

**Fresh fruits and vegetable consumption among HIV-infected pregnant women in urban resource-constrained areas**

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**Abstract**

The FAO/WHO recommends a minimum intake of fruits 160 g/day and 240 g/day of vegetables, and a combined intake of 400 g/day for normal healthy adults for prevention of chronic diseases and alleviation of micronutrient deficiencies. For vulnerable populations in resource-constrained setting, these recommendations may not be met. In this cross-sectional study, levels of fruits and vegetable consumption among HIV-infected pregnant women from resource-constrained setting in Nairobi, Kenya were assessed in selected Nairobi City County's health facilities. Semi-qualitative food frequency questionnaire was used to collect data on consumption of fruits and vegetables. Quantities of vegetables consumed were estimated from pre-established serving spoon sizes and scoops. The quantities of fruits were determined by weighing edible parts of similar sizes purchased from the locality. Only 51.0% of study participants reported consumption of fruits, with a mean intake (SE) 189.6 (16.8) g/day. Of those who reported consumption of fruits, 75.1% of them met the FAO/WHO recommended intake levels. This was significantly different by area of residence ( $\chi^2=57.7$ ,  $df=3$ ,  $p=0.000$ ). Consumption of vegetables was reported by 75.0% of participants, with a mean (SE) intake of 111.5 (8.0) g/day. However, only 16.0% of those who reported consumption of vegetables met the FAO/WHO recommendation, and, this was significantly different by age ( $\chi^2=9.0$ ,  $df=1$ ,  $p=0.003$ ) and residential area ( $\chi^2=36.5$ ,  $df=3$ ,  $p=0.000$ ). Overall, the mean (SE) quantity of combined fruits and vegetables consumed was 301.2 (21.3) g/day. Only 36.7% met the FAO/WHO recommended minimum requirements for health. This was significantly different by residential area ( $\chi^2=75.8$ ,  $df=3$ ,  $p=0.000$ ). In conclusion, consumption of fruits and vegetables among HIV-infected pregnant women is below the minimum recommendation for health. This cannot guarantee protection against opportunistic infections and non-communicable diseases. Hence, the need to intensify promotion of consumption of these foods at all health-contact points with vulnerable HIV-infected pregnant women, on health benefits of consuming fruits and vegetables.

Key words: FAO/WHO Recommendation, Health, HIV-positive, Kenya, Nairobi, pregnancy

## Résumé

La FAO / OMS recommande un apport minimum de fruits de 160 g / jour et 240 g / jour de légumes, et un apport combiné de 400 g / jour pour les adultes normaux en bonne santé pour la prévention des maladies chroniques et la réduction des carences en micronutriments. Pour les populations vulnérables dans un contexte de ressources limitées, ces recommandations peuvent ne pas être respectées. Dans cette étude transversale, les niveaux de consommation de fruits et légumes chez les femmes enceintes infectées par le VIH provenant de milieux à ressources limitées à Nairobi, au Kenya, ont été évalués dans certains établissements de santé du comté de Nairobi. Un questionnaire semi-qualitatif sur la fréquence des aliments a été utilisé pour collecter des données sur la consommation de fruits et légumes. Les quantités de légumes consommées ont été estimées à partir de tailles de cuillères et de cuillères préétablies. Les quantités de fruits ont été déterminées en pesant des parties comestibles de tailles similaires achetées dans la localité. Seuls 51,0% des participants à l'étude ont déclaré avoir consommé des fruits, avec un apport moyen (AM) de 189,6 (16,8) g / jour. Parmi ceux qui ont déclaré avoir consommé des fruits, 75,1% d'entre eux ont atteint les niveaux d'ingestion recommandés par la FAO / OMS. Ceci était significativement différent selon la zone de résidence ( $\chi^2 = 57,7$ ,  $df = 3$ ,  $p = 0,000$ ). La consommation de légumes a été rapportée par 75,0% des participants, avec un apport moyen (SE) de 111,5 (8,0) g / jour. Cependant, seulement 16,0% de ceux qui ont déclaré avoir consommé des légumes répondaient à la recommandation FAO / OMS, ce qui était significativement différent selon l'âge ( $\chi^2 = 9,0$ ,  $df = 1$ ,  $p = 0,003$ ) et la zone résidentielle ( $\chi^2 = 36,5$ ,  $df = 3$ ,  $p = 0,000$ ). Dans l'ensemble, la quantité moyenne (AM) de fruits et légumes combinés consommés était de 301,2 (21,3) g / jour. Seulement 36,7% satisfaisaient aux exigences minimales recommandées par la FAO et l'OMS pour la santé. Ceci était significativement différent selon la zone résidentielle ( $\chi^2 = 75,8$ ,  $df = 3$ ,  $p = 0,000$ ). En conclusion, la consommation de fruits et légumes chez les femmes enceintes infectées par le VIH est inférieure à la recommandation minimale pour la santé. Cela ne peut garantir une protection contre les infections opportunistes et les maladies non transmissibles. D'où la nécessité d'intensifier la promotion de la consommation de ces aliments à tous les points de contact avec les femmes enceintes vulnérables infectées par le VIH, sur les avantages pour la santé de la consommation de fruits et légumes.

Mots-clés: Recommandation FAO / OMS, Santé, VIH +, Kenya, Nairobi, grossesse

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## Introduction

Fruits and vegetables are important components of a healthy diet due to their vitamins, minerals, phytochemicals and fiber content. Globally, research evidence suggests that increased consumption of fruits and vegetables reduces the risk of diseases (Boeing *et al.*, 2012). The FAO/WHO recommends a minimum intake of fruits of 160 g/day (2 servings) and vegetables 240 g/day (3 servings) and for combined intake of 400 g/day (5 servings) for normal healthy adults (World Health Organization, 2005). The recommended minimum intake is for prevention of chronic diseases as well as for alleviation and prevention of several micronutrient deficiencies.

HIV-infected pregnant women are vulnerable to micronutrient deficiencies and diseases brought about by their physiological demands of pregnancy as well as their HIV disease condition. Their needs for utilization of antioxidant vitamins (E, C, and beta-carotene) and minerals (zinc, selenium, magnesium) for immune system maintenance are therefore above the normal requirements. Hence, their fruit and vegetable intake should be above the FAO/

WHO minimum recommended levels for healthy adults. Liu (2013) suggests an intake of four servings of fruits and five of vegetables.

In urban settings, a variety of fruits and vegetables are available throughout the year from different parts of the country, as well as importation. They are not only available, but also accessible to a majority of the urban population. It is therefore expected that the daily fruit and vegetable intake levels are met by a majority of the population. However, for the resource constrained vulnerable households, particularly those affected by HI-AIDS, competing demands for the available money for other basic needs often limits purchase and consumption of fruits. About 21% of households' food budget is spent on fruits and vegetables in urban households (Stuart-Shor *et al.*, 2012). In Nairobi, however, fruit consumption levels for about 70% of households have been reported to be lower than the WHO/FAO recommendations and about half of the resource-constrained households do not meet their vegetable recommendation levels (Ayieko *et al.*, 2005). There is however a dearth of information on the levels of fruit and vegetable consumption among the most vulnerable populations to malnutrition, especially the HIV-infected pregnant women, whose micronutrient demands are high due to both pregnancy and infections.

### **Methodology**

**Study design, site and population.** A cross-sectional study was conducted among 216 HIV-infected pregnant women who were enrolled in Prevention of Mother-to-child transmission (PMTCT) of HIV infection programme in Nairobi City County's selected health facilities. The study was conducted in the low to middle income residential estates of Nairobi, the capital city of Kenya. The four study sites were Kayole II Sub-district Hospital, Mathare Health Centre, Riruta Health Centre and Kariobangi North Health Centre. These were purposively sampled because they provide antenatal-care as well as comprehensive care for PMTCT services to pregnant women who are HIV infected. In addition, they had the highest number of enrolments in their PMTCT programmes during the preparatory phase of this study.

**Ethical considerations.** Approval to conduct the study was obtained from the Kenyatta National Hospital/University of Nairobi Ethical Review Committee (KNH/UoN – ERC, P266//6/2011), Ministry of Education, Research and Technology of Kenya. Both written and oral consent were obtained after providing information about the objectives, risk and benefits of study using written explanations in English and the major local language, Kiswahili. Confidentiality was maintained by use of unique code numbers instead of participant identifier information.

**Sampling and participant recruitment procedures.** Universal sampling method was attempted so that any patient who met the inclusion criteria of HIV-positive and pregnant in the second trimester of 14 to 27 weeks was included in the study. Two approaches were used in recruitment of participants. The first approach was used to recruit women who were already in the PMTCT programme. Recruitment was done with the assistance of mentor mothers of mother2mothers (m2m), a non-governmental organization which provides peer education and psychosocial support in Prevention of Mother to Child Transmission (PMTCT) programmes. Mentor mothers of m2m compiled a list of pregnant women who met the study inclusion criteria, with exception of depressive symptoms. The women were contacted by phone and requested to visit the clinic. Those who came and gave informed consent to participate in the study were recruited. In the second approach women

who were not registered in the PMTCT programme and were probably visiting the facility for the first time were recruited in the study. They were invited to participate and screened to determine if they met the eligibility criteria.

**Data collection.** A structured interview was conducted to obtain participants' information on demographic, socio-economic and other health and HIV-related characteristics. Dietary intake data on consumption of fruits and vegetables was collected in two phases. The first phase was a household survey aimed at establishing the types of fruits and vegetables consumed in the study area and estimating the commonly used food serving sizes and utensils. The households were sampled by convenient sampling method and were identified by a community healthcare worker attached to the health facility. A total of 13 households with women of child-bearing age within the study health facilities' catchment area were identified by community health workers. The fruit and vegetable consumption data were collected using a semi-qualitative food frequency questionnaire. The second phase of data collection on dietary intake was conducted at the health facility. Participants recalled the type and amount of fruits and vegetables eaten in the last 24 hours. The quantities of vegetables consumed were estimated from pre-established serving spoon sizes and scoops (Different sizes of spoons were shown to participants to choose the one they used). Quantities of fruits were determined by weighing edible parts (without peels) of similar sizes of fruits purchased by the researcher from the locality on a digital kitchen scale (Ramtons Kitchen Scale, Model No: RM/299).

### Findings

A total of 216 HIV-infected pregnant women participated in the study. Their mean (SD) age was 26.7 (5.6) years. Slightly more than three quarters of them (77.3%) were married and half of them (50%), had at least high school education. All participants were pregnant and were in their second trimester of pregnancy (mean 21.5 (3.7) weeks). They were from low to middle income residential areas in Nairobi with a total monthly household income of, Kenya Shillings 6,519 (SD=4814). The proportion of households who were below the World Bank's poverty line with less than Kenya Shillings 2,913 was 19.5%.

Study findings on consumption of fruits and vegetables revealed that just above half of study participants, 51.0% consumed fruits during the survey (previous day) with a mean intake (SE) of 189.6 (16.8) g/day. Among those who reported to have consumed fruits (n=110), only 75.1% (n=83), met the FAO/WHO recommended intake level of at least 160 g/day (2 servings). The consumption of fruits was significantly different by area of residence ( $\chi^2=57.7$ , df=3, P=0.000) (Table 1 and Table 2). The consumption of vegetables was reported by 75.0% (n=162) of participants, with a mean intake (SE) of 111.5 (8.0) g/day. Among those who reported consumption of vegetables, only 16.0% (n=26) were found to have met the FAO/WHO recommended vegetable intake levels of at least 240 g/day (3 servings). The consumption of vegetables was significantly different by age ( $\chi^2=9.0$ , df=1, P=0.003) and area of residence ( $\chi^2=36.5$ , df=3, P=0.000) (Table 1 and Table 2).

The mean (SE) quantities of combined fruits and vegetables consumed was 301.2 (21.3) g/day. The proportion of participants who met the FAO/WHO recommended minimum

intake of combined fruits and vegetables of at least 400 g/day was 36.7%. This consumption of at least 400 g/day was significantly different by area of residence  $\chi^2=75.8$ ,  $df=3$ ,  $P=0.000$ ). (Table 1 and Table 2)

**Table 1. Reported consumption of fruits and vegetables**

Fruit/ Vegetable (N=216)	Mean (SE) Quantity consumed in grams per day	Participants reporting consumption	
		n	%
Fruit	189.6(16.8)	110	51.0
Vegetables	111.5 (8.0)	162	75.0
Overall fruit and vegetable consumption of at least 400g	301.2(21.3)	66	30.6

**Table 2. Consumption of minimum recommended fruits and vegetables**

Demographic characteristics		Fruits (Consumption of at least the recommended 160g/day: n=83)			Vegetables (Consumption of at least the recommended 240g/day: n=26)			Combined fruits and vegetables Consumption of at least the recommended 400g/day: n=66)		
		n	%	P	n	%	P	n	%	P
		Age (Years)	15-25	40	48.2		5	19.2		27
	26 and above	43	51.8	0.739	21	80.8	0.003	39	59.1	0.253
Residence	Kariobangi	7	8.4		2	7.7		6	9.1	
	Mathare	18	21.7		2	7.7		8	12.1	
	Riruta	44	53.0		19	73.1		42	63.6	
	Kayole	14	16.9	0.000	3	11.5	0.000	10	15.2	0.000

## Discussion

Consumption of vegetables among HIV infected persons has been proven to contribute to increase in their dietary intake and CD4 count (Ndungu *et al.*, 2017). Quantities consumed for vegetables (111.5g/day) were lower than the recommended level of 240 g/day and the consumption was reported by only 75% of participants during the survey. Traditionally, in most African communities, including Kenya, vegetables are considered as an accompaniment to a cereal-based or a root and tuber based main starchy food (Vilakati, 2009). These findings may also suggest that vegetables are not considered as “food” among the urban women and may not be consumed every day. Quantity of fruits consumed (189.6g/day) in this study was higher than recommended 160g/day, but consumption was reported by only half of the participants in the study. Traditionally, fruits are not considered as “food” and would be eaten any time of the day, especially by the children. The combined quantities of fruits and vegetables (301.2 g/day) were equally below the recommended minimum daily intake for prevention of chronic diseases as well as prevention and alleviation of micronutrient deficiencies among more than half of HIV-infected pregnant women in the study

(World Health Organization, 2005). The low fruit and vegetable intake observed in this study had also been previously reported in Kenya and elsewhere (Ayieko *et al.*, 2005; Mayige and Kagaruki, 2013). Despite global commitments being in place to ensure that 95% of pregnant women living with HIV get lifelong treatment by 2018 (Joint United Nations Programme on HIV/AIDS, 2016), the poor dietary fruit and vegetable intake may dilute any gain made in ensuring that lifelong treatment.

The consumption of vegetables was significantly associated with the age of participants in this study with the older women consuming more vegetables than the younger women. This variation could be due to the current dietary lifestyle among young people in the urban. They tend to shift to energy dense diets that are high in saturated fat, sugar, and refined foods, and away from plant-based diets; and inadequate access to healthy food choices (Kimani-Murage *et al.*, 2015). The consumption of vegetables and fruits were also significantly associated with the participants' areas of residence. The reported consumption levels were higher in Riruta which has a large open-air market with plenty of fresh fruits and vegetables every day. This resulted in availability and lower prices for all who have access to Riruta area than in the rest of the study areas which were far from a large open air market. Supply and cost have been known to influence consumption of fresh fruits and vegetables (Oniang'o *et al.*, 2003, 2006; Caldwell *et al.*, 2009; Haynes-Maslow *et al.*, 2013).

## Conclusion

Consumption of fruits and vegetables among HIV-infected pregnant women is below the recommended 400 g/day for health. This cannot guarantee them protection against increased incidences and severity of opportunistic infections as well as non-communicable diseases. Hence, there is need to intensify awareness on health benefits of consumption of more than the 240 g/day of vegetables and 160 g/day of fruits that is recommended for healthy adults. This should be best done in all health contact points with vulnerable HIV-infected pregnant women. Further more studies should be conducted among urban populations especially those vulnerable to micronutrient deficiencies to establish their consumption levels of fruits and vegetables. Additionally research on knowledge, attitude and behaviors may contribute to a better understanding of barriers and facilitators of fruit and vegetable consumption among the urban vulnerable population groups.

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