Effectiveness of Out-patient Therapeutic Program on Nutrition among Under Fives: A Retrospective Study of Kisumu East District, Kenya

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Abstract

Outpatient Therapeutic Program (OTP) has been implemented with great success. Monitor ing and evaluation against program objectives is integral. This study aimed to assess effectiveness of OTP program in Kisumu East District and identify factors influencing its effectiveness.In a retrospective longitudinal study targeting malnourished child ren 6–59 months registered in OTP, information on type of malnutrition, HIV status, cure rate, defaulter rate, death rate, non -response, average weight gain and Average Length of Stay (ALOS) in the program were abstracted from hospital records of 420 eligi ble children between January to December 2009; selected by systematic random sampling. Proportions of Marasmus, Kwashiorkor, and HIV were determined. Proportions of outcomes were compared against Sphere standards to assess effectiveness. Associations between type of malnutrition and: HIV status, gender, age and Mid Upper Arm Circumference (MUAC) were determined using regression analysis. From the study findings, prevalence of Marasmus (67.4%) was higher than prevalence of Kwashiorkor (31.2%). Children cured were 54%, 3.3% died, 22.6% defaulted while non -responders were 0.7%. ALOS was 39 days and rate of weight gain 4.8g/kg/day. Regression analysis showed: MUAC and HIV status influenced type of malnutrition, low MUAC increased the chances of dying by 50% (CI 0.302 - 0.944 p=0.031) and each cm increase in MUAC reduced rate of weight gain by 0.8g/kg (CI -1.483 - -0.117 p=0.022). Increase in rate of weight gain increased cure rate by 8% (CI 1.024 - 1.15 p=0.006). The program was effective in achieving low death rates, ALOS and rate of weight gain. High defaulter rate may have obscured true death and cure rates. Factors contributing to high defaulter rates should be investigated and addressed to improve program effectiveness.

Keywords*: MUAC, Outcomes, OTP, Malnutrition*

Introduction

In sub-Saharan Africa, 9.6% of the children are wasted (Friedman *et al.,* 2005). Sadler (2007) notes that Africa is the only region where wasting continues to rise. In Kenya, the prevalence of wasting is 7% and 3.2% in Nyanza (KNBS, 2010). Ministry of Health (MOH) Kenya, recommends a MUAC of < 11.5cm, or Weight for Height Z score (WHZ) <-3SD, no underlying medical conditions and good appetite as the criteria for admission to Out Patient Therapeutic program (OTP) (IMAM Handbook, 2010).

Why and How to Evaluate

Assessments and analyses of programs should be undertaken to understand what works and what does not work, why and how they can be expanded, strengthened and redesigned (Ismail *et al.,* 2003). Sphere handbook (2004), states that programs should be evaluated against internationally accepted locally appropriate minimum standards to measure effectiveness. Effectiveness is monitored through collection, analysis and presentation of quantitative process and outcome indicators on:

- Number of admissions disaggregated by type of presentation (Marasmus, Kwashiorkor, Marasmic-kwashiorkor).
- Number of exits disaggregated by outcome (cured, died, defaulted, non -responder).
- Number of people in the program.
- Average rate of weight gain and average length of stay (ALOS) (Collins *et al.*, 2006b)

- Proportion of exits who have died should be < 10%
- Proportion of exits who have recovered should be > 75%
- Proportion of exits who have defaulted should be < 15%
- Minimum mean rate of weight gain (g kg -1 person-1 day-1) >8g (Collins *et al.*, 2004).

OTP Outcomes

In Dowa Malawi, of the OTP admissions, 85.3% recovered, 12.7% defaulted and 2.0% died in direct admissions; while in indirect admissions 84% recovered, 8.4% defaulted and 7.7% died (Collins *et*

al., 2006a). In Wollo Ethiopia, the outcome was similar between the NGO and MOH implemented programs; In the NGO implemented 80% cured, 6% died, 7% defaulted while in the MOH implemented, 82% cured, 5% died and 5% defaulted (Collins *et al.,* 2006b). In Malawi (outside Blantyre), 94% recovered, 1.8% non-responders, 3.6% defaulted, and 0.9% died (Fanzo *et al.,* 2009). In Kenya, OTP in Arid and Semi Arid Lands (ASAL) saw a total of 111,336 children discharged over the period between 2010 and 2011. The outcomes were, 81% recovered, 1.5% died, and 13% defaulted (UNICEF Kenya, 2012).

SAM in the Context of HIV and Infant and young Child Nutrition

A high proportion (90%) of childhood HIV occurs in children in Africa. This prevalence is associated with 7% of all deaths in children under five (Bunn *et al.,* 2009). In a meta-analysis of African studies on SAM, mortality in HIV-infected children was 30.4%, compared to 8.4% in HIV-negative (Bunn *et al.,* 2009). In Malawi, HIV positive children registered lower rates of weight gain than uninfected children, at 2.8 g/kg/day, and 4.7 g/kg/day respectively. ALOS was longer in HIV-infected (56days) than in uninfected children (42 days) (Bahwere *et al.,* 2008). HIV infection renders achievement of international standards by OTPs challenging (Sadler *et al.,* 2006).

In Malawi, Children with HIV had more Kwashiorkor (57.3%) than Marasmus (42.7%) as Kwashiorkor is the prevalent type of malnutrition in Malawi. Improving SAM survival for all children regardless of HIV status, is a global public health priority, key to achievement of Millennium Development Goal (MDG) number 4- reduction of child mortality (Fergusson *et al.,* 2009; Fergusson and Tomkins, 2009).

Methods

The study was carried out in Kisumu East district. The OTP sites were: Kisumu District Hospital, Pandpieri KUAP, Obunga KUAP, Magadi KUAP, Nyamasaria KMET, OLPS, Lumumba, Rabuor, Nyahera and Simba Upepo. A retrospective longitudinal design was adopted. Information was abstracted from records onto a questionnaire and effectiveness of OTP relative to standard outcomes; and factors associated with the effectiveness of OTP evaluated using either logistic or linear regression as dictated by the independent variable.

Procedure

Kisumu was selected purposively as it had 13 OTP sites operational. Ten sites that had been fully operational from January to December 2009 were included. Proportionate sampling was used to determine the number of participants from each of the facilities. Individuals were then sampled us ing systematic random sampling. Data was entered and analyzed in the Statistical Package for Social Sciences (SPSS), version 17. Descriptive statistics comprising frequencies and cross tabulations were used to determine proportions of children with Marasmus, Kwashiorkor, and HIV. Proportions of outcomes were compared against Sphere standards to assess effectiveness. Distribution of continuous variables was visually assessed for normality before analysis. Associations between HIV status, age, sex and MUAC were determined using logistic or linear regression for binary and continuous variables respectively. Results were considered significant at an alpha level of 0.05.

Results

Proportions of Admissions

Overall, 67.4% had Marasmus while 31.4% had Kwashiorkor. A higher proportion of malnourished children having Marasmus was observed in all facilities except Simba Upepo where proportions with Marasmus and Kwashiorkor were almost similar. The highest prevalence of Marasmus was observed in Magadi (90.9%) and Lumumba (88.2%). Kwashiorkor was highest in Nyahera Sub - district hospital (54.9%) and less than 50% in other facilities. Data on marasmic Kwashiorkor was not available.

Among children aged six to eleven months, Marasmus was 91% while Kwashiorkor was 9%. Among 12 to 35 months, Marasmus was 59% while Kwashiorkor was 41%, 36 to 59 months Marasmus was 65% and Kwashiorkor 35%. Prevalence of Kwashiorkor was 32% in males and 31% in females while Marasmus was 66% in males and 68% in females. There was no difference in malnutrition presentation between males and females p=*0.931* (95% CI 0.615 – 1.408).

Outcome Indicators of Effectiveness

Cure Rate. Overall Cure rate was 54%. Only Magadi at 75.8% and Lumumba at 82.4% surpassed Sphere standard.

Defaulter Rate. The program registered a high defaulter rate of 22%. Magadi at 6.1% and KDH at 7.8% were the only facilities with low defaulter rates.

Death Rate. All facilities were effective in achieving low death rates. Using <5% death rates which has been achieved by most OTP programs (Heikens *et al.*, 2008, Sadler *et al.*, 2006, Collins *et al*., 2006a), all facilities were effective except Magadi, Nyahera and Obunga.

Proximate Indicators of Effectiveness

ALOS. All facilities except Lumumba, at 68 days, met Sphere standard. Overall ALOS was 39 days. ALOS among children with Kwashiorkor was 35 days while Marasmus was 42 days, significant based on an unpaired t-test (*p = 0.019*).

Rate of Weight Gain. Sphere recommends rate of weight gain of >8/kg/day for in -patient programs while a lower weight gain of 4g/kg/day is also acceptable for OTP. All facilities exceeded the recommended 4g/kg/day weight gain except Nyahera at 3g/kg/day. The overall average weight gain was 4.8 g/kg/day.

Factors that Influence Effectiveness

MUAC and HIV status were found to influence type of malnutrition. An increase in MUAC by 1cm was associated with a 59% decrease in likelihood of having Marasmus *(p< 0.0001).* The likelihood of having Marasmus for a participant decreased by 68.2% if one was HIV n egative (*p = 0.027)*, summarized in Table 1.

Table 1. Influence of Age, MUAC, Gender and HIV Status on Malnutrition

	Indicator	**OR***	***95% CI***	***p value***
Marasmus	Age in months	0.982	0.958 - 1.007	0.159
	MUAC	**0.409**	**0.318 - 0.525**	**<0.0001**
	Gender	1.079	0.616 - 1.890	0.79
	HIV Status	**0.318**	**0.115 - 0.877**	**0.027**

None of the factors influenced ALOS. MUAC influences rate of weight gain. An increase in MUAC by 1cm was associated with a decrease in rate of weight gain by 0.8g/kg/day (*p = 0.022*), summarized in Table 2.

Table 2. Influence of Age, MUAC, Gender, HIV Status and Type of Malnutrition on Proximate Indicators

	Indicator	**B**	**95% CI**	***p* value**
Average Length of stay	Age in Months	-0.071	-0.436 - 0.293	0.700
	Gender	-2.037	-10.292 - 6.218	0.627
	MUAC at admission	-2.534	-6.114 - 1.045	0.164
	HIV Status	2.274	-10.723 - 15.27	0.731
	T ype of malnutrition	0.924	-10.145 - 11.992	0.869
Rate of Weight Gain	Age in Months	0.012	-0.059 - 0.083	0.739
	Gender	-0.315	-1.882 - 1.252	0.692
	MUAC at admission	**-0.8**	**-1.483 - -0.117**	**0.022**
	HIV Status	-0.306	-2.749 - 2.137	0.805
	T ype of malnutrition	0.855	-1.238 - 2.948	0.421

The outcome factor influenced was death: Only MUAC at admission influenced whether or not a child died. Every 1cm increase in MUAC at admission resulted in 50% decrease in the likelihood of a child dying (*p= 0.031),* summarized in Table 3.

Table 3: Influence of Age, MUAC, Gender and HIV Status on Outcome

	Indicator	**OR**	**95% CI**	***p* value**
Cured	Gender	1.049	0.666 - 1.651	0.837
	Age in months	0.994	0.974 - 1.015	0.593
	MUAC	1.062	0.902 - 1.25	0.470
	HIV Status	1.218	0.603 - 2.459	0.582
Died	Gender	0.698	0.189 - 2.58	0.590
	Age in months	0.986	0.919 - 1.057	0.687
	MUAC	**0.534**	**0.302 - 0.944**	**0.031**
	HIV Status	0.929	0.106 - 8.114	0.947
Defaulter	Gender	1.061	0.619 - 1.820	0.83-
	Age in months	0.992	0.967 - 1.017	0.522
	MUAC	1.160	0.962 - 1.400	0.120
	HIV Status	0.988	0.423 - 2.306	0.977

Rate of weight gain influenced cure rate. A unit increase in rate of weigh t gain resulted in 8% increase in likelihood of being cured (*p=0.006*).

Table 4: Influence of Proximate Factors on Outcome

Outcome	Indicator	OR*	95% CI	*p* value
Cured	ALOS	1.002	0.992 - 1.012	0.748
	Rate of Weight Gain	1.085	1.024 - 1.15	0.006
Died	ALOS	0.979	0.883 - 1.084	0.681
	Rate of Weight Gain	0.926	0.762 - 1.126	0.443
Defaulter	ALOS	0.979	0.952 - 1.006	0.132
	Rate Weight Gain	0.988	0.917 - 1.065	0.749

Discussion

Proportions of males and females included were similar. Mean age of admission was 19.0±12.0 months.

Malnutrition Admissions by Presentation

Overall, more children had Marasmus than Kwashiorkor. This was observed in all facilities except Simba Upepo where proportions with Marasmus and Kwashiorkor were similar. No data was available on marasmic Kwashiorkor. The high Marasmus prevalence corresponds to the Child Health and Nutrition Information System (CHANIS) report of 2009 where the prevalence of Marasmus and Kwashiorkor were 85% and 15%, respectively. There was no difference in malnutrition presentation among gender.

When aggregated by age, Marasmus was most prevalent in children 6 to 11 months, while at 12 to 35 months proportions of malnutrition were almost similar. Higher Marasmus cases in children 6 – 11 months could be indicative of access to protein through breastfeeding in earlier months with increasing tendency to Kwashiorkor as the child gets older and is less likely to breastfeed. Breast milk, being a source of protein, could be protective against Kwashiorkor even wh en overall energy intake is likely to be low, hence higher cases of Marasmus. Children breastfeeding at 6 – 11 months was 93.4% and Kwashiorkor increases at 18 to 23 months because those breastfeeding are 59.3% KDHS (2008-9).

Latham (1997) observed that Marasmus was more common and frequent among one to three years of age, but may occur at any age.

Elsewhere in Malawi among children aged 24-42 months, a higher proportion had Kwashiorkor compared to Marasmus; attributed to the fact that Kwashiorkor is the common form of SAM peaking at 18 to 23 months (Bahwere *et al.*, 2008). Hamidu *et al.,* (2003) stipulates that prevalence varies across geographical regions based on the diet.

Outcome Indicators of Effectiveness

Cure rates. Proportion cured for the program was 54%, below Sphere standard (Sphere, 2004). Most facilities (except Magadi and Lumumba) recorded cure rates below Sphere with KDH performing lowest at 25%. The observed differences in cure rates among health facilities could be due to a number of factors; location some operated as outreaches and high defaulters.

Programs in Bangladesh, Oromia Ethiopia, West Darfur Sudan and UNICEF's study of OTP in Kisumu recorded cure rates of 53%, 33.2%, 68% and 73.7% respectively. Reasons for these rates were given as: in Bangladesh, antibiotics were not provided, use of adapted exit protocols and integration into routine services; In Oromia, attrition of trained staff, lack of supplies and poor community mobilization; in West Darfur it was due to high defaulter rate (17%) (Save the Children, 2007; Belachew & Nekatibeb, 2007; UNICEF Kenya, 2012). A high cure rate of 90% in Southern Nations Nationalities People Regional State (SNNPRS) in Ethiopia was attributed to capacity building, community volunteers' involvement, and linkages to other services (Save the children, 2007).

Defaulter Rates. Overall defaulting was high (22.6%) with OLPS, Nyahera, Simba Upepo and Obunga being the main contributors. Only 2 out of 10 facilities met the threshold that is, Magadi at 6.1% and KDH at 7.8%. Programs in Mangochi Malawi, West Darfur Sudan, Oromia Ethiopia and Kisumu Kenya, recorded high defaulter rates of 22%, 17%, 45% and 17.3% respectively . This was attributed to; in Malawi distance to facility, weak outreach in West Darfur, caregivers were active in the fields during harvest time, insecurities hampered access, and if children improved they saw no reason to continue (Save the children, 2007; UNICEF Kenya, 2012).

SNNPRS and Dedza Malawi achieved low defaulter rates of 13% and 14% respectively attributed to; good community mobilization in SNNPRS and in Dedza, to community follow up, bi-monthly OTP schedule, awareness campaign and community gate keepers involvement (Belachew & Nekatibeb, 2007; Save the children, 2007).

High defaulter rate makes it difficult to adequately assess performance of other indicators such as death and cure rates as defaulters could have been cured, died or remained malnourished.

Death Rate. Overall death rate was 3.3%. Although there were no deaths reported in Pandpieri, Simba Upepo and Lumumba, they still recorded high defaulters. Death rates in Rabuor, KDH, Nyamasaria and OLPS were all well below 5%.

Death rate in a UNICEF' study of Kisumu was 5.2% (UNICEF Kenya, 2012). Malawi recorded death rates of 5% and 2% for Mangochi and Dedza respectively (Save the children, 2007). Only in facilities with low defaulter rates can we assume that the death rate observed may truly reflect the performance of a health facility with respect to this effectiveness indicator. Only in Magadi can we confidently take the effectiveness of achieving Sphere threshold as being a reflection of success.

Weight Gain. The overall rate of weight gain was 4.8g/kg/day. Sphere allows for lower rates of weight gain in outpatient programs, of 4g/kg/day as the risk of exposure to infection and opportunity costs for beneficiaries are lower. OTP in SNNPRS registered an average weight gain of 5.5g/kg/day (Save the children, 2007). Other programs had lower rates of weight gain as observed in Nyahera. Mangochi and Dedza programs in Malawi had weight gains of 3g/kg/day attributed to; low MUAC, illness, HIV, sharing of rations, and missing visits (Save the children, 2007).

Average Length of Stay. HIV and AIDS may result in some malnourished individuals failing to recover (Sphere, 2004). The ALOS for this program was 39 days. Lumumba was the only facility where children stayed longer than Sphere recommendation. In SNNPRS, the ALOS was 44 days (Save the children, 2007). In west Darfur, ALOS for Marasmus was 57 days (Save the children, 2007). The difference in Kisumu East ALOS for Marasmus and Kwashiorkor could be attributed to thos e with Marasmus tending to be HIV positive compared to Kwashiorkor. Bahwere *et al.,* (2008) also found that HIV-positive children recovered more slowly. He attributed it to slower weight gain arising from reduced intake due to

poor appetite; nutrient mal-absorption, increased incidence of infections, and increased nutrient requirements due to HIV.

Factors Affecting Effectiveness of OTP

In the current study, over 75% of the children were tested for HIV. Most of the children were HIV negative. Nyamasaria had the highest HIV prevalence at 21%. Most of the HIV positive children had Marasmus. The cure rate in HIV positive children was similar to the overall cure rate, supported by the findings that in this study HIV status did not influence cure rate. HIV status for 25% of the participants could not be ascertained. Not testing for HIV should not be an option: untreated, 35—59% of HIV-infected children in sub-Saharan Africa die before their second birthday and children who are HIV positive and also malnourished are twice more likely to die than those with SAM alone (Fergusson *et al.*, 2009). HIV status influenced type malnutrition. HIV positive children were more likely to have Marasmus. This is corroborated by several studies reporting that HIV-infected children develop Marasmus rather than Kwashiorkor (Bahwere *et al.,* 2008: Thurstans *et al.,* 2008).

Age, gender, MUAC at admission, HIV status and type of malnutrition did not influence ALOS. However, other studies have found that HIV status influences this variable (Thurstans *et al.,* 2008). Confidence limits for the relationship between MUAC and ALOS in this study, although corresponding to a non-significant result, suggests a possible influence of MUAC that may not have been detected due to a small sample size (CI -6.114 to 1.045).

Higher MUAC at admission is associated with increased likelihood of having Kwashiorkor than Marasmus, and reduced likelihood of a child dying; interpreted as the likelihood of dying is higher in children with Marasmus than Kwashiorkor. MUAC at admission influenced rate of weight gain and death as an outcome. Although MUAC influenced death rate, this was not attributed to its influence on rate of weight gain because rate of weight gain did not influence death rate. This indicates that MUAC influences chances of dying, and rate of weight gain, independently. Rate of weight gain however, influences cure, with increased rate of weight gain associated with increased chances of being cured. Lower MUACs are good indicators of mortality among children (Myatt et *al.,* 2006).

MUAC at admission influences rate of weight gain but is not associated with length of stay in the program. The more weight a child gains, the more chances they had of being cured, but ALOS did not influence any of the outcomes. MUAC at admission directly influences death rate, but is not associated with cure or defaulting rates. Rate of weight gain is influenced by MUAC at admission, but is not associated with either death or defaulting.

Conclusion

The common form of malnutrition in Kisumu is Marasmus, hence general energy deficits is the predominant nutrition problem. Magadi, is the only facility that was effective. The program was effective in achieving low death rates, ALOS and rate of weight gain. High defaulter rates may have masked performance with respect to death and cure rates. Factors that influence effectiveness are: MUAC, rate of weight and HIV status.

From the study findings it is recommended that OTP Programs be linked with the community and have defaulter tracing mechanisms to reduce defaulters and improve effectiveness.

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