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Research Article

"MALNUTRITION NOT HIV OR MALARIA PANDEMICS": HEALTHCARE STAKEHOLDERS' PERSPECTIVES IN KAGERA BORDER REGION, TANZANIA

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ABSTRACT

In the developing world and in Tanzania in particular, the prevalence of malnutrition is high primarily because of the limited availability of nutritionally adequate foods or due to the lack of skills to prepare balanced meals from available food stuff. Even when food supply is plentiful, some population groups do not achieve the right level of micronutrients in their diets to support good health. Scientists, physicians, and public health experts emphasize the importance of diet in improving human health. That is, an adequate diet providing all essential micronutrients contributes to not only a better nutrition, but in the long run also reduces the burden of chronic diseases. We present levels of malnutrition recorded among Kagera residents and use the HIV and AIDS history in the region considered the 'epicenter of AIDS in Africa' in the 1980s to demonstrate that prevalent endemic immunodeficiency in the region has little to do with chronic diseases, but is, rather, the result of malnutrition and its consequence at all stages of human physical and mental development. We interviewed key informants in the Tanzania-Uganda borderlands to understand their perspectives on a public health problem priority to which health interventions should focus on. Study findings suggest that nutrition interventions promoting and sustaining good nutrition habits, behaviors and practices, basic hygiene and how to avoid transmission of infectious diseases are a priority in Kagera. Concluded that timely, culturally accepted, contextualized, cost-effective, outreaching and specific group-focused nutrition interventions could improve health and reduce currently incurred treatment costs. Recommended aligning all nutrition interventions in the country with the National Social and Behavior Change Communication Strategy (2013-2918) and strengthening government coordination of all stakeholders in the field are cardinal for the attainment of improved well-being for all at all ages in Kagera and the rest of Tanzania.

INTRODUCTION

In the developing world, and in Tanzania in particular, the prevalence of malnutrition is high,[1,2,3] primarily because of the limited availability of nutritionally adequate foods. Although the supply of food can be plentiful, some population groups are not achieving the right level of micronutrients in their diets to support good health.[4] Scientists, physicians, nutritionists and public health experts all emphasize the importance of diet in improving human health: an adequate diet providing all essential micronutrients will contribute to not only a better nutrition, but will in the long run also reduce the burden of chronic diseases.

Nutrition plays a key role in human health and wellbeing. This is true through-out the life-cycle: starting from conception, and later at all stages in life: for babies, infants, adolescents, young and older adults[4]. Intake of food ensures growth in children and youth, maintains health throughout life, meets special needs for pregnancy, lactation and recovery from illness. Eating right food in right amounts and time ensures good nutrition and health. Adequate, optimum and good nutrition indicate the right amount and proportion of nutrients for proper utilization for achieving highest levels of physical and mental development.[5] The nutrients in food enable the cells in human bodies to perform their necessary functions. As Wardlaw & Insel (1996) described, the nutrients in food are essential for human physical and mental functioning; "Nutrients are the nourishing substances in food that are essential for the growth, development and maintenance of body functions ... If a nutrient is not present, aspects of function and, therefore, human health decline. When nutrient intake does not regularly meet the nutrient needs dictated by the cell activity, the metabolic processes slow down or even stop."[6]

Malnutrition is undesirable level of nutrition resulting from lack (under nutrition), excess (over nutrition) or imbalance of nutrients in the diet leading to ill health.[7] Malnutrition can be due to insufficient supply of one or more nutrients or it can result from an error in metabolism, interaction between nutrients or nutrients and drugs used for treatment.[5] In paper, we present and use study participants' narratives prioritizing nutrition interventions in Kagera, levels of malnutrition recorded among Kagera residents and the HIV and AIDS history in the region considered the 'epicenter of AIDS in Africa' in the 1980s to demonstrate that prevalent endemic

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immunodeficiency in the region has little to do with chronic diseases (malaria, anemia or HIV, for instance), but is, rather, the result of malnutrition and its consequence at all stages of human physical and mental development.

MATERIALS AND METHODS

Between September 2017 and September 2018 we conducted a larger qualitative study in four border districts of Kagera Region, Tanzania: Bukoba Rural, Bukoba Urban, Missenyi and Kyerwa. We interviewed key informants (KIs) including: 56 men and women aged 18 years and above; the Regional Medical Officer (RMO), Regional Health Officer, three District Medical Officers (DMOs), 28 regional, district and village officials, 10 health care providers and seven influential members of the community. During the in-depth interviews (IDIs) we asked our study participants a question, "If you were given TShs 100 million by the government, which of the following public health problems would you spend the money on: malaria, HIV and AIDS and low nutrition and why?" The goal was, among others, to understand KIs' perspectives on a public health problem priority that they would want to have intervention focused on.

We sought and obtained research clearance from the Muhimbili University of Health and Allied Sciences Institutional Review Board (MUHAS IRB) Ref. No. 2017-09-29/EAC/Vol.XII/73). Permission to conduct the study was requested and granted from regional, district, division and the ward authorities. With the consideration of the sensitivity of borderlands and border issues, study participants were asked for informed oral consent. Data analysis continued throughout the process of data collection following three stages of qualitative data analysis: data reduction, data display and conclusion drawing and verification. The main aim was to understand Kagera residents' health intervention priority as informed by their lived health experiences in their defined world.

RESULTS

During the IDIs with the study participants we posed a question, "If you were given TShs 100 million by the government, which of the following public health problems would you spend the money on: malaria, HIV and AIDS and low nutrition and why?" With the exception of two participants, the DMO for Bukoba Municipal Council (BMC) and the Ward Executive Officer for Kashenye, Missenyi district, the rest reported would use the money to combat low nutrition reported among Kagera residents.

The Ward Executive Officer (WEO) for Bugabo, for example, stated, "I would spend that money on low nutrition among our people … We have a lot of food in this area, however, we lack mixing skill to make balanced meals for the healthy and malnourished children and adults" (IDI, Bukoba Rural, February 5, 2018). A Sub-village Chairperson interviewed in Malehe observed, "Good nutrition status is important in all aspects of life … It improves immunity to diseases like malaria … Even the HIV-positive individuals on treatment [Anti-Retroviral Treatment, ART] need to have good nutrition status to benefit from AIDS care and treatment … In this area, some of them have stopped taking ARVs due to lack of nutritious food" (IDI, Bukoba Rural, February 5, 2018).

The BMC Nutrition Officer stated, Residents in BMC have good nutrition status compared to other districts in Kagera … However, compared to malaria and HIV and AIDS, I would spend money maintaining and improving our residents' nutrition levels because it would determine their immunity to all diseases … Yes, malaria and HIV and AIDS are important but good nutrition is more important for our people's well being ... Individuals suffering from malaria or AIDS need to have their nutrition status maintained in order to recover soon or benefit from the ARVs they take (IDI, Bukoba Urban, February 28, 2018).

The BMC Agricultural Officer observed

"There is no debate … I would spend that money to reduce malnutrition levels among children and adults in this region … I hope you know the Kagera statistics … About 41.2% low nutrition and 41.7% stunting … This is quite high and unacceptable … Low nutrition could lead patients not to adhere to regimen or benefit from treatment they are put on like ART … So, we have to reduce high levels of malnutrition to realize benefits from other health interventions" (IDI, Bukoba Urban, February 28, 2018).

Discussion this issue, the Mugana District Designated Hospital (DDH, Missenyi District) Medical Officer in-Charge commented,

"I have scientific reasons for choosing low nutrition over the other health problems in this district and Kagera region in general ... Malaria cases reported and diagnosed in our catchment area have gone down beginning 2016/17; mortality rate [Infant Mortality Rate] for U5s due to malaria and severe anemia has gone down because patients seek appropriate checkup/management and treatment … Similarly, malaria treatment equipment and supplies are abundantly available ... So, each malaria case and symptoms are carefully managed and treated leading to low malaria cases recorded in this area ... However, malnutrition levels are high in Kagera – be it child or adult malnutrition ... I hope you have these statistics from the 2014 national survey … It [malnutrition] is a problem in this region [Kagera] ... The problem is that the level of knowledge and skills for managing malnutrition is low among health personnel ... Similarly, despite the abundant food available in this region, members of the community lack food mixing skills to prepare balanced meals for the health and malnourished children and adults" (IDI, Missenyi, February 28, 2018).

The Missenyi Agricultural Officer reported,

"Malnutrition is a priority compared to malaria and HIV and AIDS … Malnourished individuals would be prone to all diseases … As you may be aware, many of the people living with HIV and AIDS who cannot afford two meals a day have abandoned ARVs … Some have become so weak; others have died … You should remember, like the healthy people, the sick need balanced meals all the time, failure of which they would not benefit from treatment they are put on" (IDI, Missenyi, February 6, 2018).

An old Lady Interviewed in Kashenye Reported,

"As I have told you, there are several factors that have led to low nutrition reported among our community members, both among children and adults … Yes, malaria and HIV and AIDS are health problems facing us … However, I think malnutrition is a serious one … Malnourished people would fall sick from every disease including mild bacterial infections like flu … As you walk around this village you will notice that many of the villagers look weak or sick … The majority cannot afford two meals; let alone balanced meals a day … Some families are

seriously starving … In addition, many of the young mothers in this area lack food mixing skills to make balanced meals for the children and adults … Low nutrition interventions in this area should focus on this shortfall" (IDI, Missenyi, February 6, 2018).

The WEO noted low nutrition was not a serious issue in Mutukula ward but admitted being recognized a serious problem at the district and the regional levels, saying,

"Low nutrition is not a big health problem in our area … However, it has been reported at the district and regional levels that Kagera is one of the five regions with high levels of malnutrition in the country … We have been directed to develop strategies to combat it … So, yes, I would spend the money on low nutrition rather than malaria and HIV and AIDS (IDI, Missenyi, March 19, 2018).

Discussing this Issue, the Kyerwa DC Commented,

"Indeed, I was shocked learning that Kagera region despite the available abundant food, has high levels of malnutrition in the country … The problem is that some *Bahaya* adults do not eat some food that are important for their health, like vegetables, meat, fruits, *entura* or milk … Again, the mothers/wives [who prepare meals] lack food mixing skills to make balanced meals for the children and adults or the sick … They just make their families eat to fill their stomachs … We need to change their mind set and their eating habits and improve their food mixing skills … If we can eliminate or reduce malnutrition we can successfully fight other diseases including malaria and HIV and AIDS (IDI, Kyerwa, March 16, 2018).

The Medical Officer in-Charge, Isingiro Health Center reported,

"We are increasingly recognizing the impact of malnutrition among our patients and Isingiro residents in general … Even among patients coming from across the borders [from Uganda and Rwanda] … Young mothers we attend are too short or too thin and anemic … Some give births to underweight children or still births, which are signs of malnutrition … The 2014 survey indicated that Kagera has high levels of malnutrition among children and the adults calling for immediate interventions to reduce this burden … Moreover, I think we are doing great in terms of HIV and AIDS and malaria control in our district [Kyerwa] and Kagera region in general … So, I would spend that money combating low nutrition in Kyerwa and Kagera" (IDI, Kyerwa, March 17, 2018).

On the one hand, the Ward Executive Office for Kashenye who reported he would spend the money combating HIV and AIDS had the following explanation for his choice,

"I have chosen HIV and AIDS because we received the district HIV and AIDS status report for the past month [January, 2018] which shows that our ward recorder 40% … That is, of all clients who tested for HIV in January in this ward, 40% tested positive … This shows that we have a problem in this area … However, mothers coming from across the border for healthcare services could have significantly contributed to this rate" (IDI, Missenyi, February 6, 2018).

On the other hand, the DMO for BMC who reported he would spend the money combating malaria justified his preference as follows,

"We have a good number of developing partners supporting the fight against HIV and AIDS and we [Kagera Region] have recorded significant success in this direction … I have no idea on what intervention one would put in place to reduce malnutrition … Should we go around distributing food to the residents or to families/households with malnourished children and adults? Which type of food should we be distributing … rice, bananas or maize flour? In my view, such interventions would be difficult to run and neither the government nor the developing partners would support such unsustainable strategies … Malaria is still a problem in our municipal despite the support we get from the development partners we work with … We have adequate stock of supplies and equipment for malaria in all facilities in the region … However, we are convinced that in addition to malaria treatment, we should put more effort in malaria prevention strategies like the use of larvicides, indoor residual spraying and destroying potential mosquito breeding sites . All this would require huge money … It is from this perspective that I would spent that money fighting malaria in Kagera" (IDI, Bukoba Urban, February 28, 2018).

Our team observed young, short and thin mothers at every health facility visited. Several members of the communities observed had clear indications of physical and psychological dissatisfactions/stress and majority complained of poverty leading to their inability to afford two meals a day, sending their children to school or paying for healthcare services needed by their family members. Some villagers we talked to/interviewed in Bukoba Rural and Missenyi districts in particular, attributed high malnutrition levels reported among Kagera residents to crop (both food and cash) diseases and declining returns from cash crops they sell to farmers' unions or on black markets.

DISCUSSION

Our study findings showed that all participants, except two, would prioritize interventions geared to combating low malnutrition in their settings and Kagera region in general. The reason behind participants' concern and choice to prioritize combating malnutrition over conditions such as malaria and HIV and AIDS was informed by the alarming statistics on the burden of this public health condition in the study area. Kagera region residents are reported to experience higher levels of poverty and chronic malnutrition.[8] The prevalence of malnutrition in the region is reported at 0.5% among the under-fives.[9,10] This situation is frightening and intolerable especially considering the fact that about 82 % of the regions' population (2.5million) is engaged in agricultural activities that contribute to about 45% of the GDP and 60% of the export earnings in the region.[11]

According to Kessy (2005), the region has the lowest (45%) per capita Gross Domestic Product (GDP)[12] and one among the regions with the highest levels of poverty,[13,14] gender disparities and trends of environmental degradation and climatic change impacts.[11,15] Similarly, the UN/Tanzania (2016) reported Kagera region residents experience high levels of malnutrition, poverty and chronic malnutrition[8]. Despite Kagera region's agricultural produce, the region experiences high levels of malnutrition of (5.0% prevalence) of under-weight among under-fives. [9,10]

More than 2,700,000 children under five years in Tanzania were reported stunted in the year 2014.[16] However, higher level of malnutrition considered as 'vey high' (that exceeds 40%) was recorded in 9 regions including: Iringa, Njombe, Geita,

Dodoma, Ruvuma, Rukwa, Kigoma, Katavi and Kagera. Kagera was one of the regions that recorded malnutrition prevalence above 50%: Kagera (51.9%), Njombe (51.5%) and Iringa (51.3%). As such the recommendation was made to prioritize nutrition interventions in five of the nine regions: Kagera, Kigoma, Dodoma, Mbeya and Mwanza that recorded higher numbers of stunted children and higher prevalence of chronic malnutrition (p. 10). The Tanzania Malnutrition Fact Sheet 2016 showed that 41.7% of children under 5 were stunted, 2.3% were wasted, 17.4% were underweight and 57.2% were anemic. Further, 39.1% of women in the reproductive age (15-49) were anemic.[17]

The TDHS-MIS 2015-16 showed that the percentage of 552 children under 5 classified as malnourished according to the three anthropometric indices of nutrition status (height-for-age; weight-for-height and weight-for-age) in Kagera: 15% were severely stunted and 41.7% stunted. About 0.5% were severely wasted and 2% wasted. Yet 4.5% were severely underweight and 17% classified underweight. The mean stunting, wasting and underweight Z-scores of children under 5 were -17, -0.0 and -1.0 in that order; reflecting that on the average, children in Kagera region are less well-nourished than children in the WHO Multicenter Growth Reference Study[18] (TDHS-MIS 2015-16). Similarly, the survey showed that of 508 children aged 6-59 months, 57%, 27.0%, 29.5% and 0.8% were classified as having any, mild, moderate and severe malaria indicating that about 50% of children under 5 in Kagera are at high risk of stunted growth, impaired cognitive performance, motor development, language development, coordination and educational achievement[18].

Equally, a cross-sectional and longitudinal (2014-2015) study of nutrition status among 437 school-children in Bumbiile archipelago, Muleba district, reported high prevalence of malnutrition: 30.7% stunting, 12.9% underweight, 4.5% thinness, while overweight was rare (2.4%).[3] The researchers attributed undernutrition affecting Bumbiile Island children to micronutrient deficiencies.

Multiple factors, genetic disorders (thalassemia and sickle cell, for example), chronic diseases (for instance, malaria, hookworm and HIV) and environmental factors, such as age, lack of proper diet, poor socio-economic status, high parity of women and lack of quality healthcare could cause iron deficiency anemia among women in the reproductive age. As a result, women could experience various poor outcomes like fatigue, poor mental health, lack of concentration, poor feto-neonatal outcomes like stillbirth, preterm birth and postpartum Hemorrhage.[19] Further, anemia increases morbidity from infectious diseases because it negatively affects several immune systems. A survey in Kagera among 612 women aged 15-49 observed that 39.1%, 29.6%, 8.6% and 1.0% of the participants as having either any, mild, moderate or severe anemia.[20] This suggested that women in reproductive age including adolescent girls (onset of menstruation) and pregnant women (increased blood volume due to pregnancy) residing in rural areas of the region were at risk of anemia[14].

However, according to some studies,[20] nutritional deficiencies, primarily due to lack of dietary iron, folate (important for the development of the brain and the spine during the pre-conception period and optimal intake reduces the risk of neural tube defects such as spina bifida and anencephaly), vitamin $B_{12,}$ vitamin A and other nutrients is the major cause of anemia among women (15-49). Anemia is reported to affect rural residents compared to urban dwellers,[18,19] suggesting women in the reproductive age, adolescent girls and pregnant women in rural Kagera are at risk of anemia and its complications.

Health personnel (public health experts, nutrition scientists and practitioners, for instance) and our study participants accentuate the importance of diet in improving human health. An adequate diet providing (all) essential micronutrients would contribute not only to a better nutrition, but would, in the long run also, reduce the burden of (chronic) diseases like malaria, HIV and sickle cell. EGAN (Patients Network for Medicine and Research, nd.), for example, reported, "Up to 50% of patients in hospitals suffer from a lack of micronutrients in their daily nutrition. This can compromise the effect of their treatments and leading to poorer patient outcomes and finally additional costs. Specific population groups such as the elderly (especially those living in institutions), disabled people and people experiencing an ill-health are vulnerable to malnutrition. This problem can be addressed through the fortification of foods, which can have a widespread impact in addressing specific micronutrient deficiencies"[4].

The importance of nutrition in human health and wellbeing through-out the life-cycle (from conception to elderly stages) cannot be over emphasized. Early malnutrition reduces an adolescent's height by 4.6 cm, schooling by 0.7 grades and lifetime earnings by 7-12%.[21] Stunting causes lifetime damage by retarding brain development, which in turn, impairs school achievement, reduces individuals' productivity as they grow into adulthood that shrinks their earning power and keeps families in poverty. Consequently, stunting among the citizenry undermines national development and economic growth.[10, 22,23] Bijlmakers *et al.*, (1998)[24] and Cameron (2017)[10] assert that vital stages occur in the children's physical and mental development during the first 1000 days (from conception to two years). Four situations can result into stunting during this period. First, mothers are poorly nourished before and during pregnancy. Poor nutrition during adolescence can set the stage for poor maternal nutrition, low birth weight in infants and increased susceptibility to stunting. Second, infants are not exclusively breastfed in the first 6 months of life. Giving infants under 6 months other food or drinks weakens immunity, undermines ability to fight disease and increases risk of exposure to contaminated food and water that can cause diarrhea and vulnerability to stunting. Other foods also have less nutritional value than breast milk. Third, children aged 6-24 months do not receive a varied nutritious diet and frequent small meals, up to 4-5 times per day depending on the age of the child. Finally, children less than 2 years experience repeated attacks of diarrhea and or malaria which depress appetite and rob them of valuable nutrients. The implication is that adequate nutrition to all at all stages of development (from conception to elderly stages) could decrease the disease burden among citizens and patients, which in turn, could save on future healthcare costs.

Participants in a qualitative study conducted with two slum communities in Nairobi, Kenya[23] reported that mothers who took one meal per day became undernourished and unable or unwilling to breastfeed because as the baby breastfed too much they became thin leading to cessation of breastfeeding. This finding suggests that children born to poor, thin and malnourished mothers are at a risk of being undernourished and thus suffering from malnutrition effects throughout their life cycles. A quotation from Deru (2001) suffices to demonstrate

the link between events that took place in Kagera leading to low levels of nutrition recorded in the region,

"At the beginning of the Twentieth Century, the region was considered a little paradise, thanks to its favorable climate (1,200m altitude), regular rainfall throughout the year, banana trees with bean plots - ensuring an abundant food supply - growing in their shade around every house, with fisheries products to complete the diet. The development of the coffee trade brings in cash. Children are schooled on the spot or are sent to Uganda for their secondary education ... However, from the First World War on, a series of events brought about a complete reversal of this idyllic situation. East Coast Fever decimated the cattle. Banana trees thus deprived of their natural fertilizer - dung - slowly withered away, to the point of falling prey to a fungus disease several decades later, ultimately bringing about a brutal decline in their productivity. In addition, coffee prices collapsed. Nationalization schemes, begun in 1967, resulted in the dismantling of the economic system. Then came the ultimate catastrophe: the devastation of the region brought about by Idi Amin Dada's war against Tanzania in [1978-1979] ... Serious malnutrition became a lasting feature. Basic commodities were in short supply. The children who managed to survive malnutrition reached adulthood with weakened immune systems, and mortality (from tuberculosis and other respiratory diseases, intestinal infections and massive infestation with parasites) in these young, chronic malaria-ridden adults was high. The disastrous sanitary and agricultural situations forced the survivors to leave and try their luck in the large East African cities."[25]

In 1983, the first three HIV and AIDS cases were detected at Ndolage Hospital in Kagera. In the late 1980s, Kagera had become an area of both high and early HIV prevalence, with prevalence rates as high as 24%.[26] Together with Rakai district (Uganda) the area was considered as the 'epicentre of AIDS in Africa'.[27] By 1985, the AIDS experts, and WHO in particular, claimed Kagera population was doomed to be decimated, unless energetic measures were taken to combat this new deadly virus.[27,28] Between 1985 and 1998, HIV and AIDS interventions in Kagera were limited to pregnant women who visited Bukoba Hospital. The Médecins du Monde NGO was in charge of the testing program, the follow-up of HIV-positive persons and promoting the use of condoms. Since 1998, "AZT had been administered to HIV-positive pregnant women in order to prevent 'mother to child transmission' [PMTCT]".[28] According to Deru (2003), "Outside of Bukoba, in the rural areas of the Kagera region, practically no preventive health or curative anti-viral measures [had] been applied".[28]"

Fifteen years later, that is, in the early 2000s unexpected results had been recorded[28]: 1) Tanzania's population showed a growth of 49% between 1988 and 2002 as opposed the envisioned drop in population; 2) Kagera region recorded a 53% population growth between 1988 and 2002; and 3) the region recorded an upward trend with respect to births and downward trend with respect to deaths. The fact that the population had returned to normal life following the disaster of the 1980s can only be attributed to the gradual improvement of the economic situation and to the development aid.[29] Deru (2003) added, "I noted that the rural population [had] a very unbalanced diet. Though sufficient in terms of calories, there are too many starchy foods and not enough foods rich in proteins, vitamins and minerals. These nutritional elements, which are indispensable for growth and proper body function, are usually lacking to a large extent. This led me to an understanding of why the state of health of young children and active young adults is so precarious, and also why women are often so exhausted, from an organic point of view, after several pregnancies and nursing periods ... In the field, no trace of an [HIV and AIDS] epidemic can be found. What one does observe is the presence of a very poor, badly nourished and malaria-ridden population suffering from commonly encountered illnesses, against a background of endemic immunodeficiency".[27]

In Deru's (2003) view, Kagera population needs safe drinking water, access to basic medical care and require effective action be taken against malaria and other chronic diseases. "Above all else, however, they need to become less poor and to be educated, so as to acquire the means of improving their living conditions and their nourishment. It is obvious that the prevailing great poverty and malnutrition are the root causes of all of the health-related problems, including the serious immunodeficiency."[27]

The Tanzania government in collaboration with development partners and stakeholders has started initiatives to improve the nutritional status of children, pregnant and lactating women and the socio-economic status of Kagera residents. The collaborators include: Tanzania Development and Prevention of AIDS (TADEPA) is a Non-governmental Organization (NGO) based in Kagera Region, Tanzania, working to improve the socio-economic well-being of the people of the country, including those infected and affected by HIV and AIDS; Addressing Stunting in Tanzania Early (ASTUTE) project is supported by UKaid, with IMA World Health, PANITA, DMI, and Cornell University collaborators. ASTUTE aims to reduce stunting among the under 5 in the Lake Zone regions including Mwanza, Geita, Shinyanga, Kagera and Kigoma. ASTUTE uses an evidence-based social and behavior change communication (SBCC) strategy for stunting reduction in the project regions. Among others strategies used, the interventions encourage families to adopt small, do-able actions that reduce stunting.[30]

The Mwanzo Bora Nutrition Program (MBNP) was a seven-year (2011–2018) program that sought to improve the nutritional status of children and pregnant and lactating women in Tanzania with a specific focus on reducing stunting and maternal anemia. The program was funded by the United States Agency for International Development (USAID) through Feed the Future (FtF) and the Global Health Initiatives (GHI); and implemented by a consortium of partners: Africare (the prime), Centre for Counseling, Nutrition and Health Care (COUNSENUTH), Deloitte Touche Tohmatsu Limited Tanzania (Deloitte), and The Manoff-Group (TMG). The MBNP also worked with regional and district government institutions and civil society organizations. Partners brought complementary skills sets and relationships with communities and networks allowing for a comprehensive, integrated approach that sought to create an enabling environment for the promotion, adoption and scaling up of key desired behaviors that impact the first 1000 days of the life of a child.[31]

The Centre for Counseling, Nutrition and Health Care (COUNSENUTH, 1998) implemented the Nutrition Intervention Project, Lishe Wajibu (2015-2018) in three regions in Tanzania: Kagera (Muleba), Coast (Bagamoyo) and Mtwara (Masasi).[32] Yara Internation, an organization fighting famine globally, helped create the Southern Agricultural Corridor of Tanzania (SAGCOT), an ambitious government-led public-private initiative aiming to revitalize 300,000 square kilometers

of arable land. The initiative is expected to boost the incomes of thousands of farmers. Over the last decade, the Tanzanian government has encouraged investment in commercial rice, sugar and maize farming and processing facilities.[33]

Bukoba Development Foundation (BUDEFO) is not-for-profit NGO whose primary objective is not only to arrest the socio-economic decline but also to conceive and implement development initiatives that are sustainable, transformative, inclusive and socially viable. Its membership is open to all Kagera-born persons regardless of where they live and irrespective of their social status. Current members include ordinary peasants in the villages, elected government leaders at the village, ward and district levels, members of parliament, business people, public servants, religious leaders and Kagera-born persons living in the diaspora.[15] The Agri-Thamani Foundation NGO officially started its operations in Kagera on November1, 2018 focusing on "mobilizing and organizing youths and women in adding value to farming, livestock and fisheries products in order to raise the residents' disposable income and improve the nutrition status of families" in Kagera.[34,35]

Despite efforts made, malnutrition levels in Kagera are still high compared to the national statistics.[32] Without data on the evaluation of malnutrition interventions in Kagera, one explanation for this situation could be that most of the interventions have remained top-bottom addressing scientifically established (by UNICEF and WHO) direct causes of malnutrition and paying less attention to indirect factors operating in the contexts within which interventions are taking place. A National Nutrition Social Behavior Change Communication (SBCC) Strategy July 2013–June 2018 in place provides that in addition to the national strategies set to improve nutrition status, nutrition SBCC interventions should be regionally conceptualized and contextualized (made socially and culturally acceptable to targeted groups/populations) for achievable and sustainable behavior change outcomes.

Kamazima, *et al*., (2018)'s[36] qualitative study with the Tanzania-Uganda borderlanders, for instance, documented 13 perceived factors contributing to low nutrition and six recommended strategies to improve nutrition status among Kagera residents that should be considered during the conceptualization and contextualization of culturally accepted and cost-effective nutrition intervention programs and projects in Kagera region. As the researchers recommended, subjecting the reported factors putting Kagera residents at high risk of low malnutrition to the five interconnected socio-ecological model (SEM) levels (individual, interpersonal, community, organizational and public policy or enabling environment) and addressing them at the same time would facilitate implementing potential, culturally acceptable and efficacious malnutrition prevention strategies and sustaining health behaviors and practices promoting optimum nutrition levels among Kagera residents. ASTUTE project[30] and MBNP[31] have set examples. In the authors' view, ASTUTE project and MBNP are successful archetypes of such initiatives that could be replicated in other nutrition interventions in Kagera and other parts of the country.

CONCLUSION AND RECOMMENDATIONS

Our study findings are congruent to Deru's (2003) observations clearly suggesting that the endemic immunodeficiency in Kagera has little to do with chronic diseases (malaria, anemia or HIV, for instance), but is, rather, the result of malnutrition and its consequence at all stages of human physical and mental development. This observation is redolent in the era of HIV and AIDS care and adherence to antiretroviral treatment (ART) and advanced technology and abundant supplies for malaria prevention, diagnosis and treatment. Likewise, our study has shown that Kagera residents understand the linkages between nutrition and human health/wellbeing through-out the life-cycle as expressed in the UNICEF/WHO conceptual framework, which presents an important basis to foster change.[36] Respondents' narratives strongly linked infant/child and adult undernutrition with poverty and inadequate dietary intake in the study area. Similarly, the narratives indicated that child feeding and adult eating habits, behaviors and practices are influenced by interlinked social and environmental factors.[37] Based on lived experiences and the definition of health needs, Kagera communities reported malnutrition number one health priority that requires multisectoral strategies to improve.

On the one hand, study participants were aware of the magnitude of this health problem in their area, its causes (both scientific and perceived), consequences and strategies to curb it that are both within and beyond their capacities. On the other hand, they acknowledge that adequate nutrition greatly influences good/positive treatment outcomes among patients. In their view, the government and development partners should engage Kagera communities in nutrition interventions that mainly focus on, but not limited to: 1) promoting and sustaining good nutrition habits, behaviors and practices such as food mixing skills to prepare balanced meals; 2) reducing anemia burden among children under 5 and women (15-49); reducing poverty (SDG, Goal 1); 3) ending hunger and attaining food security (SDG, Goal 2); reducing child and maternal mortality; improving complementary feeding for children 6-24 months; 4) strengthening communities' (parents and caregivers/takers) knowledge of malnutrition, the importance of basic hygiene and how to avoid transmission of infectious diseases; and 5) improving maternal health and promoting health/well-being for all at all ages (SDG, Goal 3). In addition, timely, culturally accepted, contextualized, cost-effective, outreaching and specific group-focused nutrition interventions could improve health and reduce (treatment) costs.

It is recommended that interventions intended to improve the nutrition status of the Tanzania population or its subgroups should be aligned with the National SBCC Strategy's (2013-2918) guidelines for efficacious and sustainable nutrition behavior change outcomes. Proper government coordination (through relevant ministries and departments) of all stakeholders in this direction is key for the attainment of this long-term goal.

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