Prevalence of overweight and obesity in an Italian Prison and relation with average term of detention: a pilot study

D. Rocca[1]

Abstract

Introduction. Obesity and overweight are universally recognized as risk factors for cardiovascular disease, stroke and other chronic diseases. The few studies of overweight and obesity in inmate populations suggest that the prevalence of obesity in an institution is associated with the prevalence of the region. The goal of the study is to describe the prevalence of overweight and obesity in a sample of prisoners.

Methods. In a sample of prisoners of Busto Arsizio prison, weight and height were measured with standard method., Once collected information about nationality, age and duration of detention, we proceeded to calculate BMI and the prevalence of overweight and obesity.

Results. The subjects enrolled were 142, all males, aged 19-66 years, with a holding period of between 30 days and two years. From the survey, the total of obese or overweight subjects was 66.9%. In the comparison between Italian and Foreign prisoners, the latter showed the highest weight gain. The analysis of the correlation between increased BMI and length of detention has not shown a statistical association during detention, but it could depend on the number of inmates enrolled.

Conclusions. The prevalence of obesity and overweight among inmates (66.9%) was higher than the Italian general population (54.8%, adult males, ISTAT, 2015). The decreasing physical activity typical of the detention, the psycho-physical discomfort (incarceration trauma) and the prison meals could have had a significant importance in increasing weight. Desirable therefore more investigations (calculation of caloric needs, ethnic and religious diets, eating disorders) in order to establish appropriate preventive interventions.

Introduction

Overweight and obesity represent a well-known major risk factor for noncommunicable diseases, such as cardiovascular diseases, diabetes, musculoskeletal disorders (especially osteoarthritis - a highly disabling degenerative disease of the joints) and some cancers (endometrial, breast, and colon) (1). Obesity has also many implications for a person's mental well-being: it is correlated with depression (2) and Alzheimer's disease (3). According to WHO, worldwide obesity has more than doubled since 1980. In 2008, 35% of adults were overweight (4). In Italy, among women and men between the age of 18 and 69, 32% are overweight, while 10% are obese. Prevalence is higher among

[1] School of Specialization in Hygiene and Preventive Medicine, University of Pavia, Pavia, Italy

people with low income (51%), and among low-level educated people, where it is approximately 64%. Regional variations also exist: prevalence of overweight and obesity is higher in the South of Italy, decreasing to the North of the Country, where prevalence is the lowest (5). Individual's weight can also be affected during an incarceration experience: poor nutrition and lack of physical exercise are two of the primary explanations for the increased likelihood of weight gain during incarceration (6). There are very few international studies on the prevalence of overweight and obesity in prisoners, which does not allow to determine whether this population is at the same level of risk of the rest of the population or, on the contrary, it requires any specific health action (7). This study examines the effects of incarceration on Body Mass Index (BMI) during imprisonment in a sample of inmates of an Italian Penitentiary.

Methods

Aim of this study was to determine prevalence of overweight and obesity in a sample of inmates of an Italian prison, and to analyze the correlation between weight gain and length of detention. The outcome of interest was BMI, which is one of the best indicators of weight associated with fat body mass (8), and it is obtained from the weight of a person in kilograms divided by the square of his height. BMI is still a useful tool to assess individual health risk, although some individual characteristics, like a large muscle mass or different racial group, can modify the expected risk. According to the Centers for Disease Control and Prevention (CDC), for a white man, a normal weight is classified into the range of BMI from 18.5 to 25 kg/m^2; below 18.5 kg/m^2 the person is considered underweight, while above 25 kg/m^2 he is considered overweight. If BMI

equals or goes above 30 kg/m^2, the person is defined as obese.

The Busto Arsizio Penitentiary, located in the North of Italy (Province of Varese, near the International airport of Malpensa), currently houses 369 inmates, more than half of them of foreign nationality. Prisoners are all males, for the most part subject to a short – medium term imprisonment. Between 15 and 22 June 2015, 142 prisoners (out of 310 present at the time of the study, 45.8%), informed about the purpose of the study, voluntarily accepted to be weighed by the institute medical staff. Inclusion criteria was a time of detention between 1 month and 2 years. A big loss of participants, 48, derived from some factors: some prisoners refused to participate in the study, some others were transferred to another prison or were involved in other activities (inside the Institute or outside) at the moment of study. Other data for this pilot study were extracted from clinical diaries, which contain demographic and non-health related information, such as date of incarceration, age, nationality, initial weight and height.

For each participant, BMI at the time of the study ("Ending BMI") was calculated. The rate of change in BMI (ΔBMI), as the difference in BMI divided by the beginning BMI, was also calculated, in order to evaluate if offenders gain weight during incarceration. Duration of incarceration was calculated using the date of incarceration and the end date for the study. Using PSPP 0.10.4, differences in beginning and ending weight and BMI were examined using paired t-test to determine whether or not ending weight minus beginning weight were significantly different from zero.

Correlations between BMI, ΔBMI, age and length of incarceration were tested to determine what relationship, if any, existed between such variables.

Results

Descriptive characteristics of the study sample are presented in Table 1. Mean age was 39.39 years (Standard Error - 0.9) for prison inmates and the mean length of incarceration was 279 days. The sample shows a high percentage of foreign prisoners (44.4% of subjects), particularly from North Africa (14.8%) and the Balkans (8.4%). 35.9% of subjects showed a detention period beyond 12 months, while 37.3% of the total was under six months of detention, a feature typical for prisoners from a high turnover institution.

Table 1 - Descriptive statistics of the study population (n = 142)

	Percentage
Age	
18-33	37.3
34-49	41.5
50-66	21.1
Nationality	
Italian	55.6
Non Italian	44.4
North Africa	14.8
Balcanic Area	8.4
South America	7.0
Other	14.1
Length of Detention (days)	
28-180	37.3
181-360	26.8
361-540	21.8
541-720	14.1

In order to determine BMI trends, all patients were divided into five groups, corresponding to different classes of BMI: subjects with optimal weight (BMI < 25), overweight people (BMI ≥ 25 but <30), grade 1 obesity (BMI ≥ 30 but <35), grade 2 obesity (BMI ≥ 35 but <40), and grade 3 obesity (BMI ≥ 40). The average age, weight, height and BMI for all five groups are shown in Table 2.

To compare the prevalence of overweight and obesity of the study sample with the general population, we considered the prevalence observed by the National Institute of Statistics (ISTAT) (9) during the same year (2015), specifically regarding males over the age of 18 years, which was 54.8%.

According to similar Italian studies (10-11), the prevalence of overweight and obesity among incarcerated inmates of the Prison of Busto Arsizio, both Italian and non-Italian, was 66.9%: a value much higher than the resident general population of Italy. In the comparison between Italian and foreign population resident in Italy, the latter shows a higher prevalence of overweight and obesity (69.8%) after detention. From the clinical diary data, we could observe BMIs at the time of incarceration: the comparison of these informations with the study results shows a significant increase of BMI for both groups, but non-Italians seem to be more affected (+17.4%, versus +3.8% in Italian prisoners). Table 3 shows that offenders entered corrections overweight and that there was a modest increase in ending BMI. Offenders also had a positive rate of change in BMI (ΔBMI) during their incarceration. The mean weight change for the population was an increase of 1.30 kg (SD 6.92 – S.E. Mean 0.58) and the mean change in BMI was 0.47 (SD 2.42 – S.E. Mean 0.20): offenders gained weight during their incarceration.

All results were entered into PSPP 10.0 database for analysis. Statistical analysis included descriptive statistics and inferential statistics. To observe a possible correlation between variation of BMI and length of detention, we supposed a general positive correlation between BMI and the different periods examined. Detention periods examined (0-6 months, 6-12 months, 12-24 months), didn't show statistically significant correlations, but this may be due to the composition of the sample (64,1%

Table 2 - Sample characteristics stratified by classes of BMI at the time of the study.

Variable	Healthy Weight (BMI < 25)	Overweight 25 ≤ BMI < 30	Grade 1 Obesity 30 ≤ BMI < 35	Grade 2 Obesity 35 ≤ BMI < 40	Grade 3 Obesity BMI ≥ 40
N	47	65	18	8	4
Percentage	33.1%	45,8%	12,7%	5.6%	2.8%
Age (years)	35.7 ± 11.3	40.1 ± 11.6	42.6 ± 10.7	50,5 ± 7.5	38.0 ± 13.5
Weight (kg)	67.67 ± 6.60	78.74 ± 5.92	88.04 ± 5.97	102.69 ± 7.58	120.50 ± 16.94
Height (m)	1.75 ± 0.07	1.74 ± 0.06	1.70 ± 0.05	1.77 ± 0.07	1.72 ± 0.04
BMI (kg/m²)	23.41 ± 1.59	27.58 ± 1.43	32.05 ± 1.69	36.62 ± 1.40	42.97 ± 5.1
Duration of detention (days)	234 ± 199	296 ± 200	376 ± 223	222 ± 188	192 ± 130

Table 3 - BMI changes during incarceration (total population, N=142).

	Min	Max	Median	Mean
Age (years) 1	19	66	37.5	39.39
Beginning weight (kg)	47.5	130	74	77.27
Ending weight (kg)	52	135	76.25	78.57
Height (m) 1	1.6	1.99	1.73	1.74
Beginning BMI (kg/m2)	17.55	45.76	25.77	27.17
Ending BMI (kg/m2)	18.07	46.5	27.01	27.63
Δ BMI (%)	-33.0	29.0	2.6	1.9
Duration of detention	28	711	223.5	278.72

of the prisoners had an average length of detention of 5 months).

Figure 1 shows the distribution of BMI changes observed after different days of detention. A long-term cohort study would be useful in highlighting any statistically significant correlations.

Interestingly, age was not significantly correlated with ΔBMI (Figure 2); older offenders were no more overweight or obese than younger offenders, and neither have gained more weight.
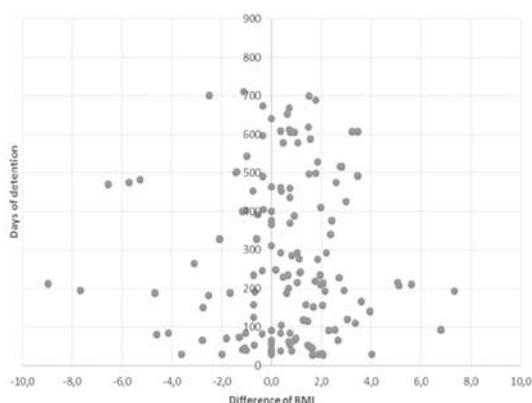

Figure 1 - Days - Δ BMI variations (N=142)

Discussion

These data are consistent with those found in other prison populations of other nations (12-13): an Australian study showed that 47.9% of young inmates were overweight or obese; in another study from 11 US state prisons (14) there was evidence that 75% of prisoners were overweight or obese. These prevalence data among prisoners show that
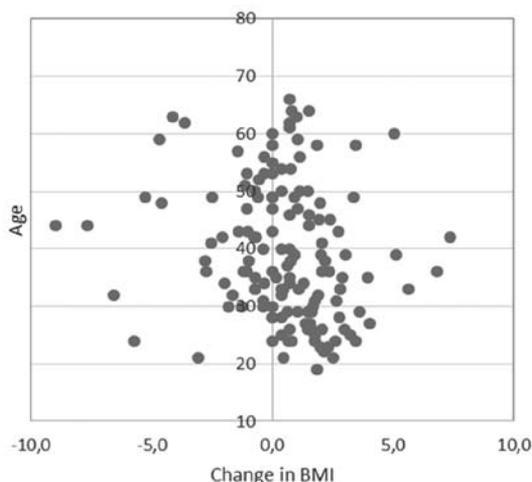
Figure 2 - Age - Δ BMI variations (N=142)

this population suffers epidemic of obesity in the same way as the general population.

However, we have to acknowledge that the present study contains some limitations. Above all the sample size (142 participants) and composition (only males) could not infer the associations we found to the general inmate population. Moreover, only few behavioral factors have been evaluated and no pathological or environmental factors have been assessed, factors that could classify the study as a pilot study.

Global data obtained in this study are worrying, because they show that the detained populations are at increased risk of obesity and overweight (67%, versus 54% of the general population, in Italy).

These results are also confirmed by several international studies, such as a recent French study (15), where there was evidence that incarceration worsened the rate of obesity in both genders (21.2% for women, 16.7% for men).

The presence of such high levels of overweight among inmates in prisons may be associated with various contextual circumstances, such as: the absence of low-calorie diets, the reduced ability to exercise because of the difficult access to open spaces

and limited time for physical exercise, and medications that incite to a sedentary lifestyle (benzodiazepines). As shown by Mannocci et al. (10), variations of BMI are inversely associated with physical activity: the discovery of high levels of prevalence of overweight and obesity in prisons should encourage the promotion of actions for the prisoners' health, as well as for the general population, with the aim of prevention and treatment. These actions should include changes in eating habits (for example, encouraging the adoption of low-calories menu) and physical activity programs, as Mannocci et al (10) also proved.

The prisoners' living habits can only be changed if there is a high involvement of the authorities responsible for the Correctional Institutes. The period of detention of a person could be a good opportunity to promote healthy habits through public institutions, which would produce direct benefits on the health of detainees and a reduction of costs of prison sanitary services, and thus a long-term outcome for the whole Public Health.

Declaration of conflict of interest: None.

Riassunto

Prevalenza di sovrappeso e obesità in un penitenziario italiano e relazione con la durata media della detenzione: uno studio pilota

Introduzione. Obesità e sovrappeso sono universalmente riconosciuti come fattori di rischio per malattie cardiovascolari, ictus e diverse malattie croniche. I pochi studi riguardanti il sovrappeso e l'obesità nelle popolazioni detenute suggeriscono che la prevalenza dell'obesità in un istituto sia associata alla prevalenza presente nella stessa regione. L'obiettivo dello studio è descrivere la prevalenza di obesità e sovrappeso in un campione di detenuti.

Metodi. Su un campione di detenuti della Casa Circondariale di Busto Arsizio sono stati rilevati, con metodiche standard, peso e altezza. Una volta raccolte le informazioni su nazionalità, età e data di ingresso in istituto, si è proceduto al calcolo del BMI e della prevalenza di sovrappeso e obesità.

Risultati. I soggetti arruolati sono stati 142, tutti maschi, di età 19-66 anni, con un periodo di detenzione tra 30 giorni e due anni. Dalla rilevazione, il totale di soggetti obesi o in sovrappeso è risultato del 66.9%. Nel confronto tra detenuti italiani e stranieri, questi ultimi mostrano il più alto incremento ponderale rispetto all'ingresso. L'analisi della correlazione tra aumento del BMI e durata della detenzione non ha evidenziato un'associazione statisticamente significativa positiva nel corso della detenzione, ma questo potrebbe derivare dalla numerosità del campione.

Conclusioni. La prevalenza di obesità e sovrappeso tra i detenuti (66.9%) è risultata superiore alla popolazione generale italiana (54,8%, maschi di maggiore età, ISTAT, 2015). Contestualmente alla riduzione dell'attività fisica tipica della detenzione, il disagio psico-fisico (trauma da ingresso in carcere) ed il vitto ministeriale potrebbero avere avuto un peso significativo nell'aumento ponderale. Auspicabili pertanto maggiori indagini (calcolo del fabbisogno calorico, diete etnico-religiose, disturbi del comportamento alimentare) al fine di predisporre adeguati interventi preventivi.

References

1. Arnold F. W., Non-communicable diseases in prisons: Lancet 2012; **379**: 1931-3.
2. Kaplan MS, Huguet N, Newsom JT, McFarland BH, Lindsay J. Prevalence and correlates of overweight and obesity among older adults: Findings from the Canadian National Population Health Survey. J Gerontol 2003; **58A**: 1018-30.
3. Sommers AR. Obesity among older Americans. Washington, DC: Congressional Research Service, 2009.
4. World Health Organization (WHO). Global Health Risks. Mortality and burden of disease attributable to selected major risks. Geneva: WHO, 2009.
5. Minelli G, Manno V, Minardi V, Lombardo FL. La mortalità per obesità in Italia - Centro Nazionale di Epidemiologia, Sorveglianza e Promozione della Salute. Roma: Istituto Superiore di Sanità, 2013.
6. Aday RH, Krabill J. Women aging in prison: A neglected population in the correctional system. Boulder, USA: Lynne Rienner, 2011.
7. Herbert K, Plugge E, Foster C, Doll H. Prevalence of risk factors for non-communicable diseases in prison populations worldwide: a systematic review. Lancet 2012; **379**:1975-82.
8. Gates ML, Bradford RK. The impact of incarceration on obesity: are prisoners with chronic diseases becoming overweight and obese during their confinement? J Obes 2015: 532468. doi: 10.1155/2015/532468.
9. Report: "Fattori di rischio per la salute: fumo, obesità, alcol e sedentarietà.", ISTAT, 2015. Available from: http://www.istat.it/it/files/2016/07/Fattori-di-rischio_salute_def.pdf?title=Fattori+di+rischio+per+la+salute++-+26%2Flug%2F2016+-+Testo+integrale.pdf) [Last accessed: 2017, Apr 18].
10. Mannocci A, Masala D, Mipatrini D, Rizzo J, et al. The relationship between physical activity and quality of life in prisoners: a pilot study. J Prev Med Hyg 2015; **56**(4): E172-5.
11. Voller F, Silvestri C, Orsini C, Aversa L, Da Frè M, Cipriani F. [The health conditions of prison inmates in Tuscany].Epidemiol Prev 2011; **35**(5-6): 297-306.
12. Leddy MA, Schulkin J, Power ML. Consequences of high incarceration rate and high obesity prevalence on the prison system. J Correct Health Care 2009; **15**: 318-27.
13. Clarke JG, Waring ME. Overweight, obesity, and weight change among incarcerated women. J Correct Health Care 2012; **18**: 285-92.
14. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. JAMA 2006; **295**(13): 1549-55.
15. Lagarrigue A, Ajana S, Capuron L, Féart C, Moisan MP. Obesity in French Inmates: Gender Differences and Relationship with Mood, Eating Behavior and Physical Activity, PLoS One 2017; **12**(1): e0170413. doi:10.1371/journal.pone.0170413.

Corresponding author: Dott. Rocca Danilo, Via Filzi 47, 21013 Gallarate (VA), Italy
e-mail: danilorocca86@gmail.com