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## Gender inequalities in coexistence of excess adiposity and iron deficiency at individual level and their socioeconomic patterning in a nutrition transition context in North Africa

Introduction: In the context of nutrition transition, the Middle East and North Africa region has experienced a dramatic rise in overweight and obesity, especially among women. At the same time, micronutrient deficiencies, like iron deficiency which women are also especially prone, persist. Thus, gender is considered as a major determinant of health inequalities. The aim of this study was then to assess gender inequality vis-à-vis this double burden of excess adiposity and iron deficiency. Sociodemographic patterning of these gender inequalities were also explored.

Methods: A cross-sectional study was carried out in the Greater Tunis region including the Tunisian capital city in 2009-2010. We analysed the sub-sample of 20-49 years old adults of both genders (women n=1689, men n=930) from a stratified, two-stage cluster sample of households. Overweight was defined by body mass index  $\ge$  25 kg/m<sup>2</sup> and obesity  $\ge$  30 kg/m<sup>2</sup> as recommended by World Health Organisation. Iron status was assessed using serum ferritin concentrations. Iron deficiency (ID) in adults was defined by C-reactive protein and orosomucoid corrected serum ferritin <15  $\mu$ g/L. The gender inequalities measures were women vs. men Relative Prevalence Ratios (RPR), assessed by multinomial logistic models, using the double burden of malnutrition in four categories as response variable. Their variation with sociodemographic characteristics were estimated by models featuring gender x covariate interactions. The type I error risk was set at 0.05 and 0.20 for interactions. Results: Gender inequality in excess adiposity was high (e.g. overweight: women 64-9% v. men 48-4%; RPR=2.0; 95% CI 1.5, 2.5) and even much higher for ID (women 27.4% v. men 10.1%; RPR =3.3; 95% CI 2.2, 5.1). The double burden of overweight and iron deficiency affected 17.2% of women v. 3.7% of men (RPR=8•6; 95% CI 5.3, 14.0). Gender inequalities in overweight adjusted for covariates, increased with age (p=0.0007) e.g. RPR=1.2 (95% IC 0.7, 2.0) for 20-29 years v. 2.7 (95% IC 1.7, 4.0) for 30-39 years v. 4.2 (95% IC 2.8, 6.5) for 40-49 years old but decreased with professional activity (p=0.0061). Adjusted women v. men inequality for ID were higher in rural area v. urban area (p=0.0102). We found that double burden of overweight and iron deficiency adjusted of all socioeconomic covariates was uniformly distributed. Conclusion:

In this context of nutrition transition, we found a large gender gap, detrimental to women, for this double burden of overweight and ID. This situation poses a new and serious public health challenge. In this respect, interventions should aim at, on the one hand, prevention of individual double burden with the difficulty of simultaneously addressing excess adiposity and iron deficiency. On the other hand women should be positively discriminated in terms of their specific needs.

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