



Household Food Insecurity and Women's Nutritional Status in Addis Ababa

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Abstract: *Background:* Existing poverty, soaring food price and fast population growth are challenges of urban areas' access to food. This especially hurt women's nutritional status. *Objective:* This study was conducted to assess the level of household food insecurity and its effect on women's nutritional status in Addis Ababa. *Methodology:* Cross-sectional study design was conducted from January to February 2012. A total of 550 households were selected using multistage sampling technique. *Result:* 3/4th of households were food-insecure by access and 40.7% of households have low dietary diversity. About 12.7% of women were underweight while 26% were overweight. Women's body mass index increases with increasing dietary diversity score but there is no association between BMI and household food access score. *Conclusion and Recommendations:* Despite the fast economic growth and nutrition transition in Ethiopia, majority of households in Addis Ababa were food-insecure and food insecurity triggers under nutrition than over nutrition. Prevalence of both underweight and overweight is substantial indicating the double burden of malnutrition in the population. Households' dietary diversity score was more sensitive than food access score in determining women's body mass Index. There is a need to do more comprehensive and longitudinal assessment to determine the full extent of the problem and need to design urban food security programs.

Keywords: Food Security, Women's Nutritional Status, Urban

1. Introduction

'Food security exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' [1, 2, 3]. Three distinct variables are essential to the attainment of food security: food Availability, food Access and Food Utilization. Renzaho and Mellor recommended another fourth dimension of food security called asset creation (4). In this research, Household food access score and dietary diversity score were used to measure the household's access to food while anthropometric measurements was used to measure food utilization.

The Household Food Insecurity Access Scale (HFIAS) and Households dietary diversity score (HDDS) which were developed by Food and Nutrition Technical Assistance (FANTA) were used to assess the access and diversity score respectively [5]. HFIAS measures household food access based on nine occurrences and nine severities of occurrence

questions [6]. The HDDS is used to measure households' access to diversified food groups and aims to identify the food security and dietary diversity status at household and population level [7]. In this research HDDS is defined as the number of foods or food groups consumed by an individual or by any member of the household inside the home over a reference time period [8-10].

Studies show that, many urban people are found to be food insecure associated with lack of access or difficulty to purchase food. Combined HDDS and HFIAS methods in West Africa revealed that 67% and 72% of households were food-insecure in 2006 and 2007 respectively [5]. Similar studies in Kenya [11] and Ethiopia [12] also showed that 95.7% and 75% of urban households were food insecure respectively. A national food security survey by Ethiopian Public Health Institute using HFIAS reported that 35% of households in Ethiopia were food-insecure [13]. Magnitude of food insecurity among Volunteer AIDS Caregivers in

Addis Ababa in 2009 was about 81% [14].

Ethiopian women are suffering from both under nutrition and over nutrition while the magnitude of under nutrition is still overriding. Based on the 2011 Ethiopian Demographic and Health Survey report, about 27% of women in Ethiopia and 14.4% women in Addis Ababa were found to be underweight (BMI less than 18.5). On the other hand, around 15.8% and 4% of women in Addis Ababa were overweight and obese respectively [15].

The relationship between household food insecurity and nutritional status is still complex. While food insecurity is expected to be a marker of underweight, different studies showed that it can also contribute to the condition of being overweight mainly because poorer households resort to cheaper high calorie and less diverse foods. Most studies showed food insecurity as a trigger of underweight in low income countries but as a trigger of overweight in high income countries [16]. Studies from Kenya and Colombia showed that households with severe hunger were more likely to be underweight than those from food-secure households [11, 17]. Another study among Ecuadorian Low-Income Urban Women also showed that household food insecurity is associated with under nutrition than over nutrition [18].

In developing countries, not only low food access score but also low dietary diversity score is also associated with under nutrition. Studies in Sri Lanka, Brazil and Tanzania suggest that high dietary diversity is associated with obesity and overweight [19, 20, 21]. On the other hand, studies from middle and high income countries like Australia and USA found that the risk of obesity is much higher among individuals from food insecure than food secured households [22-24]. Similarly study in Iran shown that central obesity is more likely in severely food insecure households of Tehran City while moderate food insecurity was negatively associated with over-weight in women [25]. Similarly, studies from Paris, USA and California also shown that, household food insecurity is significantly associated with over nutrition than under nutrition among women population [26-28].

It is expected that food insecure women are less likely to consume more food groups because of their low potential to afford for diverse foods. This idea is supported with different studies in low and middle income countries [18, 29].

Generally, the increasing urban poverty, soaring food price and fast population growth are emerging challenges of access to food and balanced diet in the urban setting. This will especially hurt women's nutritional status as they bear the brunt of household food insecurity. Ethiopia is one of the fast growing nations in Africa driving its urban population to a potential of nutrition transition. Therefore, it is found relevant to assess the food security status of such low income but fast growing urban population. This study is, therefore, conducted to answer questions like: How is the food security and dietary diversity status of urban households? What is the nutritional status of women in such metropolitan population of low income country? Is food insecurity a trigger of women's under nutrition or over nutrition in Ethiopian urban setting?

2. Methodology

2.1. Study Area and Period

The study was conducted in Addis Ababa, the capital city of Ethiopia, from January to February 2012. According to projections for 2012, the city had about 3.04 million populations, 662,728 households organized into 10 administrative sub-cities and 116 districts with average household size of 4.1 persons per household [30]. There is a high rate of unemployment (31%) and a large concentration of slum dwellings (over 80%) in the city [31].

2.2. Study Design

A community based cross-sectional study design using quantitative research method was applied.

Sample size determination: A sample of 550 households was surveyed with the following assumptions; prevalence ("p") of household food insecurity 35% [13], 95% confidence level, 5% margin of error, 5% upward adjustment for possible non-response and a design effect of 1.5. This sample was distributed across the three selected sub-cities proportional to their household size [30].

Sampling technique: First, ten administrative sub-cities were stratified into three groups based on socio-economic status. Second, based on the score given in each stratum as least, medium and most developed, one sub-city was selected from each stratum. Third, one district was selected from each sub-city using simple random sampling. Finally, based on the list of households available in the district, sampled households were selected using systematic sampling technique and only the housewife or head of the household was included if more than one eligible women are available in a household.

3. Data Collection Methods and Quality Assurance

A questionnaire based interview was conducted with one caregiver of the family (preferably mothers). The list of 12 food groups recommended by FANTA was believed to be suitable for the Ethiopian feeding practice under different studies [14, 32]. Furthermore, in order to confirm that these 12 food groups address the feeding practice of Addis Ababa community and to identify the different food items under these food groups, focus group discussions were made with women in the city. Data were collected from the interviewees by 'Yes' or 'No' questions to each food group whether they consumed or prepared in their home in the last 24 hours [7, 10]. Foods prepared and consumed outside home were not considered.

Household food access was determined using standardized set of questions derived from version 3 of the Household Food Insecurity Access Scale measurement guide (6). Women's Weight and Height were measured using standardized weight measuring scale and height measuring board to calculate the Body Mass Index, which is defined as

the weight in kilograms divided by the square of the height in meters (kg/m²) [33].

The questionnaire was first developed in English, and then translated into Amharic language with back translation to English for consistency. After pretesting in 30 households, adjustments were made on usage of locally appropriate terms recommended by respondents without losing their precision. Six data collectors were recruited and trained for a day on interview techniques and weight and height measurements. The principal investigator supervised all activities during the data collection and data completeness and cleanliness were checked daily.

Data Processing and Analysis: After checking all questionnaires for completeness, data were entered to pre-formed Epi-info template and cleaned using frequencies and cross tabulations. Then, the data-set was exported to SPSS version 16 for final analysis. Statistical tests were using Odds Ratio with 0.05 level of significant and 95% confidence interval.

Ethical Considerations: ethical clearance was obtained from School of Public Health, College of Health Science-Addis Ababa University-Institutional Review Board. According to the research ethical review protocol of the university, oral informed consent was obtained from each participant. Additional support letter from Addis Ababa City Administration was disseminated to all study districts.

4. Results

4.1. Socio-demographic and Economic Characteristics of Respondents

A total of 550 households participated and out of which 218 (39.6%) were female headed, and 418 (76.0%) were Orthodox. The mean age of household head was 45 years. The average family size was 5 with minimum and maximum size of 1 and 15 respectively. According to the respondents, 146 (26.5%), household heads were uneducated while 114 (20.7%) were unemployed. About 21% of the household heads were unemployed, only 24.4% households had their own private house. The median per capita income for this sample was 0.47 US dollar per day. All households got their food from the market and 64.7% spent more than half of their consumption expenditure on food which is an indication of vulnerability for food insecurity. Detail information of this socio-economic data is shown in *table 1*.

Table 1. Socio demographic and economic characteristics of the study participants Addis Ababa, February, 2012 (n=550).

Variables	Frequency (n=550)	Percent
Sex of household head		
Male	332	60.4
Female	218	39.6
Age of household head*		
18-24	17	3.1
25-44	259	47.1
45-64	195	35.5

Variables	Frequency (n=550)	Percent
65+	79	14.4
Family size		
1-4	228	41.5
5-8	276	50.2
9	46	8.3
Education of household head		
Uneducated	146	26.5
Primary school	176	32.0
Secondary school	127	23.1
Diploma & above	101	18.4
Occupation of household head		
Unemployed	114	20.7
Merchant	48	8.7
Government employed	91	16.5
NGO employed	86	15.6
Self employed	94	17.1
Daily wage	52	9.5
Pension	65	11.8
Housing ownership		
Private	134	24.4
Kebele	217	39.5
Private rent	147	26.7
Gift**	32	5.8
Government rental Housing	20	3.6
Average monthly income (n=430†)		
<600 Birr	114	26.5
600-2000 Birr	235	54.7
>2000 Birr	81	18.8
Food share of expenditure (n=471†)		
<50%	166	35.2
50-75%	228	48.4
>75%	77	16.3

*- UN age classification for household earning and employment activities

**-. Gifted houses are those given from relatives, NGOs and government for peoples' shelter.

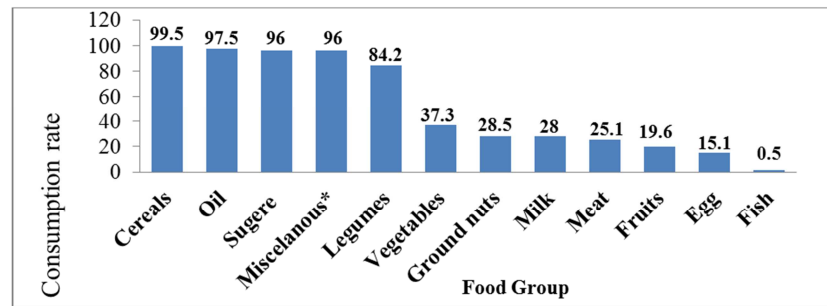
†-due to incomplete response

4.2. Households' Food Access

Overall, 412 (74.9) households were found to have high food insecurity access score (food-insecure) out of which 128 (23.3%) were severely food-insecure (in the state of hunger) while 113 (20.5%) and 171 (31.1%) were categorized as mild and moderate food insecure respectively.

4.3. Households' Dietary Diversity

The mean Dietary Diversity score of households was 6.3 + 1.7. Using this mean score households were categorized into low, medium and high diversity score. Accordingly, 224 (40.7%) households have consumed 5 or less food groups (poor dietary diversity) while 326 (59.3%) have consumed 6 or more food groups (high dietary diversity). Cereals (99.5%), sugar (96%) and miscellaneous foods like tea and coffee (96%) were most commonly consumed food groups. On the other hand, fish (0.5%), egg (15.0%) and fruits (19.6%) were the least consumed food groups. Dietary diversity of households is shown in *figure 1*.



*Miscellaneous refers to any condiment foods like tea, coffee or anything that is used to flavour food.

Figure 1. Households' Consumption rate of different food groups, Addis Ababa, February 2012 (n=550).

4.4. Women's Nutritional Status

Women have mean (standard deviation) height and weight of 1.56 (0.06) cm and 55.8 (10.4) Kg respectively and the mean BMI (SD) was of 22.9 (4.0). About 12.9% of women were underweight (BMI<18Kg/m²), 20.9% were overweight (BMI=25-29.9Kg/m²) and 5.8% were obese (BMI>30Kg/m²) and 4.2% of women are stunted (height less than 145 cm). Nutritional status of women is shown in figure 2.

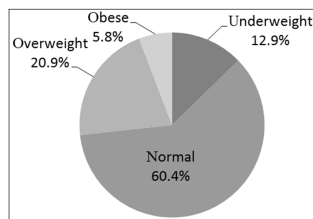


Figure 2. Classification of Women's Nutritional status using BMI, Addis Ababa, February 2012 (number are given in percentage (n=550)).

4.5. Relationship Between Household Food Access, Dietary Diversity and BMI

In this study, the effect of dietary diversity and house hold food access on women's nutritional status was assessed. Using bivariate and multivariate binary logistic regression, only dietary diversity was found to be significantly associated with women's nutritional status. Women with higher dietary diversity were more likely to be overweight than those in the lower diversity score (AOR=2.1, 95% CI=1.4-3.3). Women's BMI increased with increasing HDDS and there is significant positive correlation between women's BMI and HDDS (r=0.1, p=0.02). But, here is no significant association between women's nutritional status and households' food access. Regression analysis of HDDS, HFIAS and BMI is shown in Table 2.

Table 2. Association of women's nutritional status with household Food Access and Household Dietary Diversity, Addis Ababa, February 2012.

Variables	Underweight [Frequency (%)]		AOR (95% CI)	Overweight [Frequency (%)]		AOR (95% CI)
	Yes	No		Yes	No	
HFIAS Score						
Food-secure	19 (13.8)	119 (86.2)	1.00	37 (26.8)	101 (73.2)	1.00
Food-Insecure	51 (12.4)	361 (87.6)	0.9 (0.5-1.6)	110 (26.7)	302 (73.3)	0.99 (0.6-1.5)
HDDS						
Low DDS	37 (16.5)	187 (83.5)	1.00	42 (18.8)	182 (81.2)	1.00
Medium DDS	11 (10.0)	99 (90)	0.6 (0.3-1.1)	34 (30.9)	76 (69.1)	1.9 (1.1-3.1)*
High DDS	22 (10.2)	194 (89.8)	0.6 (0.3-1.0)	71 (32.9)	145 (67.1)	2.1 (1.4-3.3)*

HFS=Household food security, AOR= Adjusted Odds Ratio, HDDS=Household Dietary Diversity Score, *= Significance at p value<0.05.

4.6. Consumption Rate of Specific Food Groups and Women's Nutritional Status

Consumption of cereals, the staple foods of most Ethiopians, didn't vary with household food access or women's nutritional status. However, consumption of other foods such as fruits and vegetables, and all animal products increased with increasing women's BMI and household food access score. Overweight women have consumed more fruits, meat, egg and milk compared to underweight women. Overweight women were 2 times more likely to consume milk (AOR=2.05 p=0.045) and 2.5 times more likely to

consume vegetables (AOR= 2.5, P=0.004) than underweight women.

Fruits and meat were consumed by 42% and 44.9% of food-secure households compared to 6.2% and 10.2% of food-insecure households respectively. Similarly, 27.5%, and 54.3% of food secured households consumed egg and milk compared to 4.7% and 10.2% of severely food-insecure households respectively. Households in the severe food insecurity category were significantly less likely to consume fruits, meat and milk. The consumption pattern of different food groups is shown in Table 3.

Table 3. Consumption rate of specific food groups according to household food security and women's nutritional status, Addis Ababa, February 2012.

HFS & BMI	Percentage of Households consuming selected food groups								
HH Food Access	Cereals	Vegetable	Fruits	G. nut	Meat	Egg	Milk	Oil	Sugar
Food secure	98.6	55.1	42.0	50.0	44.9	27.5	54.3	100	99.3
Mild FI	100.0	38.1	19.5	26.5	27.4	18.6	28.3	100	98.2
Moderate FI	100.0	31.6	11.7	21.1	18.7	10.5	19.9	98.2	97.7
Severe FI	99.2	25.0	6.2	17.2	10.2	4.7	10.2	91.4	88.3
Women's BMI									
Underweight	100.0	27.1	15.7	21.4	21.4	10.0	20.0	98.6	91.4
Normal	99.1	35.4	20.1	29.1	24.0	15.0	27.9	97.3	96.1
Overweight	100.0	48.7	22.6	31.3	29.6	18.3	33.9	96.5	98.3
Obese	100.0	37.5	12.5	28.1	28.1	15.6	25.0	100.0	96.9

FI= food insecure

5. Discussion

The present study provides information about the food security status of households and women's nutritional status in Addis Ababa. The study revealed that around three households out of four have no access to adequate food (are food-insecure). The mean HDDS of 6.3 food groups in this study is comparable with results from studies done in Ethiopia [14, 33], Kenya [11], Tanzania [19], and Sri Lanka [21]. Despite the average consumption of food groups, households are not consuming more diverse foods such as fruits, vegetables, milk, meat, egg, and fish which are considered to be essential components of the healthy balanced diet. This indicated that urban people are at higher risk of developing malnutrition especially to with micronutrient and protein deficiencies.

The magnitude of underweight and overweight respectively in this study are similar with findings of demographic and Health Survey (DHS) 2011 for Addis Ababa [15]. However, the proportions of overweight and obesity are slightly higher than the DHS findings. This indicates the presence of both underweight and overweight and possibly increment of overweight and obesity over time. This double burden of malnutrition indicates the potential nutrition transition period of the urban population.

This study showed that nutritional status of women was significantly associated with dietary diversity of households but not with household food access. Women with higher BMI were more likely to be from households with high dietary diversity scores. This is consistent with studies from developing countries [5, 11, 17, and 18]. These findings suggest that low household dietary diversity in developing countries is still associated with under nutrition than with over nutrition. The absence of significant relationship between women's BMI and household food access can be explained by the fact that data on food access were collected only for four weeks period and variation in the availability of food within such a narrow period may not determine nutritional status of women. Additionally, household food accessibility may not always reflect food utilization by household members because food utilization is associated with other factors like gender, access to safe water and sanitation.

The association between HDDS and HFIAS is similar to studies done in Addis Ababa [14], West Africa [5], Kenya [11], and Mozambique [34]. The study reaffirmed the established links between better households' access to food and consumption of variety and high quality foods indicating both methods can be used to measure household food security status separately or in combination.

This study provides timely information for researchers and policy makers working to improve food security situation and nutritional status of urban residents. As I applied probability sampling method representing sub-cities with different levels of development, this research provides scientifically sound and valid results. Despite the effort to decrease social desirability bias, responses could be affected by expectations of getting some form of food aid.

6. Conclusions and Recommendations

The majority of households in Addis Ababa were found to have high food insecurity access score (food-insecure by access) and there is poor consumption of fruits, vegetables and animal products which may put household members at higher risk of under nutrition. A high percentage of women are underweight while the problem of overweight and obese is also substantial indicating the double burden of malnutrition in the city. It was found that Households' dietary diversity was more sensitive than food access in determining individual nutritional status and low dietary diversity was associated with underweight but not with overweight and obesity.

Overall, from this study I can learn that despite the fast economic growth and nutrition transition in low income countries like Ethiopia, many households are food insecure and this food insecurity as measured by low dietary diversity score in metropolitan areas of low income countries like Ethiopia is still associated with under nutrition than over nutrition. The nutrition transition is also bringing the population in to double burden of malnutrition.

The findings of this study indicate the need to do more comprehensive assessment to determine the full extent and severity of the problem of food insecurity on nutritional status of target population groups like women and children. Like what has been done in rural part of Ethiopia, there is a

need to nutritional intervention programs that enables easy access to basic food supplies by poor urban households. Interventions should also focus on both dimensions of malnutrition to combat the double burden of malnutrition. Further longitudinal and comparative studies are recommended to measure food security and nutritional status at individual level, at different seasons incorporating all proxy indicators of food security and analysis of their factors like market and infrastructures.

Authors' Contributions

The sole author had responsibility for all parts of the manuscript.

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Competing Interest

The author, Mr. Tesfay Birhane, confirms that there is no competing of interest.

Abbreviations

AOR = Adjusted Odds Ratio, BMI = Body Mass Index, HDDS = Household Dietary Diversity, HFIAS = Household Food Insecurity Access Score.

References

- [1] Food and Agriculture Organization of the United Nations. Rome declaration on world food security and World Food Summit plan of action. World Food Summit; Rome, Italy; November 1–17, 1996.
- [2] USAID Policy Determination, Definition of Food Security, April 13, 1992
- [3] Bickel G, Nord M, Price C, Hamilton W, Cook J: Guide to Measuring Household Food Security Revised 2000. U.S. Department of Agriculture, Food and Nutrition Service, VA. Alexandria March, 2000.
- [4] Andre M. N. Renzaho, Ph. D. and David Mellor, Ph.D. Food security measurement in cultural pluralism: Missing the point or conceptual misunderstanding? *Nutrition* 26 (2010) 1–9.
- [5] Becquey E, Bambara A, Dembe'le' B, Delpeuch F, Martin-Prevel Y, Traissac P: The Household Food Insecurity Access Scale and an Index-Member Dietary Diversity Score Contribute Valid and Complementary Information on Household Food Insecurity in an Urban West-African Setting, *The American Journal of Nutrition*. First published October 20, 2010 as doi: 10.3945/jn.110.125716.
- [6] Coates J, Swindale A, Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide VERSION 3, Washington DC: Food And Nutrition Technical Assistance Project (FANTA), Academy for Educational Development, August 2007. Available at <http://www.fantaproject.org/publications/hfias.shtml>.
- [7] United Nations System Standing Committee on Nutrition: Task Force on Assessment, Monitoring, And Evaluation: Fact Sheets on Food and Nutrition Security Indicators/Measures: Dietary Diversity.
- [8] Kennedy G. Ballard T. and Dop MC. Guidelines for Measuring Household and Individual Dietary Diversity. Nutrition and Consumer Protection Division, Food and Agriculture Organization of the United Nations, FAO 2010.
- [9] Hoddinott, John and Yisehac Yohannes. Dietary Diversity as a Household Food Security Indicator. Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington, D.C. 2002.
- [10] Swindale, Anne, and Paula Bilinsky. 2006. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v.2). Washington, D.C.: FHI 360/FANTA.
- [11] Keino S, Plasqui G, and Borne BVD Household food insecurity access: a predictor of overweight and underweight among Kenyan women. *Agriculture & Food Security* 2014 3: 2.
- [12] Birhane et al.: Urban food insecurity in the context of high food prices: a community based cross sectional study in Addis Ababa, Ethiopia. *BMC Public Health* 2014, 14: 680.
- [13] Ethiopian Health and Nutrition Research Institute (EHNRI): Nutrition baseline survey report for the National Nutrition Program of Ethiopia, 2009/10, Addis Ababa, Ethiopia.
- [14] Kenneth C. Maes, Craig Hadley, Fikru Tesfaye, Selamawit Shifferaw, and Yihenew Alemu Tesfaye. Food Insecurity among Volunteer AIDS Caregivers in Addis Ababa, Ethiopia Was Highly Prevalent but Buffered from the 2008 Food Crisis" *J. Nutr.* September 2009. vol. 139 no. 9 1758-1764.
- [15] Ethiopia Demographic and Health Survey (EDHS) 2011. Central Statistical Agency Addis Ababa, Ethiopia Calverton, Maryland, USA: and ICF International, March 2012.
- [16] Ghattas, H. Food security and nutrition in the context of the nutrition transition. Technical Paper. FAO, Rome. 2014 (available at <http://www.fao.org/economic/ess/ess-fs/voices/en/>)
- [17] Isanaka S, Mora-Plazas M, Lopez-Arana S, Baylin A, and Villamor E: Food Insecurity is highly prevalent and predicts Underweight but Not Overweight in Adults and School Children from Bogotá, Colombia: *American Journal of Nutrition* 2007, American Society for Nutrition.
- [18] Weigel MM, Armijos RX, Racines M, and Cevallos W: Food Insecurity Is associated with under nutrition but Not Over nutrition in Ecuadorian Women from Low-Income Urban Neighborhoods. Hindawi Publishing Corporation, *Journal of Environmental and Public Health* Volume 2016, doi.org/10.1155/2016/8149459.

- [19] Jayawardena et al.: High dietary diversity is associated with obesity in Sri Lankan adults: an evaluation of three dietary scores. *BMC Public Health* 2013 13: 314.
- [20] Bezerra and Sichieri: Household food diversity and nutritional status among adults in Brazil. *International Journal of Behavioral Nutrition and Physical Activity* 2011 8: 22.
- [21] Keding GB, Msuya JM, Maass BL, Krawinkel MB. Obesity as a public health problem among adult women in rural Tanzania. *Glob Health Sci Pract.* 2013; 1 (3): 359-371. <http://dx.doi.org/10.9745/GHSP-D-13-00082>.
- [22] Burns C: The link between poverty, food insecurity and obesity with specific reference to Australia: Centre for Physical Activity and Nutrition Research, School of Exercise and Nutrition Sciences, Deakin University, Literature Review, April 2004.
- [23] Basiotis, P, and Lino, M. (2002): Food insufficiency and prevalence of overweight among adult women: *Nutrition Insight* 26. Alexandria, VA: U.S. Department of Agriculture, Center for Nutrition Policy and Promotion.
- [24] Gooding H C. Walls E C. Richmond KT. Food insecurity and increased BMI in young adult women. *National Institute of Health Obesity* (Silver Spring). 2012 September; 20 (9): 1896–1901. doi: 10.1038/oby.2011.233.
- [25] Mohammadi et al.: Is Household Food Insecurity Associated with Overweight/Obesity in Women? *Iranian J Publ. Health*, Vol. 42, No. 4, Apr 2013, pp. 380-390 Available at: <http://ijph.tums.ac.ir>
- [26] Martin-Fernandez et al.: Food Insecurity, a Determinant of Obesity? – an Analysis from a Population-Based Survey in the Paris Metropolitan Area, 2010 DOI: 10.1159/000362343
- [27] Liping Pan et al: Food Insecurity Is Associated with Obesity among US Adults in 12 States.
- [28] Elizabeth J. Adams, EJ, Grummer-Strawn L, and Chavez G: Food Insecurity Is Associated with Increased Risk of Obesity in California Women *J. Nutr.* 133: 1070–1074, 2003.
- [29] Mohamadpour M, Mohd Sharif Z, Avakh K. M: Food Insecurity, Health and Nutritional Status among Sample of Palm-plantation Households in Malaysia *J HEALTH POPUL NUTR* 2012 Sep; 30 (3): 291-302.
- [30] Central Statistical Agency (Ethiopia), Government of Ethiopia, United Nations Population Fund (UNFPA), United Nations Development Programme (UNDP). Ethiopia Population and Housing Census 2007. Addis Ababa, Ethiopia: Central Statistical Agency (Ethiopia). Summary and statistical report, December 2008, Addis Ababa.
- [31] Addis Ababa Urban Profile: United Nations Human Settlements Programme Regional and Technical Cooperation Division: United Nations Human Settlements Programme (UN-HABITAT), 2008. Nairobi, Kenya, available at: <http://www.unhabitat.org> downloaded on December 11, 2011.
- [32] Seifu A. Shiferaw S. Impact of Food and Nutrition Security on Adherence to Anti-Retroviral Therapy (ART) and Treatment Outcomes among Adult PLWHA in Dire Dawa Provisional Administration, Addis Ababa University, Faculty of Medicine, Department of Community Health, Master thesis, June 2007.
- [33] World Health Organization. Obesity and overweight. Fact sheet Number 311. September 2006. Accessed on 23 November 2015.
- [34] Selvester K, Fidalgo L, Ballard T, Kennedy G, Mistura L, Deitchler M. Report on use of the Household Food Insecurity Access Scale and Household Dietary Diversity Score in two survey rounds in Manica and Sofala Provinces, Mozambique, 2006-2007. FAO food security project GCP/MOZ/079/BEL. Version 2, FAO, May 2008.