

Effect and necessity of anthropogenic copper on fresh water aquaculture organisms: A review

Alemu Adeba*, Dessalegn Tamiru, Tefera Belachewoki

Department of Nutrition and Dietetics, Jimma University, Jimma, Ethiopia

Abstract

The aim of purpose: Obesity becomes the major public health problem worldwide and unhealthy lifestyles are the most risk factors of it. With wrongly perception as an indicator of wealth group, less attention was given for central obesity by western Ethiopian, though it is a midfielder for cardio-metabolism disorders. Thus, the study aimed to assess the prevalence of overweight, obesity and associated factors among middle aged urban residents of west Ethiopia.

Methods: A community based cross sectional study design was applied on 266 participants and data was collected as of WHO approach in February 2019. SPSS version 24 was used to analyze. Descriptive statistical analysis was reported with frequency, percentage and mean \pm SD. A binary logistic analysis resulting with $P < 0.25$ candidate to multivariable and significant association was considered at $p\text{-value} \leq 0.05$.

Results: The prevalence of overweight, obesity and its combined based on body mass index was 19.5%, 24.4% and 43.9% respectively as definition criteria. Based on Ethiopian cut point for waist circumference, about 58.6% adults were at risk of developing central obesity. The mean of twelve food groups was 5.4 ± 1.9 . On binary analysis, being raised (SBP; $P=0.034$, DBP; $P=0.090$, FBS; $P=0.013$), and high DDS ($P=0.038$) were associated with central obesity. On multivariate analysis being: raised triglycerides ($P < 0.001$); elevated DBP ($P=0.047$) and high DDS (AOR=1.52; 95%CI: 1.12-2.25) were associated with central obesity, but DDS was not significant ($P=0.379$).

Conclusion: This study showed both general and central obesity was highly prevalent and associated significantly with independent variables. Consequently, healthy lifestyles education needs focus to mitigate metabolic disorders and generalize the prevalence at country level.

Keywords: Overweight, Central obesity, Magnitude, Association, Middle aged

Accepted on 28th June, 2021

Introduction

Obesity is accumulation of excess fat in the body [1] and it is becoming one of the major public health problems [2]. About 2.8 million people die each year due to combination of overweight and obesity worldwide. Unhealthy diets connote countries with scarce resources and dietary diversity score (DDS) is an indicators of risk of NCDs [3]. Globally NCDs is increasing rapidly and projected to reach 57% in 2020. The combined prevalence of overweight and obesity has increased by 27.5% for adults between 1980 and 2013 [4]. In Sub-Saharan Africa, obesity and other metabolic markers are emerging problems of public health [5].

Evidence based studies shows that dietary diversity is a good proxy of dietary quality globally [2-5]. In low and middle income countries, people typically base their diets on few food groups [6]. Dietary diversity refers to

a variety of foods across and within the food groups to ensure adequate amounts of key nutrients and maintain acceptable levels of growth and development [3,6]. DDS is cost effective, non-invasive tools to assess dietary patterns and familiarize public health policies, communicate risk and targeted interventions [7]. High DDS was associated with higher economy at household level [8,9].

Socioeconomic disparity in nutrition helps to explain some of the observed social inequalities in health [7,10]. Different studies indicate that most of Ethiopian practices unhealthy diet [11,12]; where cereals contribute about 75% of diet [3,13], and 60% of households had low DDS [14,15], keeping the effect of other risk factors. Unhealthy diet contributed to 14.8% of the global burden of diseases and it was estimated that one in every five deaths was due to poor dietary practices [16]. Nutrition interventions are primarily focus only vulnerable groups [17], where adult's neglected. Thus, this study aimed to assess magnitude

Citation: Alemu Adeba, Dessalegn Tamiru, Tefera Belachewoki. *Effect and necessity of anthropogenic copper on fresh water aquaculture organisms: A review. J Food Nutr Health 2021; 4(4).*

central obesity and associated risk factors among middle aged urban residents of West Ethiopia.

Methods

Study area and period

This study was conducted purposively in Nekemte which is the hub of west towns and located 328 Km from Addis Ababa in February 2019.

Study design

A community based cross-sectional study was used to assess magnitude of obesity and associated risk factors. From six communes of Nekemte administrations, two communes were selected. Since data would be used as baseline, one commune was randomly selected and the other purposively allocated with natural geographical buffering zone to avoid contamination.

Sample size and techniques

The minimum sample size was calculated using single proportion formula taking prevalence of dependent variable among healthy Ethiopian adults. Abdominal obesity (19.6%) was the most common prevalent [18], with margin of error of 5%, CI 95% and 10% gnawing away, minimum sample of 266 participants was calculated.

Dietary diversity score

Using food frequency questionnaires, DDS constructed

from twelve food groups by counting the intake of the food groups over a period of one week and converted to tertiles [19,20].

Anthropometric measurement

The weight was measured using a SECA electronic scale to the nearest 0.1 kg and WC with tape meter nearest to 0.1 cm. Nutritional status reported based on cut off points of obesity and metabolic syndrome markers for Ethiopian adults.

Analysis

The data was analyzed using SPSS version 24 (SPSS Inc., Chicago, IL, USA). Descriptive statistics like frequency, percentage, means, were used to describe and assess association between central obesity and DDS. A logistic regression analysis at p-value ≤ 0.05 was accepted as significant.

Result

Socio-demographic characteristics

From 266 participants comprised, the average age of adults was 52.2 years. Majority (62.8%, 54.5% and 54.89%) of the participants was females, aged between 41 year – 48 years and lives below poverty threshold respectively. Significant difference was observed between gender, age, income and urban farming with DDS (Table 1).

Dietary practices

Table 1. Socio-demographic characteristics according to dietary diversity score of middle aged, urban residents, Ethiopia, 2019.

Variable	Categories	N (%)	DDS		
			Mean	SD	P-value
Sex	Female	167(62.8)	5.6	1.9	0
	Male	99(37.2)	4.9	1.8	
Age in years	41-48	145(54.5)	5.4	1.9	0.28
	49-56	77(28.9)	5.6	1.9	0.04
	57-64	44(16.)	4.9	1.8	
Income	<37.5\$	146(54.89)	5.9	0.2	0
	>37.5\$	120(45.01)	4.7	0.2	
Marital status	Single	13(4.9)	5.5	2.3	0.1
	Married	178(66.9)	5.3	2	0.93
	Widowed	56(21.1)	5.3	1.5	0.91
	Divorced	19(7.1)	5.5	1.5	
Urban farming	Yes	20(7.5)	4.5	0.2	0
	No	246(92.5)	5.3	0.1	

Most (99.62%) of participants consuming cereal based monotonous foods and all dishes missing fishes. The highest mean consumption score was for cereals (11.974 ± 0.026) followed by tuber and roots (2.6917 ± 1.1567), legumes groups (2.0489 ± 1.1822) and overall mean \pm

SD of DDS was 5.4 ± 1.9 . Few of them eat vegetables and fruits as of recommended while the rest consume it seasonally (Table 2).

Out of the total, majority (68.0%) of the participants was consuming low DDS and 62% of adults consuming

Table 1. Socio-demographic characteristics according to dietary diversity score of middle aged, urban residents, Ethiopia, 2019.

	Minimum	Maximum	Mean	Std. Deviation
DDS	0	12	5.4	1.9
Cereals	1	11	11.974	0.0262
Legumes, pulse & nuts	1	4	2.0489	1.1822
Tuber and roots	1	4	2.6917	1.1567
Vegetables	1	4	1.406	0.2196
Fruits	1	4	0.2256	0.5971
Meat	2	4	0.0902	0.3677
Milk	1	4	0.1729	0.6144
Eggs	1	4	0.271	0.5972
Fishes	2	4	0.0075	0.1226
Fats & oil	1	4	0.7444	0.9764
Sweets	1	4	0.8872	0.1858
Spices, ect	1	4	1.4474	0.9939
5.3	5.3	5.3	5.3	5.3

mixture of oil and animal fat. In the low tertiles, 40.23% adults consumed mixture of oil and fat, and 26.69% consumed clotted oil (Table 3).

Magnitude of central obesity

Based on BMI the prevalence of overweight and obesity

Table 4. Frequency of five indices of anthropometric measures of middle aged of Nekemte, 2019.

	Low DDS	Medium DDS	High DDS
Overall	181(68.0%)	76(28.6%)	9(3.4%)
Animal fat	1(0.38%)	2(0.78%)	1(0.38%)
Clotted oil	71(26.69%)	16(6.02%)	2(0.78%)
Purified oil	2(0.78%)	4(1.51%)	2(0.78%)
Mixed	107(40.23%)	54(20.30%)	4(1.51%)

Note: - : Consume ≤ 3 food groups=Low, four-six=Medium , ≥ 7 =high dietary diversity score

was 19.5% and (24.4%) respectively and total 43.9% were at risk of developing obesity. While with WC and waist to hip ratio, 58.6% and 81.2% of adults were at risk of

developing central obesity. This is may be due the majority of participants were females (Table 4).

Table 4. Frequency of five indices of anthropometric measures of middle aged of Nekemte, 2019

		N=266	%
BMI	Normal	131	49.2
	Overweight	52	19.5
	Obesity	65	24.4
	Chronic energy deficiency	18	6.8
WC	High	156	58.6
	Low/normal	110	41.4
HC	High	192	72.2
	Low	74	27.8
WHipR	High	216	81.2
	Low	50	18.8
WHtR	High	165	62
	Low	101	38

V

Table 5. Multivariate analysis for central obesity among Nekemte residents, 2019.

Variables(Yes)	Central Obesity by Waist circumference			
	C COR(95% CI)	P-value	AOR(95% CI)	P-value
High SBP	1.75(1.31,2.29)	0.034	0.94(0.48, 1.87)	0.868
High DBP	1.04(1.53,2.04)	0.09	1.59 (1.37, 3.21)	0.046

Citation: Alemu Adeba, Dessalegn Tamiru, Tefera Belachewoki. *Effect and necessity of anthropogenic copper on fresh water aquaculture organisms: A review. J Food Nutr Health 2021; 4(4).*

High FBS	6.61(1.50,29.21)	0.013	0.20(0.04,0.98)	0.047
low HDL	0.59(0.31,1.13)	0.11	0.62(0.27,1.43)	0.261
Raised Triglycerides	0.11(0.04,0.27)	0.001	11.19(3.84,32.58)	0.001

Risk factors associated to central obesity

On binary analysis central obesity was associated with SBP, DBP, FBS, Triglycerides and DDS. On multivariate analysis, being raised TGs ($P < 0.001$); elevated DBP ($P = 0.046$) and high DDS were associated with central obesity, but DDS was not significant ($P = 0.379$) (Table 5).

Discussion

Recently obesity was recognized as public health significance; still in west Ethiopia, central obesity is seen as beauty for neckties and wrongly perceived an indication of rich family; however it is a silent killer. Thus, this study aimed to investigate magnitude and association of overweight, central obesity and risk factors.

In this study, the prevalence of central obesity was 58.6% with waist circumference definition criteria. This finding is in line with studies done on Jimma university workers, China US Asian adults. Likewise, study conducted in Namibia among a San groups show 87.5% of the participants consumed food items from only 2 or 3 different food groups, the most frequently eaten food type being maize meal. Similarly, in Addis Ababa reported that 60.4% of them had low DDS, 39.7% of people ≥ 40 years had non-diversified diet in Jimma town and in Mirab Abaya wereda Southern Ethiopia had low (65.7%) and 34.3% high DDS.

Similar to study on Sri lankan adults, nearly all participants consumed cereal based monotonous food, most frequently teff and this prevalence was higher than cereal contribution (75%) in Ethiopian diet. Also study in Addis Ababa (11%) and 3.4% of urban residents in south west Ethiopia had high DDs meaning majority of them practicing poor diet. It is known that the prevalence of metabolic syndrome was high among population consume highly dense carbohydrate and saturated lipids.

Mean of (7s.d.) finding of dietary diversity score was slightly less than study in Terhan (6.157 ± 1.02). The same scenario to our finding, socioeconomic is associated with dietary diversity and lower socio-economic status associated to poorer diets in Australia. Dietary diversity was found to be associated with general obesity and abdominal obesity in Asian and Arabic countries. Regarding urban agriculture, Home garden access was positively associated to high DD; in this study only 7.5% had urban farming mean have poor dietary practices.

Regarding lipids, most (62.0%) of the participants consumed mixture of oil and fat, mostly palm olein. Palm olein with a high content of the SFA (palmitic acid ~ 50%), 40% oleic acid and a low (10%) content of unsaturated

fatty acids has been proved to increase the serum cholesterol concentrations in humans. The recommended fat intake for healthy adults on SFA is less than 10%, but not practiced by study population.

Based on Ethiopian optimal cut off point for Mets, WC measure results showed that women (37.22%) and men (21.43%) were at risk of obesity. Similarly the study conducted in Verulam, South Africa showed 68.4% of women and 25% of men were having central obesity. The finding of our study was higher than the pooled prevalence of DHS data of 32 sub-Saharan African countries yielding 15.9%; 28.1% in Malawi and in Tanzania the prevalence of overweight and obesity among adults were 24.1% and 19.2%. In this study, being female was found to be associated with central obesity. This finding is consistent with the studies done in Brazil, Oman Eastern Sudan Northern Iran and Southern China.

This study confirms that overweight, central obesity and poor dietary practice was showed high prevalence. However, the study limited with evaluating cause-and-effect associations, chronological relations could not be established between measures of variables. Despite limitations, this study may strengthen the existing knowledge and fulfill the gaps in the already limited data on modifiable risks factors of metabolic syndrome in Ethiopia.

Conclusion

More than one fourth of study participants were found general obese and majority of them with centrally obese, it is comparably high prevalence to respective studies. And all most all respondents consume cereal and saturated oil. It implies that not only behavioral change intervention but also doses for preparation of dishes and community based healthy lifestyle education boldly need venture to generalize at country level.

Ethical Review

Permission was sought from the Institutional Review Board (IRB), Jimma University (Approval No. IHRPGY/596/2019) and official letter was taken from Nekemte health Bureau.

Acknowledgements

We appreciate study participants, Jimma University, Wollega central lab, Nekemte health Bureau, Cheleleki clinic, Staffs and Health extension workers.

Disclosure

No conflicts of interest.

Funding

No funding was received for this paper work.

References

1. Nguyen PH, Avula R, Ruel MT, et al. Maternal and child dietary diversity are associated in Bangladesh, Vietnam, and Ethiopia. *J Nutri.* 2013; 143(7): 1176-1183.
2. Arimond M, Wiesmann D, Becquey E, et al. Dietary diversity as a measure of the micronutrient adequacy of women's diets in resource-poor areas: summary of results from five sites. In: *Food and nutrition technical assistance ii project (FANTA-2 Bridge)*. Washington DC: FHI 360; 2011.
3. Gholizadeh F, Moludi J, Lotfi Yagin N, et al. The relation of dietary diversity score and food insecurity to metabolic syndrome features and glucose level among pre-diabetes subjects. *Prim. Care Diabe.* 2018;12(4): 338–344.
4. Vandevijvere S, De Vriese S, Huybrechts I, et al. Overall and within-food group diversity are associated with dietary quality in Belgium. *Public Health Nutr.* 2010; 13(12):1965–73.
5. Ruel MT. Operational dietary diversity: A review of measurement issues and research priorities. *JNutr.* 2003; 133(11 suppl2):3911S-26S.
6. FAO. *Dietary Assessment: A resource guide to method selection and application in low resource settings*. Rome, 2018.
7. James WP, Nelson M, Ralph A, et al. Socioeconomic determinants of health. The contribution of nutrition to inequalities in health. *BMJ* 1997; 314(7093):1545–1549.
8. Smith GD, Brunner E. Socio-economic differentials in health: The role of nutrition. *Proc Nutr Soc.* 1997;56(1A):75–90.
9. Lassale C, Gunter MJ, Romaguera D, et al. Diet quality scores and prediction of all-cause, cardiovascular and cancer mortality in a pan-european cohort study. *PLoS One* 2016; 11(7):e0159025.
10. Hoddinott JY, Yohannes Y. *Dietary diversity as a food security indicator*. Washington D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development, 2002.
11. Mayen AL, Marques-Vidal P, Paccaud F, et al. Socioeconomic determinants of dietary patterns in low- and middle-income countries: A systematic review. *Am J Clin Nutr.* 2014; 100(6):1520-1531.
12. Alkerwi A, Sauvageot N, Nau A, et al. Population compliance with national dietary recommendations and its determinants: Findings from the ORISCAV-LUX study. *Br J Nutr.* 2012; 108(11):2083–2092.
13. EDHS (Ethiopia Demographic and Health Survey). (2011). Central Statistical Agency, Addis Ababa, Ethiopia and ICF International Calverton, Maryland, USA.
14. Abdulhalik Workicho, Tefera Belachew, Garuma Tolu, et al. Household dietary diversity and animal source food consumption in Ethiopia: Evidence from the 2011 Welfare Monitoring Survey. *BMC Public Health* 2016;16(1):1192.
15. Alemayehu Seyoum, Dorosh P, Sinafikeh Asrat. Crop production in Ethiopia: Regional patterns and trends. *Food and Agriculture in Ethiopia: Progre and Polic Chall.* 2012;74:53.
16. Deyge Goshu, Belay Kassa, Mengistu Ketema. Measuring diet quantity and quality dimensions of food security in rural Ethiopia. *J of Dev and Agri Econ.* 2013;5(5):174-185.
17. GBD 2015. Obesity Collaborators. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N. Engl. J. Med.* 2007; 377:13–27.
18. WHO/FAO. *Fats and Fatty Acids in Human Nutrition Report of an Expert Consultation; FAO Food and Nutrition Paper 91*; FAO: Rome, Italy, 2010; 91:1-166.
19. Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014;384(9945):766-81.
20. Okafor CI. The metabolic syndrome in Africa: Current trends. *Indian J Endocrinol Metab.* 2012;16(1):56–66.

*Correspondence to:

Alemu Adeba

Department of Nutrition and Dietetics, Jimma University,
Jimma, Ethiopia

Jimma, Ethiopia

E-mail: dессalegn97@gmail.com