional-assessment and intervention is needed for hospitals that treat children with cancer in Africa to ensure improved outcome.

KEYWORDS:

survey, paediatric oncology, nutritional care, dieticians

INTRODUCTION

Globally more than 160,000 children and adolescents are diagnosed with cancer each year, of whom the majority (80% -85%) live in low income countries (LIC) and low middle income countries (LMICs) (1–3). According to the World Bank (2017) a LIC is defined as a country with a gross national income (GNI) of $995 per capita; a LMIC with less than $3 895 and a upper middle income country (UMIC) income less than $12 055 per capita (4). Current cure rate for children with cancer in high-income countries (HIC) is approximately 75% to 80%(1–3,5–7). In LMICs access to curative treatment is limited and poor survival rates have been reported for children with cancer (1,2,6–8). Poor nutritional status, both under- and over-nutrition, range from 5–50 % for paediatric cancer patients at diagnosis, with a higher prevalence of undernutrition reported in LMICs (7,9–12). The reasons for this are multi-factorial (13) and are influenced by the cancer diagnosis, stage of disease, co-morbidities, access to care and socio-demographic factors (12).

Poor nutritional status has significant consequences on treatment-related toxicity and survival (1,4,9,12,15,16). Undernourished patients have more episodes of severe neutropenia (7,12) and an increased risk for infections (1,5,12,16), while reduced tolerance to therapy (1,5,10,12,16,17) has been associated with treatment delays, dose adjustments, increased hospital stay and abandonment of care.

Africa represents a large proportion of the global burden of undernourished children with cancer causing additional clinical challenges for paediatric oncologists. Up to 60% of the children in Malawi were acutely malnourished at diagnosis, meaning undenourished (7), and 25-50% in Ghana wasted, depending on diagnosis (12) . In Pretoria, South Africa, 21.6% of children were wasted, 24.3% underweight at diagnosis (18). These figures of undernutrition highlight the need for resources to be addressed so that the necessary life-saving cancer therapy may be delivered.

Previous surveys have reported several barriers to the implementation of nutritional services in LIC (19,20), but did not focus on the Africa continent. As part of a newly formed initiative between the International Society for Pediatric Oncology (SIOP) PODC Nutrition Working Group, SIOP Africa, and the International Initiative for Pediatrics and Nutrition (IIPAN), Columbia University we conducted a continental Africa survey. The intention of this survey was to indentify the specific needs of a paediatric oncology unit (POU) in Africa to be able to guide the development of nutritional support programs to improve nutritional support in these units with endresult improved overall survival for children with cancer in Africa.

SUBJECTS AND METHODS

The online survey was adapted from a previously published survey (19). Ethics approval was obtained from the Health Research Ethics Committee (HREC) of the Faculty of Medicine and Heath Sciences, Stellenbosch University.

The survey collected information on respondents (e.g. discipline), hospital's standard of nutritional- assessment and interventions, barriers to nutritional care, educational needs, and research interests. Participants were identified by the SIOP PODC Nutrition Working Group, the SIOP PODC Supportive Group, Paediatric Oncology International Network for Training and Education website (POINTE) and SIOP Africa. The survey was conducted between December 2016 and June 2017 and administered through surveymonkey.com.

Responses were categorized using the World Bank classification according to income in Africa , namely LIC, LMIC and UMIC and regions as seen in**Table 1** (21). Incomplete surveys were removed from the study. Institutions that may have provided multiple responses were compared for consistency and if discrepancies were identified, the institutions were contacted for clarification. Countries from Swaziland, Lesotho, Mozambique, Eritrea and Sierra Leone were excluded from this survey as they do not offer treatment for children with cancer. Results are presented as the percent distribution of the institution's response by SPSS version 25.

RESULTS

Sixty-six (44.29%) of 149 surveys were received. Four surveys were incomplete and eight were duplicates and therefore removed from the final analysis. The final results contained 54 surveys representing all regions and income levels in Africa. **Table 1** presents the responses by income group and region. The responses were respectively 35.2% (n=19) for LIC, 33.3% (n=18) for LMIC and 31.5% (n=17) forUMIC.

Dietetic services

The majority (66.6%; n=36) of the institutions had permanently appointed dieticians to consult in both the in- and out-patient setting, but less than 45% (n=28) had a dedicated dietician for their POU. This was especially the case for the majority of institutions in LIC with 88.9% (n=16/19) no dedicate dietican for their POU; but the number decreased to 35.3% in UMIC (n=6/17) and 33.3% (n=6/18) in LMIC) respectively

Table 1: Survey responses by country, income group and region

Economy	Region	Sub region of Africa	Income group	Number of Sites Responded
Benin	Sub-Saharan Africa	West	Low income	1
Burkina Faso	Sub-Saharan Africa	West	Low income	1
Chad	Sub-Saharan Africa	Central	Low income	1
Congo, Dem. Rep.	Sub-Saharan Africa	Central	Low income	1
Ethiopia	Sub-Saharan Africa	East	Low income	1
Guinea	Sub-Saharan Africa	West	Low income	1
Madagascar	Sub-Saharan Africa	East	Low income	1
Malawi	Sub-Saharan Africa	East	Low income	3
Mali	Sub-Saharan Africa	West	Low income	1
Niger	Sub-Saharan Africa	West	Low income	1
Rwanda	Sub-Saharan Africa	East	Low income	1
Senegal	Sub-Saharan Africa	West	Low income	1
Tanzania	Sub-Saharan Africa	East	Low income	3
Uganda	Sub-Saharan Africa	East	Low income	1
Zimbabwe	Sub-Saharan Africa	East	Low income	1
Cameroon	Sub-Saharan Africa	Central	Lower middle income	2
Congo, Rep.	Sub-Saharan Africa	Central	Lower middle income	1
Côte d'Ivoire	Sub-Saharan Africa	West	Lower middle income	1
Egypt, Arab Rep.	Middle East & North Africa	North	Lower middle income	2
Ghana	Sub-Saharan Africa	West	Lower middle income	2
Kenya	Sub-Saharan Africa	East	Lower middle income	2
Morocco	Middle East & North Africa	North	Lower middle income	2
Nigeria	Sub-Saharan Africa	West	Lower middle income	3
Sudan	Sub-Saharan Africa	North	Lower middle income	1
Tunisia	Middle East & North Africa	North	Lower middle income	1
Zambia	Sub-Saharan Africa	East	Lower middle income	1
Angola	Sub-Saharan Africa	Central	Upper middle income	1
Algeria	Middle East & North Africa	North	Upper middle income	4
Botswana	Sub-Saharan Africa	South	Upper middle income	1
Namibia	Sub-Saharan Africa	South	Upper middle income	1
South Africa	Sub-Saharan Africa	South	Upper middle income	10

Nutritional assessment

Nutritional assessment on all newly diagnosed children with cancer admitted in the POUs was performed at 51.9% of the hospitals in the inpatient setting (n=28) ; while only 33.3% of children, visiting outpatient clinics (n=18), were assessed. Nutritional assessment for children during treatment was performed only when clinically indicated (61.1%) or if referred by the treating doctor (44.4%).

The parameters that are included in the nutritional assessment of children treated are presented in **Table 2** by income group. More than 90% of the POUs in all the different income groups relied upon length/height and weight; more than 60% asked about oral intake and associated symptoms with the majority in UMIC (82.4% and 76.5% respectively). More than 55% included mid upper arm circumference (MUAC) and laboratory indices of which 68% in LIC for MUAC and 82.4% in UMIC for laboratory parameters respectively. There were a significant difference in the use of MUAC as parameter of nutritional status between LIC (68.1%), LMIC (61.1%) and UMIC (47.1%) (p=0.009). Triceps skinfold thickness (TSF), and the use of complementary alternative medicine (CAM) were reported in less than 25% of POUs.

Nutritional intervention

We did not observe a consensus on the parameters used to commence advanced nutritional intervention (**Table 3)**. More than 40% of the POU relied on weight loss and changes in MUAC, less 40% evaluated oral intake, weight changes, a screening tool or changes in ~~TSF~~ measurements.

Forty-two percent (n=23) of the total units in the survey did not have access to TPN, with 68,4% of the LIC (n=13/19) and 44.4% of LMIC (n=8/18). Enteral products were not available in 18.5%(n=10) of POU, with 26.3% (n=5/19) of units in LIC, 17.6% in UMIC (n=3/17) and 11.1% (n=2/18) in LMIC.

Industrialized / commercial nutritional supplements were available at 48.2% (n=26) of the POUs for inpatientswhile 12.9% (n=7) had no supplements available. LMIC were mosly affected with 22,2% (n=4/18) ; 10,5 % LIC (n=2/19) and 5.8% in UMIC (n=1/11) didn't have access to supplements. In the ambulatory setting, only 35.2% (n=19) of the POUs provided industrialized supplements and 25.9% (n=14) gave no supplements. Forty-four percent of the LMIC (n=8/18), 21.05% of LIC (n=4/19) and 11.7% of UMIC (n=2/17) didn't provide patietns with supplements home. Home-made products or other products [*WHO products for e.g. F100 products SAM patients*] were frequently relied upon in LIC (36.8%) and LMIC (22.2%) due to non-availability of products for home-care). The biggest barriers POU experienced in preventing them to

Table 2: Indices used for routine nutritional assessment by units in income groups

	Income Group							
Parameters of anthropometry	**Low income (N)**	**%**	**Lower middle income (N)**	**%**	**Upper middle income (N)**	**%**	**Total (N)**	**%**
Length / Height	17	***89,5%***	17	***94,4%***	16	***94,1%***	**50**	***92,6%***
Weight	16	***84,2%***	17	***94,4%***	16	***94,1%***	**49**	***90,7%***
Symptoms/Problems influence patient from eating	11	***57,9%***	11	***61,1%***	13	***76,5%***	**35**	***64,8%***
Oral Diet /Nutrient/ Food Intake	10	***52,6%***	10	***55,6%***	14	***82,4%***	**34**	***63,0%***
Mid Upper Arm Circumference (MUAC)	13	***68,4%***	11	***61,1%***	8	***47,1%***	**32**	***59,3%***
Laboratory Indices (*e.g. albumin, pre-albumin, electrolytes*)	6	***31,6%***	10	***55,6%***	14	***82,4%***	**30**	***55,6%***
Head Circumference	7	***36,8%***	9	***50,0%***	6	***35,3%***	**22**	***40,7%***
Complementary & Alternative Medicines *(i.e. vitamins, herbal products*)	5	***26,3%***	4	***22,2%***	5	***29,4%***	**14**	***25,9%***
Triceps Skinfold Thickness (TSF)	4	***21,1%***	6	***33,3%***	3	***17,6%***	**13**	***24,1%***
Other	0	***0,0%***	1	***5,6%***	1	***5,9%***	**2**	***3,7%***

Table 3: Criteria for nutritional intervention

Parameters for intervention	**Income group**						**Total (N)**	**% of 54 POU**
	Low income (N)	**%**	**Lower middle income (N)**	**%**	**Upper middle income (N)**	**%**		
Lost 10% weight	8	***42,1%***	10	***55,6%***	8	***47,1%***	**26**	***48,1%***
Change in MUAC	7	***36,8%***	8	***44,4%***	8	***47,1%***	**23**	***42,6%***
Oral food intake < 80%	8	***42,1%***	5	***27,8%***	7	***41,2%***	**20**	***37,0%***
Change BMI Z-score or growth chart	7	***36,8%***	5	***27,8%***	7	***41,2%***	**19**	***35,2%***
Screening tool classify HR	8	***42,1%***	7	***38,9%***	4	***23,5%***	**19**	***35,2%***
Change in TSF	7	***36,8%***	5	***27,8%***	5	***29,4%***	**17**	***31,5%***
Change in BMI Z-score	1	***5,3%***	3	***16,7%***	3	***17,6%***	**7**	***13,0%***
No defined set criteria	4	***21,1%***	1	***5,6%***	2	***11,8%***	**7**	***13,0%***

Figure 1: Barriers to preventing nutritional interventions

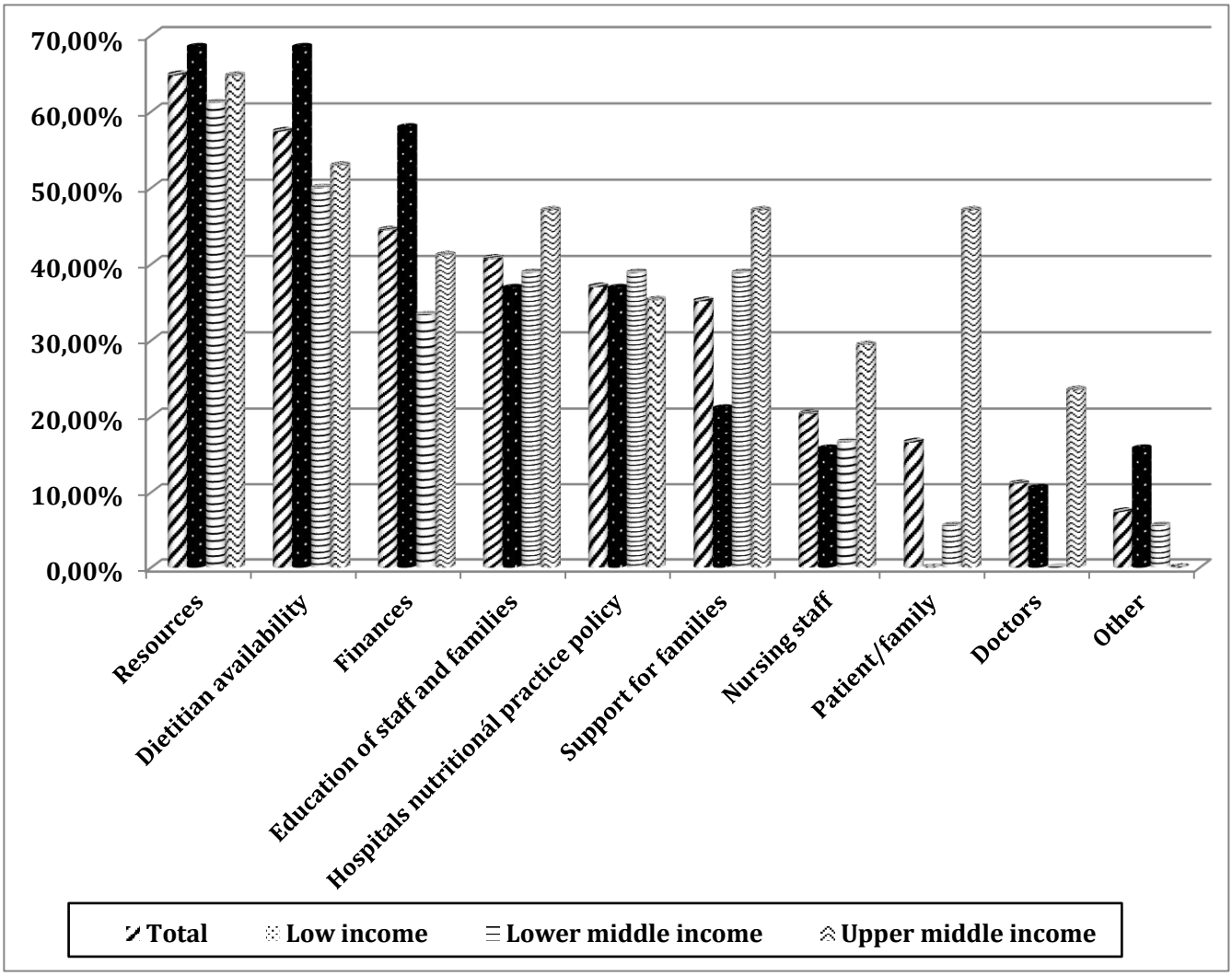
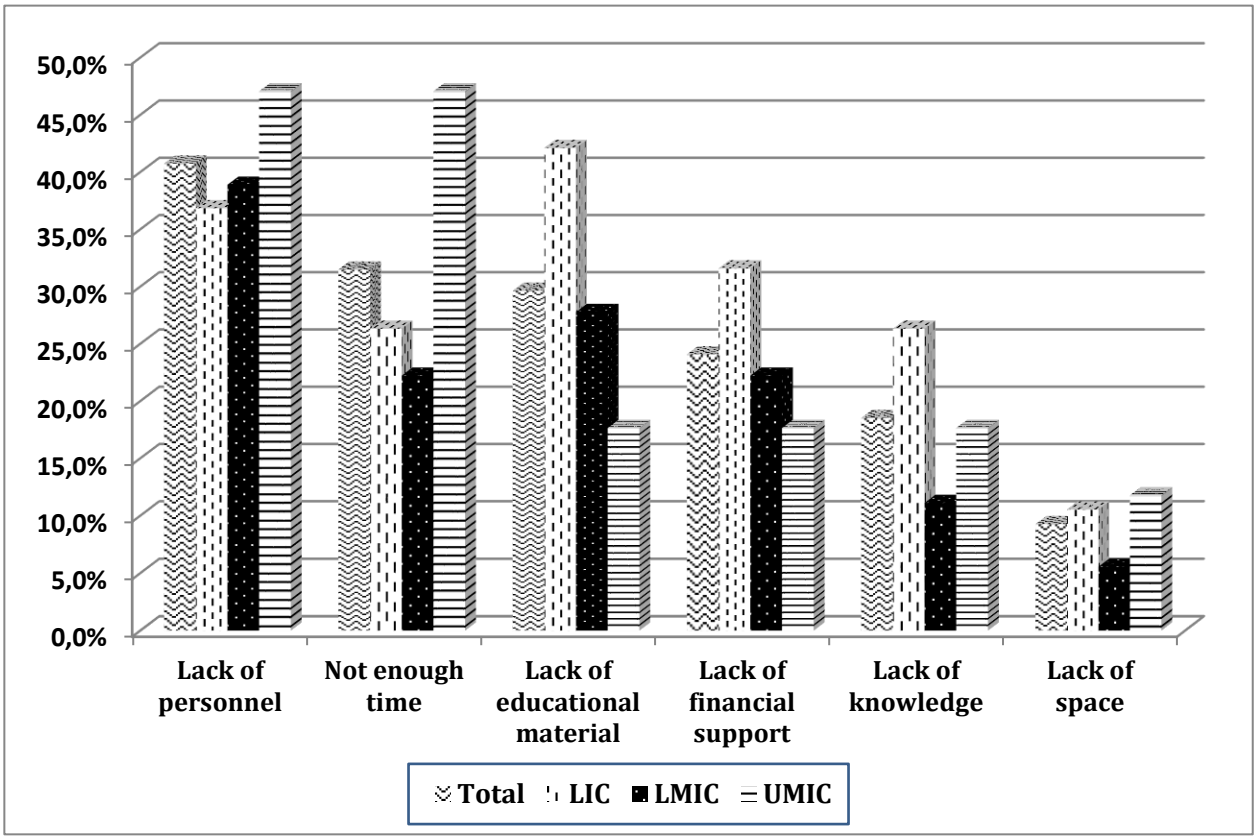


Figure 2: Barriers to nutritional education not given to patients



provide supplementation to patients were 64% resources 57,1% availablty of dietician and 44.4% finances as seen in Figure 1. These barriers were also the biggest barriers in LIC, LMIC and UMIC respectively. In LMIC education of staff and families and hospital nutritional policy were also factors (38.89% respectively)UMIC experienced education of staff and support to families (47.1% respectively).

Nutritional education

Only 38.9% (n=21) of the hospitals reported that nutrition education was provided to all patients and/or their families. Of POU in LIC, 47,4% of all patients received advice (n=9/19) with only 33.3% in LMIC (n=6/18) and 35.3% in UMIC (n=6/17).The barriers to the provision of nutritional education are presented in **Figure 2.** Forty percent didn't have enough personnel (n=22), 31,5% had time contraints (n=17) and 29.6% didn't have enough educational material (n=16) to give to patients. In UMIC 47.1% and LMIC 38.9% had lack of personnel while 47.1% in UMIC and 22.2% in LMIC reported time constraints as the most significant barriers. In LIC 42.1% reported lack of educational material and 31.6% lack of financial resources as the primarily barriers .

Non-profit organizations (NGO) play a major role in POUs, at hospitals where all the children's treatment and supportive care needs cannot be met. The greatest need indicated by this survey in LIC were enteral products for in - and outpatietns (31,5% (n=6/19) and 21.1% (4/19) respectively), 27.7% of LMIC requested TPN (n=5/18) while 35.3% in UMIC (n=6/17) thought groceries for home will improve their children's needs.

DISCUSSION

The survey was representative of the different income groups in Africa. Less than half of the hospitals had a full time dietician working in the POU, which is lower than previously reported surveys that included sites in Africa (19,22). This is likely due to the majority of the POUs responding were from LIC, witch often experience a lack of healthcare personnel due to limited financial resources. It may explain our finding that newly diagnosed children with cancer are not uniformly assessed and monitored during treatment, which is of great concern in light of the fact that in 2015 in sub-Saharan Africa 21% of the children under 5 years of age were underweight, 39% stunted and 9% wasted in(23). According to UNICEF (2017) 59 million of the sub-Saharan African population are stunted, 52 million wasted and 10 million overweight (24).

Most POUs relied upon weight and length/height as parameters of nutritional status. The use of MUAC is significantly higher than that of the reported literature, 59.3% compared to 33% (19)

for nutritional assessment with significant difference between the income groups; however, it is not routinely used as criteria for nutritional interventions. MUAC is an inexpensive, rapid and easy measurement of a child's nutritional status (25) and ideal in a LIC with limited resources as was seen in the survey where 68.4% of POU in LIC used MUAC as parameter of nutritional status. The SIOP nutritional algorithm recommends the use of MUAC to classify children's nutritional risk (26). MUAC is the recommended indicator in paediatric oncology (20) due to its independence of tumor mass (1,7,13,20), temporary gains in total body water (25) and ethnicity (1,20). Our study confirms that there are no uniform standard of nutritional assessment and monitoring during treatment and even commonly used parameters such as weight loss for initiating nutritonal interevention were relied upon in only half of the institutions. This indicates a great need for education on the importance of monitoring nutritional status during treatment and which parameter to use for intervention.

Our survey identified several barriers to nutritional intervention. The majority of the POUs do not have access to the full range of TPN or commercial nutritional products , which underlines the need for POU to use home-made products or SAM-related products. There are a variety of strategies that POUs use to advance nutritional care and can serve as models for other institutions. For example, in Cameroon, children with Burkitt Lymphoma were provided one egg, 200 ml of WHO F100 milk and families the equivalent of one US dollar per day to purchase food. This combined program (protein, nutritional supplement and money) led to increased MUAC and/or TSF in almost two-thirds of the children while on treatment, and a suggestion of decreased treatment-related mortality (7). If entities such as SIOP-Africa can assist POUs in adopting models of care and increase their available resources, this can optimize care within their POU.

We found that less than half of the POUs do give nutritional advice to families of patients; a figure aligned with a previous survey by the investigators (18). This was explained by a lack of personnel and time, that comes down to time spent on medical care of the patients and not enough time with families.

Finally, our survey highlights the need for collaborative initiatives with several stakeholders, especially NGOs to provide nutritional resources for nutritional care in POUs, according to their income group. Interesting was that units in UMIC thought groceries for patients to take home will improve patients' nutritional status, while LIC and LMIC focused on nutritional care for inpatients. The World Bank may classify countries as UMIC, but according to our survey food

security is still a problem. Our goal is to advance nutritional care in POUs on the Africa continent that can improve overall survival.

In conclusion, our results provided important information on the relevant barriers to nutritional assessment, intervention and/or education at POUs in the different income groups and regions of Africa. This information will be used to establish modifiable and adapted nutritional guidelines and education of all health care staff to improve nutritional care in the different POUs in Africa according to the income of the country. Once established, this will improve the understanding of the importance of nutrition in children and enable future research opportunities. The immediate future involves a national nutrition study in South Africa and Cameroon late in 2018 about the nutritional status of patients at cancer diagnosis. Furthermore patients's nutritional status will be monitored during treatment to determine the effect on clinical outcome. Nutrional studies in other Africa countries will follow.

LIMITATIONS

The limitations of the study are the identification of institutions caring for children with cancer was through established internet groups. It was also internet-based that might led to the low number of responses received due to limited avialbility thereof.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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