

Received: 08 November 2014 • Accepted: 10 December 2014

Short C

doi:10.15412/J.JBTW.01031203

Evaluation of the nutritional status using the anthropometric indices and dietary intakes in the central prison of Mashhad

Adeleh KhodaBakhshiFard¹, Mohammad Safarian², Sajjad Rostami², Somayeh Zamani², Mohsen Mazidi², Mostafa Arabi², Mohsen Nematy^{2*}, Abbas Yousefi Nejad³

¹ Jiroft University of Medical Sciences, Jiroft, Iran

² Faculty of Medicine, Mashhad University of Medical Sciences, P.O. Box: 91775-379, Mashhad, Iran

³ Tehran University of Medical Sciences, Tehran, Iran

*correspondence should be addressed to Mohsen Nematy, Faculty of Medicine, Mashhad University of Medical Sciences, P.O. Box: 91775-379, Mashhad, Iran; Tell: +989376259104; Fax: +98; Email: NematyM@mums.ac.ir

ABSTRACT

High possibility of diet lacking in essential nutrients between the prisoners that could lead to malnutrition; to evaluate the nutritional status of the prisoners and check the rate of nutritional disorders between them. A cross-sectional, randomized study carried out on a sample of 435 prisoners. Questionnaires including gender, age, types of food intake and type of crime were completed. Anthropometric indices were measured on the base of WHO standards. Two weeks food menu of the prison was checked. The outcomes were analyzed using SPSS. The mean BMI value for male and female prisoners was 24.5 and 28.3 kg / m² respectively. The prevalence of underweight, overweight and obesity were 13.8%, 5.5% and 1% respectively. The prevalence of underweight was significantly more in men ($p < 0.05$) compared with women. In contrast, the prevalence of overweight and obesity was much more in women compared with men. Inadequate supply of calories for men and protein for all the prisoners was recognized in the prison food menu. Results from this study showed that malnutrition risk was high in Mashhad central prison especially for male prisoners.

Key words: Nutritional status, Malnutrition, Anthropometry

Copyright © 2014 Adeleh KhodaBakhshiFard et al. This is an open access article distributed under the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/).

1. INTRODUCTION

There is no decisive definition for malnutrition as it is too difficult to determine the borders between normal and abnormal nutrition. Malnutrition is a condition in which lack of some nutrients, such as proteins, vitamins, minerals, etc. causes remarkable bad effects on body composition and function (1). Energy balance is one of the most important determiners of nutritional status. Any increase or decrease in the ratio of intake to consumption, causes different disorders (2). Probably, reduction in the amount of calorie intakes is the most important cause of malnutrition (3). Prisoners' dependency to the prison limited food menu and inappropriate nutritional behaviors increases the risk of malnutrition. Improper food intakes and malnutrition have severe effects on the incidence of aggressive and antisocial behaviors. There is evidence that periodic supplementation of the prisoners by capsules of minerals and vitamins plays an important role in controlling these behaviors (4). Nutrition is more important in women's prisons, as the prevalence of mental and physical illnesses is more in women's prisons

compared with men's (5). Therefore, good nutrition is important for mental and physical health and can reduce the rate of social problems and disciplinary offences. This paper studies the nutritional status of the prisoners using the anthropometric indices and checking dietary intakes. The results of this study can help the governments to develop the standards of the nutrition in the prisons in order to increase the rate of health of the prisoners.

2. MATERIALS AND METHODS

Needed permissions were obtained from the research ethic committee of Mashhad University of medical sciences and Mashhad central prison. Before recruitment, the purpose of the project was explained carefully to each participant. Each volunteer recruited ($n = 435$) signed an informed consent form. This is a cross-sectional study that was done in 2008 in the central prison of Mashhad. 435 prisoners (387 males and 48 females) were chosen by random sampling. First, the prisoners were categorized according to their gender, age, type of crime and whether they were

sentenced by the court or they were still alleged. 435 prisoners were chosen by using random numbers according to their ID numbers and in proportion to population of each category to be a sample of all the prisoners. The inventory and shopping lists of the prison stores and kitchen, the prison food menu and the capita of food outpours were analyzed during 2 weeks. The results were used to compare the prisoners' nutritional supply with their nutritional requirements. Also, questionnaires including demographic characteristics were completed.

2.1. Measurements

The weight of the participants was measured by seca model electronic weighing scale, with minimum clothes and without any shoes and jewelry. Their height was measured at standing position with heels and hips close to the wall and head in horizontal position. The BMI of the participants was calculated in unit of kg/m^2 . The BMIs below 18.5 were considered as underweight, more than 25

as overweight and beyond 30 as obesity.

2.2. Data Analysis

The statistical data analysis is done via SPSS v.11.5. Data is described using standard deviation and its diagram is based on two-factor analysis of variance. For BMI and weight where data is normalized, student's t-test is done to compare the two groups of men and women. Significance level is assumed to be equal to 0.05. Diagrams are drawn using Microsoft Excel. Quantitative data including age, weight, height, BMI and waist length and qualitative data are expressed using averages and absolute frequencies, respectively.

3. RESULTS AND DISCUSSION

Table 1 & Table 2 show the characteristics of the sample group. (n = 435)

Table 1. Baseline characteristics

Characteristic		Number	Percentage
Gender	Male	387	88.9 %
	Female	48	11.1 %
State of charge	Alleged	45	10.4 %
	Sentenced	390	89.6 %

Table 2. Demographic characteristics

Average age (year)*	Men	34.5 (SD = 10)
	Women	36.4 (SD = 11)
Average weight (kg)*	Men	73.3 (SD = 12)
	Women	70.9 (SD = 10)
Average height (m)**	Men	1.73 (SD = 0.6)
	Women	1.59 (SD = 0.7)
Average BMI (kg/m^2)**	Men	24.5 (SD = 4)
	Women	28.3 (SD = 4.5)
Average of the minimum calories needed (kcal)**	Men	2027 (SD = 106)
	Women	1745 (SD = 165)

In compare with women, the prevalence of underweight was significantly more in men ($p < 0.05$). In contrast, the

prevalence of overweight and obesity was much more in women compared with men. (Table 3)

Table 3. Nutritional status of the prisoners according to anthropometric indices

Characteristic	Prevalence in men	Prevalence in women	Prevalence in all
Underweight	15.2 %	6.25 %	14.2 %
Overweight	3.3 %	16.6 %	4.8 %
Obesity	0.5 %	4.1 %	1 %

Comparing usual weight (asked from 194 participants could recall) with their current weight showed that during being in the prison, 44.3 % of the participants (n = 86) had

lost weight, so they were in malnutrition risk. Weight of 15.5 % of them had not changed and the others had gained weight. (Table 4)

Table 4. Anthropometrics' comparison between participants with weight loss and others

Characteristic	Malnutrition risk (weight loss)	Weight gain or without weight loss
Number	86	108
Percentage	44.3 %	55.7 %
Age (year)	35 ± 9	34 ± 10
Weight (kg)	70 ± 11	74 ± 10
Height (cm)	170 ± 8	169 ± 9
BMI (kg/m ²)	24.1 ± 4	26 ± 4

The prevalence of weight loss was significantly higher in men than women. Also, weight gain was more prevalent in women (57.5 %) than men (35.7 %), (p< 0.01). The outcomes of data analysis showed that according to prison food menu, the average of calorie intakes was equally 1950 Kcal for both men and women. The rate of food outpours was measured for a week and was not so much. It was

more in women's prison than men's. 18.9 gr food and 5.5 gr bread per prisoner per day was outpoured in women's prison. 60 % of the participants just use the prison food menu and the others use both prison food and foodstuff of the prison stores. Table 5 shows the food intakes according to the prison food menu.

Table 5. Prisoners' food intakes according to the prison food menu

Food	Average units	Average units needed	Percentage of supply
Grains	13.4	11	121 %
Protein (meat and beans)	1	2.4	41 %
Dairy	1.9	2	95 %
Fruits	0	3	0 %
Vegetables	3.5	3	116 %

Table 6 shows the food intakes according to the prison stores for the 40 % of the participants using the prison stores foodstuff.

Table 6. prisoners' food intakes according to the prison stores' foodstuff

Food	Max per participant per day (gr)	Min per participant per day (gr)
Meat and Conserves	267.03	18.8
Fruits and Vegetables	205.4	11.57
Carbohydrates	364.09	50.01
Diary	92.28	6.63

The study showed that 44.3% of the prisoners had lost weight and 40.2% had gained weight during being in the prison. Improvement of the nutritional status, more relaxation and less mobility might be the reasons of gaining weight in those 40.2% who had gained weight. Also some people may be deprived of the minimum intakes in their own life and they can gain the opportunity to have good food intakes and more relax in the prison, so they gain weight. It should be noted that mental problems and environmental stresses can affect the prisoners' food intakes. So psychosocial supports and instruction of the life skills surely can improve the nutritional status of the prisoners. According to the results, the prevalence of weight gain was much more in women (55.7%) than men (35.7%) ($p < 0.01$). The supportive role of Mashhad central prison for female vulnerable prisoners is very important. The prisoners are mostly from poor strata of the society in which the rate of incidence of crime is high and this can affect their nutritional background. So the prison improper food supply is not the only reason of underweight and the nutritional background of the prisoners is effective too. Comparing this study with a similar study on a sample group of the public population of Mashhad showed that the prevalence of overweight and obesity was negligible in male prisoners but at least 48% in men outside the prison. Although overweight and obesity was more prevalent in female prisoners than males but it was less than the public group. In return, underweight was 2.5 times more prevalent in male prisoners than the public population (6). The prevalence of underweight in female prisoners was equal to the public group. Overall, it shows that the risk of malnutrition is much more in the prison than the public population of Mashhad (7). A study in Nigeria compared the nutritional status of 81 prisoners with 62 non-prisoners who were chosen from the poor strata of the society. The results showed that 48% of the prisoners had the BMI of less than 20 kg/m^2 whereas this rate was 28.6% in non-prisoners (8). Inadequate supply of calories for men and protein for all the prisoners was recognized in the prison food menu. Another problem was that the plant resources were mostly used to supply protein in the prison while they are considered as incomplete proteins. To solve these problems the prison food menu needed to be reorganized. For example, adding 1.5 units of meat per person (45 gr) (150% increase) to the food menu can supply the prisoners required protein. Although it needs extra financial credits,

this can be compensated through the improvement of prisoners' life and reduction in their antisocial behaviors. In addition, the fruit consumption is obviously inadequate. This can cause at least two important problems. First nutritional deficiencies like vitamins and minerals insufficient intakes and the second is the increase in the risk of chronic illnesses especially cardiovascular diseases. So adding two units of fruit with enough variety to the prison food menu is highly recommended (9). There is evidence that lack of vitamins, minerals and fatty acids can lead to behavioral problems. In a study on 231 prisoners in London, the prisoners were supplemented by capsules of vitamins, minerals and essential fatty acids. The results showed that, those supplemented by the capsules had reduction in offences and antisocial behaviors (4).

4. CONCLUSION

Results of this study showed that malnutrition risk is high in Mashhad central prison especially for male prisoners, so this problem should be considered. Correcting the prison food menu can decrease the malnutrition risk by adjusting the prisoners' dietary intakes.

ACKNOWLEDGMENT

The research was conducted with the permission of the central prison of Mashhad and Mashhad University of medical sciences.

AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

REFERENCES

1. Fazel S, Grann M, Kling B, Hawton K. Prison suicide in 12 countries: an ecological study of 861 suicides during 2003-2007. *Social psychiatry and psychiatric epidemiology*. 2011;46(3):191-5.
2. Esmaily H, Azimi-Nezhad M, Ghayour-Mobarhan M, Parizadeh M-R, Safarian M, Parizadeh M-J, et al. Association between socioeconomic

- factors and obesity in Iran. *Pakistan Journal of Nutrition*. 2009;8(1):53-6.
3. Azimi-Nezhad M, Ghayour-Mobarhan M, Safarian M, Esmaili H, Parizadeh SMR, Rajabi-Moghadam M, et al. Anthropometric indices of obesity and the prediction of cardiovascular risk factors in an Iranian population. *The Scientific World Journal*. 2009;9:424-30.
4. Nematy M, Salami H, Norouzy A, Siadat Z, Shahsavan N, Tavallaie S, et al. Indices of malnutrition in patients admitted to general medical and chest medicine wards of an Iranian teaching hospital on admission and discharge. *Mediterranean Journal of Nutrition and Metabolism*. 2013;6(1):53-7.
5. Eves A, Gesch B. Food provision and the nutritional implications of food choices made by young adult males, in a young offenders' institution. *Journal of Human Nutrition and Dietetics*. 2003;16(3):167-79.
6. Sullivan A, Sheffrin SM. *Economics: Principles in action*. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. 2003.
7. Mann J, Garrow J, James W, Ralph A. *Human nutrition and dietetics*. Human nutrition and dietetics. 1993.
8. Elia M, Stroud M. Nutrition in acute care. *Clinical medicine*. 2004;4(5):405-7.
9. Nara K, Igarashi M. Relationship of prison life style to blood pressure, serum lipids and obesity in women prisoners in Japan. *Industrial health*. 1998;36(1):1-7.