

## Prevalence of obesity and overweight and their related factors among the adults of Mazandaran Province, Iran, in 2010

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### Abstract:

**Background:** Obesity is an unpleasant outcome of changes in the behavior and lifestyle, and it leads to premature inability and loss of job in most cases. This study aimed at determining the prevalence of obesity and overweight conditions and some related factors among the adults in Mazandaran Province, Iran.

**Methods:** This cross-sectional study was conducted in 2010. The data collection tool was a standard questionnaire provided by the World Health organization (WHO). The sample of this study was selected from all people in the age range of 15 to 64 who lived in the urban and rural areas of Mazandaran Province. The researchers studied 1000 people (500 males and 500 females). The data were analyzed using mean, standard deviation, chi-squared, linear regression, and Logistic regression in SPSS version 16 software.

**Results:** The average and the standard deviation of Body Mass Index (BMI) of the participants was  $27.36 \pm 6.04$  ( $25.76 \pm 4.5$  for males and  $28.95 \pm 6.9$  for females), and the average prevalence of overweight was 34% (males: 35.8%, females: 32.2%); the average incidence of obesity was 28.4% (males: 17.8%, females: 39%). It was found that age groups of 35-44 (OR: 3.1, CI: 95%: 1.7-5.8), 45-54 (OR: 3.1, CI: 95%: 1.7-5.8), and 55-64 (OR: 4.02, CI: 95%: 2.1-7.5) and being a housewife (OR: 2.3, 95% CI: 1.03-5.1) were predictive of BMI values equal to or greater than 30.

**Conclusion:** The results of this study showed that the prevalence of overweight and obesity was significant among people of Mazandaran Province. Therefore, it is recommended that educational-research centers and health authorities look for appropriate strategies to reduce the prevalence of this problem.

**Keywords:** body mass index (BMI), overweight, obesity, Iran

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### 1. Introduction

Obesity is a multi-factor chronic disease, and it is one of the fundamental problems in many developed and developing countries. Given its high prevalence and the rate at which it is increasing, it has been the focus of attention of public health associations (1-4). Obesity is an unpleasant outcome of changes in behaviors and lifestyles (5-8), and it leads to premature disabilities and losses of jobs in most cases. The medical cost related to obesity in the United States has been estimated to be \$100 billion a year (9). Increase in weight, hypertension, smoking, and hypercholesterolemia are important risk factors for heart disease as well as hyperlipidemia, type 2 diabetes, and

several types of cancer (10). The findings of research based on epidemiological studies indicate that common diseases throughout the world are due to some risk factors, with obesity among them and ranking as the first risk factor for the increase and incidence of these complications (11). Hypertension, high blood fat disorders, diabetes, cancer, gallstones, and hormonal disorders are more common in obese people, and they may be caused by or worsened by obesity (12). Obesity is a global issue, and about 300 million people all over the world suffer from this problem, which can increase death rates and decrease life expectancy (13, 14). Many epidemiological studies have been conducted on the prevalence of obesity and overweight, and it has been recorded to be between 15 and 60% of the people in different parts of the world (15).

According to the statistics issued by World Health Organization in 2005, 1.7 billion adults (above age 15) in the world were overweight and at least 400 million of them were clinically obese. It is predicted that, in 2015, there will be 2.3 billion adults who are overweight and 700 million adults who are obese (16-19). The World Health Organization also has reported that the prevalence of obesity is different in different areas of the world (20). This organization has reported that the combined prevalence of obesity and overweight among women and men in the Middle East is 54.2% and 31.4%, respectively, which has caused the deaths of about 150,000 people in these countries (20).

According to the World Health Organization's report, 70% of the mortality rate in Iran was due to chronic diseases associated with being overweight or obese. Furthermore, the prevalence of overweight in Iranian men and women in 2005 was reported to be 54 and 70%, respectively. This organization has predicted that obesity will increase up to 74% in Iranian women between 2005 and 2015, while the condition will remain unchanged for men (21). A systematic review showed that, in Iran, the prevalence of obesity in people under 18 is about 5.5% and in adults about 21.5%. It also was observed that the prevalence of obesity is higher among women, and as they grow older, the difference between the prevalence of obesity in women and men increases (22). Hajian (2007) conducted a study in Mazandaran Province and found that the BMI was above 30 in 9.9 and 27.8% of men and women in the age range of 20-70, respectively (23). In a nationwide study conducted in 2008, it was reported that the percentile of obese people ( $BMI \geq 30$ ) in Mazandaran Province was 17.8% of men and 29.9% of women among those in the age range of 15 to 64, which is different from the results of Hajian's study, especially for men (24). Given the high prevalence of obesity in the world and among Iranian adults, the increasing rate of obesity, and the change in lifestyles due to globalization and advances in technology, the constant monitoring of BMI is necessary. Furthermore, evaluating weight increases and their patterns and determining the risk factors for non-communicable diseases are important and can provide a useful guideline for planning interventions when problems occur. Because of the contradictory results of the studies that have been conducted in this area, the researchers aimed at determining the status of obesity and overweight in Mazandaran Province and the factors that affect these two factors.

## 2. Material and Methods

This cross-sectional study was conducted in 2010 using the step method for data collection and a standard questionnaire, both of which were provided by WHO (25). First, demographic data were gathered using the questionnaire, and, then, trained data collectors measured the participants' weights, heights, and the circumferences of their waists with standard tools. The sample of this study was selected from all people in the age range of 15 to 64 who lived in the urban and rural areas of Mazandaran Province, Iran. In the cities, sampling was done based on the postal areas, but, in the villages, it was done on the basis of the family list. One stage cluster random sampling was used in the study. According to the project entitled 'Care of Non-communicable Diseases in the Islamic Republic of Iran,' the researchers divided the region into 50 clusters of 20 people with the age ranges of 15-24, 25-34, 35-44, 45-54, and 55-64 years. Overall, 1000 participants took part in the study, with 200 participants (100 males and 100 females) in each age range.

The data were analyzed using both descriptive and referential statistical analyses in SPSS version 16 software. To balance the effects of the variables, regression models also were used. Body mass index was calculated by dividing weight in kilograms by height in meters squared. A BMI over 30 is the indicator of being obese, and BMI values ranging from 25 to 29.9 indicate that the person is overweight. A BMI of 18.5 to 24.9 indicates optimal weight, and if the BMI less than 18.5, it suggests that the person is underweight (26, 27). Data of this study is a section of the project of Non-communicable Surveillance System in Mazandaran Province. This study was approved by the research committee of the Health Deputy of the Mazandaran University of Medical Sciences.

### 3. Results

The mean age of the participants was 39.41±14 years, and the average weight was 72.04±14.1 kg (men: 73.99±13.45, women: 70.1±14.6). They had a mean height of 162.8±10.1cm (men: 169.5±7.2, women: 156.2±8.1), the mean waist of 90.2±1.4 cm (men: 88.48±1.3, women: 91.95±1.5), and the mean BMI of 27.36±6.04 (men: 25.76±4.5, women: 28.95±6.9) (Table 1). Among the participants, 62.4% had a BMI of 25 and over (men: 53.6%, women: 71.2%), and in 28.4% of them the number was 30 and over (men: 17.8%, women: 39%) (Table 2). Most of the participants (42.5%) with a BMI of 25-29.9 were in the fourth age group (45-54 years old), while most of those (39.5%) with the BMI of 30 and more were in the fifth age group, that is they were 55-64 years of age (Table 3).

**Table 1.** Features of the participants

| Variable                 | Mean±SD    |
|--------------------------|------------|
| Age                      | 39.41±14   |
| BMI (kg/m <sup>2</sup> ) | 27.36±6.04 |
| Weight (kg)              | 72.04±14.1 |
| Height (cm)              | 162.8±10.1 |
| Waist (cm)               | 90.2±1.4   |

**Table 2.** BMI values of the two genders, N (%)

| Gender  | <18.5    | 18.6-24.9  | 25-29.9    | ≥30        | P value | Mean±SD    |
|---------|----------|------------|------------|------------|---------|------------|
| Male    | 14 (2.8) | 218 (43.6) | 179 (35.8) | 89 (17.8)  | <0.001  | 25.76±4.5  |
| Female  | 13 (2.6) | 131 (26.2) | 161 (32.2) | 195 (39)   |         | 28.95±6.9  |
| Overall | 27 (2.7) | 349 (34.9) | 340 (34)   | 284 (28.4) |         | 27.36±6.04 |

**Table 3.** BMI values among different age ranges N (%)

| Age range | <18.5    | 18.6-24.9  | 25-29.9   | ≥30       | P value | Mean±SD    |
|-----------|----------|------------|-----------|-----------|---------|------------|
| 15-24     | 15 (7.5) | 117 (58.5) | 44 (22)   | 24 (12)   | <0.001  | 23.89±4.86 |
| 25-34     | 6 (3)    | 86 (43)    | 64 (32)   | 44 (22)   |         | 26.81±6.4  |
| 35-44     | 2 (1)    | 61 (30.5)  | 70 (35)   | 67 (33.5) |         | 27.89±5.1  |
| 45-54     | 1 (0.5)  | 44 (22)    | 85 (42.5) | 70 (35)   |         | 28.89±6.2  |
| 55-64     | 3 (1.5)  | 41 (20.5)  | 77 (38.5) | 79 (39.5) |         | 29.31±5.9  |

The residents of cities had a higher BMI than those living in villages (Table 4). Among different occupations, those that were housewives (29.88), retired (28.01), and employees (27.4) had the highest BMI scores, with the highest amount of overweight among retired people and the highest amount of obesity in the housewives (Table 5). A chi-squared test showed that there is a significant difference between BMI status (<18.5, 18.6-24.9, 25-29.9, and ≥30) and the gender, age ranges, and occupation (P=0.0001) (Tables 2, 3, and 5). Using a linear regression test and based on the matched odds ratio, it was found that residency (P=0.2) and occupation (P=0.4) were not predictive of BMI, whereas gender and age (P=0.0001) were two predictive variables.

**Table 4.** BMI values and the place of residence N (%)

| Residency | <18.5    | 18.6-24.9  | 25-29.9    | ≥30        | P value | Mean±SD   |
|-----------|----------|------------|------------|------------|---------|-----------|
| Urban     | 12 (3.2) | 116 (30.5) | 147 (38.7) | 105 (27.6) | 0.05    | 27.5±5.9  |
| Rural     | 15 (2.4) | 233 (37.6) | 193 (31.1) | 179 (28.9) |         | 27.18±6.1 |

**Table 5.** BMI values and occupations N (%)

| Occupation    | BMI      |           |            |            | P value | Mean±SD   |
|---------------|----------|-----------|------------|------------|---------|-----------|
|               | <18.5    | 18.6-24.9 | 25-29.9    | ≥30        |         |           |
| Employee      | 0 (0)    | 21 (33.3) | 27 (42.9)  | 15 (23.8)  | <0.001  | 27.4±4.2  |
| Self-employed | 8 (2.9)  | 121 (44)  | 103 (37.5) | 43 (15.6)  |         | 25.5±4.2  |
| Student       | 10 (9.4) | 64 (60.4) | 23 (21.7)  | 9 (8.5)    |         | 23.2±4.2  |
| Housewife     | 7 (1.7)  | 83 (20.4) | 134 (33)   | 182 (64.8) |         | 29.88±6.9 |
| Retired       | 0 (0)    | 15 (25)   | 29 (48.3)  | 16 (26.7)  |         | 28.01±4.6 |
| Others        | 2 (2.2)  | 45 (50)   | 24 (26.7)  | 19 (21.1)  |         | 25.96±5.4 |

Logistic regression also was conducted to investigate the effect of the variables on obesity (BMI equal to or greater than 30). It was found that age groups of 35-44 (OR: 3.1, CI: 95%: 1.7-5.8), 45-54 (OR: 3.1, CI: 95%: 1.7-5.8), and 55-64 years (OR: 4.02, CI: 95%: 2.1-7.5) and being a housewife (OR: 2.3, 95% CI: 1.03-5.1) were predictive of BMI values that were equal to or greater than 30 (Table 6.) Also, obesity (BMI of 30 or greater) and overweight (BMI of 25 to 29.9) were relatively higher in urban adults than rural adults and the odd ratio (OR) of obesity among those living in rural areas was 1.13 (CI: 0.6-2.1) in comparison with those living in urban areas. The observed difference was not statistically significant.

**Table 6.** Obesity (BMI $\geq$ 30) status compared with using Univariate and Multivariate regression

| parameters |               | Univariate analyses |         |        | Multivariate analyses |          |        |
|------------|---------------|---------------------|---------|--------|-----------------------|----------|--------|
|            |               | OR                  | CI      | P      | OR                    | CI       | P      |
| Gender     | Male          | -                   | -       | -      | -                     | -        | -      |
|            | Female        | 3                   | 2.2-4   | <0.001 | 1.1                   | 0.6-2.1  | 0.7    |
| Residency  | Urban         | -                   | -       | -      | -                     | -        | -      |
|            | Rural         | 1.05                | 0.8-1.4 | 0.7    | 0.96                  | 0.7-1.3  | 0.8    |
| Age        | 15-24         | -                   | -       | -      | -                     | -        | -      |
|            | 25-34         | 2.2                 | 1.2-3.7 | 0.006  | 1.8                   | 0.9-3.3  | 0.08   |
|            | 35-44         | 3.9                 | 2.2-6.5 | <0.001 | 3.1                   | 1.7-5.8  | <0.001 |
|            | 45-54         | 4.1                 | 2.4-6.9 | <0.001 | 3.1                   | 1.7-5.8  | <0.001 |
|            | 55-64         | 5.02                | 2.9-8.4 | <0.001 | 4.02                  | 2.1-7.5  | <0.001 |
| Occupation | Employee      | -                   | -       | -      | -                     | -        | -      |
|            | Self-employed | 0.6                 | 0.3-1.1 | 0.1    | 0.6                   | 0.3-1.1  | 0.1    |
|            | Student       | 0.3                 | 0.1-0.6 | 0.004  | 0.6                   | 0.2-1.7  | 0.3    |
|            | Housewife     | 2.6                 | 1.4-4.8 | 0.002  | 2.3                   | 1.03-5.1 | 0.04   |
|            | Retired       | 1.2                 | 0.5-2.6 | 0.7    | 0.8                   | 0.3-1.9  | 0.6    |
|            | Others        | 0.8                 | 0.3-1.8 | 0.7    | 0.9                   | 0.4-2.1  | 0.9    |

#### 4. Discussion

Considering the results of other studies (23-24), this study indicated that the BMI level has increased during the last five years in Mazandaran Province. This increase was 10% more than Hajian (23) reported in both genders, and, with regard to the nationwide study (24), the increase was 10% just in women. According to the report related to the study of the risk factors of non-communicable diseases in the 30 provinces of Iran in 2007 (24), the highest BMI scores for people in the age range of 15-64 were for men (25.4) and women (27.1) living in Mazandaran Province, whereas the overall means of the BMI scores were 24.3 for men and 25.9 for women. Most obese or overweight people were the men (49%) and women (61.7%) living in Mazandaran Province, while the mean indices were 40.4% for men and 51.8% for women across the country. Moreover, most of the obese people were those living in Mazandaran (17.8% of the men and 29.9% of women), while 11.2% of the men and 22.4% of the women in the whole country are considered to be obese.

Other studies conducted in Iran have indicated that the rate of overweight and obesity is increasing. The prevalence of obesity and overweight in Golestan Province is 62.6% in men and 65.7% in women, whereas in urban areas in Rafsanjan, 12.5% of men and 36.9% of women are reported to be obese or overweight (19, 28). These studies show that the rate of obesity and overweight in the men living in Golestan is higher than those living Mazandaran, but the women living in Golestan are less obese and overweight. The obesity and overweight difference investigated in Mazandaran and Golestan was less than that between Mazandaran and Rafsanjan. That may be due to the fact that Golestan is a neighboring province and the culture and lifestyles are similar, so the prevalence of obesity and overweight is similar. Talaee et al. reported BMI values over 25 in an average of 52.2% of the people studied (45% in women and 59% in men). They also reported BMI values equal to or greater than 30 in an average of 18.4% of the participants, with 11.3% in men and 25.6% in women (29).

A study conducted in Khoozestan, both the prevalence of overweight and obesity were significantly greater in women, and the odds of being overweight or obese was 2.6 and 5.64 times greater, respectively, in women than in men. The ratio of obesity in women (CL: 2.2-4) in our study was three times greater than that of men (30). The

findings of this study were in line with studies that have shown the high BMI values and the problems of overweight and obesity; however, the prevalence of overweight and obesity was much higher than those of most of the other studies. The results of the studies indicated that, in different societies, obesity is considered to be a serious problem. It has been proven that obesity is associated with many non-communicable diseases. About 75% of patients with type 2 diabetes are obese or overweight, and more than a third of obese people have hypertension. In addition, the risks of coronary artery disease for people whose BMI values are the range of 25-29.9 is double that of people of normal weight. Those with BMI values greater than 29 face three times the danger of those whose BMI value is 21. Obese people have a greater rate of many life-threatening diseases, including respiratory disorders, such as apnea; gallstones; some cancers, such as breast, endometrial, colon, and prostate cancers; some mental disorders, such as depression and anxiety; and even premature death (31-34). In this study, the highest means of BMI were in the age ranges of 45-54 and 55-64 with BMI values of  $27.63 \pm 5.9$  and  $28.89 \pm 6.2$ , respectively. The obesity rates in the age ranges of 55-64 years (CL: 2.1-7.5) and 45-54 years (CL: 1.7-5.8) were 4.02 and 3.1 times greater than in the 15-25 age range. In a study conducted in Khoozestan, the highest prevalence of obesity was observed among women over 51 and men in the age range of 31-50; the highest risk of obesity was among those in the age range of 31-50 whereas, in Hajian and Heidari's study, it was observed among the age group of 40-59 (30, 35). In another study, it was indicated that the prevalence of obesity increased significantly with age, so the risk of obesity in the elderly was 3 to 4 times greater than the risk for those who were less than 29(19).

All of these studies show that the prevalence of overweight, obesity, and the overall BMI increases with age, and our findings were consistent with that. Also, all of these studies emphasize the necessity of training people to correct their eating habits and improve their lifestyles considering the major role of women in adjusting and determining the diet of the members of a family, especially the children. Therefore, it is essential to pay attention when children and teenagers are overweight, since the treatment of obesity is one of the top health priorities, so it is better to take action to prevent obesity. Different studies have indicated that the prevalence of obesity has been increasing rapidly during the last two decades. This can be observed in developing countries because of the change in people's lifestyles and the increase in urbanization. In a study conducted in Tehran, statistically significant increases in obesity and overweight in men and women were observed over a period of less than five years. This was true in the case of this study as well. This shows the serious impacts of changes in lifestyle, economical status, advances in science and technology, mechanized farming, less physical activities while farming, and consuming more rice due to its availability. Furthermore, one study reported that the average physical activity of people living in Mazandaran Province in the age range of 16 to 64 was less than that of the entire population of Iran; in addition, the average consumptions of vegetables and fruit were less in Mazandaran Province than in all of the other provinces (24).

## 5. Conclusions

The results of this study showed that the prevalence of overweight and obesity are significant among people of Mazandaran Province. Therefore, it is recommended that educational-research centers and health authorities look for appropriate strategies to reduce the prevalence of this problem. In addition, they should do their best to choose continuous, multi-dimensional, and targeted strategies to administer interventional programs for managing eating habits and confronting the new changes to reduce their unfavorable outcomes.

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## Conflict of Interest:

There is no conflict of interest to be declared.

## Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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