Original article

ANALYSIS OF VARIABLES ASSOCIATED WITH OVERWEIGHT AND OBESITY IN ITALIAN WORKERS

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Summary

BACKGROUND: The present study aims to analyze variables related to overweight/obesity in an Italian workers population, with particular attention to shift work.

METHODS: This cross-sectional study analyzed the data retrieved from the "Aspects of daily life" survey, carried out by ISTAT in 2012.

RESULTS: 16,725 participants (aged 18-64) met inclusion criteria; 44.28% of workers were overweight or obese (56.36% of males vs 27.24% of females, p<0.001). According to the logistic regression analysis, female (OR 0.28, 95% CI 0.26-0.31) and highly educated workers (OR 0.70, 95% CI 0.65-0.75) showed less risk of being overweight/obese compared to male and less educated workers. Aging was associated with an elevated risk (those aged >64 yrs compared to younger colleagues: OR 4.02, 95% CI 2.91-5.58) as well as artisans compared to employees (OR 1.11, 95% CI 1.01-1.23) and shift-work compared to daytime-work (OR 1.14, 95% CI 1.03-1.26).

DISCUSSION: Our analysis in the Italian context is consistent with the existing knowledge, suggesting that overweight is significantly associated with shift work, even when controlling for important covariates, such as education, age, gender, civil status, BMI category.

Background

Nowadays, overweight and obesity represent very important issues, since the steady increase of their prevalence in western society (1). It is already well-known that excessive body weight accumulation involves an elevated risk for cardiovascular and metabolic diseases (2,3,4,5), for some types of cancer (6) and for all-cause mortality (7). Since obesity has a multi-factorial pathogenesis (environmental, genetic, behavioral factors and life-style involved), the research was focused on the role of the working activity in the development of this pathologic condition, or its worsening.

Indeed our modern society is now considered a "24 hours society", where daily work, usually defined by a 8 am – 5 pm schedule, is placed side by side with "non-

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conventional" ones, like shift works, characterized by night work schedule, so as to grant a 24 hours productivity.

Actually, European population involved in shift work is about 16%; in 2014 Eurostat estimated that approximately 18% of the Italian workforce were employed in shifts from 10 pm to 6 am (8,9).

In addition, for some job categories (such as Health Care Workers - HCW) the start of long-hours and night-shift working activity at a young age may be associated with a further stress load (10,11,12). In this context, shift-work is rising up, producing severe consequences on workers' health, due to life and diet behavior changes. Shift work has been related to disrupted sleep/wake cycle and chronic desynchronization between endogenous circadian rhythms and behavioral cycles, thereby leading to endocrine and metabolic alterations (such as hypertension, glucose intolerance and lipid profile imbalance) (13). A careful assessment of health and social implications related to this condition is required, so as to fix up adequate solutions to preserve collective, economic, social and psychophysical wellness (14).

The present study aims to investigate the association between shift-work and Body Mass Index (BMI) gain and to analyze variables related to overweight and obesity in a population of Italian workers.

Methods

This is a cross-sectional study, conducted by reviewing data from subjects participating to the national health survey "Aspects of daily life" carried out by the Italian National Institute of Statistics (ISTAT) for the year 2012, which aims at investigating people characteristics, behaviors and various aspects of daily life, e.g. family, housing, education, work, leisure, health, micro-crime, operation of public utilities. A description of sampling strategy has been summarized elsewhere (15). Each survey participant completed a self-administered questionnaire and had a face-to-face interview with ISTAT data collectors. The present edition gathered data on 47,609 individuals, representative in terms of age and gender of the Italian population. For the present study, a selection of people aging between 18 and 64 years was considered as representative of the Italian active population. Subsequently, those declaring to have been working during the previous week and to have been working as shift or as daytime worker were selected. Moreover, selected participants declared to have been in the same working position for at least 5 years at the time of the survey. The final sample included 16,725 individuals.

Socio-demographic factors and working condition

BMI was calculated from self-reported body weight and height derived from the survey. According to the WHO definition, people with a BMI below 25.0 kg/m2 were considered to have a healthy weight; those with a BMI between 25.0 and 29.9 kg/m2 were classified as overweight; and those with a BMI of 30 kg/m2 or higher were categorized as obese (16).

Data was also collected on gender (female, male), age (categorized as follows: <25, 25-44, 45-64, >64 years), civil status (single, married, separated, widow, divorced), education (classified as "low" if worker obtained only a primary and/or secondary school degree, as "high" if an higher education was gained). Level of Occupational Physical Activity (OPA) was categorized into "present" or "absent" (17).

Occupational data

All respondents were asked about their occupation, with particular interest in the type of contract, which was classified as: employee, entrepreneur (with at least one employee), freelance and artisan.

As a proxy for the identification of shift-workers, the variability of the everyday leaving-home time was considered.

Statistical analysis

Multivariable logistic regression models were built in order to assess variables associated with overweight and obesity in Italian workers. Explanatory variables were previously tested for their association with the outcome at bivariate analyses and then were included as independ-

ent variables in the multiple model, to adjust for their indirect effects. Associations between the various characteristics and overweight/obesity were expressed as odds ratios (ORs) and 95% confidence intervals (CIs). In particular, the model included the following variables: workers' sex (1=male, 2= female); age class (1= <25 years, 2= 25-54 years, 3= 45-64 years, 4=>64 years); civil status (1= single, 2= married, 3= separated, 4=widow, 5=divorced); BMI category (1= normal or underweight, 2= overweight/obese); type of working contract (1= permanent employee; 2= entrepre-

neur, 3=freelance, 4= artisan), being occupied in shift-work or not (yes, not), OPA (yes, not).

All analyses were conducted using the Stata software, version 9.0.

Results

As shown in Table 1, 16,725 people (aged 18-64 years) were included in the analysis. Overweight and obesity were present in 44.28% (n=7 406) of workers, with a difference between males (56.35%, n=5517) and females (27.24%, n=1889, p<0.001). Older age was associated with overweight and obe-

Table 1. Distribution of overweight/obesity and healthy weight in workers by selected socio-demographic and occupational characteristics.

	Healthy weight workers (n=9,319) n(%)	Overweight and obese workers (n=7,406) n(%)	p value
Gender			
Male	4,274(43.65)	5,517(56.35)	<0.001
Female	5,045(72.76)	1,889(27.24)	
Age class			
<25	608(78.45)	167(21.55)	
25-44	5,073(61.63)	3,158(38.37)	<0.001
45-64	3,531(47.57)	3,892(52.43)	
>64	107(36.15)	189(63.85)	
Civil Status			
Single	3,274(65.74)	1,706(34.26)	
Married	4,655(49.91)	4,672(50.09)	
Separated	935(56.94)	707(43.06)	<0.001
Widow	157(52.33)	143(47.67)	
Divorced	298(62.61)	178(37.39)	
Education			
Lower educated	3,396(47.80)	3,708(52.20)	<0.001
Higher educated	5,923(61.56)	3,698(38.44)	
Type of work			
Employed	6,456(58.21)	4,634(41.79)	
Entrepreneur	933(51.60)	875(48.40)	<0.001
Freelance	674(56.12)	527(43.88)	
Artisan	1,256(47.83)	1,370(52.17)	
Occupational Physical Activity			
no	7,202(57.81)	5,255(42.19)	<0.001
yes	2,117(49.60)	2,151(50.40)	
Shift work			
No	8,141(55.80)	6,449(44.20)	0.588
Yes	1,178(55.18)	957(44.82)	

sity, with frequencies of the phenomenon increasing from 21.55% (n=167) in the <25 years old group, up to 63.85% (n=189) in the >64 years old group. At bivariate analysis, education was clearly associated with obesity, with 52.20% of frequency of overweight and obesity in less educated workers. Moreover, being married (50.09%, n=4672) and working as artisan (52.17%, n=1370) resulted to be associated with overweight and obesity at bivariate analyses. Logistic regression analysis (Table 2) confirmed the importance of gender in overweight and obesity, with females showing 72% less risk with respect to males (OR 0.28, 95% CI 0.26-0.31), as well as the role played by the age (with workers aged >64 years having an OR 4.02, 95% CI, 2.91-5.58 when compared to younger colleagues). The importance of low educa-

tion as a factor associated with overweight and obesity was confirmed at multivariate analysis; in fact, highly educated workers showed 30% less risk of being overweight and obese with respect to less educated workers (OR 0.70, 95% CI 0.65-0.75). Moreover, being an artisan was revealed as a condition highly associated with overweight and obesity if compared to being employed (OR 1.11, 95% CI 1.01-1.23).

The effect of shift work and on BMI was revealed at multivariate analysis (OR 1.14, 95% CI 1.03-1.26), when adjusting for the covariates.

Discussion
Our analysis in the Italian context adds information to the existing knowledge, showing a high prevalence (44.28%) of

Table 2. Factors associated with overweight and obesity in workers, at logistic regression analysis.

	OR	95%CI	*p-value*
Gender			
Male	1		
Female	0.28	0.26-0.31	*<0.001*
Age class			
<25	1		
25-44	2.05	1.69-2.48	*<0.001*
45-64	3.19	2.61-3.90	*<0.001*
>64	4.02	2.91-5.58	*<0.001*
Civil Status			
Single	1		
Married	1.60	1.47-1.74	*<0.001*
Separated	1.37	1.20-1.55	*<0.001*
Widow	1.84	1.42-2.38	*<0.001*
Divorced	1.44	1.17-1.78	*0.001*
Education			
Lower educated	1		
Higher educated	0.70	0.65-0.75	*<0.001*
Type of work			
Employed	1		
Entrepreneur	1.05	0.94-1.17	*0.392*
Freelance	1.08	0.94-1.24	*0.255*
Artisan	1.11	1.01-1.23	*0.037*
Occupational physical activity			
No	1		
Yes	0.99	0.90-1.12	*0.990*
Shift work			
No	1		
Yes	1.14	1.03-1.26	*0.010*

overweight and obesity in workers and thus raising an issue of public health relevance: the identification of more risk statuses, behaviors and type of works is essential for planning and realizing correct preventive strategies.

First of all, discussion about not modifiable factors (gender and age) is mandatory. Data analysis shows that male workers have an independent risk to be overweight and obese with respect to females; this result remains unchanged also if other variables are considered. This data reflects the general Italian population situation: in fact the last Iss-Epicentro surveillance (18) reports comparable scores: 51% of overweight and obese among males, 33% among females (versus 56% in males and 27% in females in our sample) (19,20).

If we evaluate the role of age, it seems evident that older age is an independent risk factor for overweight and obesity. In fact, the prevalence of these conditions grows with the increase of age, with the minimal value in the <25 years old group (21.55%) and the maximum one in the >64 years group (63.85%). We may underline the effect of age on BMI, since previous studies analyzing the relationship between age and body fat reached contrasting conclusions, with a rise in body fat until early old age, followed then by a decrease with further aging (21).

An interesting data is about civil status. In fact single status shows a protective effect on overweight and obesity, while having being married (including separated, widows, and divorced) has an OR between 1.37 and 1.84.

About modifiable risk factors, the role of occupational characteristics has been investigated extensively.

Nowadays the type of occupation, with its many aspects and features, influences our behaviors, dietary habits, physical activity, state of mind and consequently our well-being.

Previously it has been demonstrated that job insecurity, long work hours and some types of work are conditions closely linked with overweight and obesity (22 - 25). Our data suggests that the working profile with higher risk is the artisan, while there are not differences between other working categories (employee, freelance, entrepreneur). This observation strengthens if we consider education factor. In fact artisans often have a lower education level, condition that is a risk factor itself for overweight and obesity in our sample.

In this context, it is evident that a preventive strategy is needed, especially for the workers' subgroup with an elevate risk, like shift workers, as revealed by our analysis. The evidences previously demonstrated by our research group (17) and by others (25 - 29) are confirmed: shift workers have a higher risk with respect to daily workers to be overweight and obese (OR 1.14 CI 95% 1.03-1.26).

One of the limitations of the present study is the lack of investigation of other variables potentially relevant to overweight and obesity (leisure time physical activity, dietary habits, comorbidities), which have not been examined in this analysis.

In fact it is also known in literature that shift work is often associated with unhealthy lifestyles, especially for what concerns dietary habits, and this may be an important co-factor in the development overweight and obesity.

Conclusions

Italian workers have an elevated risk to be overweight and obese. The worker profile mainly interested by the phenomenon is a male, artisan, shift-worker and with a lower education. Considering this data, strong preventive activities are needed in workers, with a serious attention to the working figures with an elevated risk.

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