Urban Elderly's Nutritional Status as Influenced by Topical Issues such as Physical Activity and Energy Expenditure

***John E. P[1] and Olayiwola I. O[1]**

[1]*Department of Nutrition and Dietetics, College of Food Science and Human Ecology, Federal University of Agriculture, Abeokuta, Ogun State. Nigeria.*
P.M.B. 2240, Abeokuta, Ogun State,Nigeria.

***Corresponding Author:** Ebenezerjohn15@yahoo.com*

ABSTRACT
***Background**: The elderly, because of their low metabolic rate and physical activity level, they required a balance in nutrient intake and energy expenditure, but due to changing social structures in Nigeria, lack of the significance of exercise, their energy expenditure might be lesser than stored energy.*
***Objective:** This study aimed to assess the influence of physical activity and energy expenditure of urban elderly's on their nutritional status.*
***Methods:** The study was conducted on 220 elderly's in the Urban Areas of Abeokuta South Local Government, Ogun State, Nigeria. A structured questionnaire was used to collect the activities engaged in and time allocated, which was subjected to NutriSurvey2007software for analysis. Anthropometric measurements were taken and BMI was calculated. Both descriptive and inferential statistics were used to describe and determine the relationship between variables using SPSS. P-value ≤0.05 was considered statistically significant.*
***Results:** A Higher percentage (36.4%) of the respondents engaged in general activities that consumed little energy. This greatly affects their nutritional status, which was reflected in BMI classification where majority were Overweight (55.91%), 21.36% were Obese I, and 0.91% were Obese II. Comparing the association between their energy expenditure and nutritional status, it was statistically significance at p<0.05.*
***Conclusion:** Less energy expended by the elderly's affects their BMI. Therefore, there is a need for regular exercise for elderly's in the study area at-least 30minutes road walk per day, this can make them less susceptible to illnesses related to people living a sedentary lifestyle.*

Keywords: Elderly, Nutritional Status, Physical Activity, Energy Expenditure.

INTRODUCTION

It is now becoming clear that physical activities determine the energy expenditure of an individual, affecting the energy pull either positively or negatively (1, 2, 3). The United Nations held the First World Assembly on Ageing in Vienna in 1982. Afterward, recognizing and affirming the facts that the global population is ageing and that it is ageing at an unprecedented rate, the United Nations designated 1999 as "The Year of the Older Person" (4). Thus, all things being equal, we all will reach this category of people.

The fact, that populations in developing countries are ageing at a more faster rate than those in developed countries is alarming and more than half of the world's elderly population live in developing countries. This growth rate in developing countries has been described as unprecedented, pervasive, profound, and enduring (5).

The elderly population in Nigeria will be double by 2050 (6). Many of these elderly living in urban areas are involved in several activities from light to moderate such as reading newspapers, serving as nanny to their grandchildren, watching television series, indoor games while some are

educational. Recommended physical activity is necessary for the elderly to become fit, productive, and capable of fulfilling their responsibilities in life. More so, regular exercise and adequate nutrition make the elderly resistant to diseases; ensure strength leading to longevity and healthy aging without financial burdens on sickness. It is worthy to note that the prevalence of obesity is rapidly increasing in both developed and developing countries (7). More of the body fat in elderly person is intramuscular and intra-abdominal (8). Concurrently, lean (muscle) mass declines steadily with age, resulting in an initial increase of body fat percentage with age, then a decrease and finally a levelling-off in old age (8).The body fat acts as a reservoir of energy, it protects the body in times of illness, protects vital organs against injury (mechanical shock protection), and maintains body temperature (thermal protection). However, excessive accumulation of body fat leads to medical complications in older persons. This disorder is steadily increasing among elderly persons, leading to increased mortality due to degenerative diseases, such as diabetes, hypertension, stroke, and coronary heart disease (9). Previous studies (10, 11, 12) have shown that physical fitness is a strong independent predictor of mortality, because individuals with high physical fitness may have greater muscle mass and quality (13), and greater reserve capacity to resist physical stress, improvements in the physical fitness of elderly's through appropriate physical activity should enable them to maintain their daily activity into later years in life. Thus, this study aimed to determine how the energy expended through physical activities affects the nutritional status assessed by Body Mass Index (BMI) and Waist to hip ratio (WHR) of the urban elderly's.

MATERIALS AND METHODS

Background Information of the Study Area

Abeokuta South Local Government also known as the Premier Local Government of Ogun State, Nigeria due to the historic eminence of that geographical entity as the traditional seat of the Local Authority in Egba since 1898 and also the seat of the Government of Ogun State that came into existence in 1976. Occupations of its indigenes are poetry, tie and dye also known as *Adire*. These, they are doing on a large scale and also exported for foreign investment opportunities. There are many cottage industries in Abeokuta South Local Government, such as; Pottery at Ijaiye, Tye and dye at Itoku, Wood carving, and Blacksmithing among others. Abeokuta South Local Government is the center for all routine in the city of Abeokuta.The Local Government has three major urban areas that were used for this research namely; Ibara Housing Estate known as Ibara Government Residential Area, Sam Ewang Estate and Asero Housing Estate.

Selection of Study Area

Three wards were purposively selected out of the fifteen wards in the Local Government Area. The main reason for selecting these wards was because of its standard infrastructural facilities compare to other areas in the Local Government, and this is one of the characteristics of an urban settlement.

Determination of Sample Size

The sample size was determined using Fisher's formula (14):

$$N = \frac{Z^2 (pq)}{d^2}$$

Where N is the sample size, Z is the standard normal variable for a 95% confidence level, p is the prevalence of the attribute (using a value of p for underweight of 15%) (15), q is 1–p, and d is precision (= 0.05). The sample size for the present study was calculated to be:

$$N = \frac{(1.96)(1.96) \times 0.15 \times 0.85}{(0.05)(0.05)} = 196$$

Thus, 196 elderly people were needed for this research. Another 10% was added to account for non-responses, yielding a total value of 215.6 which was rounded up to 220.

Sampling Technique and Procedure

Three estates from three wards were purposely selected for use in the study. The 220 elderly's were selected using a simple random sampling procedure. In each estate, 74, 74 and 72 households were randomly selected in Ibara Housing Estate, Sam Ewang Estate and Asero Housing Estate respectively where the elderly gave consent for the study was obtained, making a total sum of two hundred and twenty (220) households. To be eligible for inclusion in the present study, respondents must have resided for at least 5 years in the study location. To contact

the 220 elderly's, home visitations with the assistance of the landlord chairman committee, and in some cases his approval letter was used. In each household, the oldest elderly was selected. If there were more than one elderly resident and they had the same age, a ballot was used to select one participant.

Instruments for Data Collection.
Recall of Activity Pattern:
A structured questionnaire was designed to collect the required information. It was analyzed by calculating the time (in minutes) allocated to each activity for over 24 hours. The duration of each activity was multiply by its energy cost and summed up to give the energy expended using NutriSurvey2007 software.

Anthropometric Measurements:
Anthropometric data of the elderly was obtained using international standards and procedures (16, 17).Heights of the elderly were taken using a locally produced stadiometer, while weight was measured using a sensitive Handerson bathroom scale. Hip and Waist was measured using a flexible but not stretchable tape rule. Body weight and height measurements were used to calculate the Body Mass Index (BMI) by dividing the weight (kg) by height (m^2) to give the measurement in (kg/m^2) following WHO and FAO guidelines (17, 18).

Statistical Analysis
Microsoft Excel 2016 was used for the data coding which was later imported into Statistical Package for Social Sciences (SPSS) version 20 for further data computation and analysis. Mean standard deviation, frequencies and percentage were used in describing all the variables. Pearson correlation, T-Test and Chi-Square were used to establish the associations and relationships between energy expenditure, anthropometric measurements and nutritional status of the respondents.

RESULTS
Table 1 below shows the list of physical activities with energy expended by the respondents. The time spent on sleeping determines the hours or minutes of activity carried out in a day which varies from 14hours to 18hours among these respondents. A higher percentage (46%) of the respondents spent 8 hours for sleeping which leaves 16hours left for the day's activity, followed by 43% with 7hours on sleeping leaving 17hours left for the day's physical activity, 6% used 9hours leaving 15hours, 3% used 6hours on sleeping leaving 18hours left and the least, 2% of the respondents used 10 hours leaving 14hours left for the day's activity. It was observed that all the

Table 1: List of physical activities with energy expended by the respondents

List of Activities	N	Energy Used (Kcal)		
		Minimum	Maximum	Mean±SD
Using Toilet.	220	4	22	9.49±3.73
Brushing.	220	8	51	15.69±5.76
Showering.	220	15	173	64.83±27.16
Eating.	220	36	156	84.54±22.56
Sitting Down.	220	247	811	525.71±109.93
Easy Cleaning Job.	39	26	160	47.33±34.15
Cooking.	36	96	179	133.47±29.69
Driving.	42	51	210	107.52±41.98
Making Bed.	15	7	19	10.53±4.47
Cleaning Car.	18	19	108	53.72±29.40
Going Downstairs.	11	12	19	16.09±2.70
Going Upstairs.	11	17	53	39.64±13.03
Road Walking.	11	88	431	301.64±153.87
Working While Sitting Down.	92	33	276	145.18±74.46
Energy Expenditure	220	612	1296	837.66±117.06

respondents daily engaged in five General Activities namely; using the toilet, brushing, having a shower, eating and sitting down. The table also reveals the energy expended on each physical activity showing that the respondent's highest energy was spent on sitting down having the mean of 525.71±109.93kcal while the least energy spent was on using the toilet having a mean of 9.49±3.73kcal. It was also observed that the minimum total energy expended by the respondents was 612kcal and the maximum (1,296kcal) given a mean of 837.66kcal per day.

Table 2 shows the frequency and percentage of individuals who engaged in General Activities (GA) such as using the toilet, brushing teeth, having a shower, eating and sitting down. It also shows the frequency and percentage of those who engaged in both the general activities and specific activity. It was observed that 36.4% of the respondent engaged in general activities only, which was the highest percentage, followed by those who engaged in both general activities and working while sitting down with 16.8%, 7.7% engaged in general activities, driving a car and

Table 2:Frequency and percentage of respondents to general and specific activities engaged in

General Activities (GA) with specific activities	Freq	%
GA only	80	36.4
GA and Easy Cleaning Job	8	3.6
GA and Cooking	6	2.7
GA and Driving Car	9	4.1
GA and Cleaning Car	2	0.9
GA and Working While Sitting Down	37	16.8
GA, Easy Cleaning Job and Cooking	6	2.7
GA, Easy Cleaning Job and Working While Sitting Down	6	2.7
GA, Cooking and Working While Sitting Down	2	0.9
GA, Driving Car and Cleaning Car	6	2.7
GA, Driving Car and Working While Sitting Down	17	7.7
GA, Making Bed and Working While Sitting Down	1	0.5
GA, Road Walking and Working While Sitting Down	5	2.3
GA, Easy Cleaning Job, Cooking and Making Bed	11	5.0
GA, Easy Cleaning Job, Cooking and Road Walking	1	0.5
GA, Easy Cleaning Job, Cooking and Working While Sitting Down	5	2.3
GA, Easy Cleaning, Road Walking and Working While Sitting Down	3	1.4
GA, Cooking, Making Bed and Working While Sitting Down	3	1.4
GA,Cooking, Road Walking and Working While Sitting Down	2	0.9
GA, Driving Car, Cleaning Car and Working While Sitting Down	10	4.5
Total	220	100.0

Table 3: T-Test for independent samples of anthropometric characteristics of the respondents stratified by sex

Variable	Male (n=133) (Mean ± SD)	Female(n=87) (Mean ± SD)	t-value	p-value
Weight (kg)	78.39±10.92	73.30±11.39	3.325	0.001*
Height (m)	1.71±0.08	1.64±0.78	5.734	0.000*
BMI(kg/m²)	26.92±3.05	27.23±4.14	-0.624	0.533
Waist (cm)	99.55±6.84	91.54±10.19	6.977	0.000*
Hip (cm)	98.15±5.47	96.91±8.86	1.286	0.200
WHR (cm)	1.01±0.47	0.95±0.85	7.661	0.000*

*Statistically Significant at $p \leq 0.05$

working while sitting down, and 5.0% engaged in general activities, easy cleaning, cooking and making bed.

Table 3 shows that the weight, height, waist and waist-hip ratio (WHR), were significantly different in both sexes ($p \leq 0.05$). The BMI and hip circumference for the sexes were not significant.

Association between energy expenditure and the nutritional status of the respondents

Table 4 shows the association between energy expended and the body mass index of the respondents. It was observed that majority of the respondents (55.9%) were overweight, 21.4% falls within the range of obese I, 16.4% were normal, 5.5% were underweight while 0.9% were obese II. There was a significant association between the energy expended and nutritional status assessed by BMI of the elderly's having a P-value of 0.000 ($p \leq 0.05$).

Table 5 shows the association between the energy expended and the waist to hip ratio of the respondents. Majority (43.6%) of the male respondents were in the high waist to hip range, 36.1% falls in the very high, 15.0% were within the normal range while 5.3% falls in the low waist to hip for male range. There was a great significant association between the energy expenditure and waist to hip ratio of the male respondents having a P-value of 0.000 ($p \leq 0.05$). Higher percentage (54.0%) of the female respondent's falls within the very high range, 41.4% were within the high range, while 4.6% were in the normal range for the female waist to hip ratio range. The energy expenditure and waist to hip ratio of the female respondents were statistically significant ($p \leq 0.05$).

DISCUSSION

Older persons who do not perform active work may have a higher Body Fat Percentage (BFP) which will also increases the Body Mass Index (BMI), as inactivity affects the distribution of body fat, thus increasing the number of cases of obesity as seen in this study. This is in agreement with the results of a study on aging, body composition, and lifestyle in older persons, where physical activity was associated with a decrease in BFP in male and female older persons (19).

In this present study, there was a low significant difference in BMI and gender, this might be due to the proportional relationship between body weight and body fat percentage (BFP). Because, body weight consists of fat mass and lean body

Table 4: Association between energy expenditure and body mass index of the respondents.

Energy Expenditure		Body Mass Index					Total	χ^2	
		Underweight	Normal	Overweight	Obese I	ObeseII			P - value
600-699	Count	0	9	11	0	0	20		
	% of Total	0.0%	4.1%	5.0%	0.0%	0.0%	9.1%		
700-799	Count	3	8	47	14	0	72		
	% of Total	1.4%	3.6%	21.4%	6.4%	0.0%	32.7%		
800-899	Count	0	7	46	21	2	76		
	% of Total	0.0%	3.2%	20.9%	9.5%	0.9%	34.5%		
900-999	Count	3	7	19	8	0	37		
	% of Total	1.4%	3.2%	8.6%	3.6%	0.0%	16.8%		
1000-1099	Count	0	4	0	1	0	5	121.657	0.000*
	% of Total	0.0%	1.8%	0.0%	0.5%	0.0%	2.3%		
1100-1199	Count	3	1	0	3	0	7		
	% of Total	1.4%	0.5%	0.0%	1.4%	0.0%	3.2%		
1200-1299	Count	3	0	0	0	0	3		
	% of Total	1.4%	0.0%	0.0%	0.0%	0.0%	1.4%		
Total	Count	12	36	123	47	2	220		
	% of Total	5.5%	16.4%	55.9%	21.4%	0.9%	100%		

*Statistically Significant at $p \leq 0.05$

Table 5:Association between energy expenditure and waist to hip ratio for the respondents.

Energy expenditure		Waist to Hip Ratio				Total	χ^2	P value
		Low WHR	Normal WHR	High WHR	Very High WHR			
For male respondents								
600-699	Count	0	6	0	10	16	67.265	0.000*
	% of Total	0.0%	4.5%	0.0%	7.5%	12.0%		
700-799	Count	3	4	26	6	39		
	% of Total	2.3%	3.0%	19.5%	4.5%	29.3%		
800-899	Count	0	2	17	22	41		
	% of Total	0.0%	1.5%	12.8%	16.5%	30.8%		
900-999	Count	1	6	13	6	26		
	% of Total	0.8%	4.5%	9.8%	4.5%	19.5%		
1000-1099	Count	0	2	2	1	5		
	% of Total	0.0%	1.5%	1.5%	0.8%	3.8%		
1100-1199	Count	3	0	0	3	6		
	% of Total	2.3%	0.0%	0.0%	2.3%	4.5%		
Total	Count	7	20	58	48	133		
	% of Total	5.3%	15.0%	43.6%	36.1%	100%		
For female respondents								
600-699	Count		3	1	0	4	58.662	0.000*
	% of Total		3.4%	1.1%	0.0%	4.6%		
700-799	Count		0	18	15	33		
	% of Total		0.0%	20.7%	17.2%	37.9%		
800-899	Count		1	12	22	35		
	% ofTotal		1.1%	13.8%	25.3%	40.2%		
900-999	Count		0	2	9	11		
	% of Total		0.0%	2.3%	10.3%	12.6%		
1100-1199	Count		0	0	1	1		
	% of Total		0.0%	0.0%	1.1%	1.1%		
1200-1299	Count		0	3	0	3		
	% of Total		0.0%	3.4%	0.0%	3.4%		
Total	Count		4	36	47	87		
	% of Total		4.6%	41.4%	54.0%	100.0%		

*Statistically Significant at $p \leq 0.05$

mass, thus with increase body weight the BMI will also increasing base on the height (20).

The mean values for weight, height, waist and waist to hip ratio in this present study were significantly higher in the male respondents compared to the female respondents. While the female BMI was higher than the male respondents. This differences may be due to increases in body fat and loss of muscle (lean) mass with age in both genders. Older females in this study had entered a menopausal stage, where there is a decreased functioning of the ovaries and oestrogens, and menopause is a significant predictor of decrease or loss of muscle mass as a result of oestrogen deficiency (21). The result of this study was consistent with a study in the elderly aged 70–79 years in Pittsburgh, and Memphis, United State. It was reported that the increase in Body Fat Percentage (BFP) was due to a larger increase in fat mass and a moderate increase in lean mass. Lean mass was found to decline with age, while fat mass initially increased, but subsequently decreased around the age of 80 years. These changes caused an initial increase in Body Fat percentage and subsequently increase the Body Mass Index with age, followed by a levelling-off in both older men and women (22).

CONCLUSION

This present study revealed that the respondents engaged in less physical activity which brings about the little energy expended, majority engaged in general activities that consumed little energy, such as brushing, using the toilet, having a shower, eating and sitting down throughout the left hours after sleeping and waking up for the day (Sedentary lifestyle). While few engaged in the general activities and working while sitting down. It also reveals that their highest time and energy used was on sitting down which was reflected in their body mass index classification where majority were overweight, followed by obese I. This lack of healthy physical activity place them on the high risks group of diseases and complications such as cardiovascular disease, diabetes mellitus, obesity, atherosclerosis among other non-communicable diseases. This study also shows that there was a significant difference in the respondent's weight, height, waist and waist to hip for their sexes. Lastly, the study reveals that there was a statistically significant relationship between the nutritional status and energy expenditure of the elderly, showing that less energy they expend greatly affects their body mass index and also their waist to hip ratio buttress this as well.

RECOMMENDATION

There is a need for public health workers to inculcate a healthy physical activity for the elderly at least 30 minutes of road walk exercise a day, this can make a difference and make them less susceptible to illnesses related to people living a sedentary lifestyle.

REFERENCES

1. Slentz, C. A., Houmard, J. A., & Kraus, W. E. (2009). Exercise, abdominal obesity, skeletal muscle, and metabolic risk: evidence for a dose response. *Obesity*, *17*(S3), S27-S33.
2. Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A. & Bauman, A. (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Medicine & science in sports & exercise*, *39*(8), 1423-1434.
3. Rowlands, A. V. (2007). Accelerometer assessment of physical activity in children: an update. *Pediatric exercise science*, *19*(3), 252-266.
4. United Nations (1999): Review and Appraisal of the Progress Made in Achieving the Goals and Programme of Action of the International Conference on Population and Development, 1999 Report. Sales No. E.99.XIII.16.
5. World Population Ageing 1950-2050. (2002). Department of Economic and Social Affairs, Population Division, United Nations, NY 2002 ST/ESA/SER. A/207.
6. National Population Commission (2007). 2006 Population Census of the Federal Republic of Nigeria: Analytical Report at the National Level. NPC, Abuja, Nigeria. (April).
7. Bhurosy, T &Jeewon, R (2014). Overweight and obesity epidemic in developing countries: a problem with diet, physical activity, or socioeconomic status? *The Scientific World Journal,* 2014,964236. https//doi.org/10.1155/2014/964236.
8. Ghosh, A. (2004). Age and sex variation in measures of body composition among the elderly Bengalee Hindus of Calcutta, India. *Collegium antropologicum,* 28(2), 553-561.
9. Fatmah, F., &Nasution, Y. (2016). Light physical activity increased body fat percentage in elderly Javanese.

UniversaMedicina, 30(1), 45-53.
10. Newman, A. B., Kupelian, V., Visser, M., Simonsick, E. M., Goodpaster, B. H., Kritchevsky, S. B.& Harris, T. B. (2006). Strength, but not muscle mass, is associated with mortality in the health, aging and body composition study cohort. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *61*(1), 72-77.
11. Takata, Y., Ansai, T., Akifusa, S., Soh, I., Yoshitake, Y., Kimura, Y.&Hamasaki, T. (2007). Physical fitness and 4-year mortality in an 80-year-old population. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 62(8), 851-858*.
12. Park, M. S., Chung, S. Y., Chang, Y., & Kim, K. (2009). Physical activity and physical fitness as predictors of all-cause mortality in Korean men. *Journal of Korean medical science, 24(1), 13-19*.
13. Yamada, Y., Schoeller, D. A., Nakamura, E., Morimoto, T., Kimura, M., &Oda, S. (2010). Extracellular water may mask actual muscle atrophy during aging. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*, *65*(5), 510-516.
14. Fisher, L. D., (1998)."Self-designing clinical trials." *Statistics in medicine,* 17(14), 1551-1562.
15. Olasunbo, O. I., &Olubode, K. A. (2006). Socio-demographic and nutritional assessment of the elderly Yorubas in Nigeria. *Asia Pacific Journal of Clinical Nutrition,* 15(1), 95.
16. Help Age International and School of Hygiene, University of London. Nutritional Assessment of old people. Field manual, DFIID 1999.
17. WHO (1985). Physical stature: the use and Interpretation of Anthropometry. Report of a WHO Expert Committee. Technical Report Series, No 854.
18. FAO/WHO/UNU (1992). Energy and Protein Requirement Technical report no 726 Geneva, World Health Organization.
19. Kromhout, D., Bloemberg, B., Seidell, J. C., Nissinen, A., & Menotti, A. (2001). Physical activity and dietary fiber determine population body fat levels: the Seven Countries Study. *International journal of obesity,* 25(3), 301-306.
20. Jackson, A. S., Stanforth, P. R., Gagnon, J., Rankinen, T., Leon, A. S., Rao, D. C. & Wilmore, J. H. (2002). The effect of sex, age and race on estimating percentage body fat from body mass index: The Heritage Family Study. *International journal of obesity*, 26(6), 789-796.
21. Maltais, M. L., Desroches, J., & Dionne, I. J. (2009). Changes in muscle mass and strength after menopause. *Journal of musculoskeletal & neuronal interactions,* 9(4), 186-197.
22. Ding, J., Kritchevsky, S., Newman, A., Taaffe, D., Nicklas, B., Visser, M., ... &Pahor, M. (2007). Effects of birth cohort and age on body composition in a sample of community-based elderly1–3. *The American Journal of Clinical Nutrition*, 85(2), 405-410.