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EFFECT OF FOOD CONSUMPTION PATTERNS ON ENERGY, ANIMAL PROTEIN AND CHOLESTEROL INTAKE AMONG NATIONAL UNION OF ROAD TRANSPORT WORKERS IN OWO, ONDO STATE

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Abstract

This study was carried out to assess the effect of food consumption patterns on energy, protein, and cholesterol among members of National Union of Road Transport Workers (NURTW) in Owo, Ondo State, Nigeria. Random samples of 200 members from different units of the NURTW were selected from eight existing motor parks in Owo Local Government Area. Structured and validated interviewer administered 24 hours dietary recall questionnaire was used. Data obtained include food type, portion size, price and weight of foods and drinks consumed within the last 24 hours. Food models were used to describe food portion size. A Camry electronic kitchen scale (Model: EK4150) was used to check the corresponding weight of foods consumed and bought in the nearby restaurants. Data on nutrients intake were analyzed using Nutri-survey software (version 3.0) and the cholesterol content of foods was estimated, using food composition tables. Statistical data were analyzed, using statistical package for social sciences (SPSS version 17.0) and the level of significant was determined, using correlation coefficient. Result showed that consumption frequency of energy drinks and beer was 85%, Root and tubers 76.5%, Meat, fish & poultry 75.5%, and cereal was 58.5%. About 117.5g/d of animal protein from meat, fish, & poultry alone was consumed, while 257.50mg/d cholesterol and 120.46g/d of total fat were recorded. Mean energy intake per day was 28.42MJ and energy intake from drinks and alcoholic beverages was 15.9MJ (3827.27Kcal). There was positive correlation relationship ($p \leq 0.05$) between fish pepper soup consumption on total protein, fat and cholesterol intake. In conclusion, the food consumption pattern had significant effect on the total protein, fat and cholesterol intake among the respondents. The overall mean daily energy intake from their food consumption is over 200% of the daily energy requirement for men, while energy contribution from beer and other alcoholic beverages among the road transport workers is very high. The regular consumption of foods of animal origin in high amount, alcoholic beverages and high fat diets should be discouraged as a lifestyle and dietary habit through nutrition education should be encouraged to avoid the long term adverse effect on health.

Keywords: Food consumption, Energy intake, Protein, Cholesterol, Transport workers

Introduction

The consumption patterns of food have changed dramatically in different countries of the world as a result of food and nutrition transition during the past four decades. An increase in the intake of animal products, fatty foods, energy drinks and alcoholic beverages and decrease in the intake of fruits and vegetables have drastically increased energy intake, leading to various negative health consequences and chronic diseases (Popkin, 1998). Diet that promote protein intake above the RDA of 0.8 g/kg body weight are extremely popular (Pasiakos, 2015). Several factors have contributed to this change in food consumption patterns such as changes in lifestyle, income, urbanization, demographic changes, food price as well as improvements in food processing, food subsidy policies, migration and the influence of the mass media and advertisement (Popkin, 1998). Intake of high energy food and physical inactivity are both associated with increased obesity and related human disorder, such as diabetes and cardiovascular diseases. In addition to obesity, a number of diet- related risk factors are known to influence disease-risk, such as blood lipids, particularly high levels of cholesterol and saturated fatty acids. High consumption of animal derived foods rich in these lipids, such as red meat, milk, pork, dairy products and eggs have been regarded as potentially contributing to disease-risk (Delimaris, 2013; Sauvaget, Nagano, Hayashi and Yamada, 2004, Miranda, Anton and Redondo, 2015).

It is important to recognize that the human body utilizes cholesterol for various functions, such as the production of hormones (estrogen and testosterone), maintenance of cellular structure, serves as the substrate for the active form of vitamin D, synthesis of bile acids which are compounds necessary for fat digestion (Kuang, Yang, Zhang, Wang and Chen, 2018). It becomes a problem only when excessive amounts accumulate in the blood. A homeostasis cholesterol regulation system exists in the human body, the loss of cholesterol homeostasis results in the abnormal cholesterol metabolism, such as hypercholesterolemia, which is associated with the development of cardiovascular diseases and stroke (Kuang, 2018; Gard, Thompson and Clandinin, 2011; Fritsche and Steinhart, 2016).

Proteins are the major structural components of all cells of the body and amino acids are the building blocks of proteins. Proteins can function as enzymes, membrane-carriers and hormones (Jensen, 1994). It has been estimated that the daily minimum crude protein requirements of an adult in Nigeria varies between 65g and 85g per person (Oloyede, 2005). However, it is recommended that 35g of this minimum requirement should be obtained from animal products (Oloyede, 2005; Song, Fung, Hu, Willet and Longo, 2016; Berner, 2013). The dietary consumption of animal protein and fat, such as pork, egg and beef has been implicated as the culprit in the elevated level of cholesterol in the diet, specifically in the form of low density lipoprotein (LDL) sometimes referred to as “bad cholesterol.’’ This is one of the risk-factors for cardiovascular diseases (Gunstone, 2019; Sauvaget *et al.,* 2004; Mensink and Katan, 1990).The reason for this implication of animal protein food sources in the elevation of dietary cholesterol and fat level is because most animal protein sources such as beef, pork, dairy products, egg, poultry and sea foods, contain substantial quantity of fat embedded in its tissue and these animal fats are the primary contributor to the dietary level of cholesterol and fat (Gunstone, 2019).

The consumption of diets rich in animal protein is very popular in Nigeria, particularly among the high income earners (Adetunji and Adepoju, 2009) and some road transport workers, with little or no knowledge of the long-term adverse effects of this dietary life style on their health. Available literature in relation to the effect of food consumption patterns on energy, animal protein, and cholesterol intake of consumers was insufficient and scanty. Thus, this study examined the effect of food consumption patterns on energy, animal protein and cholesterol intake among members of the National Union of Road Transport Workers in Owo, Ondo State, Nigeria.

Materials and Methods

Study design

The study is a cross-sectional descriptive survey in design and was conducted to assess the effect of food consumption pattern on the total protein, fats and cholesterol level among members of National Road Transport Workers in Owo,

Survey location

Owo Local Government is one of the largest towns in Ondo State with a population of 222,262 according to 2006 National population census (NPC, 2006). There are about eight motor parks in Owo Local Government such as Post Office Motor Park, Rufus Giwa Motor Park, Oja- Oba Motor Park, Ikare Junction Park, Ijebu Motor Park, Emure and Isuada Motor Parks.

Sample size

Random samples of 200 members from different clusters (units) of The NURTW, including Motor Bike Transport Workers (Okada) were selected from the eight existing motor parks in Owo Local Government Area.

Data collection

Structured and validated 24 hours dietary recall questionnaire was used. It was interviewer administered and data obtained include food type, portion size, price and weight of foods and drinks consumed within the last 24 hours, using household measure. Amounts of alcoholic beverages and energy content were estimated. Food models were used to describe food portion size. A digital scale (Camry: EK4150) was used to check the corresponding weight of food consumed and bought in the nearby restaurants.

Data analysis

Data on nutrients intake were analyzed, using Nutrition Survey Software (version 3.0) and the cholesterol content of foods were estimated, using food composition tables. Statistical data were analyzed, using the Statistical Package for Social Sciences (SPSS version 17.0). Data were presented in mean, standard deviation and

percentages and the level of statistical significant was determined, using correlation coefficient.

Results and Discussion

Table1: Food consumption patterns among the respondents

Food group	n	(%)	Mean intake(g/day)
Root and Tubers	153	(76.5)	707.69±174.89
Cereals	117	(58.5)	121.74±74.45
Legumes	91	(45.5)	197.31±109.72
Nut and seeds	50	(25)	28.80±10.10
Fruits and vegetables	120	(60)	135.67±77.02
Meat, fish & poultry	151	(75.5)	117.50±64.70
Milk	11	(5.5)	160.00±0.00
Energy drinks and beer	170	(85)	686.00±21.23

The food consumption pattern of the respondents is shown in Table 1. The overall food consumption pattern of the respondents showed a higher consumption frequency of energy drinks and beer (n=170), roots & tubers (n= 153), followed by Meat, Fish and poultry (n=151), cereals (n=117), fruits and vegetables (n=120), while milk had the lowest consumption frequency (n=11).

Table 2: Mean energy, nutrients and cholesterol intake among the respondents

Nutrients/ Energy intake	Amount	RDA*	% met
Total Energy (Kcal)	6798.50±2.7 (28.4MJ/day)	2900	234%
Energy supplied by alcoholic drinks(kcal)	3827.27 ±1.5 (15.9MJ/day)		
Energy from other Dietary source(Kcal)	2968.23±2.7 (12.4MJ/day)		
Protein(g/day)	150.78±2.9	65	232 %
Animal protein(g/day)	50.95±2.9	35	145%
Fat (g/day)	120.46±59.3	30	402%
Carbohydrate (g/day)	320.32±46.2	290	110%
Cholesterol (mg/day)	257.50±2.9	239	108%

* Food and Nutrition Board Institute of Medicine, National Academy of Sciences (2011), Food and Nutrition Board, Institute of Medicine, National Academy of Sciences (2005), Institute of Medicine. (2002)

Table 2 shows the mean macronutrients and energy intake among the respondents; the mean value of macronutrients intake of the respondents showed high intake of macronutrients in comparison to Recommended daily allowance. The total energy intake was 6798.50kcal (28.42MJ); protein was 150.78g; fat was 120.46g; carbohydrate was 320.32g; and cholesterol as 257.50mg, respectively.

Table 3: Pattern of animal protein, fat and cholesterol intake among the various age group

Age (yr)	n	Mean prot(g)±SD	Mean Fat(g) ±SD	Mean chol(mg) ±SD
35-40	32	57.98±4.52	23.55±2.05	289.98±25.05
41-45	28	44.72±4.26	19.84±5.66	272.51±18.73
46-50	27	38.83±3.26	18.72±8.75	284.48±20.93
51-55	26	32.71±8.20	15.83±3.73	218.59±15.76
56-60	22	51.24±5.99	21.41±3.22	202.42±19.46
61-65	13	43.91±8.73	19.98±3.75	203.02±19.98
66-70	14	87.30±4.84	36.83±2.09	309.23±15.75

Table 3 shows pattern of animal protein, fat and cholesterol intake among the various age groups of members of the NURTW in Owo. Members between the ages of 66-70years had the highest protein, fat and cholesterol consumption, while members between the ages of 51- 55years had

the lowest value of protein and fat consumed. Members between the ages of 61- 65 years had the lowest cholesterol consumed (203.2mg).

Table 4: Relationship of animal foods and some nutrients consumed among the respondents

Foods	n	Mean/day Quantity (g)	Mean pro±SD(g)	p-value	Mean fat±SD (g)	p-vaule	Mean chol±SD(mg)	p-value
Fish	116	197.63±9.36	40.62±7.30	0.02	18.78±2.13	0.02	116.34±4.41	0.05
Suya	44	49.55±5.88	19.25±2.10	0.12	4.66±5.61	0.15	48.95±5.16	0.55
Beef	48	43.50±2.79	14.83±1.00	0.70	4.09±4.96	0.83	42.32±2.23	0.72
Egg	83	58.46±3.81	7.01±1.66	0.65	5.85±1.38	0.73	247.86±5.54	0.71
Goat meat	12	235.83±2.34	51.33±27.75	0.86	8.25±0.78	0.53	177.35±6.80	0.10
Chicken	10	120.00±0.00	36.84±0.00	-	11.16±0.00	-	113.16±0.00	-
								-

Correlation is significant at p≤0.05 *level*

Table 4 shows the common animal foods consumed among the members of the NURTW. Fish (n =116) and egg (n =83) had the highest consumption frequency, while chicken, milk and goat meat had the lowest consumption frequency

Discussion

Table 1 shows the food consumption pattern among members of the NURTW in Owo. Energy drinks and beer had the highest consumption frequency (85%), followed by root and tubers (76.5%), beef, fish, egg, suya, goatmeat and chicken in that order, while fruits and vegetables was 60% and cereals 58.5%, respectively. This consumption trend may be as a result of the availability of the food, food preference and low cost of these food groups in the market. The high intake of meat, fish and poultry pepper soups is a common practice among drivers and okada riders particularly in the evening after their day's work. High intake of beers and different types of energy drinks usually go along with these pepper soups (Abiona, Aloba and Fatoye, 2006). Root and tubers and different foods from cereal were the commonest staple of highest consumption among the road transport workers. Ogunniyi, Ajao and Oladejo (2012), reported that there was high consumption of root and tubers, cereals grains, and vegetables by majority of the respondents in their study.

Milk, Nuts and seeds had the lowest consumption frequency (5.5% and 25%, respectively) which may affect vitamin D and calcium intake, consequently leading to diseases associated with vitamin D and calcium deficiency, such as osteomalacia and osteoporosis.

The mean macronutrients and energy intake among the respondents was presented in table 2 and was compared with the recommended daily allowance. The total energy intake value was 6798.50kcal/day (28.42MJ/day). This high energy intake value was due to high amount of alcohol consumption by the respondents. In all, the respondents consumed an overall 236 bottles of alcoholic beverages (beer) apart from some of the energy drinks which are alcoholic. A bottle of beer is 600ml (60cl) in volume and 100ml of beer is estimated to contain 30Kcal of energy. Therefore, in this study, the total energy intake from beer and other energy drinks alone was 3827.27 (15.9MJ), while the total energy derived from other foods intake was 2968.23Kcal (12.41MJ). The possible consequence of this type of dietary lifestyle over a long period of time may result in positive energy balance in the body, where energy intake in terms of food and calorie consumed is greater than energy expenditure in terms of energy used for different physical activities. These dietary patterns and lifestyle may lead to metabolic syndrome, such as obesity, type 2 diabetes, increase risk of cancer, and rheumatism. High consumption of alcohol may also lead to liver diseases (Abiona et al, 2006; Pasiakos, 2015).

The total mean protein intake was 150.78g/day, which was also observed to be high (232%) and in the excess of the RDA (65g/day) as shown in

table 2. Also a total of 117.5g/d of animal protein from meat, fish and poultry alone was recorded according to the result shown in table 1. This high protein intake is as a result of intake of foods of animal origin, particularly meat, fish, chicken pepper soups and suya on regular basis among the respondents. The trend in this result can be compared to the result obtained and the consequences of high protein foods in the previous study by Delimaris (2013), who reported on the adverse effects associated with protein intake above the recommended dietary allowance for adults. His findings show that 21 experimental human studies show an adverse effect associated with long- term high protein/high meat intake. The potential health dangers of long-term high dietary protein intake in adults may include decreased renal function, increase risk of kidney stone formation, hypercalciuria (excessive loss of calcium in the urine), and elevated risk of colon cancer, high sodium in intake - a risk factor for hypertension, hyperlipidemia and gout (Delimaris, 2013).

The total fat intake (120.46g/day) of the respondents was also very high, which might also be due to the excessive intake of food of animal origin, such as beef, chicken and fish pepper soups laden with fats and suya. This may result in high energy intake and consequently different metabolic diseases such as obesity, diabetes and cardiovascular diseases, if left unchecked over a long period of time. The total amount of fat intake as shown in this result is far higher than what is recommended by FAO/WHO. (2010).
The total cholesterol intake of the respondents was observed to be high, when compared with the American Heart Association (2016) dietary cholesterol desirable limit of < 200mg/day and a borderline of 239mg/day. High intake of cholesterol is associated with excessive intake of foods of animal origin, such as egg, beef, fish, goat meat, chicken and milk. As a result of this daily dietary cholesterol consumption pattern over a long period of time, there may be increase in serum Low Density Lipoprotein (LDL) resulting in increased risk of cardiovascular diseases, such as coronary heart disease. High amount of eggs was consumed by the road transport workers (Table 3.0) among 83 participants with mean intake of 53.46g. Kuang, *et al.* (2018) reported the effect of high consumption of egg on cholesterol synthesis in their study on the impact of egg nutrient composition and its consumption on cholesterol homeostasis. They reported from four studies reviewed and showed that there is an increase of serum low density lipoprotein, with increasing dietary cholesterol intake from egg (Miranda et al, 2015; Sauvaget et al, 2004).

The result of this study showed that the cholesterol in egg was the highest (247.86mg) followed by goat meat (177.35mg), fish (116.34mg) and chicken (113.16mg). Beef and Suya had the lowest cholesterol value (42.32mg and 48.95mg, respectively). Animal protein contains all essential amino acids for human nutrition (Kuang *et al.,*2018). Although protein from animal food is regarded as a good source of protein with high biological value, yet the controversy surrounding this claim is that, majority of foods of animal origin have high amount of sodium, fat and cholesterol embedded in their tissues, which have been implicated as a risk factor for cardiovascular diseases and cholesterol can only be found in foods of animal origin (Sauvaget *et al.,* 2004; Song et al, 2016). This indicates that the higher the consumption of foods of animal origin, the higher the dietary intake of sodium, fat and cholesterol (Song et al, 2016).

The total carbohydrate intake (320.32g/day) was observed to be a little higher than the RDA, which might be as a result of high consumption of carbohydrate rich foods, such as root, tubers and cereals. The negative impact on the body over a long period of time is that, there will be storage of excess calorie from carbohydrates as fat in the body, particularly when this energy intake does not balance with the corresponding expenditure, which may accumulate leading to various metabolic diseases, such as diabetes, obesity cardiovascular diseases (Roth, 2011; Pasiakos et al, 2008).

The frequency of consumption of fish pepper soups and fish was the highest (n=116), compared to other foods from animal source as shown in Table 4 above. Fish is a good source of quality protein and essential fatty acids to human nutrition. However, from the result, there was a positive correlation ($p \leq 0.05$) on fish consumption and the intake of protein, fat and cholesterol, respectively. Observation from the survey also shows that most fish pepper soups consumed were fresh catfish that was fairly high in fat, apart from the cooking fat used. This may be the reason for the significant relationship between fish consumption and high fat and cholesterol intake among the road transport workers. Egg had the consumption frequency (n=83), which

might be due to the fact that egg is cheap and readily available but highly nutritious food regularly consumed in transit by drivers (Miranda *et al.,*2015), while chicken had the lowest consumption frequency.

Conclusion

The food consumption pattern had significant effect on the total protein, energy and cholesterol intake among the respondents. High intake of animal protein was found among the participants and there was a positive correlation relationship ($p \leq 0.05$) between fish pepper soup consumption on protein, fats, and cholesterol intake among the road transport workers. The overall mean daily energy intake from their food consumption is over 200% of the daily energy requirement for men, while energy contribution from beer and other alcoholic beverages among the road transport workers is very high (15.9MJ). The regular consumption of foods of animal origin, alcoholic beverages and high fat diets should be discouraged as a lifestyle and dietary habit through nutrition education in order to avoid the long term adverse effect on general health status and potential chronic diseases manifestation should be encouraged.

References

Abiona, T.C, Aloba, O.O. & Fatoye, F.O. (2006): Pattern of alcohol consumption among commercial road transport workers in a semi-urban community in south western Nigeria. Afr Med J., 83 (9):494-499.

Adetunji, O. M. & Adepoju, A. (2009): Evaluation of households protein consumption pattern in Orire Local Government Area of Oyo State. *Journal of applied Sciences Research,* 5(6):636-644.

American Heart Association (2016). http//www.americanheart.org/presenter. jhtml$identifier.

Berner, L.A.; Becker, G.; Wise, M. & Doi, J. (2013). Characterization of dietary protein among older adults in the United States: Amount, animal sources, and meal patterns. *J. Acad. Nutr. Diet* 2013, *113*, 809–815.

Delimaris, I. (2013): Adverse Effects Associated with Protein Intake above the Recommended Dietary Allowance for Adults, External Postdoctoral Research Team, Biology Unit, Faculty of Human Sciences, University of Thessaly, 38221 Volos, Greece.

FAO/WHO (2010). *Fats and Fatty Acids in Human Nutrition. Report of an Expert Consultation*; FAO/WHO: Geneva, Switzerland.

Food and Nutrition Board Institute of Medicine, National Academy of Sciences (2011). *Recommended Daily Allowance*. Washington; National Academy press

Food and Nutrition Board, Institute of Medicine, National Academy of Sciences (2005). *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*; The National Academics Press: Washington, DC, USA.

Fritsche, J. & Steinhart, H. (2016). Analysis, occurrence, and physiological properties of trans fatty acids (TFA) with particular emphasis on conjugated linoleic acid isomers (CLA) a review. Fat/Lipid 100: 190-210.

Gard, M.L.; Thomson, A.B.R. & Clandinin, M.T. (2011) Effect of dietary cholesterol and/or ω3 fatty acids on lipid composition and ∆5-desaturase activity of rat liver microsomes. *J. Nutr.* 1988, *118*, 661–668.

Gunstone, F.D. (2019). "Oils and Fats – Past, Present and Future". Pp 1-16 in *Fats for the Future*, edited by R.C. Cambie. Chichester: Ellis Horwood Ltd.

Institute of Medicine (2002). *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids.* Washington, DC: National Academies Press; 2002.

Kuang, H, Yang, F, Zhang, Y, Wang, T, & Chen, G (2018): The impact of egg nutrient composition and its consumption on cholesterol homeostasis. *Cholesterol*, vol.2018, Article ID6303810, 22pg.

Liu, L., Guan, L. L., Wu, W., & Wang, L. (2016). A review of fatty acids and genetic characterization of safflower (Carthamus tinctorius L.) seed oil. *Organic Chemistry Current Research*, 5(160). 2161-0401.

Mensink, R.P., & Katan, M.B. (1990). Effect of dietary trans fatty acids on high-density and low-density lipoprotein cholesterol level in healthy subjects, New Engl. J. Med. 323 ;435–439.

Miranda, X., Anton, C., & Redondo (2015). "Egg and egg-derived foods: effects on human health and use as functional foods," *Nutrients*, vol. 7, no. 1, pp. 706–729

Nishida, L. & Uauy, R. (2009). WHO Scientific Update on health consequences of trans fatty acids: Introduction, *European Journal of Clinical Nutrition*, Macmillan Publishers Limited, 63, S1–S4.

NPC: (2006) National Population Commission, 2006 Census Result Abuja, Nigeria

Ogunniyi, L.T, Ajao, A.O, & Oladejo, J.A (2012). Food consumption pattern in Ogbomosho metropolis of Oyo State Nigeria, *JASR*, 12(1):74-83.

Pasiakos, S.M. (2015): Metabolic advantages of higher protein diets and benefits of dairy foods on weight management, glycemic regulation, and bone. *J. Food Sci.*, *80* (Suppl 1-

Pasiakos, S.M., Mettel, J.B., West, K., Lofgren I.E., Fernandez, M.L., Koo, S.I., & Rodriguez, N.R. (2008). Maintenance of resting energy expenditure after weight loss in premenopausal women: potential benefits of a high-protein, reduced-calorie diet. *Metabolism*, 57: 458 – 64.

Popkin, M.B. (1998): The nutrition transition and its health implications in lower-income countries. Public Health Nutrition 1(1):5-21.

Roth, MS., RD (2011). Nutrition and diet therapy (10th ed.). Indiana, university fort weyne, Indiana. Pg 70 – 74.

Sauvaget, C. Nagano, J, Hayashi, M, & Yamada, M. (2004): Animal protein, Animal fat, and cholesterol intakes and risk of cerebral infarction mortality in the adult health study

Song, M., Fung, T.T., Hu, F.B, Willett, W.C, & Longo, V.D. (2016): Association of animal and plant protein intake with all-cause and cause-specific mortality. JAMA internal medicine, 176(10): 1453-1463.