

Games and Audiovisuals of Non-Communicable Diseases as Health Promotion, Green Technology for Women Workers

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Abstract. Some of the millions of Indonesian migrant workers who live and work in Malaysia are there illegally and do not have health insurance. If they get sick, their access to health services is limited because the Indonesian JKN system is unable to protect their health. Limited facilities and infrastructure make them vulnerable, so they are more susceptible to disease, especially if the pattern of clean-living behavior is lacking, nutritional intake is low, and the body's biological condition is not good. In addition to poor sanitary conditions and working environments, a heavy workload, malnutrition, and a lack of guaranteed protection. The implementation of health development includes efforts that must be carried out in an integrated and sustainable manner. This service aims to make TKI independent in maintaining their health while working in Malaysia. Residents' knowledge from the results of the post-test after the presentation of the material shows an increase in knowledge, so that the percentage of "good" knowledge becomes 91%. The resulting attitude variable also increased from 52% to 70%. The behavior variable increased from 65% to 91% good behavior, so bad behavior decreased. Keywords: migrant workers; health promotion; game education; audiovisual technology; non-communicable disease.

1 Introduction

Use According to the World Health Rankings, the death rate of hypertension in Indonesia is 14.41 per 100,000 people, ranking it 87th out of 183 countries [1–2]. Meanwhile, the death rate due to diabetes mellitus (DM) in Indonesia is 53.33 per 100,000 people in the red (high) zone, at number 32 out of 183 countries [3]. Indonesian primary health research data shows an increase in cases of hypertension (HT) every year of around 3% and an increase in cases of hypertension with Type 2 DM of about 1% [4]. Data from the Ministry of Health states

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that cases of hypertension rank first on the list of non-communicable diseases, with a total of 185,857 cases, while DM cases take second place. The number of HT patients is four times greater than that of DM patients [5], including DM and HT patients among migrant workers in Indonesia and Malaysia [6]. Most patients do not realize they have type 2 DM, and when they find out, they have entered the stage of complications or have been diagnosed almost a decade before being diagnosed. Type 2 diabetes can affect all human body systems, from the skin to the heart. Complications of type 2 diabetes are numerous, including iatrogenic hypoglycemia, nonketotic hyperosmolar hyperglycemic coma (24–44 per 1 million), diabetic retinopathy leading to blindness (14.8%), diabetic nephropathy (10.7%), diabetic neuropathy (17.7%), cardiovascular disease (36.9%), diabetic foot (0.8%), and can also experience lactic acidosis and even ketoacidosis (17.5 per 100,000) [7]. Type 2 diabetics have a 2-4 times greater risk of coronary heart disease than people without diabetes. In addition, two-thirds of patients die from heart disease and stroke. In the Western world, type 2 DM is a significant cause of cardiovascular disease, blindness, and end-stage renal disease [8–10]. Hypertension is not a single disease, and various factors contribute to hypertension, including DM, in both obese and non-obese populations and vice versa [6, 11]. Diabetes mellitus, hypertension, and obesity cause 24% of deaths worldwide [12, 13.3].

Environmental factors also have an impact on the prevalence of diabetes mellitus and hypertension, which are both related to biological factors, including genetics. In several big cities, exposure to cigarette smoke, vehicle fumes, and increased airborne microparticles has been linked to hypertension and DM. Efforts must be made to grow circulation to maintain clean air and reduce smoke from diesel, burning waste, vehicle engines, and cigarettes. Laborers or workers, including female migrant workers, often ignore and pay less attention to environmental hygiene issues, including maintaining clean air, so health education and the need to keep clean air are considered strategic steps.

The above conditions are caused by the implementation of health development, including health efforts and their resources to be carried out in an integrated and sustainable manner to achieve optimal results, including solving the health problems of immigrant workers above with program interventions. A specific strategy for the program is to use a combination of educational games and audiovisual presentations as a health promotion strategy to address the above issues.

1.1 Study design

Research to determine the effect of health education with audiovisual media and games uses a quasi-experimental quantitative method (quasi-experimental). The quasi-experiment was chosen because of the impact of the treatment on other conditions and uncontrolled conditions. [14]. This study was given a favorable opinion by the Ethics Committee on Human and Animal Medical Research of the Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia, under the substantiated opinion number 518/A.7-III/IKP/XII/2022. After thoroughly explaining the study, all participants signed a written informed consent form.

1.2 Population and research sample

This research was conducted at the University of Malaya. The target population of this research is Indonesian Migrant workers in Malaysia. The research samples obtained were from 30 Indonesian Migrant Workers in Malaysia who were taken by the purposive sampling method. Of the 30 participants, only 23 volunteers took part in all stages of the research.

1.3 Intervention and Outcome Assessment Method

We conduct health education about diabetes mellitus (DM) and hypertension using audiovisual media and games. Following a 45-minute game phase, there is a 15-minute audiovisual explanation of hypertension and DM. In the game phase, the volunteers were divided into three groups randomly. Before the game phase begins, the facilitator explains the game's implementation techniques. A scenario-based game about a person suffering from hypertension is done in three groups for ten minutes. Educational games begin with instructions that must be followed in groups. Groups are divided into groups A, B, and C. Educational games are carried out with quizzes on the screen, and students answer with answer sheets. The hope is that games can increase knowledge, make it easier for trainees to absorb the material, and prevent boredom. After that, they will report the game's results by presenting them with pictures, and if there is a mistake in choosing an incorrect image, the facilitator will show the correct picture and explain. The game's atmosphere feels interactive, fun, and not dull [15] [16]. Game content contains images of types of staple foods, side dishes, vegetables, fruits, drinks, and their portions, high to low glycemic index types, pictures of physical activity, types of diseases, and drugs [17] [18] [19]. At the end of the activity, it was closed with a medical check-up and checking of blood sugar, cholesterol, and uric acid. A team from Indonesia carried out health checks and health consultations.

Assessment of the results of the intervention was carried out by completing a worksheet (questionnaire), which was carried out before and after this health education activity. Participants were asked to answer ten questions, as shown in Table 1.

Table 1. List of questions regarding hypertension and DM

Question	True	Doubtful	False
Can hypertension be cured?			
Can hypertension only be controlled with medication?			
Are the symptoms found in people with hypertension headaches, feelings of heaviness in the neck, and irritability?			
Is eating fruit, vegetables, and low-fat dairy products recommended for people with hypertension?			
Can salty food, tobacco smoke, and diesel smoke cause hypertension?			
Can Diabetes Mellitus be cured?			
Is taking diabetes medication continuously harmful to the body?			
Can consuming sweet foods or drinks cause Diabetes Mellitus?			
Is Diabetes Mellitus a contagious disease?			

Blood sugar can be normalized by utilizing fibrous foods, exercise, or medication for DM patients.			
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A post-test is conducted after all the programs have been completed. This activity was carried out by distributing questionnaires containing post-test knowledge regarding non-communicable diseases among Indonesian workers with the same questions as the pre-test.

The urgency of keeping the environment and air clean is associated with the evils of cigarette smoke and diesel fumes for human health. Cigarette smoke and vehicle exhaust are risk factors for DM and hypertension. By demonstrating the dangers of cigarette smoke and vehicle exhaust, awareness will grow to help keep the air clean. The need to keep the environment clean, reduce the habit of eating salty food, and consume lots of fiber and fruit has been raised not only as a health issue but also as an issue of the need to keep the environment clean. The study aimed to learn about how health educators use audiovisual presentations combined with games to increase knowledge about non-communicable diseases and environmental health.

1.4 Data analysis

Demographic and clinical data are presented descriptively. Knowledge scores before and after health education were tested by a paired t-test. Changes in respondents' distribution based on their knowledge status level before and after health education were tested with a shear test.

2 Results and Discussion

2.1. Demographic and clinical characteristics of Indonesian migrants workers

The subjects are 30 Indonesian Migrant workers in Malaysia willing to participate in health education and counseling. The results below are the distribution of village residents' pre-test data on the variable knowledge of non-communicable diseases, hypertension, and diabetes mellitus. Most of the volunteers have primary education and are of non-geriatric age. The demographic and clinical descriptions of the volunteers are presented in Table 2.

Characteristic	N	Percentage	Mean
Age group	30	100	-
Non geriatric	16	52.2	-
Geriatric	14	48.8	-
Education level	30	100	-
Basic school	13	43.5	-
Senior high school	11	39.1	-
university	6	17.4	-
Height (cm)	29	-	154.72±6.04
Body weight (Kg)	30	-	55.40±12.92
Bmi (Kg/m ²)	29	-	27.74±5.46
Systolic blood pressure (mmHg)	29	-	119.93±15.10
Diastolic blood pressure (mmHg)	29	-	76.72±11.14
Heart rate (Frex)	18	-	83.00±9.84
Blood glucose level	30	-	113.47±17.30

Uric acid	30	-	0.81±2.04
Cholesterol	30	-	211.47±46.53

Table 2 shows that female migrant workers in Malaysia have normal average blood pressure, pulse, blood sugar, and uric acid levels but have an obese BMI and hypercholesterolemia. Obesity and hypercholesterolemia are the two main risk factors for hypertension and diabetes mellitus. Four of them already had hypertension, and 18 of them had hypercholesterolemia. Health education to increase their knowledge about hypertension and diabetes mellitus is essential to inhibiting the development of risk factors for non-communicable diseases (NCD, hypertension, and DM).

2.2 Distribution of answers of female migrant workers to the knowledge questionnaire about NCD

Ten questions regarding knowledge of DM and hypertension and an overview of the level of knowledge of volunteers before being given education are presented in Table 3. Table 2 shows that six questions have been answered, with most of the respondents' answers being correct; there is still one question that most volunteers answered incorrectly.

Table 3. Distribution of female migrant workers' answers regarding knowledge about hypertension, diabetes mellitus and environmental hygiene issues

Question	True	Doubtful	False
Can hypertension be cured?	4	6	13
Can hypertension only be controlled with medication?	7	3	13
Are the symptoms found in people with hypertension headaches, feelings of heaviness in the neck, and irritability?	16	4	3
Is eating fruit, vegetables, and low-fat dairy products recommended for people with hypertension?	16	6	2
Can salty food, tobacco smoke, and diesel smoke cause hypertension?	12	6	5
Can Diabetes Mellitus be cured?	9	7	7
Is taking diabetes medication continuously harmful to the body?	5	7	11
Can consuming sweet foods or drinks cause Diabetes Mellitus?	16	3	4
Is Diabetes Mellitus a contagious disease?	14	3	6

Blood sugar can be normalized by utilizing fibrous foods, exercise, or medication for DM patients.	13	6	4
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Table 3 shows that many respondents do not know the importance of hypertension treatment, DM treatment, and the dangers of cigarette smoke, diesel smoke, and salty foods. Most respondents understand the risks of sweet foods and the importance of fruit, fiber, and low-fat foods to avoid diabetes and hypertension.

2.3 The effect of health education on the level of NCD and green environment issue-knowledge of female migrant workers

Health education about hypertension and diabetes mellitus in Malaysia is provided using audiovisual media and games. The results of calculating the score before and after giving health education are presented in Table 3 and Figure 1

Table 4. Knowledge score and knowledge status distribution of Respondents before and after providing Health education to Female Migrant Workers

Characteristic	Pre	Post	p
NCD and green environment issue-Knowledge score (mean±)	4.83±2.14	7.43±1.97	0.000
Distribution of respondents based on the knowledge status of Respondents			
Good knowledge (%)	61	87	0.00
Imperfect knowledge (%)	39	13	

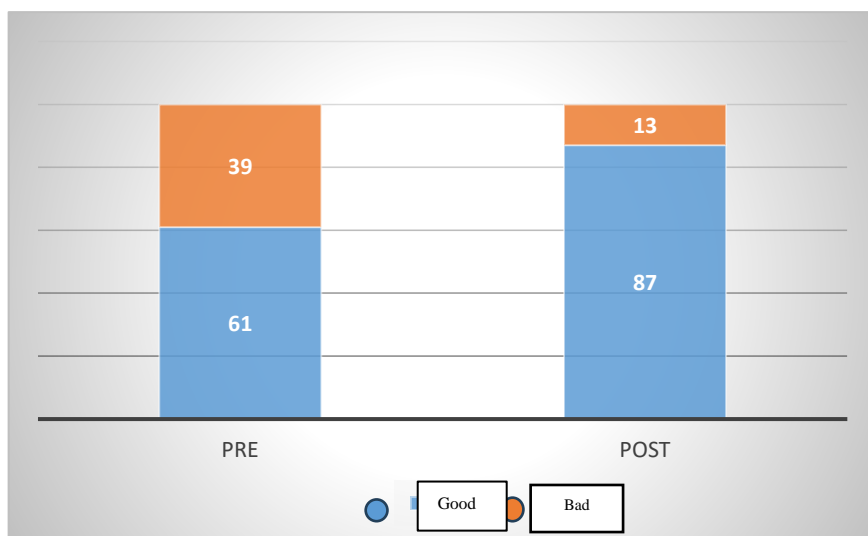


Fig. 1. Changes in the distribution of respondents based on the status of their level of knowledge of NCDs and environmental health

The graph (Fig. 1) compares pre-test and post-test results regarding the number of respondents who experienced increased knowledge. Before health education, a pre-test was carried out with good knowledge among 14 respondents, and the remaining nine respondents had poor knowledge. While the results after being exposed to health education resulted in the majority of respondents in the post-test having a good understanding, the remaining two respondents had poor knowledge. If the results of the diagram (Fig. 1) are compared with the questionnaire, for most of the first questions regarding the cure for hypertension, the majority answered incorrectly; as many as 19 respondents responded correctly. Whereas for the next question regarding hypertension, which can only be controlled with drugs, only seven respondents answered correctly, and 16 respondents did not answer correctly. Most of the 15 respondents answered correctly to questions about some symptoms, such as irritability, headaches, and a feeling of heaviness in the neck, but eight still responded incorrectly. In terms of nutrition, most Indonesian Migrant workers also understand what intake is safe for consumption by people with hypertension, as can be seen from the 15 respondents who answered correctly and the eight respondents who still responded incorrectly.

The issue of green technology is associated with the emergence of environmental damage due to cigarette smoke and diesel engine fumes and their influence on the incidence of hypertension. In health education, the issue of environmental health is associated with the habit of consuming salty food. The results showed that most respondents answered correctly (Fig. 2). As for the respondents' knowledge about salty foods, tobacco smoke, and diesel smoke that have the potential to cause hypertension, more than half of the respondents answered correctly (12 respondents), while 11 respondents still responded incorrectly. After the provision of health education, there was an increase in the number of respondents with correct answers about the dangers of salty food, cigarette smoke, and diesel or vehicle engine fumes because they could increase the incidence of hypertension. After providing health education, as many as 20 respondents had the correct answer, and two had the wrong answer.

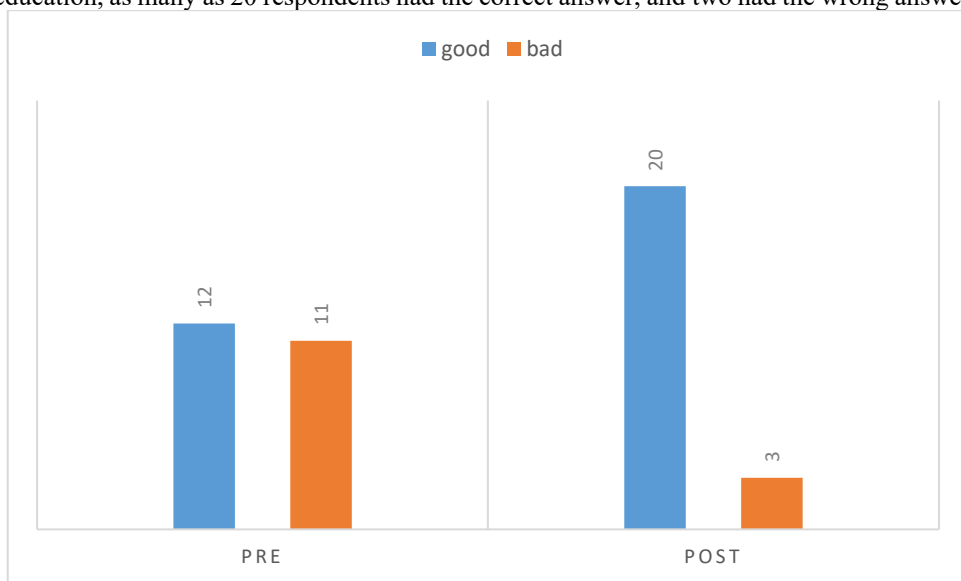


Fig. 2. The distribution is based on the respondent's level of knowledge about the dangers of cigarette smoke and diesel engine fumes.

Diabetes mellitus is a disease that occurs due to metabolic disorders. People with diabetes are often associated with high glycemic levels, which can spread and cause damage to the eyes, kidneys, nerves, heart, and blood vessels. These hazardous properties require screening and diagnostics according to their type [11]. In respondents' knowledge about the possibility of recovering from diabetes, only nine answered correctly; the remaining 14 responded incorrectly, which increased in the post-test results, with 13 answering correctly. The next question regarding the drugs consumed by people with diabetes is dangerous. Correctly, the majority still responded incorrectly, and only five respondents answered correctly. However, there was an increase in post-test results to 10 respondents. Public knowledge is good if eating sweet foods can increase the risk of diabetes; the majority of 16 respondents answered correctly, which increased to 22, or almost all answered correctly. Community knowledge about diabetes is a non-communicable disease; also, 14 respondents answered correctly, which increased after counseling to 18 respondents. Most respondents already know that diabetes is not a contagious disease but can be passed on to their offspring. The last question on the knowledge variable resulted in 14 respondents answering correctly to the statement that blood sugar can be normalized by eating fiber, exercising, and taking routine medication, increasing to 20 respondents answering correctly.

The study results showed that the post-respondent knowledge score was higher than the pre-health education score, 7.43 ± 1.97 v.s. 4.83 ± 2.14 , and has statistical significance ($p < 0.00$). In line with changes in pre- and post-education knowledge scores, the distribution of respondents based on knowledge level status also changed. This is evidenced by the increase in the results of filling out the pre-test and post-test questionnaires, which experienced an increase in marks from "bad" to "good." In the form of a pre-test, the percentage of respondents with less knowledge was 39%, and those with "good" knowledge were 61%. While the results of the post-test or the test after delivering the material show an increase in learning, the percentage of "good" knowledge becomes 87%. In comparison, the level of lousy expertise is 13%. It can be concluded that there is an increase in knowledge among respondents with health education.

Evidence from the results of this study shows that health education can be used to increase participants' knowledge regarding environmental health issues, especially those directly related to health. Previous studies indicate a relationship between knowledge level, clean and healthy living behaviors, and disease development [12] [23]. The issue of environmental health and its relation to human health has become a severe problem and has given birth to a joint commitment to realize environmentally friendly or green technology [20]. Numerous academics are looking into the factors that promote green growth. Evidence shows a relationship between economic status and clean and healthy living behaviors. Factory workers and laborers are associated with less clean living habits and less attention to the need for clean air and environmental cleanliness [21], [22], and [23]. The results of this study indicate that most female migrant workers from Indonesia who work in Malaysia already have good knowledge regarding the dangers of cigarette smoke and vehicle exhaust. Efforts are needed to upgrade from the knowledge zone to the awareness and behavior zones [24].

3 Conclusion

Combining audiovisual exposure with games about NCD health education is practical to increase knowledge about NCDs and the dangers of cigarette smoke and air pollution. Most

female migrant workers from Indonesia who work in Malaysia have sufficient knowledge about the harmful effects of cigarette smoke and vehicle exhaust. The variables of knowledge, attitude, and behavior have an impact on a person, especially in the Indonesian workforce. There is an increase in results on the variables of knowledge, attitudes, and behavior. Knowledge of previous research also shows a relationship between healthy behavior and Green technology is also an environmental health issue that supports human life. It is hoped that the workforce will have awareness in terms of maintaining health, environmental health, and efforts to fulfill nutrition. These efforts are made so that female workers have good health so as to increase productivity and minimize spending on health.

References

- 1 G. W. Setiawan and H. I. S. Wungouw, " Quality of life of hypertensive patients," **1**,1 (2013)
- 2 V. P. Giena, S. Thongpat, and P. Nitirat, "Predictors of health-promoting behavior among older adults with hypertension in Indonesia," *Int. J. Nurs. Sci.*, **5**, 2, pp. 201–205, doi: 10.1016/j.ijnss.2018.04.002 (2018)
- 3 D. J. March and E. Planas, " Center for Data and Information of the Ministry of Health of the Republic of Indonesia " (1997)
- 4 H. Idris, H. Hasyim, and F. Utama, "Analysis of Diabetes Mellitus Determinants in Indonesia: A Study from the Indonesian Basic Health Research 2013," *Acta Med. Indonesia*. **49**, 4, (2017)
- 5 A. D. Kurnia, A. Amatayakul, and S. Karuncharernpanit, "Predictors of diabetes self-management among type 2 diabetics in Indonesia: Application theory of the health promotion model," *Int. J. Nurs. Sci.* **4**, 3 (2017) doi: 10.1016/j.ijnss.2017.06.010.
- 6 S. Bansilal *et al.*, "Cardiovascular risk surveillance to develop a nationwide health promotion strategy: The grenada heart project," *Glob. Heart*, **7**, 2, (2012), doi: 10.1016/j.ghheart.2012.06.002.
- 7 E. McCracken, M. Monaghan, and S. Sreenivasan, "Pathophysiology of the metabolic syndrome," *Clin. Dermatol.*, **36**, 1 (2018) , doi: 10.1016/j.clindermatol.2017.09.004.
- 8 R. K. S. Gomes *et al.*, "Prevalence of ischemic heart disease and associated factors in patients with rheumatoid arthritis in Southern Brazil," *Rev. Bras. Reumatol. (English Ed.)*, **57**, 5 (2017) doi: 10.1016/j.rbre.2017.01.006.
- 9 E. B. Kamaleldeen, H. A. Mohammad, E. F. Mohamed, and A. G. Askar, "Microvascular complications in children and adolescents with type 1 diabetes mellitus in Assiut governorate, Egypt," *Egypt. Pediatr. Assoc. Gaz.* **66**, 4 (2018) doi: 10.1016/j.epag.2018.10.003.
- 10 E. Ritz, "Nephropathy in type 2 diabetes," *J. Intern. Med.*, **245**, 2 (1999) doi: 10.1046/j.1365-2796.1999.00411.x.
- 11 D. S. Harbuwono, L. A. Pramono, E. Yunir, and I. Subekti, "Obesity and central obesity in indonesia: Evidence from a national health survey," *Med. J. Indonesia* **27**, 2 (2018), doi: 10.13181/mji.v27i2.1512

- 12 Z. Alahmed and F. Lobelo, "Physical activity promotion in Saudi Arabia: A critical role for clinicians and the health care system," *J. Epidemiol. Glob. Health*, **7**, 1 (2018), doi: 10.1016/j.jegh.2017.10.005.
- 13 M. Masrul, "Epidemi obesitas dan dampaknya terhadap status kesehatan masyarakat serta sosial ekonomi bangsa," *Maj. Kedokt. Andalas*, **41**, 3 (2018), doi: 10.25077/mka.v41.i3.p152-162.2018.
- 14 I. Ismail, R. Siddiq, and B. Bustami, "The Effectiveness of Health Education Using Audiovisual on the Santri Smokers' Motivation to Stop Smoking," *Asian Pacific J. Cancer Prev.*, **22**, 8 (2021) doi: 10.31557/APJCP.2021.22.8.2357.
- 15 P. A. M. Ntenda and Y. C. Chuang, "Analysis of individual-level and community-level effects on childhood undernutrition in Malawi," *Pediatr. Neonatol.*, **59**, 4 (2018) doi: 10.1016/j.pedneo.2017.11.019.
- 16 R. M. Carey, P. Muntner, H. B. Bosworth, and P. K. Whelton, "Reprint of: Prevention and Control of Hypertension: JACC Health Promotion Series," *J. Am. Coll. Cardiol.*, **72**, 23, (2018), doi: 10.1016/j.jacc.2018.10.022.
- 17 I. da S. Carvalho, T. G. Guedes, S. M. M. da S. Bezerra, F. A. P. Alves, L. P. Leal, and F. M. P. Linhares, "Educational technologies on sexually transmitted infections for incarcerated women," *Rev. Lat. Am. Enfermagem*, **28**, 1 (2020), doi: 10.1590/1518-8345.4365.3392.
- 18 A. Ghadiri, D. L. Sturz, and H. Mohajerzad, "Associations between Health Education and Mental Health, Burnout, and Work Engagement by Application of Audiovisual Stimulation," *Int. J. Environ. Res. Public Health*, **19**, 15 (2022) doi: 10.3390/ijerph19159370.
- 19 I. A. Abdoulaye and Y. J. Guo, "A Review of Recent Advances in Neuroprotective Potential of 3-N-Butylphthalide and Its Derivatives," *Biomed Res. Int.*, (2016) doi: 10.1155/2016/5012341.
- 20 Z. Hussain, B. Mehmood, M. K. Khan, and R. S. M. Tsimisaraka, "Green Growth, Green Technology, and Environmental Health: Evidence From High-GDP Countries," *Front. Public Heal.*, **9**, 1 (2022), doi: 10.3389/fpubh.2021.816697.
- 21 Y. Yang, J. J. Wang, C. X. Wang, Q. Li, and G. H. Yang, "Awareness of tobacco-related health hazards among adults in China," *Biomed. Environ. Sci.*, **23**, 6, (2010) doi: 10.1016/S0895-3988(11)60004-4.
- 22 R. Gupta, N. Gupta, and R. S. Khedar, "Smokeless tobacco and cardiovascular disease in low and middle income countries," *Indian Heart J.*, **65**, 4 (2013) doi: 10.1016/j.ihj.2013.06.005.
- 23 ILO, "Guidelines for a just transition towards environmentally sustainable economies and societies for all," no. October (2015) [Online]. Available: www.ilo.org/publns.
- 24 H. Bergström, M. Hagströmer, J. Hagberg, and L. S. Elinder, "A multi-component universal intervention to improve diet and physical activity among adults with intellectual disabilities in community residences: A cluster randomised controlled trial," *Res. Dev. Disabil.*, **34**, 11 (2013), doi: 10.1016/j.ridd.2013.07.019.