International Journal of Psychology , Social and Educational Sciences
Vol.4, NO.1 , P:161 - 173
Received: 20 March 2022
Accepted: 16 May 2022

Waste management knowledge and Performance in health and medical staff in the COVID-19 epidemic

Fatemeh Seyedi
Assistant Professor of Anatomical Sciences Department of Anatomical Sciences, School of Medicine Jiroft University of Medical Sciences, Jiroft, Iran.
Email: seyedifatemeh@yahoo.com
Ehsan Movahed*
Assistant Professor of Health Education and Promotion Department of Public Health, School of Health Jiroft University of Medical Sciences, Jiroft, Iran.
Email:ehsanmovahed89@yahoo.com.
Aliasghar Kheirkhah
Assistant Professor of Internal Medicine Department of Internal Medicine School of Medicine Imam Khomeini Hospital, Jiroft University of Medical Sciences, Jiroft, Iran.
Email: kheirkhah82@yahoo.com
Mahsa Tahergorabi
Assistant Professor of Environmental Health Department of Environmental Health School of Health, Jiroft University of Medical Sciences, Jiroft, Iran
Email: tahergorabi.m@gmail.com
Mohamad Mahmoodi
Msc of Environmental Health, Department of Health Jiroft University of Medical Sciences, Jiroft ,Iran
Email: mahmoodi@yahoo.com
Zahra Seirfar
Bachelor of Nursing, Jiroft University of Medical Sciences, Jiroft ,Iran
Email: vcr.jmu@gmail.com

Abstract

Objective: This study aimed to investigate the waste management knowledge and performance in health and medical staff in the COVID-19 epidemic.

Methods: The present study was a cross-sectional study that was performed on 470 healthcare personnel in Jiroft University of Medical Sciences, Iran, from May to November 2020. Sampling method was availability sampling. A researcher-made questionnaire on waste management was used as a data collection tool. Data were analyzed using descriptive tests, independent t-test and Kruskal-Wallis with SPSS24 software.

Results: The mean age of employees was 32.16±7.03 years. The status of information, production and waste collection was favorable in employees and there was a statistically significant difference among information (p = 0.000), production (p = 0.000), collection (p = 0.000) and Comprehensive waste management (p = 0.001) in health care units. Among the healthcare personnel who are working in the Health home, the score of waste management was higher than other health centers.

Conclusion: According to the low performance of staff in cities and hospitals, especially in the field of waste segregation, transportation and recycling, it is recommended that it should be effective to use virtual and electronic distance learning and the existence of practical rules and instructions and controlling and adequate monitoring of the waste management process in hospitals.

Keywords: ”Knowledge”, ”Practice”, ”Waste Management”, ”Health Centers”, ”COVID-19”

INTRODUCTION

Increasing population and continuous expansion of cities and the expansion of hospitals and health centers were in order to raise the quality and quantity of public health, as well as the prevalence of COVID-

19 and use a N95 mask, scrubs, glasses, a special gown, gloves, boots causes to increase the infectious waste, hazardous pollution, especially soil pollution and climate change[1]. Such wastes are considered as health and environmental problems and in most cases, its management, due to its facilities and budget. Thus have led to many problems, which is very important to pay more attention to waste management (production, collection, segregation, transportation and recycling)[1].

According to the Organization for Economic Co-operation and Development (OECD), waste management is the processing and converting consumables into new products and materials in order to avoid wasting potentially useful materials, reduce material consumption, reduce raw material, reduce the energy consumption, reduce the air pollution due to burning materials and water pollution resulting from landfilling and reducing greenhouse gas emissions[2].

Efficient waste separation increases the possibility of recycling, and if consumers and employees separate waste carefully and safely, they will enjoy economic and occupational health benefits.[3] If proper waste management is applied, part of the national capital can be returned. In fact, the collection, separation and recycling of materials is one of the indisputable principles of increasing productivity in economic systems. Actually recycling allows the level of consumption to remain constant and even increase without putting pressure on primary resources and the environment, and this is one of the main manifestations of sustainable development[2]. Globally, the waste management sector faces numerous challenges. Currently, 3.4 to 4 billion tons of municipal and industrial solid waste and up to 300 million tons of hazardous waste (infectious and medical) are produced annually worldwide[4]. The problems that were caused by waste poses to humans and the environment include: health hazards, ecosystem degradation, soil and water pollution, as well as greenhouse gas emissions, which are more evident in developing countries[5]. According to the South Korean Ministry of Environment[6], about 295 tons of COVID-19 medical waste was generated from early February to early March 2020, of which 61% was allocated for hospitals, 21% for temporary isolation facilities and 18% for health centers[7].

According to a Poudel's study in 2010, infectious health waste was introduced as the second most hazardous waste in the world and they should be properly managed by trained staff in an organization; and lack of

training for hospital staff and the public on waste collection and recycling was one of the main mentioned problems [8] and government support of hospitals is vital to provide regular training to hospital staff on the proper collection of infectious and non-infectious waste[9] . In Wang et al.'s study, hospitals in China were identified as potential sources of environmental pollutants from diagnostic, laboratory, and research activities[10]. In the study of Joachim Vogt et al., the rate of separation and recycling of waste was very low and it was reported about 23% [3].

The importance of waste segregation plan in Iran is also important in the sense that waste components and compounds can be recycled up to about 60 to 70% [1]. Inadequate management in such a crisis poses potential risks to health care workers and causes to increase the transmission of the virus among them. Therefore, motivation and competition will be created by conducting research in the field of waste management for hospitals and health centers and affiliated units and familiarity with their status in order to protect the environment and It makes possible to apply effective interventions. Therefore, the aim of this study was to investigate the Waste management knowledge and Performance in health and medical staff in the COVID-19 epidemic.

Materials and methods

The study and setting

This is a cross-sectional study that was performed on all health workers in hospitals, health centers and affiliated units under the auspices of Jiroft University of Medical Sciences, from June to December 2020. The sample size consisted of 470 people who were selected using the available sampling method.

Inclusion criteria: Employees working in health centers affiliated to Jiroft University of Medical Sciences with least 2 years of work experience, informed consent to participate in the study and exclusion criteria were included being patient and non-cooperation. 40% of health units affiliated to Jroft University of Medical Sciences was randomly selected as the research sample. The selected samples were from Jiroft city (10 centers), Anbarabad city (3 centers), Kahnooj city (4 centers), Faryab city (1 center), Manojan city (4 centers), Ghale Ganj city (4 centers), Rudbar city (4 centers). And sampling was available from each health unit. Thus, after stating the purpose of the study and the confidentiality of the data and the individual's satisfaction, the questionnaire link was sent to them by cyberspace. Considering the prevalence of waste

segregation and recycling at 23% in a similar study in Germany (3), and using the formula for estimating the prevalence and 95% of confidence level and by considering an error of 0.04, the sample size of 428 people was calculated. According to the 10% probability of sample loss, the desired sample size was 470 people. However, due to the existence of COVID-19 and conducting research virtually, 428 people participated in the project.

Data collection and ethical consideration

The data collection tool consists of two parts. The first part consists of demographic information and the second part consists of 6 parts. The components of the waste questionnaire formed from 11 questions on information questions about waste status, 5 questions on waste generation, 7 questions on collection, 10 questions on separation, 6 questions on transportation, 7 questions on recycling based on a five-choice Likert scale (strongly agree 5, and strongly Disagree 1). In designing questions, the 4th question in the information section, question 7 in the collection section, question 3-7-10 in the separation section, question 1-2-2-4 in the transportation section, and questions 1 and 7 in the recycling section had inverted scoring. The lowest score is considered 46 and the highest score is 230.

The questionnaire was developed by the researcher using existing articles and books in the field of waste. The validity of the questionnaire was corrected and confirmed by 7 environmental health experts and related experts. Finally, the content validity index score was calculated more than 0.85 for the questions of all models constructs. The reliability of the questionnaire was completed by 15 health workers and it was higher than 0.80 after Cronbach's alpha analysis in all components.

Ethics Approval

This project acquired an ethical Committee approval from the Jiroft university of medical science (IR.JMU.REC.1399.034).

Data Analysis

Descriptive and inferential statistical methods were used to describe and analyze the data. Data were presented as mean (standard deviation) for quantitative data and as frequency (percentage) for qualitative data. The results were analyzed using SPSS software version 24 and independent t-test and Kruskal-Wallis tests.

Results

The age range of participants in the study was 20 to 56 years with a mean age of 32.16±7.03 years. Among the participants,

341 (79.7%) were female and 87 (20.3%) were male Table (1).

Table 1- Frequency distribution of demographic variables in the study population

Variable		N	%
Age	20-30	181	42.3
	30-40	182	42.5
	40-50	65	15/2
Gender	Female	341	79.7
	Male	87	20.3
Education	Diploma and less	118	27.6
	Associate Degree	52	12.1
	Bachelor	190	44.4
	MA	42	9.8
	PhD	26	6.1
Marital Status	Married	309	72.2
	Single	113	26.4
	Widow	2	0.5
	Divorced	4	0.9
Residence	Private	245	57.2
	Rental	95	22.2
	Organizational	54	12.6
	Other	34	7.9
Habitat	City	255	59.6
	Village	173	40.4
Income	Under one Million	10	2.3
	One to two Million	38	8.9
	2 to 5 Million	308	72
	5 Million and more	72	16.8
Total		428	100

According to the results of Kruskal-Wallis test, the status of information, production and collection of waste in employees was favorable, but segregation, transportation and recycling were not appropriate. Also, there is a statistically significant difference among information ($p = 0.000$), production ($p = 0.000$), collection ($p = 0.000$) and general waste management ($p = 0.001$) among health care units Table (2).

Table 2- Mean and standard deviation of waste management components based on health units

Variable	Hospital	Health Center	Comprehensive Health Center	Health Home	P-Value	Minimum	Maximum
Standard Deviation ± Mean							

Information	44.87±5.48	47.88±6.1	49.13±5	49.31±4.5	0.000	11	55
Production	21.36±3.5	22.35±2.9	23.37±2.5	23±2.4	0.000	5	25
Collecting	25.40±6.7	28±5.6	28.26±4.85	30.12±4.39	0.000	7	35
Separation	36±5.6	36±4.27	36.26±3.92	36.60±3.82	0.80	10	50
Transportation	20.19±4.92	19.73±4.60	20.34±4.38	20.65±4.38	0.4	6	30
Recycling	23.54±2.95	23.81±3.54	23.74±3.63	24.21±3.54	0.35	7	35
General waste management	171.47±21.50	177.87±20.21	181.12±16	183.89±15.84	0.001	117	216

The results of Kruskal-Wallis test showed that there was a significant relationship between residence (p = 0.006), education (p = 0.029) and place of work (p = 0.001) with waste management. So that people living in the village had a higher average score than residents of the city. Regarding education, the score of waste management of individuals were decreased by increasing level of education except in PhD groups. The place of work also showed that the employees in the Health home had a higher waste management score than other health centers Table (3).

Table 3- Mean and deviation of waste management criteria based on demographic variables

Variable		Waste Management		P-Value
		Mean	Standard Deviation	
Age	20-30	179.72	18.40	0.26
	30-40	179.40	18.25	
	40-50	184.02	15.40	
	50-60	197.71	16.87	
Gender	Male	181.79	18.94	0.2
	Female	179.98	17.96	
Habitat	City	178.17	19.50	0.006
	Village	183.57	15.46	
Education	Diploma and Less	183.88	16.56	0.029
	Associate Degree	182.86	16.66	
	Bachelor	178.69	18.23	
	MA	174.02	21.27	
	PhD	182.07	19.28	
Working Place	Hospital	171.47	21.50	0.001
	Health center	177.87	20.21	
	Comprehensive Health Center	181.12	16.09	
	Health home	183.89	15.84	
	Married	180.29	17.57	0.43

Marital Status	Single	180.05	19.89	
	Divorced	189	13.43	
City	Jiroft	178.51	18.92	0.08
	Anbar Abad	193	6.6	
	Kahnoj	182.57	18.45	
	Rodbar	175.96	19.42	
	Manojan	178.19	17.01	
	Faryab	183.85	18.95	
	Galeh Ganj	179.90	16.66	
Residence	Private	182.45	17.17	0.08
	Rental	177.26	19.24	
	Organizational	178.16	19.44	
	Other	177.32	18.59	
Income	Under one Million	176.80	24.73	0.9
	One to two Million	181.89	17.77	
	2 to 5 Million	180.30	17.63	
	5 Million and More	180.25	19.83	

Discussion

The results of our study showed that the knowledge of employees about waste management and their performance in the production and collection of waste causing by COVID-19 was desirable, but their knowledge and practice about the separation, transportation and recycling of waste causing by COVID-19 was not desirable. The results also showed that employees who were more knowledgeable about waste management, their performance score was higher in the production and collection of waste. Also, people living in the village and working in the health house had a higher average score than the employees working in the health units located in the city. Regarding education, the score of waste management of individuals decreased with increasing level of education except in PhD groups.

The results of our study showed employees working in all health care units learnt the appropriate knowledge about the production and collection of waste caused by COVID-19. Consistent with our study, in the study of Khorpisheh and colleagues, individuals' knowledge and attitudes were appropriate about waste management[11]. But in the study of Mahmoodabad et al., the public awareness was weak about waste management[12]. Differences in sample selection can be one of the reasons for differences. In the Mahmoodabad's study, all people living in the city were selected as the sample size, but in our study, they were among the health care workers. Also, the

presence of COVID-19 and differences in culture and geographical environment are further causes.

The performance of health staff in the Health homes in terms of production and collection was better and more desirable than other health care units, especially hospitals; however, in the Pazokinejad's study, individuals had low performance in waste management[13]. Also, in the study of Mahmoodabad et al., physicians and nurses, only has 27% role in transferring waste management information to other employees[12]. But in the Tabeshian's study, physicians working in health centers and hospitals had 63% role and health care personnel had 24% role in the transmission of information on waste management and it seems that doctors and hospital staff are more aware of waste management than employees in the Health home[14].

The results indicate that the performance of health care workers in different places is not the same and more extensive studies should be done. However, the status of waste collection and segregation within hospitals was evaluated as good in the study of Nourmohammadi et al[15]. Having a suitable structure such as waste storage containers such as plastic bins and durable and suitable garbage bags is one of the reasons for proper and desirable waste management. Also, the presence of wastes caused by COVID-19 is one of the reasons for the discrepancy in the results in the present study. Due to less workload and referrals in the Health homes than in hospitals; health workers can pay more attention to the collection and segregation of waste of coronavirus disease. In addition, patients referred to hospitals are in a worse physical condition and are needed more medical care, which in turn can generate more waste.

There is a maximum of 2 or 3 health workers in the Health home, but in hospitals, due to the large number of people, collective participation is needed. Therefore, the results show that health workers working in Health homes and people living in rural areas were more sensitive to proper waste management than those working in the city and were more careful about the benefits of waste management. But in Tayebi 's study, people living in rural areas did not know the methods of waste disposal and waste management, so proper waste management in rural areas requires proper interaction of people in rural areas and should be provided by education and public information to inform the locals about the consequences of improper waste disposal as well as damage to the environment [16]. In the present study,

conflicting results were observed regarding education and waste management; With the exception of PhDs, in other groups, with increasing education, people's performance in waste management was weaker. But in other studies[17, 18].people with higher education had better performance.

The status of production and collection of waste caused by COVID-19 was favorable in our study and was consistent with the study of Namdar et al, Mobaraki et al and Motaghi et al [19-21]. In our study 75% of people had poor waste collection performance. Also the status of waste collection by people and employees at home was more favorable than at work [12]. Also, in the study of Moradi and Barakat, waste collection was not done well [22]. Therefore, there is a need for continuous training for staff; as training has a significant effect on increasing awareness and encouraging employees to observe health issues and get the disease serious. Also, in the study of Nourmohammadi et al., storage and separation of infectious and non-infectious wastes was not done well in the hospital [15], which was consonant with the study of Mohammadian et al [23]. In the Rhee study in 2020 in South Korea, appropriate and timely guidelines for training, collection and segregation of corona waste were well implemented, and cooperation between people and staff was desirable [7]. In Spain, in order to produce less waste and collect and separate the waste caused by coronavirus, they launched a program of online shopping and home delivery at a reasonable and affordable price. But they also emphasized on training people and health workers about waste management [24].

In our study, the overall status of waste management in hospitals was poor compared to Health homes, which agreed with a study in Bazrafshan Province[25], but in Tehran and northern parts of Iran, the situation of waste management was relatively favorable in hospitals[26]. Geographical environment and suitable infrastructure in the center of Iran are the reasons for the difference.

The state of knowledge and practice of individuals regarding segregation, transportation and recycling was not favorable in our study. In many developing countries, which are relatively low economically, the waste recycling status is not good[27]. In the United States, the COVID-19 recyclable waste collection program was discontinued due to the dangers of the COVID-19 outbreak[24], but the United Kingdom carried out the COVID-19 recycling program well[28]. Kulkarni et al. emphasized a decentralized approach to the waste management system in their study; So

that waste treatment and recycling is done besides the waste production. This reduces the burden of waste collection and transportation and it can significantly reduce the risk of infection in the involved personnel[29]. Such wastes are a threat to residue, so it seems that the low awareness and performance of staff regarding the separation and recycling of waste is acceptable in the present study and it should be done by specialized people with special equipment for separation, transportation and recycling. In the United States, appropriate methods have been used to increase performance and waste management among employees and the public.

In the United States Federal emergency management agency (FEMA) recommends developing temporary waste storage and reduction sites between waste generation sites and final disposal sites[30]. For example, in the UK, to manage the additional waste generated during the COVID-19 pandemic, temporary waste storage capacity has been increased [31].

The status of waste transportation was not favorable in the present study, but, Kulkarni et al. had carried out a training program, supervision, safety management, and proper waste disposal during the COVID-19 pandemic in their study in order to improve the performance of employees and people; in which, the time and way of collection of medical waste related to COVID-19 and their transportation were different from public waste and which it cause to reduce the risk of leakage and damage during the transferring process [32].

Conclusion

The situation of knowledge, production and collection of waste caused by COVID-19 among the staff of the Health home in the villages was more favorable than the hospital in the cities, and in terms of segregation, transportation and recycling; the situation of all staff was not favorable. This shows that despite proper knowledge in the field of production and collection, but the performance of individuals in terms of segregation and recycling was not appropriate. Therefore, it is suggested that continuous training of employees electronically and virtually, especially employees working in cities and hospitals, is of particular importance to improve performance and motivation. also; In addition to improving knowledge, it is essential to pay attention to rules and guidelines, control and supervision, and use the experiences of other studies.

Acknowledgements

The authors extend their appreciation to the participants for their cooperation throughout the study. They also appreciate the assistance of the members of the Ethics and Research Boards of Jiroft University of Medical Sciences.

REFERENCES:

[1] Bashravieh Tavanayi H, Behzadi MH, MR. K: Presenting a conceptual model of public participation in waste management in Tehran. Quarterly Journal of Man and the Environment 2016, 14(3):37-46.

[2] Zarqi Amir A, H. R: Economic evaluation of the waste recycling industry. Scientific Information Center Blog 2018, 8(1):1-13.

[3] Vogt J, Nunes KRJE: Recycling behaviour in healthcare: waste handling at work. 2014, 57(4):525-535.

[4] Chalmin P, Gaillochet CJP, Veolia Environmental Services: From waste to resource :an abstract of the 2006 world waste survey. 2009.

[5] l'environnement PdNUp: Towards a green economy: Pathways to sustainable development and poverty eradication: United Nations Environment Programme; 2011.

[6] Dirajlal-Fargo S, Webel AR, Longenecker CT, Kinley B, Labbato D, Sattar A, McComsey GAJAt: The effect of physical activity on cardiometabolic health and inflammation in treated HIV infection. 2016, 21(3):237.

[7] Rhee S-WJWM, Research: Management of used personal protective equipment and wastes related to COVID-19 in South Korea. 2020, 38(8):820-824.

[8] Paudel R, Pradhan BJJoNHRC: Health care waste management practice in a hospital. 2010.

[9] Oroei M, Momeni M, Palenik CJ, Danaei M, Askarian MJJoi, health p: A qualitative study of the causes of improper segregation of infectious waste at Nemazee Hospital, Shiraz, Iran. 2014, 7(3):192-198.

[10] Wang J, Shen J, Ye D, Yan X, Zhang Y, Yang W, Li X, Wang J, Zhang L, Pan LJEp: Disinfection technology of hospital wastes and wastewater: Suggestions for disinfection strategy during coronavirus Disease 2019 (COVID-19) pandemic in China. 2020:114665.

[11] Khorpisheh Z, Mokhtari M, Madani A, Dindarloo K, Ghafari H, Alipour V: The awareness, attitude and function of the citizens of Bandar Abbas in the field of solid urban waste management. In: The 16th National Conference on Environmental Health in Iran: 2013; 2013.

[12] Mahmoodabad SSM, Movahed E, Ameri M, Atabay RA, Jadgal KM, Alizadeh S ea: Predictive Factors Related to the Waste Collection Behavior in Kerman City based on the Health Belief Model. Tolooebehdasht Journal 2018, 17(5):10-22.

[13] Pazokinejad Z, Salehi SJAS: The Analysis of Social Factors Affecting the Attitude and the Environmental Performance of Students. 2014, 25(55):71-88.

[14] Tabeshian A, Firozeh FJMSJoIAU: The effect of health education on performing pap smear test for prevention of cervix cancer in teachers of Isfahan city. 2009, 19(1.(

[15] M. N, M. R, AH. S: Survey Configuration of Collection and Disposal of Medical Wast in Hospitals of Sabzavar in 2016. Jornal of sabzavar of medical sciences 2017, 24(4):293-298.
[16] Tayebi H, Hassan Khani, Musa Reza A, Masoumeh B, Ameneh Gh, al. TMe: Report on the experience and function of improving rural and infectious waste management, collection, segregation, transportation and disposal of waste. Abstracts of the Second National Conference and the First International Conference on Experiences and Optimal Functions of the Primary Health Care System 2013, 1(1):1.
[17] Shekhi MF, Shamsi M, Khorsandi M, Heaidari MJSp, prevention i: Predictors accident structures in mothers with children under 5 years old in city of Khorramabad based on Health Belief Model. 2015, 3(3):199-206.
[18] Nejaei A, Babaiy S, Zareipour MJJoRiEH: Factors related to behavior Disposal of Garbage in health staff based on health belief model. 2018, 3(4):311-319.
[19] Namdar A, Bigizadeh S, Naghizadeh MMJJoFUoMS: Measuring Health Belief Model components in adopting preventive behaviors of cervical cancer. 2012, 2(1):34-44.
[20] Mobaraki A, Mahmoudi F, Mohebi ZJJoN, Gorgan MS: Knowledge, attitude and practice about Pap smear test in women working hospitals Yasuj City. 2008, 5(2):29-35.
[21] Motaghi M, Mostafai G, Salmani JJJoHN, Midwifery: Solid waste management of hospitals affiliated to Kashan Medical University. 2014, 24(2):49-58.
[22] Moradi B, Barakat SJIOH: Hygienic performance evaluation and effect of training in order to confronting with the Covid-19 virus in the metal industries staff. 2020, 17(1):1-12.
[23] Mohammadian Fazli M, Nassiri J, Nabizadeh RJIJoH, Environment: Qualitative and quantitative assessment and management of hospital waste in Zanjan, Iran in 2011. 2013, 6(1):55-64.
[24] Zambrano-Monserrate MA, Ruano MA, Sanchez-Alcalde LJSotTE: Indirect effects of COVID-19 on the environment. 2020, 728:138813.
[25] Bazrafshan EJZJoRiMS: Survey of quantity and quality of hospital wastes in Sistan and Balouchestan Province, 1387-1388. 2010, 12(1.(
[26] Yousefi Z, Najafi AJTBSRJ: Survey of collection and disposal of medical wastes in teaching hospitals of Sari, Mazandaran, in 2013. 2016, 1(3):1-7.
[27] Fei F, Qu L, Wen Z, Xue Y, Zhang HJR, conservation, recycling: How to integrate the informal recycling system into municipal solid waste management in developing countries: Based on a China's case in Suzhou urban area. 2016, 110:74-86.
[28] GoU. D-DfEFRA: Guidance on prioritizing waste collection services during coronavirus (COVID-19)pandemic.;https://www.gov.uk/government/publications/coronavirus-covid-19-advice-to-local-authorities-on-prioritising-waste-collections/guidance-on-prioritisingwaste-collection-services-during-coronavirus-covid-19-pandemic 2020.
[29] Penteado CSG, de Castro MASJR, Conservation, Recycling: Covid-19 effects on municipal solid waste management: What can effectively be

done in the Brazilian scenario? 2021, 164:105152.
[30] Cheng C, Thompson RGJIJoDRR: Application of boolean logic and gis for determining suitable locations for temporary disaster waste management sites. 2016, 20:78-92.
[31] DEFRA-Department for Environment Food & Rural Affairs GoU, 2020a.: Guidance on prioritizing waste collection services during coronavirus (COVID-19)pandemic., https://www.gov.uk/government/publications/coronavirus-covid-19-advice-
to-local-authorities-on-prioritising-waste-collections/guidance-on-prioritisingwaste-
collection-services-during-coronavirus-covid-19-pandemic
[32] Kulkarni BN, Anantharama VJSotTE: Repercussions of COVID-19 pandemic on municipal solid waste management: Challenges and opportunities. 2020, 743:140693.