ISSN. 2338-7475
E-ISSN. 2620-7869
Hearty
Jurnal Kesehatan Masyarakat
Berinan, Tulus, Sepenuh Hati,Berbesar Hati, Jujur, Sehat dan Kuat
Vol. 13 No. 4, Agustus 2025, Hal. 1043-1051

RISK MANAGEMENT OF SHIP PASSENGER SERVICE OPERATIONAL OFFICERS USING THE HIRADC METHOD IN THE PORT INDUSTRY IN SURABAYA

Devi *, Noeroel Widajati
Department of Occupational Safety and Health, Faculty of Public Health,
Universitas Airlangga
Jl. Dr. Ir. H. Soekarno, Mulyorejo, Kec. Mulyorejo, Surabaya, Jawa Timur, 60115, Indonesia
Email: videvi044@gmail.com

Abstract

Background: Our organization provides port services, including passenger services. carrying a range of human activity-related dangers that could harm employees' health at work. Accidents and industrial diseases can be avoided by evaluating the risks that exist right now and eliminating potential hazards at work. Purpose: Identifying hazards, conducting risk assessments, and controlling work operations for the ship service division's passenger service operating officers. Method: The data gathering method is based on both primary and secondary data, with primary data based on observations of the issue object in the field. Secondary data is data derived from data owned by the company. Meanwhile, identify and conduct hazard risk analysis utilizing the HIRADC approach, which is assessed in accordance with AS/NZS 4630:2004 and comprises three stages: Hazard Identification, Risk Assessment, and Determining Control.Result: The risk assessment identified 14 hazards, with 6 in the low-risk category, 6 in the medium-risk category, and 2 in the high-risk category. Conclusion: Several hazards were discovered during hazard identification in the operational passenger service officers discovered physical, biological, and ergonomic concerns, as well as psychological or behavioral factors that can pose a hazard.

Keywords: Determining Control, Hazard Identification, Risk Assessment

Introduction

Workplace accidents and infections are responsible for a significant number of deaths. According to data from the International Labour Organization (ILO, 2018), around 380,000 workers, or 13.7% of the 2.78 million workers, die each year as a result of workplace accidents or diseases (Monalisa, Sibakir and Listiawati, 2022). Based on results of work accident and occupational disease data from the Jaminan Kecelakaan Kerja (JKK) program of the Badan Penyelenggara Jaminan Sosial (BPJS) Employment in 2022, the number of cases continues to rise year after year. In 2021, there were 234,370 instances registered, resulting in the deaths of 6,552 workers/laborers, a 5.7% increase over 2020. (Yuli *et al.*, 2022).

Occupational safety and health (K3) is needed everywhere, including in the workplace (Ihsan, Hamidi and Putri, 2020). As in the Peraturan pemerintah Republik Indonesia No. 50 tahun 2012 tentang sistem menejemen Keselamatan dan Kesehatan Kerja (SMK3), the implementation of SMK3 must comprise K3 planning, which includes hazard identification, risk assessment, and control (Saraswati, 2020). One method is Hazard Identification, Risk Assessment, and Determining Control (HIRADC). (Indragiri and Yuttya, 2020).

Submitted: October-2024 Received: October-2024 Available Online: August-2025

The Hazard Identification, Risk Assessment, and Determining Control (HIRADC) method is a systematic, comprehensive, and structured approach to identifying problems effecting work processes as well as hazards linked with equipment or systems in the work environment. (Kevin and Yayok, 2024)

PT Pelindo (Persero) Regional III Subregional Java has numerous primary business activities, one of which is to provide passenger operational services at the Gapura Surya Nusantara (GSN) passenger terminal. The number of passenger service operational officers is 47, divided into three work shifts, with each group working 8 hours. According to first observation, 9 to 15 passenger ships docked in one day at the Gapura Surya Nusantara (GSN) passenger terminal. Based on data from 2023, the number of passengers embarking and disembarking varied by month, ranging from 59,045–186,344 a month to 1,422,352 in a year, both domestically and internationally. Based on the explanation above, it appears that PT Pelindo Subregional Jawa (Persero) at the GSN passenger terminal has risks in the embarkation and debarkation work processes, thus the purpose of this writing is to control, minimize, and, if possible, eliminate the dangers that arise during the job stages in the ship service division for passenger service operational officers at PT Pelindo Subregional Jawa (Persero).

Method

The study focused on the Ship Service Division's operational passenger service officers during the embarkation and disembarkation processes at the GSN terminal. The data collection strategy used relied on data that was both primary and secondary, with primary data coming from direct observations of the problem object in the field. Secondary data were collected from the company. Meanwhile, identify and conduct risk analysis utilizing the HIRADC method; it was studied in accordance with AS/NZS 4630:2004 and has been split into three stages. First, a systematic and comprehensive procedure is implemented to identify hazards, regardless of whether they are still under the organization's control. (Achmad *et al.*, 2020).

The risk assessment procedure then determines the priority of control according to the level of danger of accidents or occupational diseases (Saputro and Lombardo, 2021). The risk assessment measurement consists of two parameters: consequences and likelihood. (Widjanarko and Khotimah, 2022).

Tabel 1. Skala Penilaian Frekuensi kemungkinan (Likehood) Menurut AS/NZS 4360: Risk Management, 2004)

Level	Deskripsi	Uraian
1	Very Unlikely	Is it possible that it never happened
2	Unlikely	It Can Happen, but Rarely
3	Possible	It can happen under certain conditions.
4	Likely	Can occur periodically
5	Almost certain	It can happen anytime

Tabel 2. Skala Penilaian Konsekuensi dan Dampak (AS/NZS 4360: Risk Management, 2004)

Level	Deskripsi	Uraian
1	Insignificant	No injuries occurred, minor financial losses.
2	Minor	Minor injury, moderate financial loss
3	Moderate	Moderate injury, requires medical treatment, significant financial loss
4	Major	Serious injuries to more than one person, significant losses, production disruptions
5	Catastrophic/Extreme	Fatal for more than one person, with very large losses and widespread long-term impacts, halting all activities.

Once the index scale has been identified, the next step is to conduct a risk assessment to decide which issues should be solved first. A probability and impact matrix may be employed throughout the risk assessment process. (Eni *et al.*, 2021)

Risk factor = probability x Consequence.

Table 3. Risk Level Matrix (AS/NZS 4360: Risk Management, 2004)

Kemungkinan (Likehood)	**Konsekuensi (Consequences)**				
	1	**2**	**3**	**4**	**5**
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic / Extreme**
1 (Very Unlikwly)	Low	Low	Low	Medium	Medium
2 (Unlikely)	Low	Medium	Medium	Medium	High
3 (Possible)	Low	Medium	Medium	High	High
4 (Likely)	Medium	Medium	High	High	Very High
5 (Almost Certain)	Medium	High	High	Very High	Very High

Explanation:
Low = 1-3 *High* = 10-16 *Medium* = 4-9 *Very High* = 20-25

Determining control is a risk-management technique based on risk assessment results. The Hierarchy of Control is a simple control strategy that seeks to eliminate or mitigate risk (Tarwaka and Bakri, 2016). This control hierarchy includes five main risk controls: elimination, substitution, engineering control, administrative, and personal protective equipment (PPE). (Achmad *et al.*, 2020)

Results

1. Hazard Identification

   When conducting hazard identification and risk assessment in the workplace, several factors must be considered, including routine and non-routine workplace tasks; activities of all parties entering the workplace; human behavior, capabilities, and factors; and hazards from outside the workplace environment. (Jaya, Dharmayanti and Ulupie Mesi, 2021).

2. Risk Assessment

Table 4. Potential Hazard Risks and Risk Assessment in the Workplace of Passenger Operations Officers

Work Process	Work Area	The source of danger	Risk	Risk Assessment			Risk Level
				likelihood (L)	Consequence	Risk Value	
Embarkation	Check-in at the front desk before using a GSN terminal.	They are exposed to bacteria or viruses from potential ship travelers.	Officer infected by diseases.	5	1	5	M
		Standing for too long at ticket and traveler identity checks.	Leg pain, leg swelling, varicose veins, general muscle fatigue, and stiffness in the neck and shoulders.	5	2	10	H
		Crowded passenger queue	Work stress.	3	1	3	L
	X-Ray officer operator	X-Ray exposure	Eyestrain, dry mouth, difficulty swallowing, and skin damage can all raise the risk of cancer, genetic damage, sperm count, sterility, and early menopause.	3	3	9	M
		Psychological burden due to long queues of passengers	Work stress.	3	1	3	L
		Standing at the computer monitor screen.	Eyestrain	2	2	4	M
		Standing for too long during the passenger physical inspection.	Leg pain, leg swelling, varicose veins, general muscle fatigue, and stiffness in the neck and shoulders.	5	2	10	H
		Passengers fail to observe procedures, indicating a lack of passenger awareness.	Passengers fail to follow procedures, indicating a lack of passenger awareness.	3	1	3	L
	Area Check-in	Uncomfortable working posture of the check-in officer.	MSDs, and Low back pain (LBP)	3	2	6	M
		Inadequate lighting	Eyestrain	5	1	5	M
		The service to travelers is poor, and the policemen are inexperienced.	There were disagreements among travelers, including physical and verbal violence.	3	1	3	L
Debarkation	Entrance before entering GSN after exiting the ship.	Officers are exposed to bacteria or viruses.	Officers experience illnesses such as tuberculosis, common cough, flu, and fever.	5	1	5	M
		There was an argument with the passengers.	Work stress.	3	1	3	L
		The cop stumbled while directing passengers because he was standing directly on the steps in front of the door.	Minor injuries and scratches.	3	1	3	L

3. Determining Control

Tabel 6. Pengendalian Risiko di Lingkungan Kerja Petugas Operasional Penumpang

Risk	Risk Level	Control
Officers are exposed to infections like tuberculosis, common cough, flu, and fever.	M	1. Administrative control and interim waiting room sanitary checks. Putting up posters and employing audiovisuals 2. Control and use of personal protective equipment (PPE) (masks).
Leg pain, leg swelling, varicose veins, general muscle fatigue, low back pain, and stiffness in the neck and shoulders.	H	1. Engineering controls include floor mats, softer shoes or shoe inserts, and socks or stockings. 2. Administrative by educating people on the benefits of physical activity.
Stress at work	L	Administrative, increasing officers' awareness of workplace stress and how to avoid it. Schedule appropriate relaxation and stretching breaks in between tasks.
Eye fatigue, dry mouth, difficulty swallowing, and skin damage may raise the risk of cancer as well as genetic harm, which can alter sperm count, infertility, and early menopause.	M	1. Provide personal protective equipment (PPE) for radiation. 2. The company's engineering includes personnel monitoring tools such as pocket dosimeters, film badges, and TLD (thermoluminescent dosimeters), replacing lead curtains once a year, checking the thickness of lead on the X-ray body annually, and adding lead shielding to the luggage fluoroscopy machine to protect it from radiation sources. 3. Establishes a safe distance from radiation sources by administrative regulations.
Stress at work	L	Administrative, raising officers' knowledge of work stress and how to avoid it. scheduling adequate rest time and stretching in between tasks.
Eye Fatigue	M	Administrative control by management includes monitoring the level of light exposure in the check-in area with low lighting levels and providing strategic direction while working by resting the eyes for a moment, changing the rhythm of body movements, blinking frequently, placing lighting by standards, and conducting eye health checks.
Leg pain, leg swelling, varicose veins, general muscle fatigue, low back pain, and stiffness in the neck and shoulders.	H	1. *Engineer* Engineering controls include floor mats, softer shoes or shoe inserts, and socks or stockings. 2. Administrative by educating people on the benefits of physical activity.
There were arguments with passengers, which generated job stress, as well as fights that resulted in abrasions and serious injuries.	L	Administrative control, information on ship departure and arrival timetables, and information about the prohibition on importing animals unless there is an animal quarantine letter in the form of an LCD TV or a clear and visible notice board.
MSDs, and Low back pain (LBP)	M	Administrative oversight, including frequent brief breaks after one hour of work. Stretch your muscles for 3-5 minutes after every hour.
Eye Fatigue	M	1. Administrative control by management, such as maintaining an eye on the amount of light exposure in the dimly lit check-in area and offering strategic guidance while working by blinking frequently, taking short breaks to rest the eyes, and changing the rhythm of one's movements. 2. Substitution management by substituting new lamps for defective ones.
Conflicts with other passengers included both verbal and physical abuse.	L	Administrative controls, giving each employee instructions on how to treat ship passengers well. Providing employee training. Motivate employees so that they are passionate and take the initiative to complete their tasks in order to meet the company's goals.
Officers are exposed to infections like tuberculosis, common cough, flu, and fever.	M	1. Administrative control and interim waiting room sanitary checks. Putting up posters and employing audiovisuals 2. Control and use of personal protective equipment (PPE) (masks).
Disagreeing with a passenger generates workplace stress.	L	Administratively, place more guards in front of the disembarkation gate to assist passengers who have recently disembarked from the ship.
Minor injuries	L	Administrative control means that management directs disembarkation officers to work on a level floor rather than on the entry stairs.

Discussion

1. Medium Risk

a. Officers infected with the disease

The results of the risk assessment in the work environment of passenger operations officers show a probability value of 5 and an impact of 1, placing it in the medium risk category. Risk control is therefore necessary. Administratively, examine the sanitation of the temporary waiting room at the GSN passenger terminal. Ship sanitation inspections are performed during the disembarkation process on ships to minimize the danger of disease transmission from passengers to other passengers or from passengers to ship officials, which could lead to an outbreak during the journey. Ship sanitation inspections are performed on all areas of the ship, including the deck, crew and passenger quarters, bathrooms and toilets, the kitchen, and the storage warehouse (Nurbayani *et al.*, 2021).

Administrative control also includes posting posters and using audiovisual materials with sound and visual components that may be viewed, such as videos that provide advice on how to maintain personal hygiene (like how to wash your hands properly and how to cough and sneeze). Providing personal protective equipment (PPE), like masks for officers, is another way to stop the spread of diseases or viruses that passengers aboard ships may carry.

b. *Musculoskeletal Disorders* (MSDs), and *Low Back Pain* (LBP)

The author assigned a probability value of 3, indicating that the check-in officer's prolonged and repetitive use of an awkward working position is a possible scenario. The severity/impact assessment resulted in a score of 2. Thus, the moderate risk category includes the risk assessment for MSDs and low back pain. illnesses and accidents will rise with non-ergonomic work postures. Low back pain (LBP), or back discomfort, is one of the ailments brought on by work. (Suryadi and Rachmawati, 2020).

Musculoskeletal problems associated with the workplace can affect several body regions, and their frequency or severity can fluctuate depending on the task, occupation, and other physical or psychological factors. The risk of job-related illnesses and accidents will rise with non-ergonomic work postures. Low back pain (LBP), or back discomfort, is one of the ailments brought on by work. (Aziz *et al.*, 2015)

c. Employees who are X-rayed

The average X-ray operator needs fifteen seconds to do a scan. While another operator is stationed in a private area to evaluate the images that are fed into a computer, one operator leads the passenger through the scanner. Radiation exposure can cause side effects (Accardo and Chaudhry, 2014). The risk assessment results in the work environment of passenger operations officers show a likelihood value of 3 and an impact of 3, placing it in the medium risk category. Based on field observations, x-ray officers do not utilize personal protective equipment such as radiation glasses or shields. As a result, prevention requires the use of radiation Personal Protective Equipment (PPE) such as radiation glasses, radiation protection gonads, protective gloves, and radiation protective garments (aprons).

Engineering control measures implemented by the organization include changing curtains, film badges, thermoluminescent dosimeters (TLDs), and pocket dosimeters for staff monitoring. To lessen radiation exposure and eye strain on workers, the luggage fluoroscopy machine has been equipped with lead shielding-regulatory measures like establishing a safe separation from the source of radiation (Iwan *et al.*, 2023). According to the nature or properties of lead, which can absorb or lessen exposure to X-ray and gamma radiation, shielding has been added. It has been demonstrated that adding lead shielding to the luggage fluoroscopy machine and limiting worker distance to 1.5 m from the radiation source reduces worker eye fatigue by 68.85%. This

reduction in eye fatigue is caused by screening workers' decreasing tolerance for radiation exposure as they get farther away from the source. (Iffah *et al.*, 2018)

d. Eye fatigue in X-Ray machine monitoring operators and check-in officers

Based on the measurement results, there are two measurement points where the lighting is lacking or below the NAB, namely 200 lux, where the recommended threshold value is 300 lux for office workers who alternate writing and reading archival work and letter selection following the Regulation of the Permenaker RI No. 5 Thn 2018 Keselamatan dan kesehatan Kerja Lingkungan kerja.

The findings of the medium-risk risk assessment were conducted in the work environments of the product monitoring officers at the x-ray machine and the passenger operating officers in the check-in section (Sely, 2023). Thus, managerial administrative control is required, such as keeping an eye on the amount of light exposure in the dimly lit check-in area and offering strategic guidance while working by taking short breaks, varying the rhythm of movements, blinking frequently, observing the distance between the worker's eyes and the local lighting at each counter, placing lighting by standards, and performing eye exams. Additionally, substitution control is implemented in the check-in area by substituting fresh bulbs for any damaged ones.

2. High Risk

Prolonged standing has been linked to elevated blood pressure in the lower extremities as well as an increased chance of varicose vein hospitalization. Prolonged standing for more than 4 hours was discovered to be a significant risk factor for varicose veins, independent of gender. The risk assessment in the work environment of passenger operations officers yielded a likelihood value of 5 and an impact of 2, indicating a high-risk level.

Using floor mats, softer shoes or shoe inserts, socks, or stockings are some ways to prevent health issues linked to extended standing in engineering control. Additionally, administrative control is achieved by educating people about the benefits of exercise for the body. When it comes to pain from standing all day at work, exercise can help. As a result, physical risks related to prolonged standing can be minimized with exercise. (Yamuna *et al.*, 2023).

Conclusion

Based on the results of the risk assessment, it was concluded that several hazards found during the hazard identification were physical, biological, and ergonomic hazards, as well as psychological or behavioral factors that have the potential to cause hazard risks. Based on the risk assessment conducted, 14 risks were found consisting of 6 low risks, 6 medium risks, and 2 high risks. Controls that can be carried out at the GSN passenger terminal on passenger service operational officers are substitution controls, engineering controls, and PPE.

References

[1] Accardo, J. and Chaudhry, M.A. (2014) 'Radiation exposure and privacy concerns surrounding full-body scanners in airports', *Journal of Radiation Research and Applied Sciences*, 7(2), pp. 198–200. Available at: https://doi.org/10.1016/j.jrras.2014.02.005.

[2] Achmad, C. *et al.* (2020) 'Penerapan Metode Hiradc Sebagai Upaya Pencegahan Risiko Kecelakaan Kerja Pada Divisi Operasi Pembangkit Listrik Tenaga Gas Uap', *Jurnal Bisnis dan Manajemen (Journal of Business and Management)*, 20(2), pp. 41–64. Available at: https://jurnal.uns.ac.id/jbm/article/view/54633.

[3] AS/NZS 4360. 2004. 3rd Edition the Australian And New Zealand Standard on Risk Management. Broadleaf Capital International Pty Ltd. NSW Australia.

[4] Aziz, R.A. *et al.* (2015) 'Effect of Working Posture on Back Pain Occurrence among Electronic Workers in Malaysia', *Procedia Manufacturing*, 2(February), pp. 296–300. Available at: https://doi.org/10.1016/j.promfg.2015.07.052.

[5] Egar, G.Y. and Basuki, M. (2021) 'Penilaian Risiko Pada Operasional Dermaga Jamrud Surabaya Menggunakan Job Safety Analysis Dan Bow-Tie Risk Assessment', *PROSIDING, Seminar teknologi Kebumian dan kelautan (SEMITAN III) Institut Teknologi Adhi Tama Surabaya (ITATS) Indonesia*, pp. 424–430. Available at: http://ejurnal.itats.ac.id/semitan/article/view/2010.

[6] Eni, M. *et al.* (2021) *Keselamatan Kerja dan Kesehatan Lingkungan Industri*. Edited by R. Watrianthos and J. Simarmata. Semarang: Yayasan Kita Menulis.

[7] Iffah, M. *et al.* (2018) 'Kombinasi Penambahan Shielding Timbal Mesin Fluoroscopy Bagasi Dan Pengaturan Jarak Pekerja Terhadap Sumber Radiasi Menurunkan Paparan Radiasi Sinar X Dan Kelelahan Mata Pada Pekerja Screening Di Bandara Internasional X', *Jurnal Ergonomi Indonesia (The Indonesian Journal of Ergonomic)*, 4(1). Available at: https://doi.org/10.24843/jei.2018.v04.i01.p01.

[8] Ihsan, T., Hamidi, S.A. and Putri, F.A. (2020) 'Penilaian Risiko dengan Metode HIRADC Pada Pekerjaan Konstruksi Gedung Kebudayaan Sumatera Barat', *Jurnal Civronlit Unbari*, 5(2), p. 67. Available at: https://doi.org/10.33087/civronlit.v5i2.67.

[9] ILO. (2018). Meningkatkan Keselamatan dan Kesehatan Pekerja Muda. Jakarta: ILO

[10] Indragiri, S. and Yuttya, T. (2020) 'Manajemen Risiko K3 Menggunakan Hazard Identification Risk Assessment and Risk Control (Hirarc)', *Jurnal Kesehatan*, 9(1), pp. 1080–1094. Available at: https://doi.org/10.38165/jk.v9i1.77.

[11] Iwan, Z. *et al.* (2023) 'Antisipasi Risiko Terhadap Petugas Operasional X-Ray Di Bandara Sultan Aji Muhammad Sulaiman Sepinggan Balikpapan', 9(1), pp. 766–773.

[12] Jaya, N.M., Dharmayanti, G.A.P.C. and Ulupie Mesi, D.A.R. (2021) 'Manajemen Risiko K3 (Keselamatan Dan Kesehatan Kerja) Pada Proyek Pembangunan Rumah Sakit Bali Mandara', *Jurnal Spektran*, 9(1), p. 29. Available at: https://doi.org/10.24843/spektran.2021.v09.i01.p04.

[13] Kevin, F.A. and Yayok, P.A. (2024) 'Analisis Risiko K3 dengan Metode HIRADC pada Industri Kepelabuhan di Jawa Timur', *Manufaktur: Publikasi Sub Rumpun Ilmu Keteknikan Industri*, 2(3), pp. 450–461. Available at: https://doi.org/10.55123/insologi.v2i3.1883.

[14] Monalisa, U., Sibakir and Listiawati, R. (2022) 'Faktor-Faktor yang Berhubungan dengan Perilaku Tidak Aman Pada Pekerja Service Pt. Agung Automall Cabang Jambi', *Jurnal Inovasi Penelitian*, 2(10), pp. 3391–3398. Available at: https://stp-mataram.e-journal.id/JIP/article/view/1332.

[15] Nurbayani *et al.* (2021) 'Hubungan Kondisi Sanitasi dengan Keberadaan Kecoa pada Kapal Penumpang di Pelabuhan Ulee Lheue Kota Banda Aceh', *Jurnal Serambi Akademica*, 9(1), pp. 1–11. Available at: https://www.ojs.serambimekkah.ac.id/serambi-akademika/article/view/2796.

[16] Peraturan Menteri Ketenagakerjaan Republik Indonesia No. 5 Tahun 2018 Tentang Keselamatan dan Kesehatan Kerja Lingkungan Kerja. Jakarta; 2018.
[17] Peraturan Pemerintah Republik Indonesia Nomor 50 Tahun 2012 Tentang Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja. Jakarta; 2012.
[18] Saputro, T. and Lombardo, D. (2021) 'Metode Hazard Identification, Risk Assessment and Determining Control (HIRADC) Dalam Mengendalikan Risiko Di PT. Zae Elang Perkasa', *Jurnal Baut Dan Manufaktur*, 03(1), pp. 23–29.
[19] Saraswati, H. (2020) 'Hazard Identification, Risk Assessment and Determining Control (Hiradc)', (Ibk 512), pp. 0–14.
[20] Sely, A. (2023) *Penilaian Risiko Kesehatan Kerja Pada Petugas Ground Handling Di Bandara Internasional Smb Ii Palembang Tahun 2016*. Available at: http://rama.binahusada.ac.id:81/id/eprint/1416/1/SKRIPSI SELY ADELINA.pdf.
[21] Suryadi, I. and Rachmawati, S. (2020) 'Work Posture Relations With Low Back Pain Complaint on Partners Part of Pt "X" Manufacture of Tobacco Products', *Journal of Vocational Health Studies*, 3(3), p. 126. Available at: https://doi.org/10.20473/jvhs.v3.i3.2020.126-130.
[22] Tarwaka and Bakri, S.H.A. (2016) *Ergonomi untuk Keselamatan, Kesehatan Kerja dan Produktivitas*. Available at: http://shadibakri.uniba.ac.id/wp-content/uploads/2016/03/Buku-Ergonomi.pdf.
[23] Widjanarko, W. and Khotimah, K. (2022) 'Konsep Penerapan ISO 45001:2018 dalam Manajemen Risiko Keselamatan dan Kesehatan Kerja (K3) Tahap Survei Tapak pada Lokasi Pembangunan PLTN di Kalimantan Barat', *Pertemuan dan Presentasi Ilmiah Standardisasi*, 2021, pp. 141–150. Available at: https://doi.org/10.31153/ppis.2021.123.
[24] Yamuna, U. *et al.* (2023) 'Designing and Validation of Yoga Module For Workers with Prolonged Standing', *Journal of Ayurveda and Integrative Medicine*, 14(5), p. 100788. Available at: https://doi.org/10.1016/j.jaim.2023.100788.
[25] Yuli, A. *et al.* (2022) *Profil Keselamatan dan Kesehatan Kerja Nasional Indonesia Tahun 2022*. Jakarta Selatan: Kementrian Ketenagakerjaan Republik Indonesia.