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Knowledge on Benefits of Consumption and Cooking Time of Leafy Vegetables in a Peri urban Communities

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Abstract
Vegetable consumption is confers many benefits to the body. Leafy vegetables are widely available in sub-Saharan Africa. Nutritionist and other health professional's encourage clients and patients respectively to consume them. The increase of non-communicable diseases despite the increased knowledge of benefits of leafy vegetable is worrying. Currently no Leafy vegetables have been shown to boost immunity due to the high ascorbic acid levels. Leafy vegetables are also high in fiber that enables control the blood sugar levels. This helps in the prevention and management of diabetes Cooking time of leafy vegetables is important to ensure maximum benefits from leafy vegetables. The more leafy vegetables are cooked the more the nutrients degrade. Hence cooking methods such as steaming are greatly encouraged while boiling id discouraged. This study aims at providing baseline information on the relationship between knowledge of benefits and cooking time.A cross-sectional study design was used. The tools of collecting data were interviewer administered questionnaires. The data was collected in the informal settlement of Kangemi in Nairobi- Kenya. Most respondents were women. However proportionally more men were knowledgeable on benefits than women. From the study the most respondents had knowledge of benefits of vegetables. Moreover, the most used cooking method is boiling and stewing. The results also showed that there is a significant relationship between knowledge of benefits of leafy vegetables and cooking time. However, those who have the knowledge on benefits, spent more time cooking leafy vegetables. This indicates that informing clients on benefits of leafy vegetables alone is inadequate. Clients require more information to know which cooking methods are best in reserving nutrients in order to leap maximum benefits.
Keywords: Informal settlements, men, non-communicable diseases, women

1. Introduction

High vegetable consumption is associated to confer health benefits to an individual. This benefits include reducing risk of non-communicable diseases Cooke *et al* (2004). In particular cancer risk has been shown to significantly reduce by increased consumption of fruits and vegetables Kris *et al* (2002). Generally it is recommended that an individual is supposed to have at least five servings of fruit and vegetables per day Lock *et al* (2004).

Socio-economic status and education level of individuals have shown a relationship with vegetable consumption Bilson *et al* 1999, Drewnoswki *et al* (2015). Gender has shown a relationship in vegetable consumption where men tend to consume less Donkin *et al* (1998). "The Health Eating Index (HEI) a measure of diet quality", indicates that high consumption of vegetables is associated with better quality diets Seguin *et al* (2016).

Leafy vegetables are considered side dishes in most households in Africa. The traditional leafy vegetables (TLVs), have been shown to have high nutritional quality. This because they provide proteins, essential minerals and also provide vitamins Ochieng *et al* (2018).

Cooking is one of the factors that has been shown to affect nutritional content the leafy vegetables Gupta *et al* (2009). B-carotene (vitamin A precursor) is normally lost when cooking by 11% to 43% margin Rahman *et al* (1990). Antioxidant activity shows mixed results. For example in broccoli after cooking antioxidant activity remained the same Turkmen *et al* (2005). Baking and microwave cooking of vegetables has been shown to preserve antioxidants Turkem *et al* (2005). Cooking vegetables by boiling has been shown to have the greatest loss of antioxidant Turkem *et al* (2005).

The objective of this study, was to determine whether there was significance in knowledge on benefits, cooking method and cooking time of leafy vegetables.

2. Materials and methods

2.1 Study design

The study was cross-sectional and descriptive in design. The study used interviewer administered questionnaires. The respondents were giving information on benefits of consumption of leafy vegetables and the method cooking leafy vegetables.

2.2 Study site
The data was collected from Kangemi ward. Kangemi is located in a small valley at the western outskirts of Nairobi city. It is home to approximately 100,000 people KNBS 2010.

2.3 Sample size calculation
Sample size (N) was calculated based on Fischer formulae Fischer *et al* 1991. A sample size was calculated using the formula considering attrition at 10%. A total of 439 households were surveyed.

2.4 Inclusion and exclusion
The respondents had to be above 18 years old. This was confirmed by request them for their national identification cards. Any individual who was not a resident of Kangemi ward was not allowed to participate in the study.

2.5 Sampling procedure
Kangemi ward was chosen by purposive sampling. Through simple random selection five villages were selected. This villages are Kihumbuni, Gitoka, Gichagi, Sodom and Waruku. Further through simple random sampling, households were selected for interviewing.

2.6 Data collection
2.6.1 Individual questionnaire
This sought to determine the knowledge on the benefits of vegetables, the type of cooking method and time taken to cook the leafy vegetables. The question on knowledge was "do you know any benefit of eating leafy vegetables in your body?" The answer was "yes" or "no". 'Give one benefit of eating leafy vegetable to your body?" The respondent gave only one benefit per respondent.

2.7 Data quality control and analysis
The data from the questionnaire were pre-tested to ensure any information that is not clear to the respondents is rectified before going for the actual data collection. To ensure validity there was double entry of data.
The data from the questionnaires were analysed using, SPSS 16.0 soft ware. The SPSS V. 16.0 was used as tool for data management and statistical analysis. The statistical significance of results was considered at a 95% confidence level.

3. Results
3.1 Knowledge on benefits of vegetables
A total of 439 individuals participated in the study. Total men respondents were 52 of which 19% did not know the benefits of consuming green leafy vegetables. Women respondents who did not know the benefits of green leafy vegetables were 22% of the total 387 who participated. This is shown in figure 1.

The benefits that the respondents thought that were attributed to consumption of vegetables were as shown in the table 1. Respondents attributed the main benefits of leafy green vegetables to be boosting immunity (37%) and improve hemoglobin levels (35%). Based on gender, 55% of men knew that leafy vegetables boosts immunity. Women (40%) knew that leafy vegetables improves blood levels.

3.2 Method of cooking
The most common cooking method was a combination of both boiling and stewing (72%). Stewing (20%) was the second most preferred method of cooking. This is indicated in figure 2.

Knowledge of benefits and time of cooking
Using a Mann-whitey U test, those who had knowledge of benefits of leafy green vegetables had a significantly higher cooking time than those who did not have knowledge (U=33,p=0.008).

4. Discussion
Majority of respondents knew of at least one benefit that green leafy vegetables confer to them. Proportionally more men knew on benefits than women. This is an interesting result since previous study have showed men consume less vegetables compared to women Donken *et al* (1998). Studies on vegetables consumption have majored on women and children due to the importance in the nutritional lifecycle. However, studies on men in particular are limiting.

The study showed that majority of men know that consumption of leafy vegetables leads to improved immunity. Leafy vegetables are high in anti-oxidants Gupta *et al* (2009). Antioxidants have been associated with building the body's immunity Kamboh *et al* (2018). Many women knew that leafy vegetables improve blood levels. This is reflective of nutrition education programmes that encourages women of reproductive age to

consume leafy vegetables. Leafy vegetables have been shown to have high iron levels Sign *et al* (2001). Iron deficiency anemia is the leading micronutrient deficiency in the world Killip *et al* (2007). Consumption of green leafy vegetables has been shown to be one of the ways to combat iron deficiency in the developing countries. Iron is important in blood formation since it is involved in erythropoiesis. Iron deficiency result to other serious complications such as heart failure, and angina Killip *et al* (2007). Eventually iron deficiency anemia could lead to death. Other benefits that respondents attributed to consumption of leafy vegetables were: provision of energy, provision of proteins, smoothen skin and increase in bone density. Only few respondents attributed leafy vegetable consumption to control of blood sugar. This indicates that the population has not yet realized, the crucial part that vegetables play in prevention and management of diseases such as diabetes.

Majority of respondents used both boiling and stewing as a method to prepare leafy vegetables for consumption. This method of preparation of leafy vegetables results maximum loss of water soluble nutrients. This is aggravated by the fact that the boiling water is often discarded. Ascorbic acid is particularly lost during cooking and most heat sensitive vitamin Bernhardt *et al* (2006). Ascorbic acid is important for immune building in the body. Minerals are also decreased by cooking; this because the mineral leach into the water which is then drained Bernhardt *et al* (2006). The method of boiling then stewing leafy vegetables comes from the culture. Some vegetables, like traditional leafy vegetables (*Solanum nigrum*) are bitter. In order to remove the bitter taste, the vegetables are first boiled and the water discarded then stewed. Stewing was the second most popular method of cooking. Stewing is mostly used to cook the exotic vegetables such as kale, spinach and cabbage.

Steaming of vegetables has been shown to preserve most nutrients in the vegetables Bernhardt *et al* (2006). However, only few respondents use it as a method to cook leafy vegetables.

From the Mann Whitney test, respondents who had knowledge on benefits of vegetables, used more time to cook leafy vegetables. This was a significant result. This indicative that respondents lack the information on how best to preserve nutrients while cooking leafy vegetables. The longer the cooking time the more nutrients are degraded. For example “cooking leafy vegetables for 20min would lead to 75%-89% loss of ascorbic acid” Mathooho *et al* (1994). Informing the population on the benefits that leafy vegetables consumption is good. However, informing them on how to get the best from consumption of leafy vegetables is more important.

5. Conclusion

More women participated in the study. However, proportionally more men had knowledge on benefits of leafy vegetables than women. The most common method of cooking vegetables was boiling and stewing. There was a significant relationship between knowledge of benefits of vegetables and cooking time.

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Note
Research assistants are thanked for enabling a smooth flow of data collection. Respondents are thanked for responding to the questionnaires when required to.

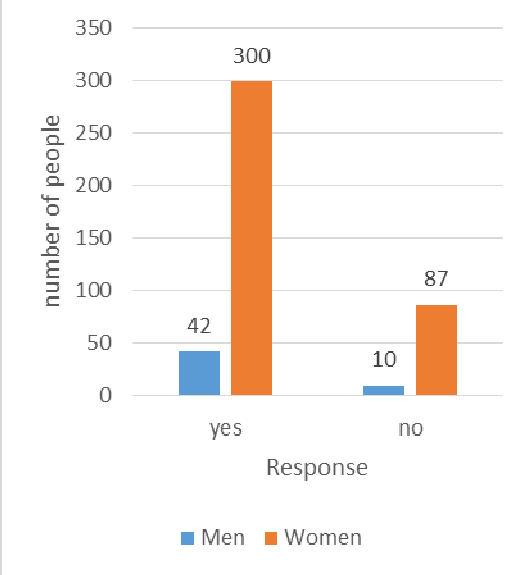

Figure 1: Proportion of respondents in relation to knowledge on benefits of vegetables

The gender description of respondents who participated in the study.

Table 1: Benefits of consuming vegetables

Benefits of consuming vegetables	Frequency (n)
Boosts immunity	121
Improve blood production	127
Solves stomach issues	18
Skin	10
Provides body with energy	44
Strengthen bones	8
Provide protein in diet	10
Provide a balanced diet	2
Enhance taste of food	2
Helps in controlling blood sugar	3

The above table indicates the number of respondents who attributed each benefit to consumption of vegetables.

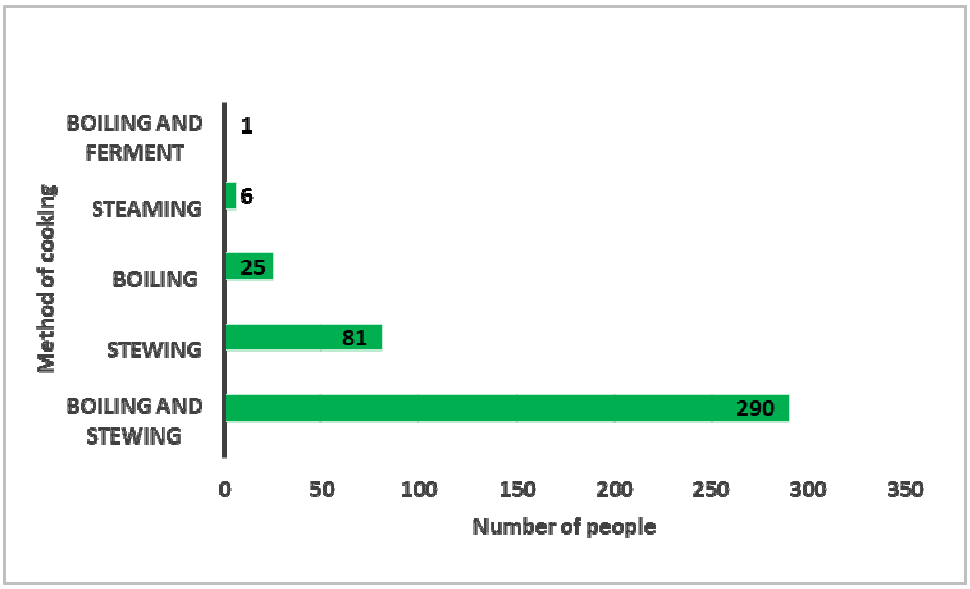

Figure 2: Methods of cooking

The various cooking methods which respondents used to cook vegetables.