

Research Article

Open Access, Volume 3

Nutritional adequacy of essential vitamins and minerals consumed by edentulous elderly at Little Sisters of the Poor in Enugu, Enugu State, Nigeria

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Abstract

Edentulism is having few or no teeth in the oral cavity, which is an irreversible condition. It has been shown to be more prevalent in the aged especially among the female. Edentulism which is an age related problem is associated with inability to eat, which render the aged deficient of essential vitamins and minerals. The aim of study is to determine the Nutritional Adequacy of Essential Vitamins and Minerals consumed by Edentulous Elderly at Little Sisters of the Poor, Home for the Elderly, Enugu. The home houses 54 inmates. All inclusive sampling technique was adopted for the study. Oral examination was conducted using mouth mirror to ascertain the number of elderly with tooth loss. The food menu used for feeding the inmates was collected from the home and it served as a guide for collection of food samples for chemical analysis to determine the adequacy of essential vitamins and minerals (vitamin D, vitamin B12, calcium, potassium and magnesium). Minerals and Vitamin D and Vitamin B12 were analyzed using Wet Ashing method. The result showed that out of 54 elderly inmates, 44 inmates are edentulous of which females are mostly affected. The result from chemical analysis of food showed 32.5 mcg intake of vitamin D, 12.2 mcg intake of vitamin B12, 0.017 mg intake of calcium, 0.346 mg intake magnesium and 0.034 mg intake of potassium and this as compared with recommended daily intake that there is adequate intake of vitamin D, excessive intake of vitamin B12 but inadequate intake of calcium, magnesium and potassium. This in turn shows that there is inadequate consumption of essential vitamins and minerals by edentulous elderly at Little Sisters of the Poor, Home for the Elderly, Enugu. This shows that there is need to include food rich in essential vitamins and minerals and also give supplement that are in form of medicine to the inmates to meet the adequacy.

Received: Mar 07, 2022

Accepted: May 27, 2022

Published: Jun 03, 2022

Archived: www.jcimcr.org

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DOI: www.doi.org/10.52768/2766-7820/1869

Citation: Adimora EE, Uzoeto HO, Nancy OC, Moneth EC, Peter IU. Nutritional adequacy of essential vitamins and minerals consumed by edentulous elderly at Little Sisters of the Poor in Enugu, Enugu State, Nigeria. *J Clin Images Med Case Rep.* 2022; 3(6): 1869.

Introduction

Human growth, development and health throughout life course, from pre conception until death are dependent upon adequate nutrition [1]. Vitamins and minerals are essential nutrients because they perform hundreds of roles in the body. Eating a healthy diet remains the best way to get sufficient amounts of the vitamins and mineral needed especially among the aged [2]. The key vitamins and minerals for people over age 50 include the following nutrients- vitamin D, vitamin B12, calcium, magnesium and potassium [3].

In a study carried out by Mann et al [4] there was inadequate intake of vitamin D, calcium, magnesium and potassium among older adults who had difficulty in chewing and swallowing due to edentulism.

Edentulous refers to the quality of having no teeth or few teeth [5]. In humans, tooth loss is usually due to accident, aging process dental decay or poor diet. Tooth loss can pose patients with difficulty chewing. Edentulism is a debilitating irreversible condition and is described as the final marker of disease burden for oral health [6]. Although the prevalence of complete tooth loss has declined over last decade, edentulism remains the major disease worldwide especially among older adults [6]. Edentulous geriatrics are elderly people having no teeth or few teeth.

A cross sectional study on impact of dental status on perceived ability to eat certain food in older adults showed that there is inadequate consumption of vitamin D, vitamin B12, magnesium, calcium and potassium among edentate [7].

Age related dental problems such as edentulism which is compounded with inability to eat, render the aged to deficiency of essential vitamins and minerals. Thus, a clear understanding of proper evaluation of the essential vitamins and minerals composition of the diets consumed by the elderly is essential for the management of edentulous older adults in Nigeria.

Materials and methods

Description of study area

Little Sisters of the Poor, Home for the Elderly is located at latitude 6°30'09.1"N and longitude 7°29'41.5"E Akwunanaw in Enugu, Nigeria., It is located in Enugu metropolis. It is an international congregation of the Roman Catholic having for charisma the care of the aged poor. They are being taken care of by congregation of Little Sisters of the Poor. It was founded by St Jeanne Jugan in the year 1872 and serving the needy in 31 countries including Nigeria. It was brought to Enugu in 1975 presently they are looking after 50 aged with no distinction of religion or ethnic group. The objective of this group is to offer the neediest elderly of every race and religion comfort and medical care that they need in their later years as well as complete assurance that will accompany them until the last moment of their year. There are up to 20 workers taking care of the elderly in the home.

Research design and population of the study

The research design to be adopted is quasi-experimental

study of the aged in little sisters of the poor, home for the elderly, Enugu. This would involve determining their food intake of the elderly by collecting the food menu, the nutrient adequacy of vitamin D, vitamin B12, calcium, magnesium and potassium would be determined by using nutrient analysis. And finally, the amount of vitamin D, vitamin B12, calcium, magnesium and potassium consumed by the inmates were compared with the standard reference in order to ascertain the adequacy of the nutrients consumed by the inmates. The total number of inmates in little sisters' of the Poor old people's home is 54. They are made up of 14 males and 40 females. Their ages range from 60-100 years old (Source: Health Record).

Sampling technique and instrument for data collection

All-inclusive sampling technique was adopted in selecting the sample size for the study. This covered the entire inmates in the Little Sisters of the poor, home for the elderly, Enugu. Mouth mirror and Institutional menu for the elderly was used.

Method of data collection

An introductory letter will be collected by the researcher from the head of the dental therapy department to be given to the mother superior of the home in order to obtain permission to carry out research. Data for edentulousness was collected by using mouth mirror for oral examination. The food menu was collected and the ration of food eaten by the inmates was also collected from the kitchen head and from which 100 g of each food sample were later subjected to nutrient content analysis. The menu contained list of food that the inmates consume daily, weekly and occasionally. Respective nutrient analysis methods were used to determine the quantity of vitamin D, vitamin B12, calcium, magnesium and potassium that are present in the food consumed by the inmates. This is then compared with the standard reference for nutritional adequacy for normal aged people.

Preparation of food samples

Samples collected in an airtight container was preserved by keeping in a refrigerator, it was then taken in for analysis when all were collected.

Determination of the essential vitamins and minerals contents

Vitamin D

Vitamin D was determined according to the method of Kumar and Rajput [8]. Food sample 100 g was weighed into a 100 ml volumetric flask. The samples were diluted to the mark with chloroform and methanol mixed in ratio 1:9. Standard solutions of vitamin D were also prepared in the sequence 100 mg/100 ml, 300 mg/100 ml and 500 mg/100 ml which were used to prepare standard graph. Samples were read against blank at 264nm.

Vitamin B12

100 g of sample was weighed into 500 ml volumetric flask and 200 ml of water was added to dissolve them. Then, 1.25 g of dibasic sodium phosphate, 1.1 m of anhydrous citric acid and 1.0 gm of sodium metabisulphate was added. The volume was

made up to mark with water. The solution was autoclaved. It was then filtered and absorbance read at 530 nm against the blank.

Calculation

Concentration of vitamin B12 in sample (mg/g) =

(Absorbance of sample Concentration of sample/Absorbance of standard)

Minerals

Minerals were determined by using Wet ash method as described by Haile et al. [9]

Procedures: A mass of 100 g test sample was accurately weighed into porcelain crucible; 2 ml of concentrated sulphuric acid was added to the weighed sample and subsequently heated on a heating hot plate until the whole content dried up. Nitric acid (1.50 ml) was added to dried sample drop wise to prevent the sample from splashing and foaming. The dried sample was then subjected to a two-stage muffle furnace heating programme until completely ashed. The resulting ash was then dissolved in 1.50 ml concentrated nitric acid. It was then diluted with deionized distilled water and filtered through a wattman filter paper into a 100 ml volumetric flask and subsequently made up to make.

Analysis: Mineral were analyzed using Atomic Adsorption Spectrometer.

The wavelength range of calcium, magnesium and potassium using Atomic Adsorption Spectrometer were 422.7 nm for calcium, 285.2 nm for magnesium and 766.5 nm for potassium respectively.

Table 1 above shows the total number of inmates in Little Sisters of the Poor, Home for the elderly, Enugu. Which is made up of 15 males and 35 females.

Table 2 above shows that out of the 54 inmates, 44 are edentulous.

Table 3 above shows that out of 44 edentulous inmates, 11(25%) are male while 33(75%) are female. This shows that females are mostly affected than males.

Table 4 above shows that 44 participants that have tooth loss, 10(22.7%) was observed to have loss 20-24 teeth and this observed to be highest number of teeth loss.

Table 1: Distribution of the inmates in Little Sisters of the Poor, Home for the Elderly.

Sex	Frequency	(%)
Male	14	25.9
Female	40	74.1
Total	54	100

Table 2: Distribution of the inmates with tooth loss that participated in the study.

Sex	Edentulous	Dentulous
Male	11	3
Female	33	7
Total	44	10

Table 3: Distribution of gender that are mostly affected.

Sex	Edentulous	Dentulous
Male	11	25
Female	33	75
Total	44	100

Table 4: Distribution of the inmates according to the number of tooth loss.

No. of tooth loss	(%)	Male (%)	Female (%)
1-4	7(15.9)	2(4.5)	5(11.4)
5-9	4(9.1)	1(2.3)	3(6.8)
10-14	9(20.5)	0(0.00)	9(20.5)
15-19	4(9.1)	1(2.3)	3(6.8)
20-24	10(22.7)	2(4.5)	8(18.2)
25-29	6(13.6)	2(4.5)	4(9.1)
30 & above	4(9.1)	3(6.8)	1(2.3)
Total	44(100)	11(25)	33(75)

Table 5a: Distribution of food menu consumed weekly by inmates.

Days	Breakfast	Lunch	Dinner
Monday	Tea + bread	Okro soup, canda, semo, wheat or indomie	Agidi, jollof rice or beans & custard
Tuesday	Indomie	Indomie, swallow, jollof rice with boiled egg.	Sweet potato, porridge or beans & custard
Wednesday	Tea + bread	Nsala soup & yam, fio fio with vegetables, agidi	Beans & custard, akpalata soup, canda, semo or wheat
Thursday	Beans akamu & custard	Nsala soup	Indomie and vegetable
Friday	Tea + bread	Igba oka	Rice and stew boiled eggs and vegetable.
Saturday	Bread and tea	Yam and stew and vegetable	Moi-moi or beans & sweet potato or plantain
Sunday	Bread and boiled eggs	Rice with stew sauce and meat (beef)	Unripe plantain + vegetables

Table 5b: Distribution of the actual food consumed by the inmates within the seven days of the study.

Days	Breakfast	Lunch	Dinner
Day 1	Tea and bread	Indomie	Beans
Day 2	Tea and bread	Semo and akaparata soup	Yam and stew
Day 3	Tea and bread	Rice and beans	Moi- moi
Day 4	Tea and bread	Igba oka	Semo and akparata soup
Day 5	Tea and bread	Beans and rice	Semo and bitter leaf soup
Day 6	Tea and bread	Abacha	Moi moi
Day 7	Tea and bread	Rice and stew with meat	Unripe plantain

Table 6: Distribution of quantity of essential vitamins and minerals content of the food consumed by the inmates for seven days as determined by nutrient analysis.

Meal	Food consumed/100g	Vitamins				Minerals		
		D		B12		Ca (Mg)	Mg (mg)	K (mg)
		Mg	Mcg	Mg	Mcg			
Breakfast	Tea and Bread	0.034	34	0.005	5	0.019	0.002	0.006
Lunch	Indomie	0.004	4	0.001	1	0	0.005	0
	Semo and Akpalata Soup	0.047	47	0.005	5	0.002	0.062	0.005
	Rice and Beans	0.036	36	0.010	10	0.020	0.008	0.011
	Igba Oka	0.045	45	0.019	19	0.009	0.039	0.003
	Abacha	0.007	7	0.002	2	0.051	0.035	0.061
	Rice and Stew with Meat	0.027	27	0.006	6	0.020	0.008	0.009
Dinner	Beans	0.039	39	0.011	11	0.010	0.016	0.006
	Yam and Stew	0.019	19	0.012	12	0.022	0.025	0.018
	Moi Moi	0.031	31	0.011	11	0.023	0.071	0.062
	Semo and Bitter leaf Soup	0.052	52	0.029	29	0.011	0.016	0.019
	Unripe Plantain	0.088	88	0.036	36	0.018	0.059	0.054

Table 5a above shows the menu of food consumed by inmates in seven days of the week for their breakfast, lunch and dinner.

Tables 5a and 5b above showed the distribution of food consumed by the inmates according to their food menu and actual food consumed during the days of collection of sample. The table above shows that food like tea and bread were consumed within seven days of collection meaning there was constant repetition of meal (monotony) and this implies that principle of nutrition was not observed.

Table 6 above shows the quantity of vitamins and mineral content in the food consumed by the inmates, it also shows the meal that has the highest content of vitamin. It shows moi moi having the highest magnesium and potassium content (0.071mg and 0.062mg) and abacha having the highest calcium content (0.051mg). It shows that unripe plantain has the highest content of vitamin D and vitamin B12 (88mcg and 36mcg) respectively.

Table 8 above shows that there is inadequate intake of calcium, potassium and magnesium by the inmates. It also shows that there is adequate intake of vitamin D by the inmates and excessive intake of vitamin B12 standard as compared with standard reference.

Table 7: Standard reference for recommended daily allowance.

Nutrients	Recommended daily intake
Vitamin D(mcg)	100
Vitamin B12(mcg)	2.4
Calcium (mg)	1200
Potassium (mg)	4700
Magnesium(mg)	420

Source: National Institute of Aging, United States of America.

Table 8: Adequacy of essential vitamins and minerals consumed by inmate as compared with the standard reference.

Nutrients	Recommended daily intake	Intake quantity by inmates
Vitamin D(mcg)	15-100	32.5
Vitamin B12(mcg)	2.4	12.2
Calcium (mg)	1200	0.017
Magnesium (mg)	420	0.346
Potassium (mg)	4700	0.034

Discussion

This study was carried out in Little Sisters of the Poor, Home for the Elderly Enugu, having 54 participants. Out of the 54 inmates, 44 inmates were edentulous. Among the edentulous inmates 33(75%) were females while 11(25%) were male, making female gender mostly affected. This in line with the findings of Kaira et. al. [10], which stated that females have higher rates of edentulism than do males.

The food menu and actual food consumed by the inmates revealed that was no variety for the breakfast. Tea and bread were consumed for breakfast during the seven days of study which implies that the principle of nutrition (variety was not observed. This is in line with Garriguet et al. [11], which state that there was no variety in food eaten by the elderly in Canada.

The findings revealed that moi-moi has the highest content of magnesium (0.071 mg) and potassium (0.062 mg) though the recommended daily intake was not attained, while abacha has the highest calcium (0.051 mg) content which did not also meet the recommended daily intake. Unripe plantain had the highest content of vitamin D (88 mcg) which meets with the recommended daily intake of Vitamin D. Unripe plantain was also seen to have the highest content of vitamin B12 (36 mcg) which is higher than the recommended daily intake. This is in line with findings of Allen. [12] which state that older adults tend to consume vitamin B12 excessively.

The findings also revealed that all the food consumed by the inmates met the recommended daily intake of vitamin D except indomie and abacha.

In the findings there was generally inadequate consumption of calcium, magnesium and potassium by the inmates, this is in line Kuon et al. [13] which states that there was inadequate consumption of calcium, magnesium and potassium by edentulous elderly. There was adequate intake of vitamin D and excessive intake of vitamin B12.

Conclusion

There is inadequate intake of essential vitamins and minerals by edentulous older adults, this because some the essential vitamins and minerals contained in the food does not meet the recommended daily intake. Being adequate means that all must reach the recommended requirements. Based on the findings my findings that magnesium, calcium and potassium were inadequate, vitamin D adequate and vitamin B12 excessive in edentulous older adults, the researcher suggest that:

1. The management of the home should include food rich in essential mineral and vitamins in the food for the elderly.
2. The management should include supplements that are in form of medicine to the inmates to meet the adequacy.
3. The government and philanthropists should aid the home by establishing several nutrition intervention programs aimed at improve adequate intake of essential vitamins and minerals.

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