Environmental Effects and the Prevalence of Under-nutrition among Preschoolers living in Matisi Peri-urban location, Trans- Nzoia District, Kenya

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ABSTRACT
Background*: Under-nutrition is a serious problem facing pre-schoolers worldwide and especially in developing countries. Peri- urban populations are normally characterized by difficult socio- economic situations which are likely to have direct or indirect implications on the health hence may contribute to the prevalence of under-nutrition among the pre-schoolers.*
Aims: *To assess the prevalence of under-nutrition in pre-school children and the associated environmental factors.*
Methods*: A cross sectional survey design was used. Mother – preschooler pairs (n= 208) were recruited. The population was peri- urban based and in a slum setting. Children's anthropometric measurements (body weight, height, and MUAC) were taken. Interviewer administered questionnaire and a check list were used. Data was analyzed using SPSS version 17.0. Chi square test of association and logistic regression was used to examine the effects of environmental factors on the prevalence of under-nutrition. Epi- Info version 3.4.3 analyzed anthropometric data to get z scores (SD) indices of HAZ, WHZ and WAZ.*
Results*: Under-nutrition by stunting, underweight and wasting was (24%), (21.6%) and (5.3%) respectively. The children who had suffered fever two weeks before the study were four times likely to be stunted (p=0.032 OR 3.660, 95% CI 1.118-11.982). Fecal disposal site was associated with underweight among the pre-schoolers (p=0.002 OR 3.7 95% CI 1.601-8.911).*
Conclusion: *The most prevalent forms of under-nutrition were stunting, wasting and underweight. Fecal waste disposal site is a significant factor associated with under-nutrition among the pre-schoolers.*

Key words: *Under-nutrition; Environmental factors; Peri-urban; Pre-schoolers*

1.1 Introduction

World Health Organization showed that about 60% of all deaths, occurring among children aged less than five years in developing countries, could be attributed to under-nutrition (WHO, 2002). UNICEF (1998) estimated that 226 million children are stunted, 67 million are wasted, and 183 million are underweight globally. Within the Sub-Saharan Africa 35% and 29% of preschool children are stunted and underweight respectively (Leenstra *et al*., 2005). According to WHO Bulletin (1995) the highest level of stunting is found in East Africa where on average 48% of preschool children were affected. Matisi location is characterized by people mainly of low socio-economic status which forces them to live in the peri-urban slum that lacks most basic

necessities. Sanitation in the area is poor characterized by open drainages, garbage is littered all over, and most pit latrines are full. Water shortage is rampant with majority of people using open wells and a few purchasing water from water vendors. Housing structures are mostly semi-permanent and congested (Trans Nzoia Development Plan, 2001-2007). Studies show that inadequate provision of basic human necessities like water, housing adversely affects the growth and nutritional status of children of the weaker section of a disadvantaged community like the peri-urban slums (Mariara *et al*., 2006). Reports reveal that un hygienic living conditions e.g. presence of child waste inside the house, prolonged storage of cooked foods, feeding with unwashed hands, poor handling of drinking water, lack of good sewerage system, unprotected water sources, poor sanitation due to improper methods of waste disposal and overcrowding increases risks of illness hence predisposing children to infectious diseases which is a risk factor to under-nutrition (UNICEF, 1998; Abate *et al*., 2000; Odunayo and Oyewole, 2006; Vitolo *et al.*, 2008).

2.1 Methods

Most plots in Matisi location have pit-latrines that are communally used and the area is served with one health facility which is privately owned and one public primary school (Chege, 2006).

A cross-sectional study design was employed. A mother -child pair (208) was used to give information. Children's anthropometric measurements which included body weight, height, and MUAC were taken. Interviewer administered questionnaire was used to gather socio-demographic data and a check list to get environmental data. Simple random sampling was used where the list of all households with 24-59 months old children (250) was entered in a computer package which generated random numbers of 208 households. In cases where there was more than one child in a household aged 24-59 months, only one child was chosen from that household randomly before proceeding to the next household. Children with physical malformations that was likely to interfere with anthropometric measurements, children whose parents refused to consent and children whose ages could not be ascertained children aged between 24-59 months but with chronic illnesses were excluded from the study. The study was approved by Institutional Research and Ethics Committee [IREC] of Moi Teaching and Referral Hospital and also written permission was sought from the area chief.

Data was analyzed using SPSS version 17.0. Chi square test of association and logistic regression was used to examine the effects of various environmental factors on the prevalence of under-nutrition. Epi- Info version 3.4.3 was used to analyze anthropometric data which generated z scores (SD) indices of HAZ, WHZ and WAZ.

3.1 Results

The results show that the mean age, weight and height was 38±10.7, 13.7± 2.4 and 91±9.2 months, kg and cm respectively. Under-nutrition by stunting, underweight and wasting was (24%), (21.6%) and (5.3%) respectively. Most 154 (74%) of the respondents lived in rented houses that were either made of mud or polythene. The rest were made of grass or corrugated iron roofed houses. More than half 143 (68.8%) lived in single rooms, that were likely to be crowded bearing in mind that almost half 102 (49%) of the households had 5-8 members.

Slightly below a third 62 (29.8%) of the households used a stream as a source of their drinking water and none of them used rain water as shown in Table 1. This is not surprising bearing in mind the type of roofing materials (grass and polythene) that were used to construct the houses as shown in Appendix 1. Over half 136 (65.4%) of the respondents had their water sources at a

distance of < 500m from their residence. More than three quarters 173 (83%) of the households do not treat their drinking water. The few that treat the water, more than half 125 (60%) boil it and the rest 83 (40%) use water guard.

3.1.1 Disposal of waste

Mothers were asked how they disposed household refuse. Majority 152 (73%) of the sample disposed their kitchen waste anywhere and especially along the roads in trenches, with just a few 46 (22%) having rubbish pits and 10 (5%) disposing in the garden. During the study, most of the compounds were observed to be untidy with litter lying in trenches and around the houses. A quarter 53 (25.5%) of the households did not own latrines. They claimed that they defecated along the roads in trenches and paper bags that they threw anywhere.

Table 1 Water source

Sources of water	**n=208**	**(%)**
Unprotected well	37	(17.8)
Protected well	54	(26)
Stream	62	(29.8)
Tap	55	(26.4)

3.1.2 Environmental factors and under-nutrition

The results of the study showed that the source of drinking water was associated with wasting among the children but not with stunting and underweight. None of the children from households that were using protected wells was wasted. The fecal waste disposal site was associated with wasting and underweight among the children. Compounds were observed using a check list and underweight was associated with the littered compounds. House size in terms of number of rooms was investigated and it was found that the size of the house was associated with wasting in children as illustrated in Table 2.

Table 2 Environmental factors by the prevalence of under-nutrition

	Stunting		**Wasting**		**Underweight**	
	Yes	**No**	**Yes**	**No**	**Yes**	**No**
	n=50(%)	**n=158(%)**	**n=11(%)**	**n=197(%)**	**n= 45 (%)**	**n=163(%)**
Sources of drinking water						
Un protected well(n=37)	13(26)	24(15.2)	2(18.2)	35(17.8)	12(26.7)	25(15.3)
Protected well(n=54)	12(24)	42(26.6)	0(0)	54(27.4)	11(24.4)	43(26.4)
Streams(n=62)	12(24)	50(31.6)	8(72.7)	54(27.4)	11(24.4)	51(31.3)
Tap(n=55)	13(26)	42(26.6)	1(9.1)	54(27.4)	11(24.4)	44(27)
p	**0.342**		**0.009**		**0.357**	

Faecal waste disposal site						
Anywhere(n=53)	16(32)	37(23.4)	6(54.5)	47(23.9)	18(40)	35(21.5)
Latrine(n=155)	34(68)	121(76.6)	5(45.5)	150(76.1)	27(60)	128(78.5)
p	**0.225**		**0.023**		**0.012**	
House size						
1 room(n=139)	30(60)	109(69)	11(100)	128(65)	27(60)	112(68.7)
>1 room(n=69)	20(40)	49(31)	0(0)	69(35)	18(40)	51(31.3)
p	**0.239**		**0.016**		**0.272**	
Cleanliness of compound						
Not littered(n=75)	16(32)	59(37.3)	1(9.1)	74(37.6)	8(17.8)	67(41.1)
Littered(n=133)	34(68)	99(62.7)	10(90.9)	123(62.4)	37(82.2)	96(58.9)
p	**0.790**		**0.130**		**0.012**	

Fecal waste disposal site was significantly associated with underweight in children and those children from households that were disposing fecal waste anywhere were 4 times likely to be underweight compared to those disposing in the latrine (p=0.002, OR 3.8, 95% CI 1.601 – 8.911), when controlling for water source.

Table 3. Multivariate analysis for underweight

	Underweight	
Variables	**OR(95% CI)**	**P-value**
Environmental		
Source of water		
Unprotected	1.621 (0.611 – 4.301)	**0.332**
Protected	0.572 (0.199 – 1.645)	**0.300**
Stream	0.434 (0.147 – 1.283)	**0.131**
Faecal disposal(anywhere)	3.777 (1.601 – 8.911)	**0.002**

4.1 Discussion

This survey revealed an association between the sources of drinking water and wasting among the children. Children from households that drew water from streams and unprotected wells had a high rate 8 (12.9%) and 2 (5.4%) of wasting respectively than those who drew water from protected wells, which is in agreement with a study by (Mbagaya *et al.*, 2004) who reported similar findings.

This study revealed that a quarter 52 (25%) of the households lack latrines with three quarters 156 (75%) using the latrines that were mostly used communally hence they are likely to be

unkept. The study observed that most pit latrines were dirty and full though they were being locked. There was an association between the fecal waste disposal site and wasting and underweight. Children from household that dispose fecal waste anywhere had high prevalence of wasting 6 (11.3%) and underweight 18 (34%). This shows similar findings with studies by (Mbagaya *et al.,* 2004; Vitolo *et al.,* 2008).

An association was seen between the cleanliness of the compound (littered or not) with underweight showing high trends 37 (27.8%) of underweight among those children that lived in littered compounds compared to lower rates 8 (10.7%) in the children from unlittered compounds. A study by Vitolo *et al.,* (2008) also found similar results where underweight was associated with poor sanitation (dirty compounds and lack of sewerage system). Most of the households disposed of kitchen and faecal waste anywhere making the compounds dirty so children are likely to play there, and pick up disease causing microorganisms that may cause diseases which may lead to under-nutrition.

5.1 Conclusion

Fecal waste disposal site are significant factors associated with under-nutrition among the pre-schoolers.

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7.1 Recommendations

Municipal council should provide enough treated drinking water and organized means of refuse disposal.

Slum upgrading projects like waste management projects should be set up by government and NGO's.

Hygiene education should be taught through the chief *Barazas'* by the Ministry of public Health and Sanitation.

8.1 References

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APPENDIX 1: PICTURES OF KIPSONGO AND SHANTI VILLAGES