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# The Relationship Between Nutritional Status and Some Socio-Economic Factors in Primary School Children in Shiraz, Iran

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**Abstract**

**Background:** The worldwide prevalence of malnutrition which is the root cause of many health problems, and presented as underweight and overweight, has increased in past decades. Therefore efforts are required to prevent malnutrition and its associated complications.
**Objectives:** The present study aimed to assess the relationship between nutritional status and some socio-economic factors in elementary school children in Shiraz, Iran.
**Materials and Methods:** This cross-sectional study was performed on 740 primary school students in Shiraz selected through cluster random sampling. The data consisted of personal characteristics, including demographic features, education grade, height, weight, birth order, number of children in the family, parents' age, parents' education levels, parents' occupation, immigration history, divorce, birth weight, breastfeeding period, birth season, history of obesity in the first degree relative, sleep duration, time spent on watching TV, using computer, and playing video games, eating meal and pre-meal patterns, and economic status. Besides, the students' Body Mass Indices (BMI, weight (kg)/height × height ($m^2$)) were measured in order to determine student's percentiles.
**Results:** The study results revealed that 73 (9.9%), 524 (70.8%), 101 (13.6%), and 42 (5.7%) students were underweight, normal, overweight, and obese, respectively. Among the evaluated factors, only mid-afternoon meal was significantly related to nutritional status. In comparison to having more than two pre-meals a day, not consuming afternoon pre-meal increased the chance of being underweight by about 10.1 folds. Moreover, the chance of being underweight increased in children who did not consume afternoon pre-meal due to less energy intake.
**Conclusions:** This study revealed a high prevalence of malnutrition among the primary school students. Yet, further studies are required to accurately identify the effective factors for prevention and treatment of malnutrition in school age children.

*Keywords:* Nutritional Status, Socioeconomic Factor, Child

## 1. Background

The worldwide prevalence of malnutrition characterized by underweight and overweight has increased in past decades. According to the reports published in 2010, approximately 150 million children were underweight, 43 millions were overweight and obese, and 92 millions were at risk of becoming overweight (1, 2).

Moreover, the statistics published by UNICEF showed that 11% of the Iranian children were underweight, 5% were wasted, and 15% were stunted (3). On the other hand, 17% of the Iranian school age children were overweight and obese (4). These findings underline the importance of nutritional status and malnutrition. Malnutrition in childhood results in adverse effects on every bodily organ accompanied by short- and long-term complications (4). Undernutrition is the cause of over one-sixth of all diseases in the world. In the regions with poor socio-economic status, this measure can reach one-half (50%) of the population (1). The consequences of overweight and obesity in childhood include metabolic syndrome, type 2 diabetes, and earlier menarche in girls, hypertension, cardiovascular disease, sleep apnea, obesity in adulthood, many kinds of tumors, and preterm death (5). Since malnutrition is the known cause of many global health problems, it seems that some efforts are required to prevent malnutrition and its associated complications in children.

Malnutrition can originate from complex interactions among genes, dietary intake, physical activity, environmental and individual factors, and socioeconomic factors (6, 7), such as birth weight, breastfeeding, sleep duration, parents' jobs, marital status, family income, and parents' education levels (8). These interactions could

eventually cause malnutrition among children. However, some other underlying factors of malnutrition in childhood have remained undiscovered. A study on 7 year old students in Shiraz showed a significant correlation between breastfeeding duration, family history of obesity and overweight, and prevalence of obesity among the students. However, no significant relationship was observed between overweight and obesity, and birth weight and socio-economic status (9). Another study revealed that factors, such as sleep duration, eating snacks while watching TV, skipping breakfast and dinner, daily allowance, and cost of snacks, were associated with overweight and obesity in children. However, these relationships might not be independent (10).

Since malnutrition in childhood could cause various diseases and disorders in adulthood, children's health plays a key role in achieving the country's goals. Therefore, in order to prevent these problems, the determinants involved are required to be identified.

## 2. Objectives

Considering the importance of these risk factors, the present study aims to assess the relationship between malnutrition and some socio-economic factors in elementary school children in Shiraz, Iran.

## 3. Materials and Methods

### 3.1. Study Population

This cross-sectional study was conducted from May to June 2013. The data were collected from 740 primary school students in Shiraz selected by cluster random sampling method.

After randomly selecting 12 schools from the 4 educational districts in Shiraz, the number of samples (n = 740) was divided by the average number of students in each class (30 students), giving the number of classes required for data collection (740/30 = 25 classes). All the students of these classes were enrolled into the study. The students suffering from any diseases were excluded from the research.

### 3.2. Data Collection

The study data were collected using a questionnaire involving personal characteristics, such as demographic features, education grade, height, weight, birth order, number of children in the family, parents' age, parents education levels, parents' career, immigration history, divorce, birth weight, breastfeeding period, birth season, history of obesity in the first degree relative, sleep time period, time spent on watching TV, using computer, and playing video games, eating meal and pre-meal patterns, and economic status. Economic status was evaluated by factors, such as owning a house, number of house rooms, owning a car, parents' average income, owning facilities, such as TV, refrigerator, washing machine, video devices, and computer, daily allowance, and the cost of snacks.

### 3.3. Anthropometric Measurement

To measure the students' height, they were asked to stand on a Seca stadiometer with their heels, buttock, shoulders, and back of head touching the wall. Their height was then measured to the nearest 0.5 cm.

In addition, the students' weight was measured to the nearest 100 g while standing on a Seca scale, wearing light clothing and without shoes.

Accuracy of the above-mentioned tools was confirmed after control measurements. For instance, after weighing every 10 students, the scale was checked using standard weights.

The students' Body Mass Index (BMI, weight (kg)/height. Height ($m^2$)) was measured and their percentiles were determined based on the physical growth diagram of the girls and boys in the age range of 2-20 years. Accordingly, the measures below the 5th percentile were considered as malnutrition, those between the 85th and the95th percentiles regarded as overweight, and values above the 95th percentile indicated obesity. Finally, the measures between the 5th and the 85th percentile considered as normal weight.

### 3.4. Statistical Analysis

After data collection, univariate chi-square was used to determine the relationship between nutritional status and independent variables. Besides, the real association between weight status and independent variables was assessed using multinomial logistic regression models. All the analyses were performed using the SPSS statistical software (version 19.0) and $P < 0.05$ was considered as statistically significant.

## 4. Results

Overall, 740 questionnaires were collected and sent to the department of Epidemiology of Shiraz University of Medical Sciences for analysis. According to the results, 332 students were males and 408 females, with the mean age 9.45 years. Moreover, 73 students (9.9%) were underweight, 524 (70.8%) had normal weight, 101 (13.6%) were overweight, and 42 (5.7%) were obese. Among 332 male students, 33 (9.9%) were underweight, 224 (67.5%) had normal weight, 50 (15.1%) were overweight, and 25 (7.5%) were obese. On the other hand, regarding female students, 40 (9.8%) were underweight, 300 (73.5%) had normal weight, 51 (12.5%) were overweight, and 17 (4.2%) were obese. Thus, overweight and obesity seemed to be more prevalent among the male students compared to the females.

The results of univariate analysis are presented in Tables 1 - 3.

**Table 1.** The Relationship Between the Students' Weight Status and Social Factors[a]

| | Underweight (< 5 percentile) | Normal Weight (5 - 85 percentile) | Overweight (85 - 95 Percentile) | Obesity (> 95 Percentile) | Total | P Value |
|---|---|---|---|---|---|---|
| **Education grade** | | | | | | .582 |
| 1 | 15 (10.6) | 96 (67.6) | 19 (13.4) | 12 (8.5) | 142 (100) | |
| 2 | 14 (10.4) | 98 (73.1) | 16 (11.9) | 6 (4.5) | 134 (100) | |
| 3 | 14 (9.9) | 105 (74.5) | 17 (12.1) | 5 (3.5) | 141 (100) | |
| 4 | 8 (7.7) | 77 (74.0) | 15 (14.4) | 4 (3.8) | 104 (100) | |
| 5 | 8 (6.5) | 89 (71.8) | 17 (13.7) | 10 (8.1) | 124 (100) | |
| 6 | 14 (14.7) | 59 (62.1) | 17 (17.9) | 5 (5.3) | 95 (100) | |
| **Mother's job** | | | | | | .184 |
| Homemaker | 62 (9.8) | 454 (72.1) | 82 (13) | 32 (5.1%) | 630 (100) | |
| Employee | 11 (10) | 70 (63.6) | 19 (17.3) | 10 (9.1) | 110 (100) | |
| **Family history of obesity** | | | | | | .002 |
| No | 59 (11) | 388 (72.2) | 65 (12.2) | 22 (4.1) | 534 (100) | |
| Yes | 14 (6.8) | 136 (66) | 36 (17.5) | 20 (9.7) | 206 (100) | |
| **Immigration** | | | | | | .962 |
| No | 60 (9.9) | 426 (70.4) | 84 (13.9) | 35 (5.8) | 605 (100) | |
| Yes | 13 (9.6) | 98 (72.6) | 17 (12.6) | 7 (5.2) | 135 (100) | |
| **Birth season** | | | | | | .564 |
| Spring | 21 (12.5) | 109 (64.9) | 28 (16.7) | 10 (6) | 168 (100) | |
| Summer | 18 (8.7) | 146 (70.9) | 30 (14.6) | 12 (5.8) | 206 (100) | |
| Autumn | 18 (9.5) | 144 (75.8) | 21 (11.1%) | 7 (3.7) | 190 (100) | |
| Winter | 16 (9.1) | 125 (71.0) | 22 (12.5) | 13 (7.4) | 176 (100) | |

[a]Data are presented as No.(%).

**Table 2.** The Relationship Between the Students' Weight Status and Eating Meal and Pre-Meal Pattern[a]

| | Underweight (< 5 Percentile) | Normal Weight (5 - 85 Percentile) | Overweight (85 - 95 Percentile) | Obesity (> 95 Percentile) | Total | P Value |
|---|---|---|---|---|---|---|
| **Eating breakfast** | | | | | | .323 |
| No | 20 (11.2) | 131 (73.6) | 21 (11.8) | 6 (3.4) | 176 (100) | |
| Yes | 53 (9.4) | 393 (69.9) | 80 (14.2) | 36 (6.4) | 562 (100) | |
| **Weekly lunch-withdraw** | | | | | | .335 |
| No | 69 (10.3) | 471 (70.1) | 95 (14.1) | 37 (5.5) | 672 (100) | |
| Yes | 4 (5.9) | 53 (77.9) | 6 (8.8) | 5 (7.4) | 68 (100) | |
| **Weekly dinner-withdraw** | | | | | | .056 |
| No | 52 (9.7) | 371 (69.3) | 79 (14.8) | 33 (6.2) | 535 (100) | |
| Once weekly | 17 (11.8) | 112 (77.8) | 9 (6.3) | 6 (4.2) | 144 (100) | |
| **More than once** | 4 (6.6) | 41 (67.2) | 13 (21.3) | 3 (4.9) | 61 (100) | |
| **Morning pre-meal eating** | | | | | | .424 |
| No | 19 (14.7) | 87 (67.4) | 17 (13.2) | 6 (4.7) | 129 (100) | |
| 1 - 2 | 50 (9.5) | 376 (71.7) | 72 (13.6) | 31 (5.9) | 529 (100) | |
| More than twice | 4 (4.9) | 61 (74.4) | 12 (14.6) | 5 (6.1) | 82 (100) | |
| **Evening pre-meal eating** | | | | | | .045 |
| No | 8 (9) | 67 (75.3) | 9 (10.1) | 5 (5.6) | 89 (100%) | |
| 1 - 2 | 62 (11.2) | 383 (69.1) | 82 (14.8) | 27 (4.9) | 554 (100) | |
| More than twice | 3 (3.1) | 74 (76.3) | 10 (10.3) | 10 (10.3) | 97 (100) | |

[a]Data are presented as No.(%).

**Table 3.** The Relationship Between the Students' Weight Status and Economic Status[a]

| | Underweight (< 5 Percentile) | Normal weight (5 - 85 Percentile) | Overweight (85 - 95 Percentile) | Obesity (> 95 Percentile) | Total | P Value |
|---|---|---|---|---|---|---|
| **Owning a house** | | | | | | .387 |
| Owner | 30 (8.7) | 244 (70.5) | 54 (15.6) | 18 (5.2) | 346 (100) | |
| Renter | 43 (10.9) | 280 (71.1) | 47 (11.9) | 24 (6.1) | 394 (100) | |
| **Owning car** | | | | | | .390 |
| No | 20 (11.2) | 131 (73.6) | 18 (10.1) | 9 (5.1) | 178 (100) | |
| Yes | 53 (9.4) | 393 (69.9) | 83 (14.8) | 33 (5.9) | 562 (100) | |

[a]Data are presented as No.(%).

**Table 4.** Descriptive Information of the Parents' Ages Based on 4 Types of Weight Status

| CDC | Underweight (< 5 Percentile) | | | Normal Weight (5 - 85 Percentile) | | | Overweight (85 - 95 Percentile) | | | Obesity (> 95 Percentile) | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Median | Min | Max | Median | Min | Max | Median | Min | Max | Median | Min | Max | Median |
| **Father's age, y** | 31 | 57 | 42 | 29 | 75 | 41 | 27 | 69 | 42 | 29 | 61 | 39 | 27 | 75 | 41 |
| **The age of mother, y** | 23 | 47 | 36 | 20 | 50 | 35 | 26 | 53 | 35 | 26 | 49 | 34 | 20 | 53 | 35 |

The students' growth and weight status was analyzed with regard to their classes. Among the 6 classes of elementary grades, the most obese cases (8.5 %) were among the students of grade 1. Concerning the inheritance of obesity, the prevalence of obesity was significantly higher among the students who had obese mothers, fathers, brothers, or sisters (P = 0.002).

According to Table 1, no significant relationship was found between weight status and family history of immigration, season of birth, and mother's job.

The relationships between the students' weight status and eating meal and pre-meal patterns has been shown in Table 2. Accordingly, no significant relationship was observed between weight status and eating the main meals and the mid-morning meal. Moreover, most of the underweight and overweight students were among those who received one or two afternoon pre-meals. Also, the prevalence of obesity was higher among the students receiving more than two afternoon pre-meals. However, only the difference between underweight and normal weight students was statistically significant. According to multinomial logistic analysis, lack of afternoon pre-meal consumption increased the chance of being underweight by about 10.1 folds in comparison to having more than two pre-meals a day.

The relationship between weight status and owning a house and car has been presented in Table 3 where no significant correlation was found between the students' weight status and the family's economic status.

The factors with P < 0.025 in univariate analysis were examined through multinomial logistic test. In our study, the results of univariate analysis demonstrated that the prevalence of overweight and obesity was significantly higher among the students with family history of obesity (P = 0.002). However, no such relationship was observed in multinomial logistic regression analysis.

The range and median of the parents' age which were evaluated qualitatively are presented in Table 4.

Other factors evaluated in the present study included family size, number of children, parents' education levels, father's job, divorce, birth weight, breastfeeding duration, sleep duration, time spent on watching TV, having meal at sleeping time, number of rooms in one's house, average family income, daily allowance, and cost of snacks. Nevertheless, these factors were not statistically analyzed due to the insufficient amount of data.

## 5. Discussion

The current survey showed a high prevalence of malnutrition among the school age children in Shiraz. Overweight and obesity were found to be highly prevalent, particularly among the boy students. Wang et al. reported that in big cities in China from 1985 to 2000, the prevalence of overweight and obesity among 7-9 years old increased by approximately 15% among girls (from 1 - 2% to 17%) and 23% among boys (from 1 - 2% to 25%) (11). This growing trend has become an epidemic in developed and developing countries (5).

The results of the current cross-sectional study indicated no significant correlation between age, grade, and nutritional status regarding underweight, overweight, and obesity. One reason for the non-significant relationship between the students' weight status and educational grades might be the low number of malnourished children in each class which led to inappropriate statistical analysis. Hajian et al. performed a study on nutritional status of 6 - 11 year old students in Babol and reported that the lowest and highest prevalence rates of malnutrition were related to 6 and 11 year-old students, respectively.

Besides, they found a statistically significant correlation between malnutrition and age, but no significant correlation between malnutrition and sex, which confirms our results (12). The present study demonstrated no relationships between weight status and sex, and the parents did not differentiate health concerns between boys and girls. Similar results were also obtained in the research carried out by Hajian (12).

In our survey, most of the underweight, overweight, and obese students were born to employed mothers, where these correlations were not statistically significant ($P > 0.05$). This might result from the increment of all mothers' awareness of and attention to the children's proper nutrition. Therefore, mother's job has no effects on the children's nutritional status. However, the survey by Hajian et al. revealed that the prevalence of malnutrition was higher in the children whose mothers were housewives. Mother's employment could in fact reduce child's malnutrition because of the mother's higher education level and improvement of the family's economic status (12).

The findings of the current study demonstrated no significant association between nutritional status and history of immigration. This might be due to the small number of students who immigrated to Shiraz, which led to inappropriate statistical analysis.

In our study, most of the overweight and obese students had positive family history of obesity, and the difference between the two groups was statistically significant ($P = 0.002$) in univariate chi-square test but not in multinomial logistic regression. This association may be disturbed by other variables. However, some studies have shown a significant relationship using multinomial logistic regression (9, 13). Neutzling et al., found that having overweight or obese parents was significantly associated with teenagers' obesity. In that study, parental obesity had a more significant role compared to other factors (13). In addition, Kalantari et al., showed a significant correlation between the mothers' BMI and students' overweight and obesity. According to the results, the BMIs of the students who had mothers with BMI > 25 were higher in comparison to those whose mothers had normal BMIs. Moreover, they found a statistically significant relationship between positive history of obesity in the first degree family members and obesity in 7 year -old students (9). The risk of obesity has been reported to be more than 40% among the children with obese parents, but less than 15% among those with normal weight parents. This phenomenon reflects the remarkable role of genetic in obesity (14). One study showed that parents' overweight and obesity was the most important predictor of children's obesity in Germany (15). Some other studies have also come to the same conclusions (16). Many researchers believed that the relationship between children's and parents' obesity resulted from the effect of genetic on development of obesity, incorrect food and nutritional patterns, wrong lifestyle, and low physical activity, and ruling in their families (16, 17).

Our study demonstrated no significant relationship between weight status and eating the main meals. This non-significant result might be due to the small number of students who escaped the main meals. However, some studies have indicated a significant relationship between weight status and eating the main meals (10, 18). For instance, Alborzimanesh et al. found that incidence of ignoring the main meals was inversely related to overweight and obesity (10). One cross-sectional study performed by Moy FM et al., showed that 19.9% of the students neglected at least one of the main meals (18). Although the results of many studies have confirmed the association between the frequency of meals and changes in weight, those of some epidemiological studies have revealed no relationships between meals and obesity. This can be justified by suppression of appetite resulting from reduction of plasma insulin concentration in the individuals increasing their number of meals. Elevated insulin levels could inhibit lipase enzyme which might result in suppressed lipolysis and increased fat storage (19).

Our study results showed no significant relationship between weight status and eating morning pre-meal ($P = 0.424$). Also, the results of multinomial logistic analysis revealed that lack of afternoon pre-meal consumption increased the chance of being underweight by about 10.1 folds in comparison to having more than two pre-meals a day. In fact, the chance of being underweight increased for the children who did not consume afternoon pre-meal due to less energy intake, a finding contrary to other studies. For instance, some studies have suggested that eating pre-meal might enhance energy intake which could boost weight gain (20, 21), but some other studies have shown an inverse correlation between eating pre-meals and weight status (22, 23). Moreover, Alborzimanesh et al., found that the number of morning and afternoon pre-meals was significantly higher in obese individuals compared to those with normal weight (10). Summerbell et al., stated that pre-meals contain more carbohydrates and less fat in comparison to the main meals (24). Among the night snack takers, one reason for reduction of calorie intake and increase in the trend of losing weight could be due to eating foods from cereal category after the evening meal (25).

The findings of current study indicated no significant correlations between season of birth and weight status. This might be due to the fact that in Iran, climate variety in all seasons provides access to all types of foods. Thus, birth season may not be effective in weight status. One reason for the significant relationship between weight status and season of birth can be the fact that cold weather might affect food intake during pregnancy, leading to abnormal fetal hypothalamic growth. Melatonin hormone may also play a role in this relationship. Shorter day light period may result in reduction of serum melatonin levels which leads to change in metabolism, eventually increasing weight. Hence, change in fetal melatonin levels, which occurs by mother exposure to light, could play an important role in postnatal growth (26).

Our survey showed no significant correlation between weight status and economic status. Nowadays, parents try to provide optimal nutrition for their children, because of their awareness of nutrition impact. Therefore, low economic status may not be effective in children's nutrition status. Similarly, Shahghelyan et al. found no significant correlation between the students' economic status and weight status (27), a finding consistent with the report of Tabatabaii et al. (28). This might be due to the fact that the methods used for assessing the economic status did not take into account the families' facilities. Overall, because of many social and cultural differences between different regions of Iran, to date no accurate method has been designed to determine the families' economic status (28).

Although many studies have shown associations between nutritional status and some health-related factors, such as family size, number of children, parents' age, parents' education levels, father's job, divorce, birth weight, breastfeeding duration, sleep duration, time spent on watching TV, having meal at sleeping time, number of rooms in one's house, average family income, daily allowance, and cost of snacks (5, 8, 10, 13, 18, 27-31), these factors were not statistically analyzed in our study because of the insufficient amount of data.

The present study had some limitations. First, this cross-sectional study was conducted in Shiraz; therefore, generalization of the results to the students from different parts of the country should be done with caution. Another limitation of this study was collection of the data based on the parents' self-reports. Also the low number of sample in this study may be the cause of some insignificance relationship between a few factors. Finally, the last limitation of our study was inappropriate cooperation of the authorities of some educational districts in gathering the study data.

In summary, the results of the current study only revealed a significant relationship between eating afternoon pre-meal and nutritional status. According to the results, lack of afternoon pre-meal consumption increased the chance of getting underweight by about 10.1 folds in comparison to having more than two pre-meals a day.

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