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INTEGRATION OF TEMPORARY DISABILITY AND MEDICAL EXAMINATIONS: STRATIFICATION OF OCCUPATIONAL RISKS BASED ON DIGITAL MODELS

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Abstract

This paper presents a comprehensive hygienic and epidemiological assessment of working conditions (microclimate, noise, dust concentration) and worker health at the Fergana Thermal Power Plant (TPP). The study analyzed the results of periodic medical examinations of 665 workers and temporary disability (TD) records for 2021–2025. Somatic morbidity was detected in 266 workers (40.0%), led by eye disorders (29.3%), respiratory diseases (23.3%), and musculoskeletal conditions (10.2%). In contrast, the structure of TD was dominated by respiratory diseases (44.00 ± 1.10%) and musculoskeletal disorders (20.67 ± 1.13%). The Mann–Whitney U test confirmed statistically significant differences in microclimate ($p < 0.00001$) and noise ($p < 0.00001$) between the exposure and control groups, with 98.0% of workers in the exposure group subjected to harmful working conditions (Classes 3.1–3.3).

Keywords: Fergana TPP, occupational risk, periodic medical examination, temporary disability, microclimate, noise, Mann–Whitney U test, morbidity structure.

INTRODUCTION

In modern energy-sector facilities, particularly at thermal power plants (TPPs), protecting the health of workers and assessing occupational risk factors are among the highest-priority tasks of occupational hygiene and preventive medicine [1,2]. Technological processes at TPPs are characterized by long-term exposure to unfavorable production factors, such as high air temperature (up to 38.5–39.7 °C in the warm season), noise (80.0–82.4 dBA, up to a maximum of 98 dBA), vibration, and dust concentration in the workplace air (up to 3.42 mg/m³). These harmful factors act on the worker's body in combination [3,4], creating the conditions for the development of general somatic and work-related pathology, for temporary disability, and for the accumulation (cumulation) of functional changes.

The aim of the study was to carry out a comprehensive analysis of the results of periodic medical examinations of workers in the main and auxiliary divisions of the Fergana Thermal Power Plant, together with the 2021–2025 temporary disability (TD) indicators, in relation to the hygienic factors of production (microclimate, noise, dust), and to provide a scientific substantiation of the level of occupational risk.

MATERIALS AND METHODS

The study was carried out as a comprehensive investigation at the Fergana Thermal Power Plant (TPP), combining hygienic, epidemiological, and clinical-statistical methods [1]. The study population consisted of the workers of the plant's main and auxiliary divisions, specifically the turbine, boiler, electrical, and fuel-and-transport shops, as well as the chemical water treatment and wastewater distillate preparation department (OSDT).

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The analysis of the results of periodic medical examinations conducted at the Fergana TPP demonstrated a high organizational level of worker health protection at the enterprise. According to the plan, 677 workers were due to undergo the examination; after the lists were revised, this figure was refined to 665 (106 women). In practice, exactly 665 workers (102 women and 563 men) were examined, which ensured 100.0% coverage (Table 1). No cases of occupational poisoning or suspected occupational disease were recorded at the enterprise, nor were there any workers who had been granted disability for the first time because of an occupational disease.

Among the 665 workers who underwent the medical examination, somatic diseases of varying severity were identified in 266 (40.0%). In the structure of nosological classes, eye diseases ranked first (78 cases; 29.3%; intensive rate 11.73 per 100 examined), the vast majority of them being low-grade myopia [5,6]. Respiratory diseases ranked second (62 cases; 23.3%; rate 9.32) and diseases of the musculoskeletal system third (27 cases; 10.2%; rate 4.06) [5,6]. Diseases of the circulatory system and vegetative-vascular dystonia (VVD) each accounted for 23 cases (8.6% each), taking fourth and fifth places; when VVD and circulatory pathology are considered together, they amount to 46 cases (17.3%) and effectively move into second place.

In the distribution by shops, 78 of the 266 cases (29.3%) belonged to the five shops designated as the hygienically hazardous (main) group (electrical, turbine, fuel-and-transport, boiler, and OSDT) (Table 3). The divisions with the highest numbers of pathology cases were the electrical shop (23 cases; 8.6%), the gas turbine group (22 cases; 8.3%), the centralized repair shop (22 cases; 8.3%), and the turbine shop (20 cases; 7.5%).

In the structure of treatment and preventive measures, 22 workers (8.27%; intensive rate 3.31) were referred for a therapeutic diet and special nutrition, 16 (6.02%) for outpatient treatment, 13 (4.89%) for sanatorium-resort treatment, and 2 (0.75%) for inpatient treatment (Table 4) [2,7]. In the assessment of work capacity, 265 workers (99.6%) were found to be fully fit to work in their positions; only 1 worker (0.4%) had his or her work activity temporarily restricted.

The TD data for 2021–2025 were examined in five separate cross-sections. In the occupational cross-section (631 workers), 3,161 TD cases and 30,654 lost workdays were recorded over the 5 years; the mean duration of one case was 9.70 days. The largest numbers of cases fell to fitters (558 cases; 17.7%), machinists (499 cases; 15.8%), and sagittariuss (279 cases; 8.8%), together accounting for 42.2%. In terms of mean duration, equipment operators (11.81 days) and cleaners (11.71 days) led.

The analysis by shops (697 workers) identified 4,227 cases and 49,295 days (mean 11.66 days) (Table 6). In the five shops designated as the main (hazardous) group (electrical, boiler, turbine, fuel-and-transport, and Wastewater distillation workshop(WDW), 1,984 cases were recorded, accounting for 46.9% of the total TD burden. This figure is considerably higher than the corresponding share in the medical examination data (29.3%).

By age and length of service, the core of the workforce consisted of workers aged 40–59 years (323 persons; mean 17 ± 3.2) and those aged 30–39 years (259 persons; 13.6 ± 3.02), who together accounted for 82.8% (Table 7) [8]. In the length-of-service cross-section, workers with 11–20 years of service (258 persons; 13.5 ± 2.4) predominated.

In the nosological structure of TD, respiratory diseases were the clear leader (44.00 ± 1.10%), followed by diseases of the musculoskeletal system (20.67 ± 1.13%) [8,9]. The dynamics over 2021–2025 showed a sharp rise in diseases of the circulatory system, from 27 to 59 cases, and in diseases of the genitourinary system, from 35 to 81 cases (an increase of 131%).

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A comparison of the structures of periodic medical examinations and TD revealed clinical and epidemiological differences. Eye diseases, which ranked first in the medical examinations with a share of 29.3%, accounted for only 1.22 ± 0.34% of TD; by contrast, respiratory diseases rose to 44.00% and musculoskeletal diseases to 20.67% in the TD structure.

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