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# A PRELIMINARY SURVEY ON CONSUMPTION OF MORINGA PRODUCTS FOR NUTRACEUTICAL BENEFITS IN ILORIN, KWARA STATE, NIGERIA

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## Abstract

*The public's need for health and dietary adequacy has been the driving force for their use of Nutraceutical supplements. Moringa oleifera is one of the herbal plants promoted based on its acclaimed of its Nutraceutical benefits. However awareness and adoption are critical issues in the utilization of any product/service. This preliminary survey was conducted to examine the consumption of moringa products for nutraceutical benefits in Ilorin, Kwara state, Nigeria. One hundred adult respondents were interviewed using semi-structured questionnaire. Descriptive statistics, Binary Logistic Regression and non-parametric correlation analyses were employed to achieve the study's objectives. The results indicated that a fairly high proportion of the respondents (48%) had used Moringa products for its claimed Nutraceutical benefits. Lack of awareness was a major barrier to the use of Moringa product: 87% of the non-users indicated lack of awareness as a reason for non-use. Educating non-users on its claimed Nutraceutical benefits led to 85% prospective adoption. However, given knowledge, the major determinant of reticence to its adoption was safety concerns, which is statistically significant ($p<0.01$). Hence, it is recommended that an awareness of the claimed Nutraceutical benefits of Moringa products should be increased since it could increase adoption with a consequent increase in market share. However, it is paramount that pre-clinical and clinical trials on Moringa products for claimed Nutraceutical benefits should be conducted to assure its safety and efficacy in the immediate and long term.*

Keywords: Moringa products, Nutraceutical benefits, use, adoption, clinical trials.

## INTRODUCTION

*Moringa oleifera* is one of the species of Moringa tree which is often referred to as “the miracle tree” (Wallis, 2003). The tree is native to India (Coote *et al*., 1997), but it is currently found in many parts of the world. In Nigeria, it is found in the Northern, Southern, Western and Eastern parts of the country. The plant is known as “Zogale” in Hausa, “Gawara”, in Fulani, “Okwe Oyibo” in Igbo, and “Ewe Igbale” in Yoruba (Kadashi, 2008).

*Moringa oleifera* has been adopted as a national plant and it is being cultivated as a crop due to many claimed benefits offered by the plant. The plant is claimed to have many nutraceutical benefits: antibacterial, anticancer, antiasthma, antihypertensive, immunity booster, anti-inflammatory, improves fertility and reproductive health and nutritional supplement (Animashaun *et al*., 2013; Adejumo *et al.*, 2012; Anwar *et al.,* 2007; Fahey, 2005; Fuglie, 2000). Many scientific studies of the chemical profile of parts of the Moringa plant (Makkar and Becker, 1996, 1997, Goyal *et al.*, 2007) and their examination in vitro and in animal models of human disease confirm that it is a rich source of micro- and macronutrients as well as several phytochemical compounds including antioxidant, anti-inflammatory, and antineoplastic compounds ( Goyal *et al.*, 2007) through which it may mediate its claimed effects in humans. Many studies in animals also confirm its low toxicity (Furo and Amballi, 2011) lending credence to claims that it is safety based on its use in human food and medicines for over two millennia.

The Nigerian Federal Government Raw Materials Research and Development Council (RMRDC), Nigeria, has been actively encouraging the uptake of *Moringa oleifera* farming and its consumption. Moreover, the public's concerns for health and dietary adequacy have been the driving force for the rapid growth of use of nutraceutical supplements. Hence, they turn to use of natural remedies or herbal products rather than orthodox medicines. *Moringa oleifera* is one of the natural products that have been used due to claimed Nutraceutical benefits.

However, one of the strategies for the adoption for use of any product/service is behaviour modification. According to Hochbaum (1995), human behavior is in a paradigm with awareness at the beginning which affects knowledge with consequent effect on understanding. The understanding affects attitude which then affects habits which is at the end of the paradigm. Habit is the output of behaviour. While bahaviour modification has to be voluntary, it can be motivated through information, education and communication. A user acceptance of any product/service at the individual level is associated with its perceived usefulness (Morton and Wiedenbeck, 2009; Archer and Cocosila, 2011). Hence, implementing an intervention such as the exposure of the populace to the usefulness of the product/service could affect positively the willingness to adopt the use of it.

A survey of the awareness, usage and perception of food supplements among adult residents in Metro Manila in 2008 when compared to an earlier study in 1998 revealed an increase in the awareness and usage of the food supplement from 37.5% to 85.6% and 22.9% to 46.8% respectively (Cruz *et* al., 2011). Such increasing awareness is not surprising since many of the orthodox medicines used in the prevention and treatment of diseases today originate from plants (Federal Ministry of Health, Nigeria, 2005). For example digoxin a glycoside used in congestive heart failure is from leaves of *Digitalis lanata*. Quinine an antimalarial and quinidine an antiarrythmia are alkaloids found in cinchona bark. Despite many of these supplements appearing to be safe, some of the commonly used herbal supplements have shown severe side effects and interactions with orthodox medicines or other herbal supplements. In some cases, several deaths have occurred such as that caused by ephedra occasioning its ban by United States Food and Drug Administration in 2003. Liver toxicity from pyrrolidine alkaloids found in

some plants, nephrotoxicty induced by aristolochia (Chinese herb) and cardiac events associated with ephedra alkaloids are a few examples (Society of Gastroenterology Nurses and Associates Inc. 2012). Examples of herbal supplements interacting with orthodox medicines include St. John's wort (an antidepressant) reducing the plasma concentrations of digoxin (a digitalis used for congestive heart failure) and indinavir (antiretroviral medicine) and garlic, ginger and ginkgo biloba increasing the antiplatelet activities of ibuprofen, aspirin and warfarin (Lacy *et al*., 2006). Hence, the requirement of the Nigerian National Drug Policy that there should be an investigation into herbal medicines for efficacy, safety and quality with a view to integrating them into the healthcare system (Federal Ministry of Health, Nigeria, 2005). According to the Nigerian National Drug Policy, this is one of the areas listed for research that should be supported with provision of grants by the Government, local and International development parties. This study was therefore aimed at investigating the consumption of moringa products for nutraceutical benefits in Ilorin, Kwara state, Nigeria.

The objectives of the study were to:

I assess the usage of Moringa product for claimed nutraceutical benefits;

II examine the respondents' willingness to adopt Moringa product for claimed nutraceutical benefits;

III identify the perceived constraints to the use of Moringa for claimed nutraceutical benefits and

IV explore the respondents' preferred and alternative choices of the form of presentation of Moringa products for nutraceutical benefits.

## MATERIALS AND METHODS

The study is a descriptive preliminary survey of the consumption of moringa products for nutraceutical benefits in Ilorin, Kwara State, Nigeria. One hundred adult respondents were purposively sampled and interviewed using semi-structured questionnaires. The questionnaires were designed to collect information on respondents' demographic characteristics, use of Moringa products for claimed nutraceutical benefits, willingness to adopt the use of Moringa product for claimed nutraceutical benefits and the preference of choice of the form of presentation of Moringa products.

The data obtained was stored on a computer and analyzed using Statistical Package for Social Sciences (SPSS) version 17 computer software. Descriptive statistics, binary logistic regression and non-parametric correlation analyses were employed to achieve the study's objectives.

## RESULTS

Table 1: Socio-demographic characteristics of respondents.

| SOCIO-DEMOGRAPHIC CHARACTERISTICS | FREQUENCY | PERCENTAGE |
|---|---|---|
| A. GENDER | | |
| Male | 69 | 69 |
| Female | 31 | 31 |
| B. EDUCATION | | |
| No formal education | 1 | 1 |
| Qur'anic school | 1 | 1 |
| Primary school | 8 | 8 |
| Secondary school | 38 | 38 |
| Tertiary school | 52 | 52 |
| Total | 100 | 100 |
| C. AGE IN YEARS | | |
| 18 -27 | 20 | 20 |
| 28 37 | 42 | 42 |
| 38 47 | 19 | 19 |
| 48 - 57 | 14 | 14 |
| 58 - 67 | 4 | 4 |
| > 68 | 1 | 1 |
| Total | 100 | 100 |
| D. OCCUPATION | | |
| Artisan | 7 | 7 |
| Farmer | 2 | 2 |
| Trader | 8 | 8 |
| Private service | 38 | 38 |
| Public service | 45 | 45 |
| Total | 100 | 100 |

Figure 1: Distribution of respondents according to the use of moringa products

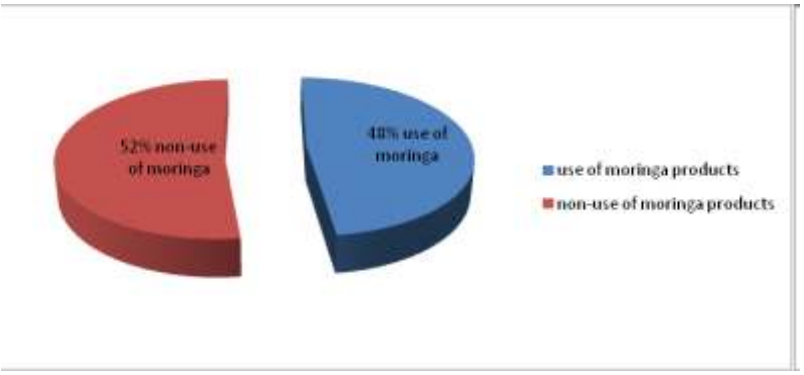


Figure 2: Reasons for the non-usage of moringa products.

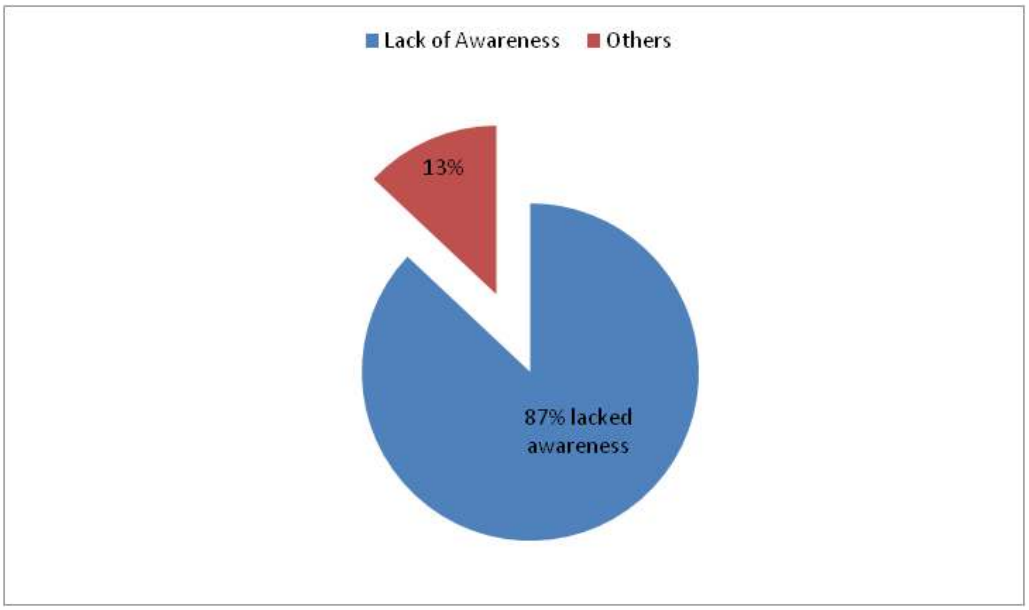

Figure 3: Distribution of the non-users according to willingness to use after being exposed to the claimed Nutraceutical benefits of Moringa products.

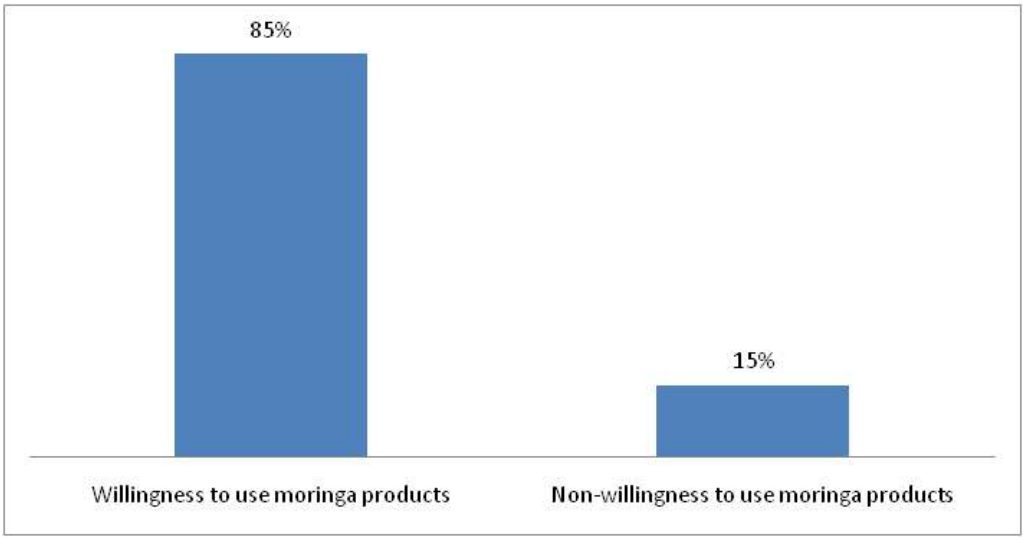


Table 2: Determinants of reticence to the adoption of Moringa product for claimed Nutraceutical benefits.

| Variables | Coefficient | Standard error | p | 95% confidence interval | |
|---|---|---|---|---|---|
| Gender (male) | 0.8366445 | 0.9334602 | 0.37 | -0.9929 | 2.6661 |
| Education attained | 0.54249 | 0.54703 | 0.32 | -0.52967 | 1.6146 |
| Age | 0.01717 | 0.04611 | 0.71 | 0.0732 | 0.1075 |
| Occupational activities | -1.4761 | 1.017307 | 0.14 | -3.4700 | 0.5177 |
| Safety concerns | -37.63525 | 1.417359 | 0.00*** | -40.4132 | -34.857 |
| Availability | 18.0564 | - | - | - | - |
| Constant | 6.158346 | 5.5889 | 0.27 | -4.7958 | 17.1125 |
| LogLikelihood= -17.86<br>LR $chi^2$= 24.19<br>P>$chi^2$=0.01<br>Pseudo $R^2$ =0.4037 | | | | | |

*** *Indicates p-value significance at 1 %*

Table 3: Preference for the form of presentation of moringa product.

| PREFERRED FORM | YES | | NO | |
|---|---|---|---|---|
| | FREQUENCY | PERCENTAGE | FREQUENCY | PERCENTAGE |
| Teabag | 60 | 60 | 40 | 40 |
| Juice | 34 | 34 | 66 | 66 |
| Confectionary | 24 | 24 | 76 | 76 |
| Dry powder | 39 | 39 | 61 | 61 |
| Capsule | 32 | 32 | 68 | 68 |
| Snack | 17 | 17 | 83 | 83 |
| Tablet | 43 | 43 | 57 | 57 |
| Liquid extract | 31 | 31 | 69 | 69 |

Table 4: Respondents' preferred alternative choices of forms of presentation of moringa products.

| | Teabag | Juice form | Confectionary | Dry powder | Capsule | Snacks | Tablets | Liquid extracts |
|---|---|---|---|---|---|---|---|---|
| Prefer teabag | 1 | | | | | | | |
| Juice form | 0.371** | 1 | | | | | | |
| Confectionary | 0.411** | 0.437** | 1 | | | | | |
| Dry powder | 0.318** | 0.422** | 0.415** | 1 | | | | |
| Capsule | 0.473** | 0.458 | 0.669** | 0.550** | 1 | | | |
| Snacks | 0.206* | 0.293 | 0.369** | 0.239* | 0.546** | 1 | | |
| Tablets | 0.297** | 0.315 | 0.411** | 0.465** | 0.617** | 0.252* | 1 | |
| Liquid extracts | 0.371** | 0.477 | 0.535** | 0.351** | 0.560** | 0.272 | 0.422** | 1 |

*Note: Single asterisks indicate significance of Correlation at p<0.05.*
*Double asterisks indicate significance of Correlation at p<0.01*

## DISCUSSION

The socio-demographic characteristics of the respondents showed that 69% were male while 52% had tertiary education (Table 1). The age range was 20 years to 78 years with a modal age class of 28-37 years (Table 1). Forty five percent of the respondents were in the public service while 2% were farmers. There is relative bias with regards to the gender of the respondents.

The Users of moringa products constitute about half of the study population (48%) as shown in

Figure 1. This is slightly higher than the findings of the study conducted by Cruz *et al.*, (2011) where 46.8% were users of food supplements. This contrast may be underpinned by the increasing concerns about health and dietary adequacy and increasing exposure to the claimed health benefits of Moringa in Nigeria. Indeed, the data suggests that there is still room for growth in the use of Moringa in the study population given that lack of awareness accounted for 87% of the reasons for the non-usage (Figure 2). This finding is different from the finding of an earlier study in which the major barrier to the use of food supplement was "very expensive" (high cost) which accounted for 58.8% of the respondents (Cruz *et al.,* 2011). The shift in reason for the non-usage of Moringa products could be due to the increase in concerns for health and dietary adequacy such that respondents were more willing to pay for any product/service that they perceive would meet these concerns.

Exposing the non-users in the present study population to the claimed Nutraceutical benefits of Moringa products resulted in 85% prospective adoption. This is in line with Hochbaum's bahaviour paradigm in which awareness affects knowledge with consequent effect on attitude (Hochbaum, 1995), which is manifested in the individual's willingness to use moringa products. This prospective adoption could be due to the perception of usefulness of Moringa product in line with the studies conducted by Morton and Wiedenbeck, (2009) and Archer and Cocosila (2011) which showed that awareness about the perceived usefulness of a product/service affects its adoption. Thus creating awareness about the Nutraceutical benefits of Moringa could lead to an increase in the consumption with a consequent increase in the market share. The economic implications of this are that increased market share would lead to job and wealth evaluation for the individuals and the nation. This will contribute to the achievement of Millennium Development Goal (MDG) number 1: *Eradication of extreme poverty and hunger.*

Despite the exposure of the non-users of Moringa products to the Nutraceutical benefits, about one-eighth of the respondents indicated their non-willingness to use it. The major determinant of reticence was safety concerns which is statistically significant ($p<0.01$) as shown in Table 2. This is expected in view of the adverse drug reactions and drug interactions observed in the use of herbal supplements such as ginger, garlic and ginkobiloba with ibuprofen, warfarin and aspirin; and St John's wort with antiretroviral protease inhibitors (Lacy, 2006). There were also cases of toxicity of ephedra alkaloids. Hence, it is necessary to conduct pre-clinical and clinical tests on the Moringa products in order to assure its safety and efficacy in the short and long term in line with the requirements of Nigerian National Drug Policy (2006). There is also the need for standardization of Moringa products and formulations with a view to integrating such products into the healthcare system.

With reference to the preferred choice of the form of the presentation of Moringa products, three-fifth of the respondents preferred the tea bag Table 3. This is expected since individuals have been observed to consume herbal tea as regular users once or 2-3 times daily or as sporadic users once or 2-3 times daily (Cruz *et al*., 2011). This could also be due to social signaling value of tea consumption.

The respondents' preferred alternative choices of the form of presentation showed that respondents who preferred tablet would more likely prefer capsule ($r = 0.617$; $p < 0.01$) as shown in Table 4. This may be due to ease of handling and/or the perception of similarity of forms: both are medicine dosage forms. However, respondents who preferred confectionary were more likely to prefer capsule forms of presentation ($r = 0.669$; $p < 0.01$), while respondents who preferred snacks were more likely to prefer capsule forms; of presentation ($r = 0.546$; $p < 0.01$). The latter two alternative choices defy easy explanation and there is the need to conduct further studies with regards to the reasons for the alternative choices of the form of presentation.

The results of this study must be taken with caution, given the limitations of power afforded by the sample size of the respondents.

## CONCLUSION AND RECOMMENDATIONS

Moringa products are used by about half of the study population and lack of awareness about the claimed nutraceutical benefits of Moringa products was a major reason for the non-usage (in the non-user population). Educating the non-users about the claimed nutraceutical benefits resulted in willingness to use products in a majority of cases. However reticence was found to persist in some non-users even after the education. The major determinant of reticence is safety concerns. Hence, it is necessary to conduct clinical tests to evaluate safety and efficacy in the immediate and long term. There should be standardization of the Moringa products and formulations with a view to integrating them into the healthcare system. Further studies are required with regards to the reasons for the alternative choices of the form of presentation identified in this study. This preliminary survey on the consumption of moringa products for nutraceutical benefits in Ilorin, Kwara State, Nigeria is limited with regards to sample size. Hence, further studies which are larger in scale are required so that findings can be extended to an adequately powered wider sample of the population and independently evaluated. Perception, attitudes, use and Nutraceutical efficacy of Moringa among children and the elderly were purposely omitted from the current study and should be examined independently.

This study recommended that:

I government and other Stakeholders should create more awareness about the claimed nutraceutical benefits of Moringa products;

II government regulatory agencies should ensure that pre-clinical and clinical tests are conducted on Moringa products to define their safety and efficacy in the immediate and long term;

III further studies should be conducted by researchers on the preferred and alternative choices of the form of presentation;

IV government regulatory agencies should ensure standardization of Moringa products and formulations; and

V further studies which are larger in scale, and of adequate power, should be conducted by researchers so that findings can be evaluated in a wider population.

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