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Influence of occupational factors on the development of gynecologic pathology in flight attendants in civil aviation

Nailya I. Nasyrova[1, 2], Artem Yu. Yurovskiy[2], Aleksei V. Overko[1], Lyudmila A. Ozolinya[1]

[1] Pirogov Russian National Research Medical University, Moscow, Russia;
[2] Central Clinical Hospital of Civil Aviation, Moscow, Russia

ABSTRACT

The literature review reflects the main possible gynecological pathologies and their causes in female flight attendants. These diseases are serious problems for all women; however, aviation professionals are at a higher risk. The article examined various factors that can contribute to the development of not only gynecological diseases but also breast cancer and venous thrombosis in female flight attendants. Risk factors include long-term exposure to ionizing radiation, static stress, jet lag, and chronic stress. The review also analyzed existing studies related to the effect of occupational exposure on the health of flight attendants and suggested possible measures for the prevention and treatment of emerging pathologies, which can serve as a basis for the development of effective programs to preserve the health of female flight attendants.

Keywords: flight attendants; civil aviation; gynecological pathology; professional factors; ionizing radiation; venous thrombosis; circadian rhythms; breast cancer.

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Влияние профессиональных факторов на развитие гинекологической патологии у бортпроводниц в гражданской авиации

Н.И. Насырова[1,2], А.Ю. Юровский[2], А.В. Оверко[1], Л.А. Озолиня[1]

[1] Российский национальный исследовательский медицинский университет им. Н.И. Пирогова, Москва, Россия;
[2] Центральная клиническая больница гражданской авиации, Москва, Россия

АННОТАЦИЯ

В обзоре рассматриваются основные возможные гинекологические патологии у бортпроводниц, а также причины их возникновения. Данные заболевания становятся серьёзной проблемой для всех женщин, но профессионалы, работающие в авиационной отрасли, подвержены более высокому риску их возникновения. Статья сфокусирована на изучении различных факторов, которые могут способствовать не только развитию гинекологических заболеваний, но и рака молочной железы, а также венозных тромбозов у бортпроводниц. Факторы риска включают длительное воздействие ионизирующего излучения, статические нагрузки, смены часовых поясов и хронический стресс. Обзор включает анализ существующих исследований, связанных с влиянием профессионального воздействия на здоровье бортпроводниц, а также предлагает возможные меры для профилактики и лечения возникающей патологии, что может служить основой для разработки эффективных программ по сохранению здоровья женщин, работающих в гражданской авиации.

Ключевые слова: бортпроводницы; гражданская авиация; гинекологическая патология; профессиональные факторы; ионизирующее излучение; венозные тромбозы; циркадные ритмы; рак молочной железы.

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职业因素对民航女乘务员妇科病发展的影响

Nailya I. Nasyrova[1, 2], Artem Yu. Yurovskiy[2], Aleksei V. Overko[1], Lyudmila A. Ozolinya[1]

[1] Pirogov Russian National Research Medical University, Moscow, Russia;
[2] Central Clinical Hospital of Civil Aviation, Moscow, Russia

摘要

本综述探讨了女乘务员可能患上的主要妇科疾病及其原因。这些疾病正成为所有女性面临的严重问题，但在航空业工作的专业人员患上这些疾病的风险更高。本文重点讨论了可能导致女乘务员患上妇科疾病、乳腺癌和静脉血栓的各种因素。风险因素包括长时间暴露于电离辐射、静态负荷、时差和长期压力。本综述分析了有关职业暴露对女乘务员健康影响的现有研究。作者还提出了预防和治疗新病理的可能措施，这可以作为制定有效的民航女性职工健康保护方案的基础。

关键词：女乘务员；民航；妇科病学；职业因素；电离辐射；静脉血栓；昼夜节律；乳腺癌.

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INTRODUCTION

Nowadays, there are many professions that require responsibility not only for ourselves, but for those around us, such as healthcare professionals, rescuers, train drivers, airplane crews, and many others. The health of these people is critical to the safety of those they are supposed to help. Flight attendants are civil aviation employees responsible for maintaining order in the cabin, assisting passengers, as well as assisting with aircraft control and passenger evacuation in the event of an emergency. These are usually women imposed with great responsibility, so much attention should be paid to their health [1].

Flight attendants undergo a thorough annual medical examination to detect the slightest deviations from a normal state of health. A comprehensive check-up detects diseases at their earliest stages. However, there are also some issues. No check-up is possible without taking a history, and many diagnoses are based on the patient's subjective symptoms and complaints. For fear of losing their jobs, many flight attendants hide menstrual disorders, abnormal uterine bleeding, dysmenorrhea, and other gynecological symptoms disorders that are difficult for a gynecologist to detect during a single examination. In addition, as a result of development of private healthcare in Russia, many flight attendants receive medical care in non-government clinics, where their data are not shared with federal healthcare institutions. Trying to keep their jobs, women do not think about the risk of disease deterioration during the next flight, as well as about its long-term consequences. Consequently, some flight attendants who were previously considered healthy are now being diagnosed with advanced forms of disease, including malignant tumors, after they have retired or left the flight attendant profession.

Therefore, it is important to study the main diseases that occur in flight attendants, to determine their causes, pathogenesis, diagnostic and treatment options.

KEY FACTORS AFFECTING FLIGHT ATTENDANTS DURING A FLIGHT

Air transport plays an important role in the modern global community, allowing people to move efficiently across countries and continents. Flight attendants are one of the most important elements of this industry. They provide passengers with a high level of service and safety during the flight. However, this job is associated with a number of physical, psychological and other factors that can negatively affect the health and well-being of flight attendants.

Physical and static stress

Flight attendants have to be in constant motion throughout the flight. They lift and lower baggage, serve food and beverages to passengers, conduct security checks and provide medical assistance when necessary. Good physical fitness and stamina are essential for flight attendants to perform their duties. Flight attendants spend a lot of time on their feet in the confined spaces of an airplane. This can put excessive strain on their legs, backs, and joints. Constant awkward postures can cause pain in the back, neck, and other parts of the body. The first studies on clot formation during air travel were published in the mid-20th century [2–4]. However, this issue is still under research. For example, Abunnaja et al. (2014) describe a case of both venous and arterial thrombosis resulting from a long-range flight [5]. A recent study by Zubac et al. (2020) reports development of hypohydration and hemoconcentration during flight as a result of exposure to dry and cool air in the cabin and low atmospheric pressure, which, in addition to deteriorating blood rheology, have other adverse effects on various human body systems [6].

Exposure to ionizing radiation

Exposure to ionizing radiation during flight is one of the potentially hazardous aspects of flight attendant work. Airplanes fly at high altitudes, where the level of cosmic radiation is higher than at the Earth's surface. This is because the Earth's atmosphere and magnetic field are weaker at higher altitudes and do not provide complete protection from radiation [7–8].

Chronic exposure to ionizing radiation can have many health effects on flight attendants, including an increased risk of cancer. The human body has some natural protection against radiation, but regular exposure to ionizing radiation can lead to dose accumulation and irreparable damage to the body [9–12]. The most serious consequence of exposure to ionizing radiation in flight attendants may be development of breast cancer (BC). A large meta-analysis by Weinmann et al. (2022), which included examinations of more than 30,000 women, confirms a higher risk of breast cancer in flight attendants compared to the general female population [13]. Similar results were found in the Chinese study by Liu et al. (2016), which evaluated cancer development in flight attendants from China [14].

Changing time zones

Air travel often involves crossing multiple time zones, which can lead to disrupted natural circadian rhythms, sleep disturbances, and increased fatigue. Time zone changes, also known as jet lag, are caused by the time difference between the place of departure and destination. Disturbances in sleep and rest patterns can affect the physical and mental state of flight attendants, impairing their cognitive function and performance [15].

Many large population studies report associations between menstrual cycle irregularity and duration and reduced sleep duration, sleep disturbance, insomnia symptoms, and shift work [16–18]. Sleep plays an important role in the regulation of many physiological processes in the body, such as cell renewal and detoxification. Disruption of melatonin production due to shift work by flight attendants can lead to hormonal imbalances, including sex hormones such as

follicle stimulating hormone (FSH), luteinizing hormone (LH), and prolactin (PRL), whose dysfunction plays a key role in development of breast cancer [19]. Park et al. (2022) confirm that sleep deprivation may contribute to the development of chronic inflammation, which, together with exposure to ionizing radiation, significantly increases the risk of breast cancer in flight attendants [20].

In addition, studies suggest a correlation between circadian rhythm disorders and infertility and obstetric problems in flight attendants. The incidence of spontaneous miscarriage in flight attendants increases with work experience and is significantly higher than in women without exposure to these adverse factors [21–22].

Psychological effects

Flight attendants' health can be significantly affected by emergencies, conflicts with passengers, and work in a closed team. As airline employees, flight attendants often face situations that require quick decision-making, stress management, and provision of passenger safety.

The job of a flight attendant can be very stressful due to the high level of responsibility involved and the need to stay calm and ensure passenger safety in emergencies such as evacuations, emergency landings or take-offs. This can lead to anxiety, stress, and even post-traumatic stress disorder and emotional exhaustion [23]. Flight attendants may also experience loneliness, separation from family and loved ones, and personal instability due to irregular working hours [24].

Flight attendants work in a closed team and need to be in close contact with their colleagues for long periods of time. They may experience conflicts and problems in communication and cooperation, leading to social isolation and problems in relationships with other crew members, especially when space is limited and there is no way to avoid unwanted contact [25].

PELVIC VEIN THROMBOSIS

Flight attendant work is associated with prolonged static loading of the legs and exposure to other factors that may contribute to venous thrombosis, including pelvic vein thrombosis. These factors include reduced physical activity, long flights, changes in air pressure, and low cabin humidity. Such a complex effect of negative mechanical, physical and biochemical factors is possible only in flight attendants, so pelvic vein thrombosis can be considered an occupational disease.

In a large-scale multicenter study, Grajewski et al. (2015) found an association between working as a flight attendant and an increased risk of venous thrombosis. In flight attendants, the risk of thrombotic events was twice the risk in the general population [26].

A meta-analysis by Russo et al. (2023) reviewed studies from 1996 to 2020 that evaluated the physical health of flight crews, including flight attendants. The authors suggest that suppressed fibrinolysis and increased erythropoietin production due to hypobaric pressure and hypoxia also contribute to venous thrombosis during the flight. There are several negative factors that increase blood coagulation, so a comprehensive approach to diagnosis, treatment and prevention of this condition should be developed [27].

Early detection and prevention of prethrombotic conditions are important to prevent venous thrombosis in flight attendants. Some of these measures include wearing compression stockings, staying well hydrated, exercising regularly during flights, and maintaining an overall healthy lifestyle [28].

In addition, a therapy for hypobaric hypoxia has recently been developed. A team of investigators from the University of Hong Kong (State Key Laboratory of Chinese Medicine and Molecular Pharmacology (Incubation), Shenzhen) evaluated the efficacy of cardiotonic agents in treatment of hypobaric hypoxia. The study showed that this treatment prevented hypobaric hypoxia-induced vascular damage, oxidative stress, inflammatory response, and thrombus formation [29].

Further research and monitoring of the health of flight attendants are needed to better understand the factors that contribute to thrombosis and to develop effective preventive measures.

BREAST CANCER

Breast cancer (BC) is one of the most common types of cancer in women. We can identify risk factors and develop prevention strategies by studying the relationship between breast cancer and certain jobs [8]. A large number of studies have been conducted to evaluate the relationship between breast cancer and employment in the aviation industry. Flight attendants are exposed to several risk factors such as long-term ionizing radiation, specific working environment conditions, stress, and sleep deprivation [9–11].

A large study in this area was conducted by Kojo et al. (2015) with 1041 flight attendants. Cosmic radiation exposure was assessed from flight histories and schedules reported by the flight attendants themselves. The incidence of breast cancer was found to correlate with work experience and increased significantly with more than 10 years of work as a flight attendant [7].

Several large meta-analyses evaluating the causes of breast cancer confirm that ionizing radiation and circadian disruption are major etiological factors. In addition, oncologic diseases were found to be more common in flight attendants working in transmeridian flights [30–32].

However, these studies need to be further evaluated because the risk factors and occupational effects on development of breast cancer may differ between groups of women and regions, which may influence the choice of preventive measures.

MENSTRUAL DISORDERS

Menstrual disorders are one of the possible female reproductive disorders in flight attendants. Stressful situations, psychological discomfort, sleep and biorhythm disturbances cause flight attendants to experience various menstrual disorders, including complete cessation of menstruation.

Studies have identified several factors that affect the health and well-being of flight attendants. A high level of work-related stress is one of these factors. Flight attendants often face various situations that can cause mental stress, including communication with disgruntled passengers, dealing with different customs and cultures, and being away from family and friends for long periods of time. All these factors negatively affect regulation of menstrual function in flight attendants [33–35]. Work for international airlines requires the ability to communicate with passengers of different nationalities and cultures, and to speak multiple languages. Failure to communicate effectively and understand cultural differences can lead to conflicts and increased stress.

Due to their irregular work schedules and multiple flights in different time zones, flight attendants often face the problem of circadian rhythm disorders. Circadian rhythm disorders, also known as delayed sleep phase syndrome, can negatively affect the physical and mental well-being and performance of flight attendants [36–37]. Grajewski et al. (2015) evaluated effects of altered circadian rhythms on the physical and mental health of flight attendants. The study showed that long-term suppression of normal circadian rhythms caused by flying and working in different time zones can lead to reproductive disorders, dysmenorrhea, and obstetric problems [26]. Recent studies have shown changes in FSH, LH, and PRL levels in sleep disturbances or circadian arrhythmia. A meta-analysis by Sciarra et al. (2020) showed that circadian rhythms modulate several physiological functions, including the sleep-wake cycle, body temperature, hormone secretion, and heart rate. This complex mechanism is controlled by specific clock genes that regulate the body's homeostasis. The stress associated with transmeridian flights leads to rhythmic disturbances in the suprachiasmatic nuclei and may affect the pulsatile release of sex hormones. This may contribute to the development of hypothalamic-pituitary-gonadal disorders and anovulatory infertility [16–17, 38–39].

A better understanding of the problem of circadian rhythm disruption and development of effective preventive measures may maintain normal reproductive function in flight attendants.

CONCLUSION

Work of a flight attendant involves prolonged exposure to physical and psychological stress, ionizing radiation, and changes in sleep and wake patterns. These factors negatively affect the hormonal balance and the immune system of the body, contributing to development of various gynecological diseases. Constant changes in climate and time zones can disrupt the natural biorhythms of the female body, leading to menstrual cycle dysregulation and reproductive system dysfunction.

Further research and development of effective preventive measures are needed to reduce the impact of occupational factors on the development of gynecological disorders in flight attendants. In addition to regular medical check-ups, psychological support and training in stress management techniques are very important. It is also necessary to improve the occupational safety standards for this professional group and to develop measures to prevent possible illnesses among women who have chosen this demanding and necessary profession, in order to provide flight attendants with optimal working conditions and to maintain their health.

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AUTHORS' INFO

***Lyudmila A. Ozolinya,** MD, Dr. Sci. (Medicine), Professor;
address: 1 Ostrovityanova str., Moscow, 117997, Russia;
eLibrary SPIN: 9407-9014;
ORCID: 0000-0002-2353-123X;
e-mail: ozolinya@yandex.ru

Nailya I. Nasyrova, MD, Cand. Sci. (Medicine),
Head of the Department;
eLibrary SPIN: 9016-5566;
ORCID: 0000-0003-0657-7655;
e-mail: ni_nasyrova@mail.ru

Artem Yu. Yurovskiy, MD, Cand. Sci. (Medicine);
eLibrary SPIN: 5890-3974;
ORCID: 0000-0003-0344-2093;
e-mail: artemyurovskiy@gmail.ru

Aleksei V. Overko, clinical resident;
eLibrary SPIN: 5519-2836;
ORCID: 0000-0002-4629-9074;
e-mail: leha.overko@yandex.ru

ОБ АВТОРАХ

***Озолиня Людмила Анатольевна,** д-р мед. наук, профессор;
адрес: 117997, Москва, ул. Островитянова, д. 1;
eLibrary SPIN: 9407-9014;
ORCID: 0000-0002-2353-123X;
e-mail: ozolinya@yandex.ru

Насырова Наиля Ильдаровна, канд. мед. наук,
зав. отделением;
eLibrary SPIN: 9016-5566;
ORCID: 0000-0003-0657-7655;
e-mail: ni_nasyrova@mail.ru

Юровский Артём Юрьевич, канд. мед. наук;
eLibrary SPIN: 5890-3974;
ORCID: 0000-0003-0344-2093;
e-mail: artemyurovskiy@gmail.ru

Оверко Алексей Вячеславович, клинический ординатор;
eLibrary SPIN: 5519-2836;
ORCID: 0000-0002-4629-9074;
e-mail: leha.overko@yandex.ru

* Corresponding author / Автор, ответственный за переписку