Coexistence of Obesity and Anemia in older Mexican Adults: A common challenge among the poor

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1. Background

Aging in Latin America is occurring much faster compared to other regions in the developing world (Wong R & Palloni A, 2009). Furthermore, birth cohorts reaching age 60 and older in Latin America after 1990 are unique in that they are largely the product of medical interventions in the absence of significant improvements in standards of living. Compared to developed countries, most countries in Latin America (LA) are still undergoing a demographic transition with aging occurring in a compressed period of time, while challenges of significant population sub-groups, such as limited access to healthcare, malnutrition, and low income still need resolution (Palloni, Pinto-Aguirre, & Pelaez, 2002). Malnutrition affects a large number of older adults and includes a variety of disorders: undernutrition, nutrient imbalances and obesity. Both obesity and anemia are caused by malnutrition and increase the risk of disability and mortality among older adults (Al Snih et al., 2007; Eisenstaedt, Penninx, & Woodman, 2006; Izaks, Westendorp, & Knook, 1999). The coexistence of obesity an anemia illustrates the "double burden" of health that developing countries like Mexico are likely to face as the epidemiological and demographic transition proceeds(Frenk, 2006).

Obesity is a growing phenomenon worldwide. Once considered highly prevalent only in high income countries, overweight and obesity are now dramatically increasing in developing countries as well. This is a considerable concern for well being of the population given that overweight and obese people are at increased risk for comorbidities, functional decline, impaired quality of life, increased use of health care resources, and mortality (Ledikwe et al., 2003). There is now high prevalence of overweight and obesity in Mexico where about 20% of men and 35% of women over 60 years of age are obese (Shamah-Levy et al., 2008). Similarly, in the United States the prevalence was reported at 33% for men and 35% for women of the same age group (Ogden CL, Carroll MG, McDowell MA, & Flegal KM, 2007). Many countries in Latin America and the Caribbean report much lower rates of obesity compared to Mexico (WHO, 2006).

Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population (WHO, 2002). The current World Health Organization (WHO) definition identifies women with hemoglobin concentration of <12 g/dL and men with <13 g/dL as anemic(WHO, 2008). This definition is commonly used in epidemiological studies. Some Mexican subgroups are exposed to anemia since childhood and the prevalence of anemia increases with age (Izaks et al., 1999). However, we focus on anemia during old age because it is associated with a wide range of complications including increased risk for mortality, cardiovascular disease, cognitive dysfunction, longer hospitalization after elective procedures, reduced bone density, falls, and fractures (Eisenstaedt et al., 2006).

There is little information available on the overlap between obesity and anemia in older adults. Older adults in countries in transition like Mexico may be at risk for higher rates of obesity and anemia, due to increased rates of poverty and limited access to both preventive and curative health resources and the coexistence of infectious and chronic conditions. It has been suggested that socioeconomic status (SES) and demographic characteristics play an important

role in the development of both anemia and obesity (Garry, Goodwin, & Hunt, 1983; Grafova, Freedman, Kumar, & Rogowski, 2008; Todhunter & Darby, 1978; Wang, Kim, Gonzalez, MacLeod, & Winkleby, 2007). It is therefore crucial to identify the characteristics of older Mexican adults with anemia, obesity or both. It is also necessary to study and determine if elderly individuals with both anemia and obesity have unique traits that can help identify this particularly vulnerable group. This information can help design public health initiatives for older Mexicans as well as increase understanding of the phenomenon among sub-groups that are aging rapidly in other countries. This paper examines the prevalence of anemia and obesity using a national sample of older adults aged 60 and older. We provide evidence that the presence of anemia, obesity, and both conditions, varies by socioeconomic characteristics and health risk factors. We perform univariate and multivariate estimations to identify covariates that document the importance of malnutrition. We conclude highlighting the role of anemia within a worldwide epidemic of obesity as aging continues to advance in developing countries such as Mexico.

2. Data and Methods

Data

We use data from the Mexican National Health and Nutrition Survey (ENSANut 2006). The ENSANut 2006 is representative of all urban and rural areas of the country. Of the population 60 years and older, 25.8% lives in rural areas, 27.7% in urban areas, and 46.5% in metropolitan areas. We used sampling weights to make the sample representative of the Mexican population. A total of 45,241 adults (20 years and older) were interviewed during the study. From a total of 5,927 older adults aged 60 and older, we selected a total of 5,605 (Mean 70.3 years, SD 7.8) with valid values for Body Mass Index and Hemoglobin. Most of the older adults are married (64.2%), 25% are widowed, 5% are divorced or separated, and only 5.8% never married.

Socioeconomic measures

We construct a categorical variable for education. The variable consists of three categories computed from the continuous variable that measured years of education. A large portion of the population has low levels of education (mean 3.6 and SD 4.07); 63% of the population has fewer than 3 years of education, 24% has between 4 and 6 years of education and only 13% has more than 7 years of education.

Since 50% of the older adult population does not receive income from salaries, benefits or public transfers income is not a reliable measure of economic well-being (Wong & Espinoza Higgins, 2003). We used an alternative measure using principal components analysis (PCA) to construct an asset-based wealth index (United Nations, 2005).To perform the PCA we integrated a mix of asset based variables – such as ownership of homes, vehicles, and appliances – and dwelling characteristics. We used a total of 28 variables and obtained eight factors with an eigenvalue greater than one.

Anemia and obesity

To measure anemia and obesity we establish valid values of Body Mass Index (BMI) and Hemoglobin (Hb). Hemoglobin was measured in (g/dl) (mean 14.5, SD 3.1). We use the World Health Organization (WHO) cut-off points for anemia (WHO, 2008). Hemoglobin values within 3 standard deviations (SD) of the mean are used for the analysis. The prevalence of anemia for adults 60 years and older is 12.9%. Body Mass Index (BMI), defined as the total weight in kilograms divided by the square of height in meters, is used based on the WHO cut-off points to

construct underweight (<18.5), normal weight (18.5-24.99), overweight (25-29.99), and obese categories (≥30) for both males and females (WHO, 2006). We also consider a valid range for BMI values using a statistical approach of three standard deviations under and above the sample mean (mean 27.4, SD 4.8). The prevalence of obesity in adults 60 years and older is 27.6% and 40.4% of the population is overweight.

We categorized the coexistence of anemia and obesity as follows: *anemic and obese*, *anemic and non-obese*, *non-anemic and obese*, and *non-anemic and non-obese*. We used this last category as the reference category in multivariate analyses.

Other health Conditions

We also used an index for the number of self-reported health conditions. Subjects were asked "Has a doctor ever told you…?". The conditions included were diabetes, hypertension, cardiovascular diseases, and stroke.

Additionally, we considered current status of alcohol consumption and smoking to include the added effect of health behaviors. To analyze high risk alcohol consumption, we constructed a dichotomous variable when the subject reported more than 3 drinks per day, 7 drinks per week, or 28 drinks per month. Smoking is used as a dichotomous variable for subjects reporting currently smoking.

3. Preliminary Results

Table 1 shows the results of the chi-square test used to establish the relationship between anemia and obesity. The results indicate the relationship between the four categories created and determined the difference among them. Almost twenty eight percent of subjects had obesity and 13% had anemia. The prevalence of both obesity and anemia was three percent. However, among obese 9.4% have anemia, while 20% of anemic have obesity.

Table 2 shows the sample characteristic by each of the four categories of anemia and obesity (*anemic and obese*, *anemic and non-obese*, *non-anemic and obese*, and *non-anemic and non-obese*.) Among the obese and anemic categories statistically significant differences are observed by age, education, area of residence, health conditions, and smoking. Conversely, there were no significant differences by marital status and high risk drinking.

Among the obese and anemic, we found a higher proportion of younger subjects and a lower proportion of less educated. Additionally, we found among this group a higher proportion of diabetes and heart diseases. A higher proportion of anemic were rural residents and reported higher rates of stroke. Obese subjects reported the highest proportion of hypertension regardless of their anemia status.

Our preliminary findings suggest there are important differences in the four obese and anemic categories with respect their socioeconomic characteristics and health risk factors. Further analysis will aim to determine the multivariate associations.

4. References

Al Snih, S., Ottenbacher, K. J., Markides, K. S., Kuo, Y. F., Eschbach, K., & Goodwin, J. S. (2007). The effect of obesity on disability vs mortality in older Americans. *Archives of Internal Medicine, 167,* 774-780.

Eisenstaedt, R., Penninx, B. W., & Woodman, R. C. (2006). Anemia in the elderly: current understanding and emerging concepts. *Blood Reviews, 20,* 213-226.

Frenk, J. (2006). Bridging the divide: global lessons from evidence-based health policy in Mexico. *Lancet, 368,* 954-961.

Garry, P. J., Goodwin, J. S., & Hunt, W. C. (1983). Iron status and anemia in the elderly: new findings and a review of previous studies. *J Am.Geriatr.Soc, 31,* 389-399.

Grafova, I. B., Freedman, V. A., Kumar, R., & Rogowski, J. (2008). Neighborhoods and obesity in later life. *Am.J Public Health, 98,* 2065-2071.

Izaks, G. J., Westendorp, R. G., & Knook, D. L. (1999). The definition of anemia in older persons. *JAMA, 281,* 1714-1717.

Ledikwe, J. H., Smiciklas-Wright, H., Mitchell, D. C., Jensen, G. L., Friedmann, J. M., & Still, C. D. (2003). Nutritional risk assessment and obesity in rural older adults: a sex difference. *Am.J Clin.Nutr., 77,* 551-558.

Ogden CL, Carroll MG, McDowell MA, & Flegal KM (2007). Obesity Among Adults in the United States - No Statistically Significant Change Since 2003-2004. NCHS [Electronic version].

Palloni, A., Pinto-Aguirre, G., & Pelaez, M. (2002). Demographic and health conditions of ageing in Latin America and the Caribbean. *International Journal of Epidemiology, 31,* 762-771.

Shamah-Levy, T., Cuevas-Nasu, L., Mundo-Rosas, V., Morales-Ruan, C., Cervantes-Turrubiates, L., & Villalpando-Hernandez, S. (2008). [Health and nutrition status of older adults in Mexico: results of a national probabilistic survey]. *Salud Publica de Mexico, 50,* 383-389.

Todhunter, E. N. & Darby, W. J. (1978). Guidelines for maintaining adequate nutrition in old age. *Geriatrics, 33,* 49-6.

United Nations (2005). *Household Sample Surveys in Developing and Transition Countries.* (Series F No. 96 ed.) New York: Department of Economic and Social Affairs, Statistics Division, Studies in Methods.

Wang, M. C., Kim, S., Gonzalez, A. A., MacLeod, K. E., & Winkleby, M. A. (2007). Socioeconomic and food-related physical characteristics of the neighbourhood environment are associated with body mass index. *J Epidemiol.Community Health, 61,* 491-498.

WHO (2002). *The World Health Report 2002: Reducing risks, promoting healthy life* WHO press.

WHO (2006). Global Databse on Body Mass Index. World Health Organization [Electronic version]. Available: http://apps.who.int/bmi/index.jsp

WHO (2008). *Worldwide prevalence of anaemia 1993-2005* WHO press.

Wong R & Palloni A (2009). Aging in Mexico and Latin America. In Uhlenberg P (Ed.), *International Handbook of Population Aging* (pp. 231-252). Springer.

Wong, R. & Espinoza Higgins, M. (2003). Income and assets of the population of middle and old age in Mexico. *Papeles de Población, 37,* 129-166.

Table 1. Coexistence of anemia and obesity in Mexican older adults (weighted)			
	Obesity		
Anemia	Non Obese	Obese	Total
Non- Anemic	4,426,270	1,778,936	6,205,206
	71.3%	28.7%	100.0%
	85.7%	90.6%	87.1%
Anemic	737,479	184,952	922,431
	80.0%	20.1%	100.0%
	14.3%	9.4%	12.9%
Total	5,163,749	1,963,888	7,127,637
	72.5%	27.6%	100.0%
	100.0%	100.0%	100.0%

Table 2. Subject Characteritics by Group

	Obese		Non Obese	
	Anemic	Non Anemic	Anemic	Non Anemic
Sample Size (N)	184,952	1,778,936	737,479	4,426,270
	2.59%	24.96%	10.35%	62.10%
Age* (Mean, SD)	68.08 (6.33)	67.59 (6.48)	73.74 (8.53)	70.02 (7.72)
60-69	61.00%	66.09%	37.35%	52.87%
70-79	31.90%	28.42%	35.00%	32.84%
80+	7.10%	5.49%	27.64%	14.29%
Gender*				
Female	40.07%	30.05%	53.38%	49.72%
Education* (Mean, SD)	4.15 (4.09)	3.95 (3.86)	2.76 (3.55)	3.55 (4.20)
3 yrs or less	51.93%	56.38%	69.07%	64.62%
4 to 6 years	34.88%	29.73%	23.32%	21.14%
7 yrs +	13.19%	13.89%	7.61%	14.24%
Area of Residence*				
Rural	21.64%	18.02%	30.02%	28.38%
Urban and Metropolitan	78.36%	81.98%	69.98%	71.62%
Marital Status				
Married	62.79%	62.66%	59.51%	65.70%
Widowed	26.31%	25.99%	29.42%	23.77%
Single, Divorced	10.89%	11.35%	11.08%	10.53%
Conditions* (Mean, SD)	.91 (.98)	.85 (.82)	.65 (.83)	.60 (.76)
Diabetes*	25.97%	18.46%	20.40%	16.80%
Hypertension*	44.47%	46.68%	29.32%	30.42%
Heart Diseases*	20.33%	10.98%	9.68%	7.51%
Stroke	1.33%	0.70%	2.86%	1.50%
Risk Factors				
Current smokers*	2.80%	8.99%	12.20%	14.42%
High risk drinking	3.41%	6.36%	11.92%	9.63%

*p=0.000