

POSSIBLE IMPACT OF AUTOMOTIVE INDUSTRY ON THE HEALTH OF WORKING POPULATION

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Abstract

Introduction: The automotive industry represents the most important industrial sector in Slovakia. Overall, there are more than 200,000 people employed in this sector. The work in automotive industry is monotonous and repetitive with excessive number of movements of upper extremities.

Methods: In this retrospective study the development of specific occupational diseases in Slovak automotive industry was analyzed. The frequency and occurrence of major occupational diseases in the period from 1987 to 2017 was analyzed, including major causes and factors which influence the rise and development of these occupational diseases (the long-term excessive unilateral load of upper extremities, noise-related diseases). Data on occupational diseases cases were retrieved from the National Registry of occupational diseases.

Results: Diseases due to the long-term excessive unilateral load of upper extremities have been at the first place in the order of all admitted occupational diseases in the Slovak Republic since 1997. The total number of notified occupational diseases in respective years shows a declining trend whereas the number of diseases due to the long-term excessive unilateral load of upper extremities as well as evaluations of suspected occupational diseases has the rising trend. Between 1987 and 2017 a total of 20,370 new cases were recorded, of which 4,707 (23.10%) were diseases due to the long-term excessive unilateral load of upper extremities and 2,150 (10.55%) were noise-related occupational diseases.

Conclusions: The automotive industry offers a lot of job opportunities. On the other hand, it is characterized by a type of working activity that poses a considerable risk to employees.

Key words: occupational medicine, automotive industry, carpal tunnel syndrome, noise, workplace

INTRODUCTION

As a result of constant modernization, automatization, and robotization in the past few years, physically demanding work is done less and less. On the other hand, the number of works in which small muscle groups of hands and forearms are loaded is increasing. An average person spends approximately 1,800 hours in the work environment, about half the life in the workplace, and many years preparing for the career. People are exposed to various risk factors of work and working environment. These factors may have a negative impact on their health. When assessing the impact of the working environment and work on the individual-employee's health it is necessary to take into account the fact that health is the result of mutual interaction of working and environmental factors, genetic factors, and also lifestyle factors (1, 2). Health condition of the worker is the result of independent influence of the working, non-occupational, and personal predispositions. This requires a multidisciplinary approach and a comprehensive assessment of the factors of work and the working environment (3).

The impact of the working environment usually lasts from adolescence to old age. The retirement age is prolonged every year and the person spends a lot more time in the working environment, being exposed to risk factors. Since January 2017 there was a change in the

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retirement age. Determining the retirement age depends on the retirement age in the previous calendar year and the development of the mean life expectancy in the Slovak Republic (SR). In 2017 the retirement age was 62 years and 76 days, in 2018 the retirement age is 62 years and 139 days (4).

The most common diseases due to the long-term excessive and unilateral load of upper extremities are carpal tunnel syndrome, bursitis, epicondylitis, impingement syndrome etc.

The long-term excessive and unilateral load of upper extremities is a frequent cause of prolonged sick leave, disability, and related financial costs not only for treatment. For example, in the United States (US) the costs associated with limb diseases are estimated at 0.5-2% of the gross domestic product (GDP) (5). According to German authors the most frequent occurrence of professional carpal tunnel syndrome is among workers such as gardeners, assembly workers, masseurs, upholsterers (6). Buchancová et al. indicate the most frequent occurrence of excessive local load on the upper limbs mainly in the sawmill professions, assembly workers, in the work related to grinding, cutting, sewing, and in a variety of other stereotypically performed manual activities (1).

Physical dynamic overload is over time replaced by static overload. This phenomenon is caused by a change in the character of work and the supply of labor in the market. In the recent years the automotive industry is taking the lead in the SR.

An important step is prevention as a multidisciplinary approach to education and introduction of elements into working process to reduce the overload of the musculoskeletal system.

METHODS

In this article we examined the influence and strength of the automotive industry on the health of employees and development of the automotive industry in the SR. The development of specific occupational diseases in Slovak automotive industry was analyzed in this article. We used retrospective study. The frequency and occurrence of major occupational diseases in the period from 1987 to 2017 in the Slovak automotive industry was analyzed, including major causes and factors which influence the rise and development of these occupational diseases (diseases due to the long-term excessive unilateral load of upper extremities, noise-related diseases). We chose the year 1987 because before there had not been a carmaker in SR that would have a significant impact on the health of its employees. The start and expansion of the automotive industry was noticed only in 1991. Before, other diseases that are specific to the particular industry in SR had played a significant role.

RESULTS

Based on available data we processed the characteristics of the automotive industry in SR and thereby provided a comprehensive overview of the onset of the automotive industry. Although Volkswagen bought Skoda Slovak production sites in the SR already in 1991, it got the full control only in 1999 when Volkswagen Slovakia was established, which actually started the fast development of the automotive industry. Volkswagen decided to produce in our country thanks to good geographic position and qualified workforce. Due to the wide supply network other automakers come to Slovakia in the past decade. Secondly, the French company PSA Peugeot Citroën decided to build its production plant in Trnava. A year later (2004) a similar step was announced by the Korean carmaker Kia which built its factory in Žilina. It was their first production plant in Europe. The fourth automaker, Jaguar, shall launch its production in December this year. After these investments SR has become what Detroit used to be in the US over the last few years. The impact of the automotive industry has increased very significantly in the overall Slovak economy. At present this sector has an irreplaceable place in our economy (7).

In the SR the automotive industry employs more than 200,000 people in total, with more than 300 companies operating in it. Since 2007 Slovakia has been the world's largest producer of cars per capita with a total of 1,043,237 cars manufactured in 2016 alone in a country with 5 million people. Automotive is the largest industry in Slovakia with a share of 12% on the Slovak GDP in 2013, which was 44% of industrial production and 35% of Slovakia's export (Fig. 1) (7-9).

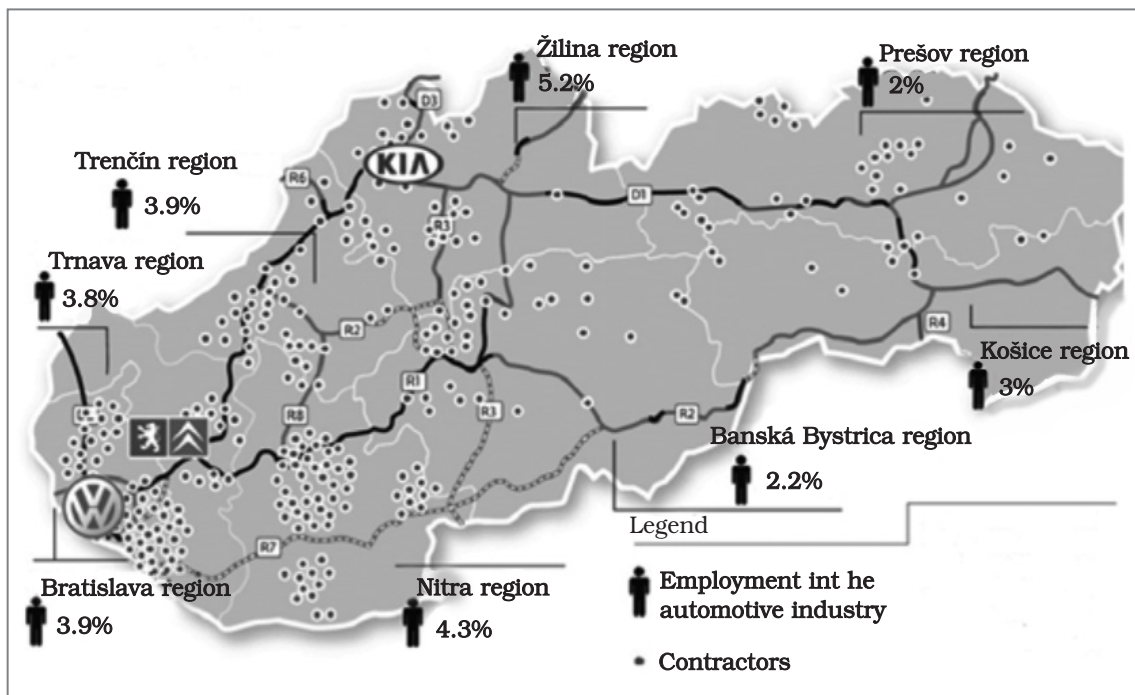


Fig. 1 Concentration of automotive industry in the Slovak Republic (8, 9)

In 1987 there were 1,262 occupational diseases reported. The most frequent occupational diseases were the noise-related diseases (179 cases) and diseases due to the long-term excessive unilateral load of upper extremities (26 cases). After 1992 the incidence of occupational diseases changed. Until this year we have recorded more noise-related diseases than diseases due to the long-term excessive unilateral load of upper extremities. In 1993 1,076 occupational diseases were reported. The most frequent occupational diseases were diseases due to the long-term excessive unilateral load of upper extremities (121) and noise-related occupational diseases (105). Diseases due to the long-term excessive unilateral load of upper extremities have represented the first place in the order of all admitted occupational diseases in the SR since 1997. In Slovakia there were 1,279 occupational diseases due to the long-term excessive unilateral load of upper extremities reported in years 1996-2006 (of which 459 were females).

Most reported occupational diseases within our monitored period were in 1991 (1,311 diseases). On the other hand, least occupational diseases were reported in 2013 (301 occupational diseases). 3,303 occupational diseases were reported in years 2007-2014. In 2015 in Slovakia there were reported 156 occupational diseases due to the long-term excessive unilateral load of upper extremities, i.e. 46% of all reported occupational diseases. In 2016 the annual incidence rose to 173 diseases due to long-term excessive unilateral load of extremities, i.e. more than 50% of all reported occupational diseases. Based on analysis of

reported occupational diseases in relation to categorization of works 204 newly diagnosed diseases were reported in 2016 in the category of work classified in I. and II. category, which represents 64.6%. For this reason it is necessary to provide comprehensive health care also for workers classified in I. and II. work category in terms of health risks. In 2017 354 occupational diseases were reported (147 female, 207 male). The most frequent occupational diseases in 2017 were the diseases due to the long-term excessive unilateral load of upper extremities (50.3%, 178 cases), disease of upper limb caused by vibration (16.7%, 59 cases), and infectious and parasitic diseases (8.5%, 30 cases). On the fourth place there were diseases caused by noise (7.3%). According to the classification of jobs 42 occupational diseases were reported in the assembly workers in 2017, of which the disease due to the long-term excessive unilateral load of upper extremities was reported up to 28 times. According to the classification of economic activities in 2017 the highest number of employees were in the motor vehicle, semi-trailer and trailer production (29 cases, of which 20 diseases due to the long-term excessive unilateral load of upper extremities) (Fig. 2) (10–14).

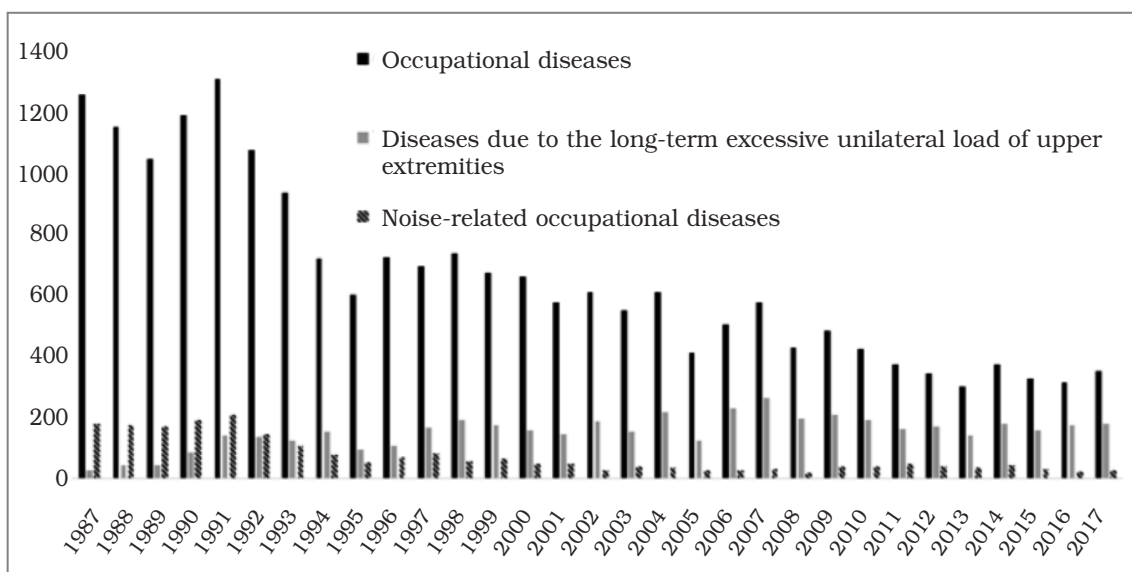


Fig. 2 Trends of occupational diseases in the Slovak Republic in years 1987–2017

DISCUSSION

The automotive industry offers a lot of job opportunities. On the other hand, it is characterized by a type of work activity that poses a considerable risk to employees. Work is monotonous with load of the same muscle groups of the upper extremities, especially associated with numerous movements of small muscle groups of the hands. Work is associated with stretched fingers associated with flexion and extension of the wrist and movements performed at high frequency. In this case we refer to the risk factor for local muscular load. Employees work in a standing position during the entire work shift without the possibility of rotation of the working position. Thus, also the axial apparatus - the spine is permanently in the non-physiological position. The work performance of employees in automotive industry is normed and requires a lot of concentration, it is associated with sensory and psychological stress. Another risk factor in this sphere is noise. Hrušková et al. assess the impact of noise on employees in the automotive industry. In the ensemble of 195 employees

aged 37.8 ± 11.7 years ($x \pm SD$) preventive medical examinations (in relation to work) were made after a certain time after taking up the employment. In the whole group, in the first treatment, over a relatively short period of exposure to noise in the last workplaces, there were 17 hearing loss detected with Fowler's CSS over 10-59%; of which 4 people were permanently expelled from the noise risk for contraindications. In one case a professional disease from the noise was reported (15).

Šišová et al. reported the occurrence of difficulties associated with the musculoskeletal system within the group of 62 seamster/seamstress of car seat cover sewing industry. 27 workers (43.5%) had to visit a doctor during their work in the aforementioned company due to difficulties of strained part of the body from car seat covers sewing. As the most problematic the employees reported experiencing pain in the area of neck, hand, wrist, and upperback. An over-majority (39.63%) of the workers stated the long-term work in the same work positions as the biggest problem. Nearly 43% (27) of respondents reported poor quality of working tools (sewing machines) and considered that a big problem. As a moderate burden 58% (36) employees reported working in forced positions and performing repetitive movements in individual work operations. Employees of the car seat cover sewing company perform in average 53,280 working movements of the small muscles of hands and forearms (16).

According to the Occupational Safety and Health Administration the local muscular burden is the most frequently occurring and most costly occupational health problem affecting hundreds of thousands of people in the EU. The US government has to invest annually to compensate employees for diseases caused by local overloading of limbs over \$100 billion (17). According to the US Bureau of Labor Statistics 45% of all reported occupational diseases were due to exposure to the re-loading of the upper limbs (wrists, elbow, or shoulders) (17, 18).

Economic losses related to health damage in the European Union (EU) are estimated at 3-5% of GDP, with only the loss of professional health damage, but 10-15% GDP, including the reduction of working age for trained productive persons (3).

The Slovaks spend an average of 40.3 hours a week at work. Compared to European countries it is about 8 hours, i.e. one working day, more. According to Trenkwalder we are the fourth European country with the longest working time. The automotive industry has the greatest impact on employee's health, it is the largest industry in the SR (18).

In accordance with the EU Strategic Framework for Health and Safety at Work 2014-2020 one of the main priorities of the European Agency for Safety and Health at Work (EU-OSHA) is to promote the prevention of work-related diseases (19). The aim is not only to improve the lives of workers but also to minimize the cost of occupational diseases and work-related deaths (20). Over the last 10 years the number of occupational injuries has decreased by 25%. However, occupational diseases still account for approximately 2.4 million deaths worldwide, including 200,000 in Europe (21).

CONCLUSION

Based on our findings the influence of automotive industry to health of employees has been confirmed. The main reason is the type of work that employees perform. The work is normed, monotonous with performing repetitive movements of upper extremities. This type of work causes diseases due to the long-term excessive unilateral load of upper extremities. The higher number of newly diagnosed diseases due to the long-term excessive unilateral load of upper extremities among women (carpal tunnel syndrome in automotive assembly workers) compared to men was recorded for the first time in SR in 2016. The automotive industry is the largest industry in Slovakia and offers a lot of job opportunities. An important role in increasing the load of the upper extremities is played by lifestyle and also the excessive use of electronic devices. For this reason an important step is to educate both employers and employees in the field of prevention. Examples are stretching exercises designed by physiotherapists, technology, employee rotation etc.

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