

HYGIENIC ANALYSIS OF THE NUTRITIONAL STATUS OF UZKIMYOSANOAT WORKERS

Ortikov Bobomurod Baymamatovich¹, Buriboyev Eldar Mamurjonovich²,
Khaydarov Shovkatjon Madaminjon ogl³, Saidova Gulbakhor Tursunaliyevna⁴

¹PhD, Associate Professor Department of Hygiene of Children, Adolescents and Nutrition Tashkent State Medical University, Tashkent, Uzbekistan

Email: bobomurodortiqov89@gmail.com ORCID: <https://orcid.org/0000-0003-1182-8172>

²PhD, Associate Professor Department of Hygiene of Children, Adolescents and Nutrition Tashkent State Medical University, Tashkent, Uzbekistan Email: elwolfchik@gmail.com ORCID: <https://orcid.org/0000-0001-5470-4159>

³PhD, Senior teacher Department of Hygiene of Children, Adolescents and Nutrition Tashkent State Medical University, Tashkent, Uzbekistan

Email: sh.xaydarov77@gmail.com ORCID: <https://orcid.org/0009-0002-5763-5018>

⁴PhD, assistant Department of Hygiene of Children, Adolescents and Nutrition Tashkent State Medical University, Tashkent, Uzbekistan

Email: gulbaxorsaidova595@gmail.com ORCID: <https://orcid.org/0009-0002-0522-409X>

DOI: 10.63001/tbs.2025.v20.i04.pp1238-1237

Keywords
Worker nutrition, daily diet, seasonal nutrition (winter-spring and summer-autumn), physiological norms of food consumption.

Received on:

16-10-2025

Accepted on:

11-11-2025

Published on:

15-12-2025

ABSTRACT

Objectives: To analyze the dietary status of workers in a manufacturing enterprise both at home and in the workplace. To conduct a comparative analysis of the daily food consumption levels of workers in the winter-spring and summer-autumn seasons against physiological normative indicators. Based on the obtained results, to recommend a preventive dietary plan.

Aims: To conduct a hygienic analysis of the absolute dietary status of workers at AMMOFOS-MAKSAM-Uzkimyosanoat.

Methods: The study included 283 workers (185 men and 98 women) employed at AMMOFOS-MAKSAM-Uzkimyosanoat between 2021 and 2023. Data on their actual dietary intake at home and in the workplace was collected and analyzed using a questionnaire survey.

Results: The consumption levels of 38 types of food products in the daily diet of Uzkimyosanoat enterprise workers were analyzed for the winter-spring and summer-autumn seasons. The consumption of flour products ranged from 64.3–82.8% in winter-spring and 35.0–42.8% in summer-autumn. Bread consumption followed a similar trend, with 47.4–71.9% in winter-spring and 39.8–47.6% in summer-autumn. The consumption of pasta was 17.7–15.6 g and 12.6–10.8 g, confectionery products 30.6–27.9 g and 6.8–8.1 g, sugar 1.61–2.47 times and 1.57–2.43 times, margarine 302–376% and 244–234%, and salt 4.8–4.1 g and 2.7–1.8 g, all of which were found to be consumed in excess. Meanwhile, the supply indicator for milk and dairy products was only 56.3–55.1% in winter-spring and 29.3–31.3% in summer-autumn.

Conclusion: The daily intake levels of the above-mentioned food products were found to exceed physiological norms, whereas the intake of essential nutrients was insufficient. These dietary imbalances can lead to disruptions in rational and healthy nutrition, ultimately affecting workers' health. Ensuring proper nutrition is crucial for maintaining and strengthening workers' health and enhancing their work productivity.

1. Introduction

In the context of the rapid development of modern industry, unfavorable working conditions that affect the health of workers in manufacturing

enterprises remain a pressing issue. One of the key factors in maintaining workers' health is ensuring an adequate supply of essential nutrients

to the body. Any disruption in dietary patterns can negatively impact human health, reduce tolerance to unfavorable working conditions, decrease productivity, and contribute to the development of occupational diseases [6,10,16].

Nutrition is one of the primary determinants of human health, playing a crucial role in strengthening the body's immune system, ensuring longevity, and increasing resistance to adverse environmental effects. Deficiencies or excesses of macro- and microelements in the daily diet can lead to the development of various nutrition-related diseases. Overall, such issues significantly increase economic losses associated with workplace accidents and occupational diseases on a global scale. These losses account for approximately 4% of the world's gross domestic product (GDP) [5,19].

In cases where people live and work in ecologically unfavorable and hazardous conditions, therapeutic and preventive nutrition (TPN) plays an essential role in the system of medical and preventive measures aimed at preserving and improving health [2, 14, 18].

An assessment of the actual dietary habits of workers in manufacturing enterprises shows that 47% of them use the company's cafeteria during working hours, while 50% bring homemade food. The remaining 3% of workers do not eat at all during their shifts. The reasons for not using the company cafeteria vary: first, the continuous nature of the production process does not allow for breaks. Second, the distance between dining facilities and workplaces is another significant factor. Third, the allocated break time for lunch and preventive hot meals is insufficient [1,3,17].

These factors negatively impact workers' overall health and can contribute to the development of occupational diseases [4,12,13].

As a result of poor dietary habits, workers' bodies do not receive adequate nutrients. Deficiencies or imbalances in proteins, vitamins, and essential macro- and microelements (such as calcium,

iodine, iron, and fluoride) in the daily diet can lead to health deterioration [5,7,8,11].

The primary goal of therapeutic and preventive nutrition is to enhance the body's protective and adaptive abilities. This process aims to strengthen the body's resistance through food consumption, reinforce physiological defense mechanisms, regulate the metabolism of xenobiotics, and reduce the depletion of food and biologically active substances[9,15,20].

2. Methods

The study included 283 workers (185 men and 98 women) employed at AMMOFOS-MAKSAM-Uzkimyosanoat between 2021 and 2023. Data on their actual dietary intake (both at home and in the workplace) was collected using a questionnaire survey. For statistical processing, the "Statistica for Windows 7.0" software package was used on a personal computer.

3. Results

Our study conducted a hygienic analysis of the actual dietary status of 283 workers at AMMOFOS-MAKSAM-Uzkimyosanoat, located in Olmaliq district, Tashkent region. In the first stage of the study, the daily energy expenditure of the workers at Uzkimyosanoat was analyzed. Based on the physical activity coefficient (1.9), their work intensity and physical workload were classified under Group 3 (2,500–3,300 kcal), in accordance with the normative indicators from SanMvaQ 0007-20 ("Average daily rational nutrition norms for different age, gender, and occupational activity groups in the Republic of Uzbekistan").

In the next stage, the dietary habits of Uzkimyosanoat workers were analyzed. The first stage, conducted during the winter-spring season, examined the daily diet composition of workers from a textile enterprise. A comparative analysis of 38 types of food products in the workers' daily diet against physiological normative indicators is presented in Table 1.

Table 1. Analysis of the absolute dietary status of AMMOFOS-MAKSAM-Uzkimyosanoat workers during the winter-spring season.

| No. | Products | Physiological standard , gr | | Winter-spring season | |
|-----|---------------------------|-----------------------------|-------|----------------------|---------------|
| | | Male | Woman | Male workers | Woman workers |
| 1 | Flour | 30 | 25 | 49.3±1.5 | 45.7±1.3 |
| 2 | Rice | 55 | 50 | 70.5±1.9 | 62.2±1.5 |
| 3 | The gluttons | 25 | 25 | 55.1±1.3 | 49.4±1.1 |
| 4 | Bread and bakery products | 250 | 220 | 368.5±12.8 | 378.3±11.2 |
| 5 | Pasta | 55 | 50 | 72.7±1.6 | 65.6±1.7 |
| 6 | Potato | 280 | 250 | 260±8.7 | 235±6.1 |
| 7 | Cucumber , tomato | 110 | 95 | 50.8±2.1 | 55.1±2.0 * |
| 8 | Beetroot and carrots | 90 | 85 | 92.6±4.1 | 89.9±3.2 |
| 9 | Other vegetable | 90 | 85 | 92.2±4.1 | 89.4±3.2 |
| 10 | Pomegranate crops | 70 | 60 | 73.2±3.4 | 65.5±3.1 |
| 11 | Pumpkin | 60 | 60 | 8.1±0.1 | 6.3±0.1 * |
| 12 | Fruits | 40 | 40 | 48.6±0.4 | 55.4±0.2 |
| 13 | Grapes | 250 | 250 | 189.2±5.4 | 196.1±4.2 |
| 14 | Beef | 40 | 40 | 38±1.2 | 36±1.3 |
| 15 | Sheep meat | 65 | 60 | 86±1.7 | 83±1.9 |
| 16 | Internal products | 30 | 20 | 16.7±0.9 | 13.4±0.8 * |
| 17 | Chicken | 8 | 5 | 11.8±0.4 | 10.3±0.3 |
| 18 | Sausage | 70 | 65 | 74.6±2.1 | 67.8±2.3 |
| 19 | Fish | 25 | 15 | 31.9±0.3 | 30.1±0.1 |
| 20 | Fish products | 40 | 35 | 51.7±1.7 | 44.5±1.1 |
| 21 | Fish canned food | 30 | 30 | 36±1.4 | 32±1.3 |
| 22 | Milk | 400 | 400 | 181.4±4.1 | 172.0±3.7 |
| 23 | Milk products | 22 | 22 | 18±0.2 | 19±0.4 |
| 24 | Cheese | 20 | 20 | 22.3±1.3 | 27.1±1.1 * |
| 25 | Cottage cheese | 50 | 45 | 55.2±0.3 | 50.3±0.5 |
| 26 | Egg | 1 | 1 | 1.9±0.03 | 1.6±0.03 ** |
| 27 | Sugar | 35 | 20 | 56.2±1.2 | 49.5±1.1 |
| 28 | Margarine | 5 | 5 | 20.1±0.8 | 23.8±0.9 |
| 29 | Plant oil | 35 | 25 | 48±1.5 | 38±1.3 |
| 30 | Mash | 6 | 6 | 8.8±0.1 | 7.9±0.1 ** |
| 31 | Beans | 6 | 6 | 9.7±0.3 | 7.6±0.2 |
| 33 | Letter No. | 8 | 8 | 17.6±0.4 | 13.7±0.3 |
| 34 | Salt | 5 | 5 | 9.8±1.4 | 9.1±1.2 |
| 35 | End paste | 5 | 5 | 9.7±0.5 | 7.6±0.1 |
| 36 | Coffee | 2 | 2 | 2.4±0.01 | 2.9±0.01 ** |
| 37 | Butter | 35 | 30 | 41.7±0.8 | 40.3±0.9 * |
| 38 | Confectionery products | 40 | 40 | 70.6±4.1 | 67.9±3.2 |

Based on the data presented in Table 1, it is evident that the daily diet of Uzkimyosanoat enterprise workers contains significantly higher levels of nearly 30 types of food products compared to physiological norms.

The daily supply level of flour in the workers' diet was found to exceed physiological norms by 64.3% (19.3 g)–82.8% (20.7 g). In addition to exceeding the recommended intake, an important

observation regarding bread consumption is that it is primarily supplied in the form of wheat flour-based bread and bakery products. The consumption of these products was 147.4% (368.5±12.8 g)–171.9% (378.3±11.2 g) of the physiological norm.

The consumption of pasta products was as follows: 72.7±1.6 g for male workers and 65.6±1.7 g for female workers, which exceeded physiological

norms by 17.7–15.6 g. During the cold season, daily confectionery product consumption exceeded the norm by 30.6 g in male workers and 27.9 g in female workers. The daily sugar intake was 1.61 times higher than the norm in men and 2.47 times higher in women. Daily margarine consumption was 20.1 ± 0.8 g (402%) for male workers and 23.8 ± 0.9 g (476%) for female workers, indicating a significant excess. The daily consumption of

potatoes was 260 ± 8.7 g (92.8%) for male workers and 235 ± 6.1 g (94%) for female workers. The daily salt intake was 9.8 ± 1.4 g (196%) for men and 9.1 ± 1.2 g (182%) for women, which significantly exceeded the recommended levels. The total daily intake of milk and dairy products was 276.9 g for male workers and 268.4 g for female workers, with supply levels at 56.3% and 55.1%, respectively.

Table 2. Analysis of the absolute dietary status of AMMOFOS-MAKSAM-Uzkimyosanoat workers during the summer-autumn season.

| No. | Products | Standard, gr | | Summer- autumn | |
|-----|---------------------------|--------------|-------|------------------|---------------------|
| | | Male | Woman | Male workers | Woman workers |
| 1 | Flour | 30 | 25 | 4.05 ± 0.9 | 35.7 ± 0.7 |
| 2 | Rice | 55 | 50 | 6.30 ± 1.4 | 6.18 ± 1.3 |
| 3 | The gluttons | 25 | 25 | 37.2 ± 0.3 | 36.4 ± 0.4 |
| 4 | Bread and bakery products | 250 | 220 | 34.95 ± 10.4 | 324.7 ± 9.8 |
| 5 | Pasta | 55 | 50 | 67.6 ± 1.4 | 60.8 ± 1.3 |
| 6 | Potatoes | 280 | 250 | 29.15 ± 5.2 | 27.26 ± 6.1 |
| 7 | Cucumber, tomato | 110 | 95 | 113.9 ± 3.1 | 103.5 ± 2.4 |
| 8 | Beetroot and carrots | 90 | 85 | 75.7 ± 2.5 | 79.3 ± 2.4 |
| 9 | Cabbage | 55 | 50 | 66.2 ± 0.3 | 64.3 ± 0.9 |
| 10 | Other vegetable | 70 | 60 | 74.9 ± 2.4 | 71.4 ± 2.3 |
| 11 | Pomegranate crops | 60 | 60 | 73.8 ± 0.8 | 69.5 ± 0.6 |
| 12 | Pumpkin | 40 | 40 | 41.5 ± 0.3 | 43.4 ± 0.5 |
| 13 | Fruits | 250 | 250 | 238.7 ± 6.1 | 230.8 ± 5.1 |
| 14 | Grapes | 40 | 40 | 62.3 ± 1.4 | 54.6 ± 1.7 |
| 15 | Beef | 65 | 60 | 78.1 ± 2.4 | 75.8 ± 1.4 |
| 16 | Sheep meat | 30 | 20 | 16.9 ± 1.0 | 13.7 ± 1.1 |
| 17 | Internal products | 8 | 5 | 3.2 ± 0.1 | 3.8 ± 0.1 |
| 18 | Chicken | 70 | 65 | 74.6 ± 1.7 | 66.4 ± 1.2 |
| 19 | Sausage | 25 | 15 | 26.5 ± 0.4 | 17.4 ± 0.7 |
| 20 | Fish | 40 | 35 | 35.2 ± 0.7 | 30.6 ± 0.9 |
| 21 | Fish products | 30 | 30 | 28.1 ± 1.1 | 26.2 ± 0.8 |
| 22 | Fish canned food | 22 | 22 | 19.3 ± 0.1 | $18.4 \pm 0.2^*$ |
| 23 | Milk | 400 | 400 | 117.4 ± 2.4 | 125.3 ± 2.3 |
| 24 | Milk products | 20 | 20 | 21.3 ± 0.7 | 24.7 ± 0.6 |
| 25 | Cheese | 20 | 20 | 14.5 ± 0.3 | 12.9 ± 0.2 |
| 26 | Cottage cheese | 50 | 45 | 43.8 ± 0.3 | $41.6 \pm 0.1^*$ |
| 27 | Egg | 1 | 1 | 1.5 ± 0.01 | $1.2 \pm 0.01^{**}$ |
| 28 | Sugar | 35 | 20 | 54.9 ± 0.9 | 48.6 ± 0.9 |
| 29 | Margarine | 5 | 5 | 12.2 ± 0.4 | 11.7 ± 0.7 |
| 30 | Plant oil | 35 | 25 | 47.8 ± 1.4 | 53.5 ± 1.2 |
| 31 | Mash | 6 | 6 | 4.9 ± 0.1 | 4.1 ± 0.1 |
| 32 | Beans | 6 | 6 | 3.4 ± 0.1 | 4.6 ± 0.1 |
| 33 | Letter No. | 8 | 8 | 5.8 ± 0.1 | 6.3 ± 0.1 |
| 34 | Salt | 5 | 5 | 7.7 ± 0.2 | 6.8 ± 0.1 |
| 35 | End paste | 5 | 5 | 5.0 ± 0.02 | $4.6 \pm 0.01^{**}$ |
| 36 | Coffee | 2 | 2 | 0.7 ± 0.01 | 1.1 ± 0.01 |
| 37 | Butter | 35 | 30 | 38.9 ± 0.5 | 33.7 ± 0.7 |
| 38 | Confectionery products | 40 | 40 | 46.8 ± 2.1 | 48.1 ± 2.2 |

Note: * - differences are significant compared to the indicators of the physiological norm group (* - $P < 0.05$, ** - $P < 0.01$, *** - $R < 0.001$)

The dietary consumption of Uzkimyosanoat enterprise workers during the summer-autumn season is fully outlined in Table 2. During this season, the daily supply level of flour and flour products exceeded physiological norms by 35.0% (10.5 g)–42.8% (10.7 g). The consumption of bread and bakery products was 349.5 ± 10.4 g for male workers and 324.7 ± 9.8 g for female workers. Regarding pasta product consumption, male workers exceeded the physiological norm by 12.6 g (22.9%), while female workers exceeded it by 10.8 g (21.6%). The consumption of potatoes in the daily diet was as follows: 291.5 ± 5.2 g (104.1%) for male workers and 272.6 ± 6.1 g (109.0%) for female workers. The consumption of confectionery products exceeded the norm by 6.8 g (117.0%) for men and 8.1 g (120.2%) for women. The supply level of spices in the daily diet was 40% higher for male workers and 50% higher for female workers. The sugar intake was 1.57 times higher than the norm in male workers and 2.43 times higher in female workers. Daily margarine consumption was 12.2 ± 0.4 g (244%) for male workers and 11.7 ± 0.7 g (234%) for female workers, indicating an excessive intake. The daily salt intake was 7.7 ± 0.2 g (154%) for men and 6.8 ± 0.1 g (136%) for women, which exceeded the recommended levels. Regarding milk and dairy products used for preventive purposes, the consumption was 117.4 ± 2.4 g for male workers and 125.3 ± 2.3 g for female workers, while the physiological norm is 400 g. Among dairy products, the intake of cheese and cottage cheese was lower than the recommended levels: cheese supply was 72.5%–64.5%, and cottage cheese supply was 87.6%–92.4%. The supply level of fish and fish products was 35.2 ± 0.7 g for male workers (physiological norm: 40 g) and 30.6 ± 0.9 g for female workers (physiological norm: 35 g).

4. Conclusion

The daily consumption of 38 types of food products by Uzkimyosanoat enterprise workers was analyzed across winter-spring and summer-autumn seasons. The findings indicate: Flour consumption exceeded the norm by 64.3%–82.8% in winter-spring and 35.0%–42.8% in summer-autumn. Bread consumption exceeded the norm by 47.4%–71.9% in winter-spring and

39.8%–47.6% in summer-autumn. Pasta consumption exceeded the norm by 17.7–15.6 g in winter-spring and 12.6–10.8 g in summer-autumn. Confectionery products exceeded the norm by 30.6–27.9 g in winter-spring and 6.8–8.1 g in summer-autumn. Sugar intake was 1.61–2.47 times the norm in winter-spring and 1.57–2.43 times in summer-autumn. Margarine intake was 302%–376% in winter-spring and 244%–234% in summer-autumn. Salt intake exceeded the norm by 4.8–4.1 g in winter-spring and 2.7–1.8 g in summer-autumn. Milk and dairy product supply was significantly low, at 56.3%–55.1% in winter-spring and 29.3%–31.3% in summer-autumn.

5. Recommendations

The findings highlight an excessive intake of certain food products beyond physiological norms, while essential nutrients remain insufficient in the workers' diet. This imbalance can negatively impact rational and healthy nutrition.

In the modern workplace, preventive nutrition plays a crucial role in maintaining and strengthening workers' health and productivity. It not only ensures an adequate supply of essential nutrients but also protects against harmful and hazardous workplace conditions while supporting the body's adaptation processes.

6. Acknowledgments

I extend my sincere gratitude to the Tashkent Medical Academy and the Committee for Sanitary-Epidemiological Well-being and Public Health for their constructive criticism and valuable insights, which significantly enhanced the quality of this research.

7. Conflict of Interest

The authors declare that this research was conducted without any commercial or financial relationships that could be interpreted as a potential conflict of interest.

Data Availability Statement

The original contributions presented in this study are included in the article and supplementary materials. For further inquiries, please contact the corresponding author(s).

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