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MEDICAL WASTE MANAGEMENT AND MANAGEMENT OF WASTE DURING THE COVID-19 PANDEMIC

Gamze MERCAN[1]
Ebru AĞAÇKESEN[2]
İrem BÜYÜKER[3]
Eray BAYAR[4]

ABSTRACT

As a result of industrialization, environmental concerns are escalating in today's globe, posing a grave threat to the lives and living conditions of all living beings. Rapid population increase, careless use of our resources, and rising consumer demands all contribute to the problem of waste. These wastes represent a grave danger to both human and environmental health. The most significant hazard in this respect is health institution-generated medical waste. To fulfill their objectives of lowering health issues and removing possible dangers to human health, it was unavoidable that health services would create hazardous waste. Compared to other pollutants, the wastes generated by health facilities provide a greater risk of harm and illness. All sorts of garbage should be collected, stored, transported, and disposed of or recovered using safe and dependable means. Inadequate and incorrect management of medical waste can have detrimental implications on human health and the environment. Instead of Medical Waste Management, the notion of Safe Medical Waste Management has become crucial, especially in terms of human and environmental health. The Covid-19 pandemic, which began near the close of 2019 and is currently raging with ferocity, has demonstrated once more why the regulated and secure treatment of medical waste is more than a requirement in our global community. As a result, it has become imperative to evaluate and revise all legislation pertaining to this topic after the required provisions have been completed. Short- and long-term implementation of efficient medical waste management programs requires multisectoral cooperation and engagement at all levels. Global policies should be controlled, but local management methods should be adopted. Medical waste management should focus primarily on supporting national policies within the legal framework, training people, and educating citizens.

Keywords: Medical Waste, Medical Waste Management, COVID-19

[1] Hacettepe Üniversitesi, Nanoteknoloji Nanotıp ABD, ORCID: 0000-0001-5515-999X, gmercn@gmail.com
[2] Ankara Büyükşehir Bel., Atık Koord. Şube Müd., ORCID: 0000-0003-3405-8465, ebruaksn82@gmail.com
[3] Ankara Büyükşehir Bel., Atık Koord. Şube Müd., ORCID: 0000-0002-8495-2521, irm.buyuker@gmail.com
[4] Ankara Büyükşehir Bel., Atık Koord. Şube Müd., ORCID: 0000-0003-0541-7246, eraybayr@icloud.com
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TIBBİ ATIK YÖNETİMİ VE COVID-19 PANDEMİ DÖNEMİNDE ATIK YÖNETİMİ

ÖZET

Günümüz dünyanında sanayileşmenin de etkisiyle çevre sorunları her geçen gün artmakta, buna bağlı olarak da canlıların hayatını ve yaşam ortamlarını ciddi olarak tehdit etmektedir. Hızlı nüfus artışı, kaynaklarımızın bilinçsizce kullanılması ve tüketim ihtiyaçlarının artması atık sorununu gündeme getirmektedir. Oluşan bu atıklar insan ve çevre sağlığı açısından ciddi tehdit oluşturmaktadır. Bu konudaki en önemli tehdit unsuru ise saglik kuruluşlarından kaynaklı tibbi atıklardır. Sağlık hizmetlerinin, sağlık problemlerini azaltma ve insan sagligina yönelik potansiyel riskler ortadan kaldırma amaçlarını gerçekleştirmek için tehlikeli atıklar ortaya çıkarması kaçınılmazdu. Sağlık kuruluşlarının faaliyetleri esnasında uretilen atıklar diger atıklara gore daha fazla yaralanma mki ve daha yüksek enfeksiyon riskı taşırlar Tum atık türlerinin toplanması, depolanması, taşınması ve bertarafi ya da geri kazanılması için güvenli ve güvenilir yöntemler kullanılmalıdır. Tıbbi atıkların yetersiz ve uygunsuz muamelesi, ciddi halk sağlığı sonuçları yaratabilir ve çevre üzerine olumsuz etkiler yapabilir. Bu yüzden Tıbbi Atık Yönetimi yerine Güvenli Tibbi Atık Yönetimi kavramı özellikle insan ve çevre sağlığı açısından çok önemli bir hale gelmiştir. 2019 yılının sonlarına doğru başlayan ve hala yoğun bir şekilde devam eden Covid-19 salgını bir kez daha göstermiştir ki tıbbi atıkların kontrollü ve güvenli bir şekilde yönetilmesi dünyamız için bir zorunluluk olmaktan daha fazlasıdır. Bu yüzden bu konu ile ilgili tüm mevzuatların gözden geçirilmesi, gerekli düzenlemeler yapıldıktan sonra güncellenmesi artık kaçınılmaz olmuştur. Kısa ve uzun vadede etkili tibbi atık yönetim programlarını uygulayabilmek için multisektörel işbirliği ve her düzeyde etkileşim gereklidir. Politikalar global olarak düzenlenmeli ve yönetim uygulamaları yerel olarak yerine getirilmelidir. Ulusal politikaların yasal çerçevede desteklenmesi, personelin eğitimi ve vatandaşın duyarlılığının artırılması tibbi atık yönetiminin temel unsurları olmalıdır.

Anahtar Kelimeler: Tıbbi Atık, Tıbbi Atık Yönetimi, COVID-19

INTRODUCTION

In the literature, there is no widely accepted definition of waste (Osmani, 2011). In the literature, numerous definitions of waste have been proposed. The Environmental Protection Act of 1995 defines waste as “any substance or object that the owner has disposed of or intends to dispose of.” Examples include food, textiles, wood, and chemical products, among others. Among the industrial activities that generate waste, hotels and restaurants, entertainment, culture, and sports activities are also mentioned (Williams, 1998).

Wastes are materials that are not the primary product (i.e., products produced for the market) that the first user no longer requires for their own production, conversion, or consumption. Population growth and urbanization have contributed to a steady rise in waste production. Manufacturing processes, industries, and municipal solid waste are examples of waste materials (Kan, 2009).

Waste is any substance (solid, liquid, or gas) that has no direct use and is discarded permanently. A waste is considered hazardous if it possesses any of the following characteristics: flammability, reactivity, explosiveness, radioactivity, infectiousness, or irritancy (La Grega et al., 2001). Waste: discarded for any use that is discarded, rejected, undesirable, surplus, or abandoned, or for purification by a process separate from that which produces the substance, or for sale regardless of its worth. It is defined as discarded, unwanted, surplus, or abandoned material. "Waste" is defined as something that is no longer desired, has degraded or been irreparably damaged, and is therefore discarded because it is no longer useful or required (Spellman, 2022).

1. GENERAL INFORMATION

1.1. Definition of Medical Waste

According to the Regulation on Control of Medical Wastes, this includes infectious wastes, pathological wastes, and wastes containing sharp objects. It would be incorrect to only consider medical waste from health institutions. Medical wastes are wastes that can be produced by all medical procedures. In addition, when medical waste is combined with household waste, the resulting waste must be classified as medical waste.

Healthcare organizations play significant roles in a variety of activities, utilizing modern technology to improve and maintain community health via their various departments and companies. Hospitals, clinics, medical centers, private practices, home health services, blood banks, veterinary offices, clinical facilities, research clinical laboratories, and all unlicensed and licensed medical facilities constitute medical establishments (Labib et al., 2005).

Medical waste is defined as any waste generated by health-related services or facilities. Depending on the institution or department where they are generated, the types of waste classified as medical waste vary. For instance, the majority of blood bank waste consists of disposable needles and syringes, whereas the majority of a research laboratory's waste consists of animal carcasses and organs (Doucet, 1991).

The health services industry is one of the sectors that has experienced significant growth. According to a report by the World Health Organization (Prüss et al., 2013), medical waste is also referred to as clinical waste. Legally, health wastes are defined as clinical waste, and this classification has not changed.

However, healthcare waste in the clinical waste stream must be classified according to its hazardous properties and origin. In practice, clinical waste management regulations are based on the classification of waste into hazardous groups (Cheng et al., 2010). Waste generated by healthcare organizations, research facilities, and laboratories is considered healthcare waste.

This problem is treated seriously on a global scale, and suitable waste management methods are designed and implemented. As a result, the pollution concerns related with garbage management and trash creation have garnered considerable attention, and several research have been undertaken on these topics (Babanyara 2013). To avoid the spread of viruses and safeguard environmental health, infectious trash must be treated with care and kept apart from normal garbage.

According to the Medical Waste Control Regulation, this includes infectious wastes, pathological wastes, and wastes containing sharps. It would be incorrect to regard medical wastes simply as trash from hospitals. Medical wastes are wastes that can be produced by all medical procedures. Similarly, when medical waste is combined with household waste, the resulting wastes should be classified as medical waste.

Hospitals generate vast quantities of waste, including organic and inorganic materials, infectious materials, disposable used equipment, packaging, etc. Infectious waste should not expose patients, staff, visitors, waste-handlers, or the environment to disease.

Wastes from the treatment of patients with infectious diseases can spread disease through direct contact with the environment or indirect contact with the environment (Cheng et al., 2010). This problem is treated seriously on a global scale, and suitable waste management methods are designed and implemented. To prevent the spread of pathogens and protect environmental health, infectious waste materials must be handled with care. The amount of medical waste produced by hospitals can vary based on a variety of factors, including hospital size and tour, hospital occupancy rate, the number of inpatients and outpatients, and geographic location.

Health-related waste can be broadly classified as general waste and hazardous waste (Pichtel 2010). The proportion of hazardous and nonhazardous components of healthcare waste is predicted to range from 675 to 90 percent (Sharma et al., 2013) In addition, 85 percent of garbage created in hospitals and clinics (Kumar et al., 2011). On the other hand, according to (Komilis et al., 2012), 80% of the total waste created by health-related activities is general trash, while the other 20% is deemed hazardous since it is typically infectious, poisonous, or radioactive.

The earliest legislative rule on the issue is the Medical Waste Control Regulation, which was published in the Official Gazette on 22 July 2005 with the number 25883 and was last updated in 2017. This law classifies medical wastes as infectious wastes, pathological wastes, and penetrating wastes.

According to the Regulation on the Control of Medical Wastes, contaminated wastes include all types of bodily fluids, human tissue, organs, anatomical parts, autopsy components, placenta, and other pathological materials, including suspected or presumed infected blood and blood products. In addition to these, medical waste includes the outputs of patients who have been placed in hemodialysis and quarantine, the bacteria filters used in the devices, laboratory culture and culture stocks, animal remains, materials that have come into contact with animals infected with infectious diseases, and the wastes from these services.

In addition, medical waste includes tissue and tissue fragments, organs and their components, which come from surgical intervention, autopsy, and anatomy research and are classified as pathological waste. In addition, injectors, needles, and needle-like materials, as well as materials used in cutting, piercing, and piercing operations, such as lancets, blade scalpels, glass, and ampoule bottles, were deemed medical waste (TAKY, 2017: 10).

1.2. Categorization of Waste

According to their physical properties, chemical properties, and production conditions, wastes can be classified. The classification of chemical wastes is prominent among these.

According to their physical qualities, chemical properties, and manufacturing conditions, wastes can be categorised. The categorization of chemical wastes is prominent among these. Consumers, producers, utilities, and businesses create several waste kinds with vastly distinct chemical and physical characteristics. To adopt cost-effective waste management solutions that promote public health and the environment, waste must be categorised. For instance, wastes can be classified based on the kind of producer, or the source or industry that creates the waste stream. Municipal waste, hazardous waste, industrial waste, medical waste, construction and demolition waste, radioactive waste, mining waste, and agricultural waste are some major types of waste (Pichtel, 2014).

It is possible to characterize waste in a variety of ways, as waste exists in a variety of forms. Physical conditions, physical properties, reusability, biodegradability potentials, source of production, and degree of environmental impact are frequently used to classify waste (Dixon and Jones, 2005). According to their physical state, he stated, wastes can be divided into three main categories: liquid, solid, and gaseous (White et al., 1995). The most frequent classifications are listed below (Amasuomo & Baird, 2016):

- Solid waste, liquid waste, and gaseous waste are the physical states of waste.
- Domestic waste, industrial waste, agricultural waste, commercial waste, demolition and construction waste, and mining waste are the sources of waste.
- Impact on the environment: hazardous and nonhazardous waste.

How garbage may be treated is determined by its classification as hazardous or nonhazardous. In reality, this classification must be applied to all hazardous wastes. With this, necessary actions to safeguard health and the environment will be adopted.

It is crucial to classify wastes that may be demonstrated to be nonhazardous in this manner. This guarantees that sustainability standards for recycling and resource conservation are satisfied (Sjoblom, 2012).

The relevance of the waste kind or chemical status appears in the categorization of medical waste. Blood and other bodily fluids and tissues are typically used to determine the classification of medical waste. Regardless of how medical wastes are classified, it would be more acceptable to prioritize their effects on human health and nature when classifying them. According to legal restrictions, wastes are categorized according to their consequences.

Wastes may be divided into three categories based on their impacts, structures, and formation sources:

- All wastes found on earth are discharged into nature and categorized as hazardous or nonhazardous based on their effects on the environment and human health. aspect
- The structures of liquid, solid, and gaseous wastes are used to classify them.
- Domestic wastes, industrial wastes, commercial institution wastes, agricultural wastes, and special wastes can be categorized in accordance with their composition.

The majority of medical waste originates from health facilities. As a result of hospital operations, several waste types are produced. Regarding the impact of wastes generated by health facilities, medical wastes play a crucial role. Blood and blood derivatives are commonly found in contaminated medical waste. Therefore, such wastes hold a significant possibility of being infectious or disease-carrying. In addition, it is known that such wastes contain bacteria, viruses, parasites, and fungus, and that contact with them can result in severe health issues and even death (TAKY, 2017:10).

1.3. Medical Waste Management: Principles to be Applied

The Regulation on Control of Medical Wastes establishes the guiding principles for the management of medical waste. According to this;

- It is prohibited to dispose of medical wastes directly or indirectly in a manner that is harmful to the environment and human health.
- It is crucial that medical wastes are not combined with other types of trash, such as hazardous, nonhazardous, municipal, or packaging wastes.
- It is vital to collect, temporarily store, transport, and dispose of medical wastes separately from other wastes at the point of generation.
- Those responsible for the collection, transportation, temporary storage, and disposal of medical wastes are jointly and severally accountable for damages resulting from environmental contamination and degradation caused by medical wastes. For losses incurred as a result of these actions, liability for compensation is reserved in accordance with applicable law. Expenditures made or to be made by public institutions and organizations due to the failure of the persons responsible for the management of medical wastes to take the necessary measures to stop, eliminate, and reduce environmental damage, or to take these measures directly by the competent authorities, are subject to the provisions of Law No. 6183 on the Collection of Public Claims,

enacted on July 21, 1953. obtained from the waste management authorities.

- Persons, institutions, and organizations responsible for the management of medical wastes are required to take the appropriate steps to mitigate the negative impacts of these wastes on the environment and human health.
- Health institutions must cover the costs associated with the collection, transportation, sterilization, and disposal of their wastes.
- The local environmental committee determines the cost of medical waste collection, transportation, sterilization, and disposal.
- It is essential that the health institutions and municipalities responsible for the collection, transportation, and disposal of these wastes, or the companies to which the municipalities have delegated their authority, train and conduct periodic health checks on the relevant personnel performing the medical waste management activities, and that these personnel perform the activities within the scope of medical waste management.
- Environmental permits are required for all medical waste treatment plants.
- Medical waste transportation vehicles are required to get a waste transportation license, carry medical wastes to processing facilities using licensed vehicles, and employ UATF throughout transit. In health facilities that produce up to 1 kilogram of medical waste per day, UATF is not necessary during the transfer of medical waste; nonetheless, a medical waste receipt document/receipt must be used when receiving medical waste from these institutions.
- Pathological waste is disposed of by combustion. However, human parts and organs, such as blood bags and blood replacements, that have not been chemically treated can be processed in the sterilizing facility. Only pathological wastes that are identifiable, such as limbs, legs, and fetuses, and do not pose an infection risk may be buried. The pathological wastes requested for burial are handed to the asking patient or patient's relative together with a paperwork produced by the health facility. In carrying out the burial procedure, the regulations of the Regulation on the Construction of Cemetery Places and Funeral Transport and Burial Procedures, issued in the Official Gazette on January 19, 2010 under number 27467, should be applied.

Medical waste cannot be sent to intermediate storage facilities. According to the Medical Waste Control Regulation, health institutions are prohibited from establishing and operating their own waste treatment facilities.

In this regulation, the responsibilities and authority of the Ministry of Environment and Urbanization and Provincial Directorates of Environment and Urbanization, as well as the duties of Municipalities and Health Institutions, are spelled out in detail (TAKY, 2017:10).

1.4. The Role of the Ministry of Environment and Urbanization and Provincial Environmental Directorates in the Management of Medical Waste

The responsibilities and authorities of the Ministry of Environment and Urbanization are as follows:

- To determine the programs and policies for the environmentally compatible management of medical wastes, to ensure cooperation and coordination for the implementation of this Regulation, and to take the necessary administrative measures,
- To control and conduct periodic inspections of all activities pertaining to the management of medical wastes from their formation to their disposal; and c. To ensure compliance with the provisions of this Regulation.
- Providing medical waste treatment facilities with environmental permits.

The Provincial Directorates of Environment and Urbanization have the following responsibilities and authorities:

- To control and periodically audit all activities covering the management of medical wastes from their formation to their disposal, to impose sanctions in case of violation of the relevant legislation,
- Issuing transportation licenses to persons, institutions, or organizations that will transport medical waste, and their vehicles, inspecting their activities and vehicles,
- Issuing transportation licenses to persons, institutions, or organizations that will transport medical waste, and their vehicles,
- Examining, evaluating, and implementing the medical waste management plans submitted by municipalities; i. Monitoring and inspecting the activities of medical waste processing facilities with environmental licenses, imposing sanctions in case of violation of the relevant legislation,
- Obtaining, evaluating, and reporting to the Ministry information on the amount of medical waste generated, collected, and disposed of within the province's borders,
- Organizing or directing the implementation of a medical waste management awareness campaign.
- Evaluating the municipality's request to ship medical wastes created in the province to a medical waste processing facility outside the province, or to accept medical wastes generated outside the province for processing in the province (TAKY, 2017:10).

1.5. Obligations of Municipalities Regarding Medical Waste Management

- To design the medical waste management plan, submit it to the provincial directorate, execute it, and tell the public,
- Removing the medical wastes from the medical waste temporary storages and sending them to the medical waste processing facility,
- Ensuring that pathological wastes treated with any chemical are disposed of in accordance with the way outlined in Article 20,

- To ensure/have the sterilization and/or disposal of medical waste, to establish/establish, operate/operate a medical waste processing facility for this purpose, to. Obtaining/obtaining an environmental license for medical waste processing facilities,
- Obtaining/obtaining a transport license for the transport of medical wastes,
- Informing the provincial directorate in cases of stopping, maintenance, malfunctions and similar situations lasting more than one week in the waste processing facility.
- To offer periodic training to staff accountable for the management of medical wastes,
- To supply and utilize specialized attire and protective gear for individuals responsible for the handling of medical wastes,
- To immunize staff responsible for the management of medical wastes, to undertake a health check at most every six months, and to take additional preventive measures,
- To record the quantity of medical waste collected, transported, sterilized, and discarded from the health institution.
- Registering the medical waste processing facility to online programs, preparing mass-balance information containing information on the wastes accepted, processed, and created as a balance in the facility, and wastes generated as a result of the medical waste processing activity, and notifying using the online program.

These duties are equally and severally owed by municipalities and the individuals and entities to whom they have delegated responsibility.

Medical wastes generated in the province's central and all district municipalities are sent to the province's medical waste processing plant. Medical wastes may be sent to a medical waste treatment plant in a different province. In this instance, the necessary municipality should be founded following the consent of the provincial directorate of the province in which the medical waste processing plant is located, assuming that the local environmental committees of both provinces reach a favorable conclusion.

In provinces devoid of medical waste processing facilities, municipalities are obligated to identify suitable medical waste processing facilities. In this instance, a contract must be signed with the appropriate municipality, pending permission from the provincial directorate of the province where the medical waste processing plant is located and a favorable vote by the local environmental boards of both provinces (TAKY, 2017:10).

1.6. Obligations of Medical Facilities Regarding Medical Waste Management

- Establishing a system that reduces waste at the source,
- Appropriate collection, transportation, and disposal of medical waste,
- To establish a protocol with the city,
- Prepare and implement the medical waste management plan, which includes the separate collection of medical wastes, their transportation and temporary storage within the health institution, and the emergency response procedures.

- To collect medical, hazardous, nonhazardous, packaging, municipal, and other wastes separately, without mixing them, at the source.
- Separate collection of pathological wastes treated with any chemical from other medical wastes,
- When collecting medical waste, use bags and containers whose technical specifications are specified in this regulation,
- To deliver the medical waste by issuing UATF if it generates more than 1 kilogram of waste per day, and by using the medical waste receipt if it generates less than 1 kilogram of waste per day.
- Transport the same collected medical waste to the medical waste temporary storage container using the lidded container, container, and bucket designated for this specific task.

- Establishing a temporary medical waste storage facility if the facility generates more than 50 kilograms of medical waste per day, and maintaining a temporary medical waste container if the facility generates up to 50 kilograms of medical waste per day. If it generates up to 1 kilogram of medical waste per day, transport it to the closest or most suitable temporary storage container for medical waste, or give it to the vehicle that collects medical waste.
- Periodically training/providing training for the personnel responsible for medical waste management,
- To immunize the personnel responsible for the management of medical waste, to undergo a health check every six months at most, and to take other precautionary measures.
- To provide and utilize special protective clothing and equipment for the personnel responsible for managing medical wastes,
- To cover the costs associated with the collection, transportation, sterilization, and disposal of medical wastes.
- To record the amount of medical waste created on a regular basis.
- Completing the waste declaration form, which includes information from the previous year, using the online apps developed by the Ministry between January and March, approving it, and retaining a copy of the form output for five years.
- Health facilities belonging to military units and institutions are excluded from the

requirement to complete the waste declaration form using Ministry-developed online apps. The Ministry of National Defense and the General Staff report in writing to the Ministry of Environment and Urbanization, beginning in January and ending by the end of March each year, the quantity of medical waste created by military health institutions (TAKY, 2017:10).

1.7. Health Dangers of Medical Wastes and Countermeasures Against These Dangers

Exposures that can occur during the collection, transportation, and temporary storage of medical wastes can result in infections and injuries. Due to the fact that medical waste:

- Contains bacteria that cause illness,
- May induce DNA mutations,
- May contain poisonous or harmful substances or medications,
- May contain radioactivity can be hacked

Everyone who is exposed to medical waste is at danger. Both the workers within and outside of health facilities that generate medical waste, as well as other individuals who are exposed to these wastes as a result of negligent medical waste management, are at risk. Principally at danger are healthcare professionals and other hospital/health institution personnel, patients and their family members receiving treatment/care in healthcare facilities or at home, patient visitors, and employees at waste sterilization/disposal facilities.

According to research, 80% of hospital wastes are safe, 15% are infectious, 1% are cutting and piercing materials, and the other 20% are radioactive and pharmaceutical wastes, particularly chemical wastes (WHO 2000):

- The World Health Organization has provided the following collection, transportation, and storage instructions for medical waste.
- The procedure of waste collection should begin in the patient room and services.
- Medical trash should not be combined with household rubbish.
- The wastes from patient rooms in healthcare facilities and other workplaces should be carried using waste transport carts suited to their intended purpose.
- He highlighted that the transport vehicles must be thoroughly cleaned and sanitized. During the collection and delivery of hospital trash, medical wastes constitute a threat to public health. Consequently, the transportation of hazardous wastes requires specific consideration.
- Inside the hospital, materials with a low danger ratio should be utilized wherever possible. The most crucial aspect of hospital administration is to distinguish between harmful and non-threatening behaviors. For this reason, innocuous wastes should be

analyzed and proper storage locations for non-recyclable chemical wastes should be provided.

- The creation of secure sites for radioactive materials and the separation of chemical waste from wastewater treatment facilities are required. Such garbage should be transported to organizations with experienced people without any intervention. In the event of a low amount of garbage, remote locations should be considered. 8.As a result of the bad circumstances, health institutions that generate hazardous waste should be wary in advance of where to seek assistance.
- The establishment of hospitals should include waste management planning for all health facilities.
- Due to the fact that the quantity of trash generated by hospitals might fluctuate based on the number of patients, appropriate preparations must be taken.
- Aqueducts should be separated, trash collecting instruments and equipment should conform with the law, and temporary waste storages should be located as close as feasible to garbage collection centers.
- The procedures of trash disposal should be arranged in advance. Because, despite the fact that the technique of disposal by their own means is economical, particularly for hospitals with a big patient capacity, this may be expensive for some organizations. It would be helpful for these health facilities to share a disposal area.

In accordance with the World Health Organization's guidelines, there is an urgent need for waste-related actions that minimize all concerns. In addition, the tools and materials utilized for garbage collection, transportation, and storage must be adequate for waste management (Ertaş 2019:16).

2. MEDICAL WASTE MANAGEMENT

Waste management includes waste collection, control, accumulation, removal and waste treatment procedures. In other words, it covers the processes after the separation, collection, temporary storage, recovery or destruction of the wastes at the source and destruction. The aim here is to ensure that the resources available on earth are used at the highest level and the waste parts are minimized after their use. Another aim is to prevent contamination, mixing and leaks that may arise during the reuse of wastes from harming the environment and to ensure their disposal.

The best medical waste management practice is to prevent and minimize waste generation (Hossain et al. 2013). Waste management should be organized from the point of production to the point of final waste disposal.

A good waste management system aims to keep the impact on economy, people and the environment at a minimum during the disposal of all wastes. The shortest way to achieve this is to reduce the amount of waste to the minimum level possible. A good waste management system also requires appropriate technology and method as well as an appropriate management program. At the stage of fulfilling this, it is necessary to act in accordance with the legislation in force. The efficiency of waste management systems is evaluated in terms of recovery and finance. It can be said that the more the amount of medical waste can be reduced for a health institution, the higher the gain.

Considering all waste groups, it is seen that medical wastes carry more risk factors in terms of human health. There has been an increase in the amount of medical waste over the years. The fact that medical wastes are risky for human health also increases the management cost significantly. A good waste management system can be established to reduce the economic burden of medical waste.

It is very important to make a good planning for the success of medical waste management. In this planning, a managerial perspective is needed as well as the amount of medical waste. Concerning the management of medical wastes, the Environment and Development Conference was organized within the United Nations, and various decisions were taken on the prevention or reduction of wastes within the scope of the conference. At the beginning of these decisions is the reduction or prevention of Medical Wastes at their source. However, if possible, recycling of wastes has been stated as another opinion, and other recommended issues are; creating a safe environment in the processing of wastes and safe disposal of wastes (Ertaş, 2019:16).

There are some additional steps that must be taken by medical waste producers in order to carry out the process from the formation of medical waste to its disposal in a healthy way. These steps can be gathered under 10 sub-titles: preparing a medical waste management plan, completing the training of the relevant personnel, the process from the formation of medical wastes in the protective light of the personnel to their disposal, and the work to be done in this process. All this information can be listed as providing equipment, fulfilling financial obligations and recording the work and transactions:

- Separation and collection of medical waste,
- Transport of medical wastes within the health institution,
- Temporary storage of medical wastes in the health institution,
- Transport of medical wastes to processing facilities,
- Reception and temporary storage of medical wastes in waste treatment facilities,
- Sterilization disposal of medical waste,
- Preparation of a medical waste management plan,
- Education,

- Provision of protective equipment,
- Financial obligations and registration.

2.1. Separation and Collection of Medical Waste

This issue is covered in detail in the Medical Waste Control Regulation. Although there are differences in practice in the field, the correct sorting and collection of medical wastes at the source in our country has been significantly improved compared to about a decade ago. It is still possible to come across inaccurate distinctions in the source, since people other than patients and their relatives and healthcare professionals are not fully educated on this subject.

In medical waste management, it is very important to separate wastes and define their types. Therefore, it is important to have an efficient segregation system as well as designated storage space in the healthcare facility. The most appropriate way to determine medical waste categories is to separate the wastes according to the color code within the recommendations and guidelines of the World Health Organization (Dohare, Garg & Sarkar 2013). It presents some recommended color coding techniques and container types to be used for the sorting and storage of various elements of medical waste.

WHO recommends that medical waste be sorted into suitable containers/bags at the point of production. To encourage separation at source, reusable containers or lined baskets of the right size and thickness should be placed as close to the point of manufacture as possible (Bala, Narwal 2013a). They should be appropriately color-coded (yellow or red for infectious waste) and clearly marked with the international symbol for infectious waste. When 3/4 full, the bags should be closed with string and placed in larger containers (Mathur 2014):

- Clinical waste bags are labeled with a code that identifies the area where the waste is generated.
- Clinical waste bags are correctly closed when maximum 2/3 full,
- Containers with breakers are correctly closed when no more than 2/3 full,
- Containers with cutters are labeled with a code to identify the area where the waste is generated.

According to the Regulation on Control of Medical Wastes;

Medical wastes are collected separately by the relevant health personnel, especially doctors, nurses, midwives, veterinarians, dentists, laboratory technical staff, without mixing with other wastes at the source during their formation. Collection equipment is kept in accordance with the nature of the waste and at the closest point to the source of the waste. Medical wastes can never be mixed with municipal wastes, packaging wastes, hazardous wastes and other similar wastes.

In the collection of medical wastes; “International Biohazard” in black color on both sides, with a double layer thickness of 100 microns, a lifting capacity of at least 10 kilograms, produced from medium density polyethylene raw material, resistant to tearing, puncture, explosion and transportation, leakproof, double bottom seam and without bellows. red plastic bags with the emblem and the phrase “CAUTION! MEDICAL WASTE” are used. The bags are filled at a maximum of 4, their mouths are tightly tied, and when necessary, each bag is placed in another bag with the same characteristics to ensure absolute sealing. These bags cannot be recovered or reused in any way. The contents of the medical waste bags cannot be compressed in any way, removed from the medical waste bags, emptied and transferred to another container.

Apart from other medical wastes, pathological wastes are puncture, break and explosion proof, waterproof and leakproof, black with “International Biohazard” emblem in black CAUTION! It is collected in red colored plastic collection containers bearing the phrase “PATHOLIC MEDICAL WASTE”. These collection containers cannot be opened, emptied or recovered after being filled. Body parts and organs, including blood bags and blood spares that have not been treated with any chemicals, can be collected in the medical waste bags specified in the second paragraph. .

Wastes with sharp and penetrating properties, apart from other medical wastes, are resistant to puncture, tear, breakage and explosion, waterproof and leakproof, impossible to open and mix, with the “International Biohazard” emblem in black on it and “ATTENTION! WASTE” is collected in boxes or containers made of plastic or laminated cardboard with the same characteristics. These collection containers are filled at the maximum rate, their mouths are closed and put into medical waste bags. After the sharp-piercing waste containers are filled, they cannot be compressed, opened, emptied or recovered. Liquid medical wastes are also condensed with suitable absorbent materials and placed in medical waste bags.

Wastes with sharp and penetrating properties, apart from other medical wastes, are resistant to puncture, tear, breakage and explosion, waterproof and leakproof, impossible to open and mix, with the “International Biohazard” emblem in black on it and “ATTENTION! WASTE” is collected in boxes or containers made of plastic or laminated cardboard with the same characteristics. These collection containers are filled at the maximum rate, their mouths are closed and put into medical waste bags. After the sharp-piercing waste containers are filled, they cannot be compressed, opened, emptied or recovered. Liquid medical wastes are also condensed with suitable absorbent materials and placed in medical waste bags.

Medical waste bags are kept in a medical waste container or bucket during storage. The medical waste container or bucket must be made of puncture, tear, breakage and explosion-proof, waterproof and leakproof, orange colored plastic material bearing the black “International Biohazard” emblem and the black “CAUTION! MEDICAL WASTE” phrase. It is ensured that feed bags and containers are kept ready for use at the source of the waste or in the nearest area.

Although all these articles are included in the regulation, it is possible to encounter problems arising from both personal and physical environment in practice. The important thing is to minimize the problems with an effective medical waste management process.

2.2. Transport of Medical Wastes within the Health Institution

Medical waste bags are made of stainless metal, plastic or similar material by personnel trained for this job in the health institution, do not have sharp edges that may cause damage or puncture of the bags during loading and unloading, are easy to load, unload, clean and disinfect, and are reserved for this purpose only. It is collected and transported with a lidded container/container/bucket. The container/container/bucket used for the transportation of medical wastes within the health institution is orange in color, there is a black "International Biohazard" emblem and a black "ATTENTION! MEDICAL WASTE" phrase on them.

Medical waste contained in a red biohazard bag must be labeled with the word "Biohazardous Waste or the international biohazard symbol and the word "Biohazard" (Bala, Narwal 2013: 6):

- Red biohazard bags are tied to prevent contents from leaking or being ejected during future storage, handling or shipping.
- Red biohazard bags must be placed in a rigid secondary container for storage, handling or shipping. Rigid secondary containers must be sealed, have tight-fitting lids, and be kept clean and in good condition. Containers can be of any color and can be labeled with the word "Biohazardous Waste or the international biohazard symbol and the word "Biohazard" on the lid and side, visible from any side.
- Medical waste bags are tightly tied and transported with a lidded container, container and bucket without being compressed. Waste bags and pathological waste collection containers can never be carried by hand. During the collection and transportation process, contact with the body is avoided. During the transportation process, waste chimneys and walking lanes cannot be used. Pathological waste collection containers are transported by wheeled medical waste transport vehicles.
- Medical wastes and other wastes cannot be loaded and transported on the same vehicle.
- Medical waste container container buckets are cleaned and disinfected regularly every day. In case of any bag tearing, bursting or spilling, the waste is safely emptied into a new bag and the container, bucket and bucket are disinfected immediately. Personnel assigned to collect medical wastes within the health institution and transport them to the temporary medical waste storage are required to wear the orange colored special clothing specified in the Regulation on Control of Medical Wastes and use protective equipment during transportation.
- In the medical waste collection program to be implemented within the health institution,

the route to be followed by the waste transportation vehicles/waste carrying personnel is determined as far as possible from the places where patients are treated and other clean areas, and areas where human and patient traffic is intense (TAKY, 2017:10).

2.3. Temporary Storage of Medical Wastes in a Healthcare Institution

Medical wastes can be kept in the medical waste temporary storage or container for no more than 48 hours before being transported to the medical waste processing facility. The waiting period can be extended up to one week, provided that the temperature in the medical waste temporary storage is +4 °C and the capacity is suitable.

To prevent both accumulation and decomposition of waste, it must be collected daily and regularly in the area where the larger containers are kept before being transported to the central landfill (Almuneef, Memish 2003). This transport is usually accomplished using a wheelie bin or trolley. Wheeled bins or carts should be easy to load and unload, have no sharp edges that could damage waste bags or containers, and be easy to clean. Ideally, they should be marked with the corresponding coding color (Bala, Narwal 2013b).

The central storage area should be sized according to the volume of waste generated as well as the frequency of collection. The facility should not be located near food stores or food preparation areas. Access should always be limited to authorized personnel, and should also be easy to clean, have good lighting and ventilation, and be designed to prevent the entry of rodents, insects or birds. Especially in countries with hot and humid climates, the storage period should not exceed 24-48 hours (Pichtel 2010c).

In health institutions that produce up to 1 kilogram of medical waste per day, medical wastes can be kept in the lidded container and bucket for no more than 48 hours. These wastes are collected by the relevant municipality's medical waste collection and transportation vehicle, or they are taken to the nearest or most suitable medical waste temporary storage or container by the waste producer with a lidded container, container and bucket. Medical wastes cannot be left outside before the medical waste collection vehicle arrives, cannot be mixed with other wastes and cannot be placed in containers where municipal wastes are collected. In the event that these health institutions do not deliver their medical wastes to the transport vehicle, they are obliged to make an agreement with the medical waste temporary storage or the health institution to which the container belongs, and to make a protocol with the municipality by presenting this agreement. For these health institutions, the condition of “the staff on duty to wear special orange clothes and to use protective equipment” is not required.

Health institutions that produce less than 50 kilograms of medical waste per day can establish temporary medical waste storage if they wish.

If the Provincial Directorates of Environment and Urbanization deem it necessary due to environmental risks, health institutions that produce less than 50 kilograms of medical waste per day have to establish a temporary medical waste warehouse (TAKY 2017, 10).

In the regulation, it is stated that in some cases, containers can be used instead of medical waste temporary storage. Although it is clearly stated that the Provincial Directorates of Environment and Urbanization may require temporary medical waste storage when necessary, the pandemic process we are facing today has shown that temporary waste storage should be mandatory for all medical waste producers. Many first-line healthcare facilities that produced less than 50 kilograms of medical waste per day before the pandemic started to produce serious medical waste with the pandemic, and the containers they were currently using were insufficient. Especially Community Health Centers and District Health Directorates had to serve more patients than before during the pandemic (sampling, filiation studies, vaccination, etc.). During the pandemic process, serious environmental risks have occurred in the health facilities mentioned. Similar situations have been observed in many provinces and districts, and it has become inevitable to make medical waste temporary storage mandatory for all waste generating health facilities.

The aforementioned temporary medical waste storage should have the following characteristics according to the Medical Waste Control Regulation.

- The volume of the warehouse will be large enough to accommodate at least two days' worth of waste.
- The volume of the warehouse will be large enough to accommodate at least one week's waste if the temperature is -4 °C and the capacity is appropriate.
- The floor and walls of the warehouse are covered with a durable, impermeable, microorganism and dirt-proof material that is easy to clean and disinfect. There is sufficient lighting in the warehouses.
- Uncooled warehouses have passive ventilation system.
- The door of the warehouse will be orange or painted orange, with a visibly black “International Biohazard” emblem and a black “CAUTION! MEDICAL WASTE” phrase. The door is always clean and painted.
- The warehouse door opens outwards or is bolted.
- The warehouse door is always kept closed and locked except for their use, unauthorized persons are not allowed to enter.
- The warehouse and its door are established in such a way that no animals can enter inside.
- Containers are cleaned and disinfected immediately after discharge of waste or any accident. Cleaning and disinfection is done using appropriate disinfectant.
- Containers are not used for any purpose other than temporary storage of medical waste.

2.4. Transport of Medical Wastes to Processing Facilities

Another important step in the management of medical waste is the transfer of wastes temporarily stored in the health facility to licensed processing facilities. As with every step of the process, this process should be carried out meticulously. For this reason, the points specified in the Medical Waste Control Regulation must be fully complied with. It is imperative that medical wastes are transported safely to the medical waste processing facility without spreading around and leaking water.

Transfer stations are not used for transporting medical waste.

Transport vehicles are cleaned and disinfected after the discharge of medical waste.

Medical waste bags can be loaded directly to the medical waste transport vehicle or loaded into the waste transport vehicle in plastic or metal container bucket containers with lids. In case of transportation in this way, the containers/buckets/containers are cleaned and disinfected after the medical wastes are discharged. In the event that the bags in which medical wastes are placed burst or spread around for any other reason, it is imperative that the environment be cleaned and disinfected immediately.

Vehicles used for the collection and transportation of medical waste are not used for other works or for the transportation of other wastes.

In medical waste temporary storage or containers; It is not tied or torn in a way that adversely affects the environment, human health and transportation. In case it is determined that medical waste has been disposed of with another bag other than the medical waste bags and containers that have burst or spilled, or that the medical wastes have been emptied directly into the containers, the negative will be reported to the medical waste officer and the medical wastes will not be collected and transported under any circumstances until the problem is eliminated.

Medical wastes are filled with UATF and delivered to the licensed transport vehicle. Health institutions that produce up to 1 kilogram of medical waste per day are obliged to deliver their medical waste to the transport vehicle or to the nearest or most suitable temporary medical waste temporary storage container, using the medical waste receipt/receipt.

Health institutions that produce up to 1 kilogram of medical waste per day can use UATF if they wish. In case the medical waste is delivered to the nearest or most suitable medical waste temporary storage container, it is obligatory to fill in the waste generator section of the UATF and deliver it.

It is obligatory that the outer surfaces of the medical waste transport vehicles are orange in color, there must be an appropriately sized and black “International Biohazard” emblem that can be seen on the right, left and rear surfaces, and the black “CAUTION! MEDICAL WASTE” phrase. The principles regarding the transportation of medical wastes are determined by the Ministry of Environment and Urbanization (TAKY, 2017 10).

2.5. Acceptance of Medical Wastes to Waste Processing Facilities and their Temporary Storage

Another important issue to be made after the transport of medical wastes to licensed processing facilities is the acceptance of these wastes to the facility and their temporary storage in accordance with the Medical Waste Control Regulation. This process is a purely technical issue and how the work and transactions will be carried out is determined by the regulations. The most important point to be considered here is the safe storage and processing of these wastes without harming the environment and human health. With a radiation detector, weighed from medical waste producers

Medical waste bags, which are scanned and found to be free of radiation, are brought to the facility by licensed trucks. Medical waste bags/boxes are subjected to radiation test again. The wastes are taken to the cold storage.

2.6. Sterilization / Disposal of Medical Wastes

The last stage of medical waste management is sterilization disposal. How these processes will be carried out is determined by the provisions of the Regulation on Control of Medical Wastes, the Regulation on the Regular Storage of Wastes and the Regulation on the Incineration of Wastes. The sterilization process is done as follows.

Waste management, treatment, recovery of useful materials and changing the properties of waste can be done by making waste less hazardous and increasing environmental protection (Ahmed, Soni & Gupta 2013).

In landfill operations, it is recommended that all infectious waste be treated before disposal, as it may cause loss of containment integrity and dispersal of infectious waste. There are a number of different treatment methods and options for handling medical waste, including incineration. These are steam sterilization (sanitation), microwave sanitation, chemical disinfection, dry heat disinfection and disinfection with the superheated body (Demirbaş, 2011). Medical wastes loaded from cold storage to autoclave containers are first weighed on the scale of the sterilization device. After the weighing process, chemical indicators are placed in the device once a week, and chemical indicators are placed in each cycle. In addition, as per the Regulation, the biological indicator process is carried out once every six months by the staff of the Provincial Directorate of Environment and Urbanization. After these processes, medical wastes are loaded into the sterilization device and the sterilization process begins. The steam required for sterilization is provided by a steam generator that produces steam at temperatures up to 165 °C and uses compressed natural gas as fuel. The pressure is provided by the compressor. During the operation, which lasts approximately one hour, the medical waste is sterilized under high heat and pressure. The success of sterilization is controlled by the color change in biological and chemical indicators. If there is no color change in the indicators, the sterilization process is repeated. Sterilized wastes are crushed by passing through the crusher. Waste that has been sterilized and brought to domestic waste norms is sent to the sanitary landfill. As a result of these processes summarized, medical

waste is sterilized at 4-6 log 10 levels, its weight is reduced by 30-35% and its volume is reduced by 65-70%.

Infectious wastes and penetrating wastes can be sterilized and rendered harmless. Waste rendered harmless is defined in the II. The class can be disposed of in landfills.

Medical waste can be disposed of by incineration. It is obligatory to dispose of pathological wastes treated with any chemical by incineration. In the disposal of medical wastes by incineration, the provisions of the Regulation on Incineration of Wastes published in the Official Gazette dated 06/10/2010 and numbered 27721 are complied with.

2.7. Medical Waste Management Plan

In the medical waste management plan that health institutions should prepare in accordance with the Regulation on Control of Medical Waste; Separate collection and accumulation of medical wastes at the source, equipment and vehicles to be used in the collection and transportation of wastes, waste amounts, collection frequency, collection route, temporary storage systems, cleaning and disinfection of collection equipment, precautions and procedures to be taken in case of accident, personnel responsible for the management of these wastes and It has to include detailed information, especially trainings, and update the plan it has prepared every year.

Prepared medical waste management plans can be integrated into the waste management plan, which includes the management of all wastes.

2.8. Education

Within the framework of the provisions of the Regulation on the Control of Medical Wastes, the rules to be followed and the points to be considered during the collection, transportation, temporary storage, sterilization and disposal of medical wastes, the health risks created by these wastes and the injuries and diseases they may cause. It is obligatory to be subject to the training program that includes the measures to be taken in the event of an accident or injury periodically, and to document that this training has been received with a Certificate of Authorization. In cases where medical waste collection, transportation, sterilization and disposal processes are performed through service procurement, it should be stated in the relevant tender specifications that the personnel to be employed should be documented to have received this training.

The procedures and principles regarding education are determined by the Ministry of Environment and Urbanization.

2.9. Supply of Protective Equipment

In the Regulation on the Control of Medical Wastes, “Persons assigned to the collection, transportation and disposal of medical wastes use gloves, protective glasses, masks, boots and special orange protective clothing during work. Special clothes and equipment used in these processes are kept in the same place. The supply and cleaning of these is provided by the waste

producer, the municipality or the persons and organizations to whom it has delegated its authority. Health institutions are also obliged to provide the protective equipment of the personnel working in this field.

2.10. Financial Obligations and Registration of Medical Waste Producers

According to the provisions of the Regulation on the Control of Medical Wastes, health institutions are obliged to pay the expenses required for the collection, transportation, sterilization and disposal of the wastes they produce to the disposer. Failure to pay the fee does not constitute an obstacle for the disposal of medical waste. In case the medical waste disposal fee is not paid, this fee is collected from health institutions in accordance with the provisions of Law No. 6183.

Again, provided that it complies with the same regulation, the medical waste disposal fee, which will be the basis for collection, transportation, sterilization and disposal expenditures, is determined and announced by the local environmental board of the province where the medical waste is generated, and notified to the Ministry of Environment and Urbanization. In the determination of the medical waste disposal fee, the transportation distance of the waste to the sterilization and/or disposal facility and the sterilization and/or disposal costs are taken into consideration.

During the receipt of medical wastes from health institutions that produce up to 1 kilogram of medical waste per day; A medical waste receipt document/receipt is issued between the health institution and the institution that disposes of the carrier, in order to certify that the medical wastes are given to the carrier, received by the carrier and given to the disposal facility by the carrier. On this document/receipt, the name of the health institution producing the medical waste, the address, the name and contact phone of the responsible person, the date, the code and amount of the medical waste, the name of the carrier institution, the name of the driver, the license plate of the vehicle, the license number and the information about the medical waste processing facility. is found.

Medical waste receipt receipt is prepared in three copies, one copy is in the medical waste producer health institution, the second copy is in the institution carrying out the transport operation, and the third copy remains in the institution that operates the waste processing plant and is signed by the relevant officials. It must be kept for at least three years and shown to the inspectors by all relevant parties during the inspection and inspection. Health institutions request the transportation of their medical wastes and submit them to the licensed company.

It has been carrying out the work and operations in the process until the delivery of the product through the Integrated Environmental Information System established by the Ministry of Environment and Urbanization for the last few years.

According to the Medical Waste Control Regulation, medical waste producers;

- University hospitals and clinics,
- General purpose hospitals and clinics,

- Maternity hospitals and clinics,
- Military hospitals and clinics,
- Community health centers, family health centers, dispensaries and similar primary health care institutions,
- Other health centers, medical centers,
- Centers providing outpatient diagnosis and treatment services,
- Dialysis centers,
- Morgues and autopsy centers,
- Medical and biomedical laboratories,
- Biotechnology laboratories and institutes,
- Microbiology laboratories,
- Medical research centers,
- Blood banks and transfusion centers,
- Emergency and first aid centers,
- Ambulance services,
- Rehabilitation centers,
- Physical therapy centers,
- Other health institutions providing health services (doctor's offices, dental and oral health practices and the like),
- Nursing homes and nursing homes,
- Animal hospitals,
- Organizations that conduct research and experiments on animals,
- Veterinary control and research institutes,
- Veterinary clinics and practices,
- Zoos,
- Acupuncture centers,
- Home treatment and nursing services,
- Beauty, ear piercing and tattoo centers,
- Pharmacies,

- Persons, institutions and organizations that are not included in this list but cause the formation of medical waste as a result of their activities are listed.

3. WASTE MANAGEMENT DURING THE COVID-19 PANDEMIC PERIOD

It has been reported that the coronavirus disease (COVID-19) first started in December 2019 in the city of Wuhan, People's Republic of China (CHC) and can be transmitted from person to person (Yu et al, 2020). Since then, the number of people exposed to the infection has increased rapidly, causing a global emergency.

Controlling the spread of the COVID-19 pandemic and restrictions on business activities, mobility and the manufacturing sector have significantly impacted waste management. Waste management is critical for human development and health outcomes, especially during the COVID-19 pandemic. The invaluable service provided by the waste management industry has helped prevent unusual waste piles that pose health risks and accelerate the spread of COVID-19. (Sarkodie, and Owusu, 2020)

Before the COVID-19 pandemic, the world was facing challenges in the waste management industry, where more than two billion people had their waste collected and more than three billion people had no access to waste disposal. (UN-Habitat 2020) The closure of hotels, restaurants and other food-related services due to the emergence of the COVID-19 pandemic and the quarantine and social distancing measures taken by the states has caused some changes in waste management and quantity. The onset of the COVID-19 pandemic has led to a change in consumer behavior that triggered panic buying of food, toilet paper, face masks, gloves, cleaning products and 70% alcohol-based hand sanitizer. (Sarkodie and Owusu 2020). During this period, shopping for essential protective equipment, products and groceries increased by over 20% in only one Supermarket. This panic buying has increased the disposal of perishables and surplus materials, which ultimately create tons of waste. (Sarkodie and Owusu, 2021)

Due to social distancing measures to contain the spread of COVID-19, the curfew period has reportedly increased plastic use, a situation with policy implications (Klemes et al., 2020). Thus, increased plastic use during quarantine and stay-at-home measures serves as a conduit for contamination between animal and human-borne pathogens that increase the spread of diseases. Also, the COVID-19 pandemic has impacted the recycling market due to social distancing measures such as curfews, affecting livelihoods. Due to the low oil price and demand, the competitiveness of recycled plastics has decreased, thus affecting the price of unprocessed plastics (Sarkodie, and Owusu, 2021).

There are problems and difficulties in the sustainable management of medical wastes, especially in emergencies such as the COVID-19 pandemic. Due to the global pandemic, modification of existing waste facilities to control the unusual medical waste and its associated viral spread impact requires adequate knowledge of the amount of medical waste generated and

the existing treatment facilities. Technical knowledge of separation, transportation, storage and sustainable waste management technologies is required to maximize the existing infrastructures to adapt to emergency situations such as pandemics, where there may be a potential rapid expansion in the amount of medical waste (Sharma et al. 2020). Mismanagement of medical waste exposes patients, healthcare professionals and external stakeholders in the waste management process to injuries, infections, toxic consequences and air pollution (Mihai, 2020).

Different forms of medical waste and its derivatives include non-hazardous waste, pathological waste, radioactive waste, infectious waste, chemical waste, cytotoxic waste, cutting waste and pharmaceutical waste (WHO 2018). The global pandemic has resulted in an unusual amount of medical waste being reported. For example, due to the COVID-19 pandemic in China, the increase in personal protective equipment and its immediate disposal after use, it is reported that medical waste from personal protective equipment such as gloves, face masks and goggles has increased (Ma et al, 2020).

Curfew, stay-at-home policy and other preventive measures to contain the spread of COVID-19 have seen an increase in the production and consumption patterns of non-medical and household-related products such as masks, gloves, thermometers, disinfectants. Quarantine and fear of viruses lead to concentration of disposable products and panic buying (Sarkodie and Owusu 2020).

Waste pickers, whose livelihoods depend on waste collection, are no longer able to reap benefits and do their business as usual due to strict social distancing measures. For example, waste collectors assist in the collection of reusable and recyclable solid waste spilled, necessary for integration into economic production (Moreno-SÁNchez and Maldonado 2006). Therefore, waste collectors play an important role in achieving a circular economy, especially in developing countries. More than 8,000 waste pickers have been banned in Turkey as part of COVID-19 containment measures; however, food aid and municipal shelters were provided (Hikmet, 2020). Waste collectors are the occupational risk group that is more sensitive to health conditions (Cruvinel et al. 2019); therefore, the Turkish government's ban has prevented many waste pickers from being exposed to secondary transmission of COVID-19.

Appropriate waste management in the context of the COVID-19 pandemic ensures that recycling services are arranged to include safety measures that include continuity and functionality of waste services and workers, safety of waste service workers, and spillage in the collection, disposal and processing of medical waste (Sarkodie, and Owusu, 2020).

CONCLUSION AND EVALUATION

All this information shows us that the management of medical wastes is a complicated process shaped by many laws and regulations, where many components are evaluated together, different stakeholders have very different responsibilities. Various regulations, especially the Medical Waste Control Regulation, help us to manage this process in the most accurate way. In

today's conditions, it is a serious gain for our country to have these and similar regulations that will guide us in almost every stage of medical waste management.

In addition, there are 65 medical waste sterilization facilities in our country, and in the sterilization / disposal stage, which is an important pillar of medical waste management, these facilities make serious contributions to the process by making our wastes safe and free of risks. Presence of medical waste facilities in almost every province is not a correct approach in terms of sustainability in this service area and control of medical waste disposal costs. In this process, which has many variables, it is important to position these facilities in certain cities and regions where criteria such as population density, amount of medical waste produced and distance to health facilities are emphasized. Unfortunately, since these balances were not taken into account in the past, many facilities in our country have to dispose of medical waste sterilization well below their capacity, and this causes the sterilization disposal costs to increase in the regions they serve. In order to both protect this service sector and keep costs under control, this issue should be taken into account by authorized ministries, institutions and organizations.

One of the biggest problems encountered in medical waste management in our country is “Medical Waste Collection and Transport Personnel. These personnel are at serious risk in the workplaces where they work in medical waste sterilization disposal facilities, municipalities and health institutions. However, these personnel are under serious risk from their employment to their training and social rights. With a comprehensive study to be done, it should be ensured that people with certain technical qualifications are preferred for these jobs while the personnel who will work in this and similar fields are recruited for the first time. should be organized and even these training programs should be certified and the process should be continued with successful personnel.

Risk premiums given to Medical Waste Collection and Transport Personnel at a very small rate in some public institutions and organizations should be paid equally for all public and private sector employees within the framework of a certain standard.

An issue that we have mentioned before in medical waste management, making medical waste temporary storage mandatory for all waste generating health facilities is also very important for the safe management of the process. In this way, the issue of having medical waste temporary storage in all health facilities producing medical waste in our country should not be left to the discretion of the administrators in the cities and should be made compulsory. In this way, serious environmental risks will be prevented under all circumstances, especially during the pandemic process.

As of 2017, our country has reached a very successful point in the management of medical wastes compared to the past, especially with the recently published Medical Waste Control Regulation. However, this process is changing so rapidly that the increasing population and the new health facilities opened accordingly show that the regulations that guide us in the management of this process should be constantly updated.

The covid-19 pandemic, which has caused serious negativities in many aspects, especially health and economy all over the world in the last two years, has clearly shown us that medical waste management is a process that should be constantly improved in terms of both human health and environmental risks.

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