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Risk Management in Selected Public Passenger Transport During a Pandemic

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Abstract

The work concerns the important issue of the risk of contracting the COVID-19 infectious disease caused by the SARS-CoV-2 coronavirus in selected means of transport. Coronavirus, the risk of infection with it, and methods to limit its spread, are the main topic of almost every media every day. Therefore, it is important to raise the topic of occupational risk both at the workplaces serving selected means of passenger transport and the risk of infection for travelers. In the study, an attempt was made to assess the risk of being infected with the SARS-CoV-2 coronavirus at the service workplaces of selected means of passenger transport and among passengers of these means of transport using the Risk Score method. The research was conducted based on data resulting from generally accepted procedures in selected means of passenger transport and on the basis of expert interviews. It has been proven that properly organized and implemented protective measures can reduce the risk of contracting coronavirus.

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Keywords: coronavirus pandemic; passenger transport; risk; Risk Score method

1. Introduction

From March 11, 2020, the pandemic of the infectious disease COVID-19, caused by the SARS-CoV-2 coronavirus, has been ongoing in the world, announced by the World Health Organization. Its high contagiousness, as well as the movement of people between regions and countries, contributed to the rapid spread of this disease.

Nowadays, people can travel all over the world without major obstacles. Millions of people use various means of transport every day for business, leisure, education or family purposes. There are no problems with traveling by plane,

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train or travel coach. Almost every farm has a car, and cities and municipalities offer residents the possibility of using public transport in the form of buses, trams and suburban railways.

The attitudes of employees in public transport are nowadays the most important element of ensuring safety for both passengers and employees of transport companies. In creating and applying safety procedures, apart from technical activities, a significant role is played by appropriate training, which translates into motivating for safe conduct. The effectiveness of these activities requires an appropriate approach to the issue of risk and developing among employees attachment to behavior compliant with safety regulations, as well as sensitizing employees to the perception and negative assessment of dangerous behavior in others Woźny(2020) and Niciejewska (2020).

Transport consists in the provision of a service (payable), which is the movement of people (passenger transport) and various types of cargo (freight transport). To a large extent it affects the economic development of the country Saif, M. A. et al. (2018).

Passenger air transport is the most modern type of transport, dynamically developing Bellizzia et al. (2020). The airport infrastructure is constantly being modernized. More and more people are using an airplane as a means of transport for travel or work. It is a branch that requires large financial outlays and high qualifications of employees due to technologically advanced and complicated navigation devices and means of transport. The main advantage of air transport is the speed of movement, moreover, air transport is considered the safest mode of transport. Airplanes are machines that are properly serviced and can be used for up to 30 years. The disadvantage of this type of transport is the high price, primarily of the purchase and maintenance of aircraft and the entire aviation infrastructure. This type of transport is also susceptible to weather and various types of natural disasters.

Passenger road transport is the most popular means of transport. Due to the extensive road network, it can reach virtually any place. Due to the low cost of entry into the market, there are many companies providing road transport services, making them available almost anywhere. The disadvantage of road transport is high traffic congestion, and hence - traffic jams, dependence to a large extent on weather conditions and the production of exhaust gases, which have an impact on environmental pollution.

Passenger rail transport is, despite strong competition from other means of transport and the reduction of rail infrastructure, a significant branch of transport Hansson, J. et al. (2019). It has many advantages, including relatively low fare and maintenance, easy accessibility, and in highly developed countries - speed of movement. The disadvantages of this type of transport include: differences in track gauge in different countries, or low resistance to emergency situations. Poland has one of the longest railway networks in Europe, and the activities modernizing the railway infrastructure carried out in recent years have contributed to the increased interest in travel by such means of transport.

2. Methodology of research

The main aim of the study is to assess the risk of infection with the SARS-CoV-2 coronavirus Królakowski et al. (2020) in selected workplaces related to passenger transport. The analysis was carried out in the period from April to October 2020, using data provided by air, rail and road transport operators. The research was supplemented by an online expert interview with specialists from selected passenger transport industries (persons directly related to passenger traffic, employees of sales departments, customer service, connection networks and journalists from trade magazines).

In order to assess the risk of infection with the SARS-CoV-2 coronavirus, the related information was reviewed with the impact of the pandemic on the analyzed means of transport and the current regulations on measures to minimize the risk of infection. Then, using the Risk Score method, the degree of occupational risk in the positions of airplane pilot, travel coach/bus driver and train ticket controller as well as the degree of risk among travelers was assessed. Due to the limitations resulting from the pandemic, the research did not include direct interview and observation of the above-mentioned positions, as well as interviews with passengers. Therefore, the research using the
Risk Score method is treated as a pilot, preliminary but necessary research and requiring more detailed analysis due to the ongoing coronavirus pandemic.

3. The coronavirus pandemic and passenger transport

The pandemic has hit hard passenger transport companies, unfortunately many of them did not survive the first months of the pandemic, and it is also estimated that more transport companies will lose liquidity in the coming months. In addition, the pandemic forced these companies to apply a lot of restrictions aimed at making the transport of people, at this extremely difficult time for everyone somewhat safe.

The basis for taking action in these conditions is, first of all, the analysis of threats in the service process together with the proposed list of preventive measures. Full identification and supervision of hazardous factors at their source becomes particularly important in terms of maintaining safety. These concepts, in accordance with the guidelines of safety systems in production processes, are adapted to service processes carried out in epidemic conditions and are designed to closely monitor participants in this process and the ways of spreading threats Rosak-Szyrocka and Abbāse (2020). Failure cause and effect analysis (FMEA) is the process of identifying potential failures before they occur in order to eliminate them from the service process. This approach is the basis for creating safe behavior procedures for employees and takes into account the likelihood of these behaviors in customers/passengers. In this approach, risk estimation is designed to prevent potential dangerous situations Labajanand Koomsap (2019). The use of the principles of analysis is particularly useful in the process of designing or redefining the process of providing a service in which these risk indicators related to the health situation should be taken into account. This approach allows potential dangers in the process to be identified so that they can be eliminated by taking preventive measures before proceeding. The method can be used not only to analyze the causes of already identified failures, but also to prevent defects that may only occur Wolniak (2019).

Currently, air transport, especially passenger transport, is experiencing difficult times related to the SARS-CoV-2 coronavirus pandemic. At the beginning of the pandemic, many countries closed their borders, which was the first severe blow to passenger air transport. The International Transport Association assessed that during the summer season, passenger traffic showed a slight increase, but since August it has slowed down again and decreased by 75%. In Poland, e.g. at Chopin Airport and Katowice Airport in July 2020, a decrease in passenger traffic by about 75% was recorded compared to the same month last year https://www.pb.pl/ (11.2020). People fear coronavirus infection, both at the airport and on the plane, but also at the travel destination. In addition, travel restrictions may be discouraged by restrictions imposed by many countries on travelers: showing a negative test for coronavirus, undergoing quarantine or self-isolation, showing whereabouts or undergoing additional medical examinations ordered by local authorities. Currently, the Ministry of Health of Poland advises against traveling abroad, which is not necessary. The restrictions apply to international flights, including from Bosnia and Herzegovina, Georgia, Montenegro or the United States (excluding Illinois and New York) https://www.gov.pl/web/koronawirus/aktualne-zasady-i-ograniczenia (11.2020). In connection with the coronavirus pandemic, airlines have introduced a number of restrictions both at airports and on airplanes, which are to minimize the risk of infection for travelers. They are similar in most airlines. For example, LOT Polish Airlines requires a mask to be worn both on board the plane and at the airport (this does not apply to children under the age of 5). They also inform about the obligation to keep an appropriate distance during certain activities in the terminal (this applies, among others, to checking or collecting baggage). After returning to the country, it is obligatory to fill in the Passenger Location Card and Health Declaration Expert interviews (10.2020). It is recommended that the procedure of check-in was online. Both at the airport and in airplanes, employees are equipped with personal protective equipment, such as masks, gloves and antibacterial gels. Disinfectants are available throughout the airport, plus all contact spaces with passengers, including aircraft interiors, are disinfected. After entering the airport, each passenger is subjected to a body temperature test using thermal imaging devices. Buses carrying passengers to airplanes have limits on the number of passengers. The flight itself is also safe. All meals are served in individual packages, and passengers are provided with antibacterial gels or wipes Expert interviews...
served in individual packages, and passenger carrying passengers to airplanes have limits on the number of passengers. The flight itself is also safe. All meals are recommended that activities in the terminal (this applies, among others, to checking or collecting baggage).

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Currently, air transport, especially passenger transport, is experiencing difficult times related to the SARS CoV-2 coronavirus pandemic. At the beginning of the pandemic, many countries closed their borders, which was the first means of transport). It is compulsory to wear masks on any public road transport and keep a safe distance. The vehicles are aired (they are stopped at each stop and all doors on buses are opened), it is also recommended to buy or change the date of travel via the Internet https://www.transport-publiczny.pl/ (11.2020).

The coronavirus pandemic has also hit the railroad industry that deals with passenger transport. At the beginning of the pandemic, passenger carriers lost 85 to 90% of revenues from ticket sales, and in March 2020 almost 37% less passengers were transported compared to the previous year Expert interviews (10.2020). The Rail Transport Office forecasts that the coronavirus epidemic will reduce the number of passengers at the end of 2020 by about 100 million, compared to 2019. In order to minimize the risk of contracting coronavirus, the railway industry has also introduced a number of restrictions and restrictions, both on trains and at stations and platforms. Passengers are required to wear masks at stations, platforms and underground passages on trains. In these places there are posters informing travelers about the coronavirus and the prevention of infections. In the waiting rooms there are stickers to keep distance. In some of the railway stations there are dispensers with disinfectant liquid. Passengers are encouraged to book and purchase tickets online and pay cashless. The rolling stock is cleaned and disinfected more often, and the staff has separate safety zones in itExpert interviews (10.2020). The same seat limits apply as for road transport.

Table 1 presents a summary of the most important restrictions and recommendations in connection with the coronavirus pandemic in selected types of passenger transport.

| Table 1. Restrictions and recommendations in connection with the coronavirus pandemic in selected types of passenger transport. |
|---------------------------------------------------------------|
| **Air transport**                                             | **The passenger transport industry by road** |
| -wearing masks (on board the plane, at the airport),          | -limits in public transport,                 |
| -keeping an appropriate distance,                             | -wearing masks (in any means of public road |
| -filling in the Passenger Location Card and Health Declaration after returning to the country, |
| -online check-in procedure,                                   | -keeping an appropriate distance,            |
| -personal protective equipment for personnel,                 | -vehicle ventilation,                       |
| -disinfectants at the airport,                                 | -purchase recommendation or rescheduling of travel via the Internet. |
| Rail transport                                                |                                                |
4. Risk assessment using the Risk Score method

The Risk Score (RS) method is also called the risk or time risk indicator method. It is a qualitatively quantitative method Krause (2011), Sadlowska-Wrzesińska (2018), Tytyk (2017). It develops the definition of occupational risk Antosz and Miąsik (2015). It analyzes the probability of occurrence of adverse events that are related to the performed work and cause losses, such as adverse health effects for employees. In the Risk Score method, the value of occupational risk is calculated according to the formula Fine (1971):

\[ R = S \cdot E \cdot P \]  

(1)

where:
- \( R \) - Estimated value of the occupational risk.
- \( S \) - Effect, loss (potential).
- \( E \) - Human exposure to danger.
- \( P \) - The probability of an event with a given loss

These three parameters are selected based on specific tables.

The risk value calculated using the formula (1) is read from the risk matrix https://allebhp.pl/blogWPis,16,metoda-risk-score.html (11.2020).

The paper presents the occupational risk assessment using the Risk Score method at 3 positions related to passenger transport:
- airplane pilot,
- travel coach / bus driver,
- train ticket controller.

Occupational risk is associated with SARS-CoV-2 coronavirus infection by people working on the above-mentioned positions and was included in the information cards about the hazards occurring at the above-mentioned positions. In addition, it has become necessary to attempt to assess the risk of contracting SARS-CoV-2 coronavirus infection among travelers, who, like passenger transport employees, are an essential "link" in this system.

The airplane pilot does his job in the airplane cabin. Despite this, he spends a lot of time at the airport between flights. The position of a coach or bus driver is associated with frequent contact with a passenger. It is possible to buy tickets in buses, and especially in older vehicles, there is no separate cabin for the driver yet. On the other hand, the train ticket controller is almost constant contact with many people traveling by train. Therefore, there is a possibility of contracting the coronavirus in any case.

The occupational risk assessment for selected workplaces related to passenger transport, presented in Table 2, is presented in two situations: before and after the implementation of restrictions to minimize the risk of infection.
The first part of the analysis presented in Table 2 is the measurement of risk in "normal" conditions that existed for selected workplaces before the coronavirus pandemic. It shows that by far the highest value of risk exists at the workplace of a train ticket controller - here the risk is high and there is a need to immediately reduce the risk. A slightly lower risk value at the permissible level exists for the travel coach / bus driver workplace, while the low risk value - for the airplane pilot.

The next part of the analysis concerns measuring risk under the conditions of a sanitary regime. It showed that at selected workplaces the risk of contracting coronavirus is decreasing. The lowest risk occurs, as in normal conditions at the position of an airplane pilot, and it is an acceptable risk. According to the regulation of November 26, 2020 on the establishment of certain restrictions, orders and bans due to the epidemic https://www.prawo.pl/prawo/zasady-noszenia-masczek-od-soboty-28-listopada,502254.html (11.2020), no masks are required in the pilot's cabin. However, at the airport where the pilot spends some part of his work, there are restrictions, described in the work, that minimize the risk of contracting the coronavirus. Also, the travel coach or bus driver is excluded according to the above regulation with the obligation to wear masks. Apart from the limitations mentioned in the previous chapter, the contacts between the driver and passengers are minimized by creating protection zones in buses, which means that the first door cannot be used and tickets cannot be purchased on the bus. Train ticket controller has limited contact with passengers to a minimum and is equipped with personal protective equipment. In both positions, the risk value decreased to a low level.

The next part of the analysis concerns the risk assessment using the Risk Score method for people traveling by selected means of transport. Here too, the analysis was carried out under the pre-pandemic conditions and under the sanitary regime. The occupational risk assessment for travelers is presented in Table 3.

The risk analysis for travelers using selected means of transport showed a very high risk of contracting the coronavirus, taking into account the conditions that existed before the pandemic. This is an unacceptable risk and preventive measures to reduce this risk should be implemented immediately. After the implementation of restrictions, such as wearing masks, disinfecting and airing means of transport, space limits and social distance, risk analysis showed a reduction in the level of risk from very high to low.
5. Conclusion

In such a specific and difficult time as the coronavirus pandemic, an extended risk analysis for each worksite becomes indispensable. An additional element of this analysis should concern the risk of contracting coronavirus in the workplace. The work dealt with the risk management process on public transport. In addition to the basic risks associated with working in this position and which are included in the risk cards, an attempt was made to assess the risk of contracting coronavirus. Through the specificity of work and contact with a large number of people, the risk is unfortunately possible. Coronavirus infection risk assessment was also carried out for passengers traveling by public transport. The Risk Score method was used to calculate the risk index for two different situations: pre-pandemic travel conditions and conditions that were introduced and are still in place, sanitary regime conditions. By determining the parameters related to the effect, exposure and probability of an event (coronavirus infection), risk indicators were calculated for selected workplaces and for travelers. The result of the calculations was a high and very high risk index in the conditions that prevailed before the pandemic. Through the available information and expert interviews, it was estimated that the risk index may decrease in a situation after the introduction of restrictions, under the conditions of the sanitary regime. This dependency is confirmed by research, which says that "Preventive measures implemented in public transport around the world have made it the safest place on Earth today"https://www.transport-publiczny.pl/mobile/brytyjskie-badania-obalaja-mity-o-ryzykach-zarazen-w-komunikacji-zbiorowej-66134.html (11.2020).

The results presented in this article may also be useful in other branches of science and industry, where it is increasingly necessary to analyze various risks related to both the threats to the employee and the entire functioning of the organization. The risk analysis scheme is also applicable in metal industry, especially in alloy production Lipinski (2015a), Lipiński (2015b), the machinery industry Pacana et al.(2018), or in biohazard exposed biotechnology Skrzypczak-Pietraszek et al. (2019). Some elements of this analysis can also be used in the electronics industry, especially in the soldering process Pietraszek et al. (2014), where automatic quality control requires the implementation of image analysis procedures Gadek-Moszczak (2017). This may be of particular interest to SMEs Nowakowska-Grunt and Mazur (2016), which are very flexible, but are also exposed to high risk related to quick decisions and their results Ulewicz and Ingaldi(2018), as well as universities whose long-term educational strategies are increasingly destabilized by the rapidly changing social and business environment Ulewicz (2014).

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