

Global Health- Wellness & Bio-Waste Management To Attain Sustainable Development Goals

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ABSTRACT

Good health and wellness are core essences in human lives. Sustainable Developmental Goal #3 focuses on boosting the health of citizens and to eradicate all preventable diseases and premature deaths. According to SDG Target 6.2, to achieve free access to sanitation and hygiene for one and all to pay more attention to women and children living in tribal and vulnerable situations. Availability of clean, pure drinking water and proper sanitation are critical to the health and wellness of people and the planet. Universal Health Coverage (UHC) is now the turning point to establish a standard touchstone for all the countries across the globe to evaluate the progress toward the “Sustainable Development Goals (SDGs).” However, it has been observed that so much biomedical waste from various hospitals and healthcare centers is being generated and causing exposure risks and health hazards to medicos, doctors, health workers, refuse workers, etc. Hence, segregation of biodegradable and non-biodegradable Biomedical wastes should be there. It should be properly disposed of to save the environment, soil, water, and land and to protect the public and healthcare workers who are prone to getting various diseases and infections. Various steps in the proper management of these wastes include handling, accumulation, storage, transportation, and finally disposal. Various laws, rules, and regulations are being framed by the central and state governments to minimize biowaste and to their proper management. It is therefore mandatory to adhere to the laws formulated to ensure proper waste disposal without destroying the ecosystem and environment. The waste handling should be properly taken care of without causing adverse effects on the health of animals and humans. Let's join hands together to eradicate diseases caused by biomedical wastes by creating awareness among people that nature has bestowed bounties on us, we must take proper care of our natural resources and not pollute them. For example; ethnomedicinal plants are very effective, they possess several curative properties like antioxidant, antimalarial, antiviral, antibacterial, etc to cure various diseases and disorders. We should use more plant-based therapies to cure diseases to minimize biowastes. Globally, any nation should be self-reliant and rise with its technological prowess only if its citizens have a positive mindset with a sound body. So, leading a healthy lifestyle is to sustain happiness which involves intake of a balanced diet, regular walking and exercise, meditation, positive thinking, and spiritual and emotional wellness. Changing the perspective of life from pain to healing and acceptance, endurance, and equanimity aids in good health. Biomedical wastes can be managed effectively by trash minimization and proper waste segregation into various blue bins, green bins, etc. Sustainability is the requisite of meeting the present needs without compromising future generations' needs. Judicious uses of resources and their management are the key sources of environmental, social, and economic sustainability. In this rapidly changing world of environmental and agricultural challenges, we need to empower and increase awareness in our students and learners to promote positive influence on this planet. Various Sustainability consultants, Renewable energy Specialists, Environmental Scientists, Sustainable architects or Urban planners, Environmental Policy Analyst, Green Marketing Specialists, Waste Management and Recycling Coordinator, and Sustainable Fashion Designer are identifying areas to manage biowastes. Their work includes contributing to environment protection, reducing the ecological footprints of agriculture, waste reduction management, reduction and recycling programs, use of eco-friendly materials, and contributing to a more ethical and eco-friendly fashion ecosystem.

Distinguishing global healthcare norms setting, Research works, and establishments of International forums are needs of the hour to sustain and promote health and wellness. Various scientific leadership and expertise, development of public health workforce, unique expertise in health and wellness, well-equipped laboratories, management of biowastes, e-waste strategies and data analytics, and emergency health care programs are required to cure disease outbreaks and future threats. The use of Artificial intelligence, Machine learning, Technical partnerships, Ministries of Health, other Public Health Sectors, and Scientific Knowledge across domestic and global public health issues can lead to the betterment of health and benefit humanity.

Keywords: Machine learning; Health Sector; Recycling Programmes; Treatment Techniques.

1.1 INTRODUCTION:

1.2 Sustainable Development Goal # 3: Good Health & Well-being aims to recognize and take all major health priorities by providing universal health coverage for everyone. Good health and well-being are the aim of this goal and also, they are the result of other goals that empower people to develop better in different social, economic, and productive areas. Good health is one of the greatest assets. We all strive to maintain good health and wish to lead a healthy lifestyle. The Healthcare sector is one of the leading industries worldwide. Across the globe, various highly equipped medical colleges and health sectors are established. Greater health awareness, increased life expectancy, reducing genetic disorders, and kicking off prolonged illness have been major key factors in this exponential growth of health sectors. In India, the distinguished healthcare sector includes medical colleges, corporate and private hospitals, mohalla clinics—dental colleges, research laboratories, schools, and other hospitals which generate huge amounts of biomedical waste. Various waste produced from health care centers can prove to be more fatal, post-pandemic and if they are not treated properly it can contribute to the rapid spread of coronavirus and other infections.



Figure:1 SDG # 3: Good Health & Well-being

1.4 AIMS & OBJECTIVES:

1.5 To sustain health and wellness at every level intake of nutritious and well-balanced diet, regular exercise, adequate sleep, clean surroundings, and a pollution-free environment are required. The study reveals that Biomedical waste recycling and management is a major concern of various healthcare centers in India and across the globe. Creating a consciousness and awareness about good health and wellness is the need of the hour. This article throws light on the various harmful effects of biomedical wastes on living organisms and the various methods of proper and safe disposal. There is a major concern for the safety of frontline healthcare workers and garbage collectors engaged in procuring and disposing of biomedical wastes. The aim of this study was to create awareness among learners and health practitioners about biomedical waste management and their effective recycling and reusing for future use.

STUDY DESIGN:

A descriptive cross sectional comparative study was conducted.

MATERIALS AND METHODS:

This study was conducted post-pandemic time among health workers belonging to Eastern part of India from August 2023 to June 2024. A total of 153 people participated in the study. A questionnaire was framed in Google form and distributed among all through Gmail, WhatsApp, and other social sites to assess the knowledge and awareness of effective recycling and biomedical waste management (BMW). Interviews were conducted telephonically. The collected data was examined and assessed on a 5- 5-point unipolar scale. The statistical analysis was used to collect and analyze data.

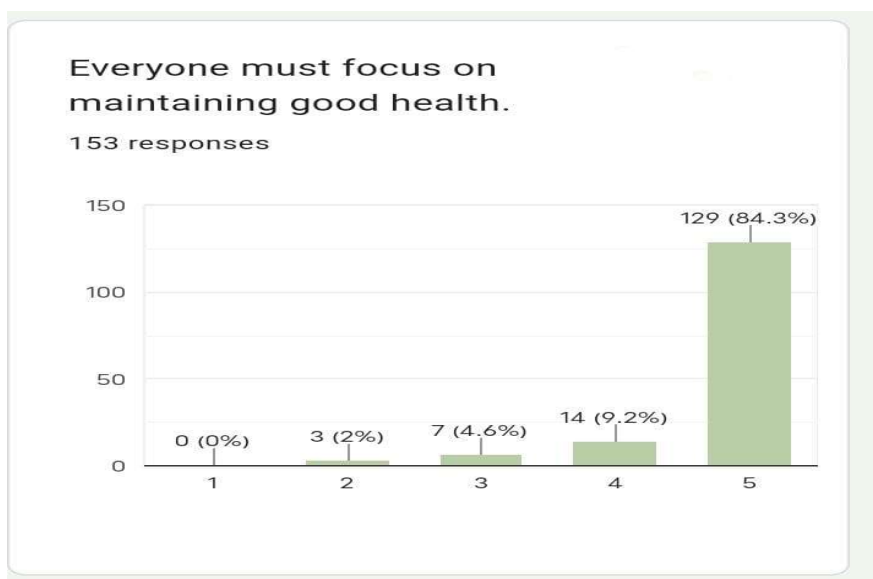


Figure 2.1: (84.3)% participants knew the importance of Good Health & Well-being

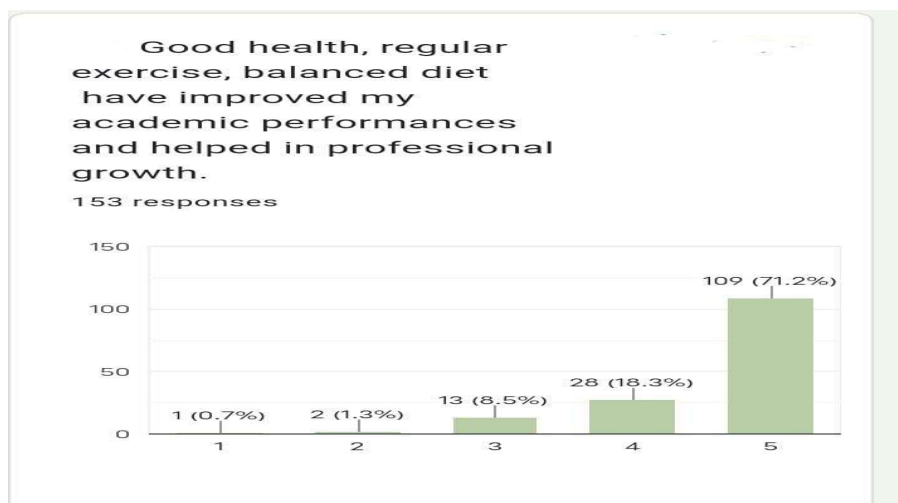


Figure 2.2: (71.2)% participants knew the importance of Active Lifestyle

DISCUSSION:

The new global agenda and Sustainable Development Goal # 3 is to maintain universal health coverage to provide access to safe and effective medicines and vaccines for one and all and to cease various diseases by 2030 to transform and empower humanity. It has been observed that huge amounts of biomedical waste are generated from dental centers and the health sector which can be extremely hazardous to Mother Nature, as well as to those who directly or indirectly come in contact [1]. It has been observed that only about 10 to 25% of biomedical wastes are hazardous, the rest is not hazardous. The harmful parts of the wastes are causing various physical, chemical, and biological risks to the public and distinguish health care workers associated with handling, treatment, and recycling of wastes[2]. According to the guidelines of the World Health Organisation, the government should allot part of the budget for the creation, and maintenance of healthcare waste management, and their effective disposal. NGOs should also undertake various programs and activities to overcome the hazards caused by BMW[3]. It includes various sharps, anatomical and laboratory wastes, and others and if not carefully segregated, it may be fatal and their inappropriate segregation might harm our environment and ecosystem [4]. BMW is hazardous and in the late 1980s and 1990s, people feared contact with microorganisms which may cause potential risks of BMW and the spreading of diseases like Human immunodeficiency virus (HIV) and hepatitis B virus (HBV)[5]. Therefore, it's important for a proper temporary storage room well locked and sealed from general public reach and biotic factors like animals to spread diseases further. BMW is covered by the Biomedical Waste Management Rules and Regulations Amendment 2016, 2018-2019. As the improper disposal of biomedical wastes and their careless mishandling may cause severe risk and threat to general public health. Hence, it should be disposed of properly to prevent the exposure and spread of communicable infectious diseases like respiratory disorders, asthma, cardiopulmonary ailments, endocrine disruptions, antibiotic resistance, cancer, fetal abnormalities, etc. According to the Biomedical Waste Management and Handling Regulations 1988 and the Environment Protection Act of 1986, Indian laws cover

the rules governing the production, proper storage, treatment, handling, and disposal of biomedical wastes[6,7]. In India, out of 710 tonnes of waste produced 126 tonnes of waste was produced due to COVID-19. Numerous examples of diseases produced due to these wastes are *Salmonella*, *Mycobacterium tuberculosis*, AIDS, *Streptococcus pneumonia*, and helminthic infections[8]. The proper survey was conducted and a systematic review was obtained to study the parameters of BMW management. The study shows that effective successful waste management depends on the effective segregation of all the wastes produced at the point of generation[9]. Improper disposal increases major health risks so four major principles are applicable: placement of colored bins, segregation, removal, and disinfection of wastes[10]. The main aim of BMW's management is to avoid and minimize the generation of waste and if produced then reuse or recover as much as possible to avoid chaos[11]. The new protocol approach in order to reduce environmental pollution is proper segregation, transportation, treatment, etc of biomedical wastes[12].

STEPS OF BIOMEDICAL WASTE MANAGEMENT:

1. Collecting and putting wastes by proper segregation into different color bins.
2. Pre-treatment of chemicals, industrial effluents, and laboratory liquid waste.
3. Proper transportation of wastes into trolleys and other waste collectors from the central storage area to the main common treatment centers.
4. Further transportation to central areas of waste treatment plants.
5. Treatment of the collected wastes and recycling within 48hours and its proper management and disposal[13].

To stop the spread of hazardous wastes incineration is required in all healthcare centres and laboratories. However, due to the unavailability of sufficient incinerators in a few countries, BMW has to be sent to landfills which contaminates soil, pollutes underground water, depletes the water table, causes soil pollution, threatens aquatic life, reaches in food chain, and harms the environment. Due to incomplete combustion toxins are evolved during incineration. Hence, some new standards should be issued to resolve the various issues to safeguard and protect human health and save mother nature[14]. So, the process of BMW management needs to be well organized and systematic to overcome any health hazards to the people in charge. Various steps in waste management from collecting, categorizing, storing, and transporting may reduce the risks of improper management[15]. Segregation of wastes is important to prevent the reuse of syringes and needles disposed of in the health sectors. It also helps in achieving the desirable goals of recycling various metal and plastic waste generated[16]. All wastes must be properly segregated into different containers at the source of its generation and they should be well labeled. Also the schedules of Biowaste Handling Rules, 1988, earlier it was ten in number, now it has been reduced to four[17]. As biohazards are threatening our ecosystem and environment, so we must use maximum Biohazard Symbols to prevent harm and hazards to the general public[18].



Figure 3: Biohazard signs symbolizing the nature of waste to be disposed of.

Transportation vehicles must be properly covered and fewer traffic routes must be followed to avoid public exposure[19]. Proper training, workshops, and seminars for entire health sector workers and staff members on handling BMW should be mandatorily conducted annually for proper record keeping and improving segregation and disposal[20]. BWM requires proper classification and color coding of garbage bins for effective segregation, handling, and proper waste disposal. Nowadays, the bins used are color-coded, this step is very helpful in avoiding chaos, improper handling, and eradication of many diseases[21]. Different categories of BMW include needles, syringes, anatomical wastes, cotton swabs, blades, sharp scalpels, blood bags, vaccines, medicines, beakers, test tubes, chemicals, infectious wastes, hand gloves, masks, PPE kits, pharmaceutical and laboratory wastes, plastic bags, glass wares, sanitary napkins, sanitizers, soaps, handwashes, food wastes, paper cups, disposable plates, wet and dry wastes, electronic wastes, etc. These wastes should be segregated in different colored bins and sent for treatment before proper disposal[22]. Various anatomical, infectious, and laboratory wastes should be collected in yellow bins. Red bins should collect hazardous collect non-chlorinated polybags and recyclable contaminated wastes. Glassware wastes, test tubes, pipettes, beakers, etc should be collected in Blue containers. In White bins which are translucent contaminated and discarded sharps are disposed of. All these sharp wastes must always be handled with utmost care and to be disposed of in puncture-proof containers to avoid accidents for handlers [23,24]



Figure 4: Segregation of BMW using different colored bins. **Multi-colored bins for the segregation of different types of waste [21].**

MINDFUL MANAGEMENT: INTEGRATING EDUCATION AND COMMUNITY ENGAGEMENT FOR WASTE REDUCTION:

Effective waste management is imperative for sustainable development and environmental conservation. This article explores the pivotal role of education and community engagement in optimizing waste management techniques. By fostering awareness, knowledge, and participation at the grassroots level, communities can become active stakeholders in waste reduction, recycling, and resource recovery initiatives. Tailored educational programs serve as catalysts for raising awareness, disseminating knowledge, and instilling behavioral changes among individuals and communities. These programs not only elucidate the detrimental impacts of improper waste disposal but also emphasize the benefits of adopting sustainable practices such as recycling, composting, and waste reduction. Moreover, education empowers citizens with the requisite skills and knowledge to make informed decisions regarding waste management, thereby fostering a culture of environmental responsibility. This article thus, aims to emphasize the need for tailored educational programs, outreach campaigns, and collaborative efforts to instill behavioral changes and promote sustainable practices. Amidst the escalating challenges associated with waste production and disposal, the significance of local community participation is amplified. Thus, this article underscores the significance of inclusive community engagement strategies that empower citizens to take ownership of waste management solutions, leading to cleaner environments, resource conservation, and overall societal well-being. This participatory approach not only enhances the effectiveness of waste management solutions but also strengthens social cohesion and collective action within communities.

Through a holistic approach that integrates education and community engagement, this article advocates for transformative action toward more resilient and eco-conscious waste management systems. It underscores the imperative for comprehensive involvement of diverse stakeholders across different community tiers, alongside concerted collaboration with the scientific community. Together, these efforts are poised to tackle the relentless surge in waste generation, paving the way for sustainable solutions and a cleaner future.

RESULTS:

SDG # 3 Good Health and Well-Being has been framed for the overall growth and development of countries, according to the 2030 Agenda for Sustainable Development Goals adopted by the United Nations in September 2015 for the peace and prosperity of everyone.

Out of 153 participants, forty-five percent of the health workers were not at all aware of the proper management of biomedical wastes, 23% were moderately aware, whereas the rest were fully aware of the proper decomposition and recycling of biomedical wastes. We all must take a few promising steps to minimize and reduce the volume of waste discarded from various sources. Various biotic factors like rodents, rats, and house mice can spread pathogens and vectors of various diseases to the residents living near these wastes [25]. Application of the 3Rs system must be encouraged from the school level to the University to reduce, reuse, and recycle. Awareness of one and the 3Rs can bring about desirable change and we can maintain a cleaner and sustainable environment [26].

CONCLUSION: Good Health and wellness have to be conferred prime importance in the country, and across the globe however, not investing in healthcare sectors can result in devastating economic consequences. There should always be a joint team effort and support from Govt and NGOs for proper Biomedical Waste Management. The study reveals that there is a lack of requisite knowledge among health practitioners and garbage collectors regarding biomedical waste recycling, reusing, or management. Considering the harmful and wrong impact on the environment and causing eco hazards by creating natural imbalance, biomedical waste management requires the immediate attention of Govt and NGOs. The academic assessment to increase awareness is mandatory for all ages of society. For proper recycling and effective disposal of biomedical wastes, there should be proper finance and infrastructure support from Govt and NGOs, collective teamwork from health care facilities, municipalities, corporate offices, tough legislature strong regulatory bodies, etc.

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1.5. CONFLICTS OF INTEREST:

There are no conflicts of interest.

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