



REVIEW ARTICLE

A Review of Medical Waste Management in South Africa

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Abstract:

Background:

Poor medical waste management has been implicated in an increase in the number of epidemics and waste-related diseases in the past years. South Africa is resource-constrained in the management of medical waste.

Objectives:

A review of studies regarding medical waste management in South Africa in the past decade was undertaken to explore the practices of medical waste management and the challenges being faced by stakeholders.

Method:

Published articles, South African government documents, reports of hospital surveys, unpublished theses and dissertations were consulted, analysed and synthesised. The studies employed quantitative, qualitative and mixed research methods and documented comparable results from all provinces.

Results:

The absence of a national policy to guide the medical waste management practice in the provinces was identified as the principal problem. Poor practices were reported across the country from the point of medical waste generation to disposal, as well as non-enforcement of guidelines in the provinces where they exit. The authorized disposal sites nationally are currently unable to cope with the enormous amount of the medical waste being generated and illegal dumping of the waste in unapproved sites have been reported. The challenges range from lack of adequate facilities for temporary storage of waste to final disposal.

Conclusion:

These challenges must be addressed and the practices corrected to forestall the adverse effects of poorly managed medical waste on the country. There is a need to develop a medical waste policy to assist in the management of such waste.

Keywords: Medical wastes, South Africa, Waste management, Practices, Challenges, Policy.

1. INTRODUCTION

Medical waste, also referred to as healthcare waste has been defined by the World Health Organization (WHO) as “all the waste generated within healthcare facilities, research centres, and laboratories related to medical procedures; including the same types of waste generated from other scattered sources and homes” [1]. Waste management is defined as “all activities, administrative and operational, involved in the handling, treatment, storage, recovery and recycling (of healthcare general waste) and the disposal of waste (including transportation)” [2].

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Medical wastes are classified into two general classes: the general or, non-hazardous waste and the hazardous waste. Hazardous waste can be further sub-classified into sharps, infectious, pharmaceutical, cytotoxic, pathological, radioactive and chemical waste [1]. The general waste, which is comparable to domestic waste, usually constitutes the bulk of medical waste (75 - 90%) and includes waste generated from administrative works, packaging and maintenance works; while the hazardous waste constitutes only between 10 - 25% [3].

In the developed countries, there are policies from the national to the regional and local levels guiding all stakeholders in the proper management of medical waste. For instance, a Teaching Hospital in Germany has 54 rules regarding medical waste management – 36 from the national government, 5 from the regional government and 13 from the hospital [4].

The enormous health risks to humans and the environment posed by medical waste range from direct injury to humans from disposing of used sharps to indirect injuries from land, water and air polluted with toxic chemicals from the medical waste. These risks arise from the inclusion of sharp objects, human tissues and other infectious materials in medical waste [5]. Several studies have reported an increase in the number of epidemics and waste-related diseases due to poor medical waste management and several major health threats which occurred in the past have been traced to inappropriate management of medical waste [6, 7]. Globally, about 5.2 million people, including 4 million children die annually from waste-related diseases and the situation is likely to get worse if proper intervention is not put in place to avert further disaster [8]. Many workers who handle medical waste and people who live in areas where medical waste are discharged have been found to suffer from diseases like cholera and salmonellosis [9].

The quantity of waste being generated from health facilities has been on the increase in recent years due to an increase in the number of healthcare facilities catering for the increasing human population and the use of disposable medical products [10 - 12]. This increases the cost of treatment and disposal and thus exacerbates the problem of waste management [13]. That is why the South African National Standards [2] encourages the reduction and possible reuse of medical waste.

Most developing countries are unable to effectively manage their medical waste because of lack of resources, poor management of available resources and lack of transparency in administration [14, 15]. In South Africa, incineration is the most common method being used in the disposal of toxic medical waste; however, incinerators are known to pollute the air by releasing toxic metals to the atmosphere, polluting soil and surface water and the use of incinerators has been implicated in the disruption of human hormonal, immune and reproductive systems and cancers [16]. The lack of sufficient equipment to deal with the ever-increasing burden of medical waste has resulted in the dumping of a large quantity of the waste in illegal sites and sometimes burning within the premises of the health facilities [17]. Uncontrolled burning of these waste may result in air pollution and toxic emissions from incomplete combustion which is both harmful to the public [16]. Despite the magnitude of the problem; practices, capacities and policies on dealing with medical waste management in many countries, especially in developing nations is inadequate, thus requires intervention [18].

This study, therefore, aims to critically review medical waste management in the nine provinces of South Africa in order to establish the practices, identify existing challenges and compare what obtains in the nine provinces. It also aims to look into the trend of medical waste management in South Africa to identify the areas of improvement over the years and where more attention is required.

2. RESEARCH METHOD

This review considers published works on medical waste management in South Africa within the last decade (2007 - 2017). A web search was done on databases such as Science Direct, Medline, Greenfile, Environment Complete and Health Source using the following keywords: “medical waste management in South Africa”, “healthcare waste management in South Africa” and “hospital waste management in South Africa”. The search was limited to journal articles to exclude other types of publications such as book chapters, newspaper articles and conference proceedings. It was also limited by the year of publication to exclude publications that were made before the year 2007. The initial search yielded a total of 1, 183 research articles which were further assessed for their relevance to this study. Articles who dealt with solid waste management in households or other institutions aside health facilities were removed from the collection, as well as articles that focus on other issues in South Africa aside from medical waste management. Eventually, 35 articles which deal with the management of medical waste in the provinces of South Africa and published in accredited journals were selected for this review paper. Relevant dissertations, theses and publications by

the Department of Health and provincial governments in South Africa were also consulted.

3. RESULTS AND DISCUSSION

This section reviews the rate of generation of medical waste in South Africa, the national policies guiding medical waste management in the country and the documented practices of medical waste management in each of the provinces of South Africa.

3.1. Medical Waste Generation in South Africa

The Republic of South Africa is made up of 9 provinces (Fig. 1).

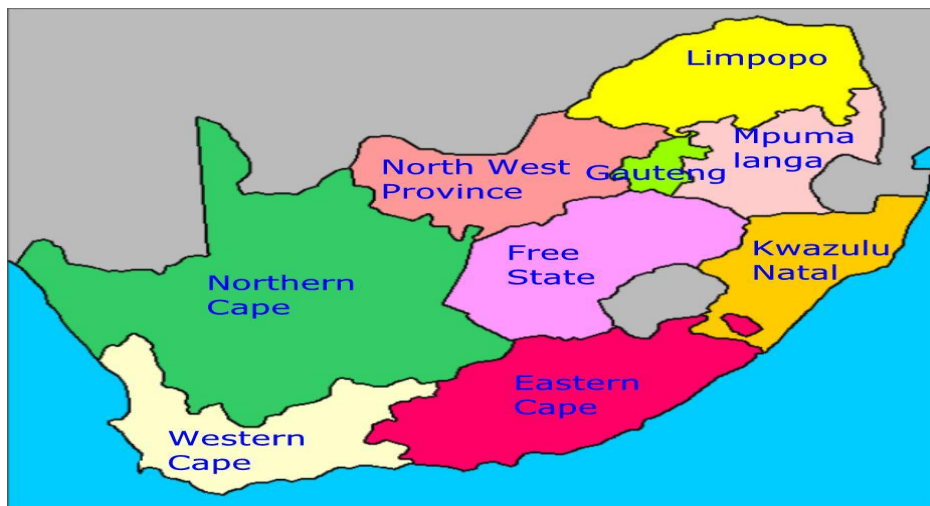


Fig. (1). Map of South Africa showing the 9 Provinces (<https://www.southafrica.to/provinces/provinces.html>)

The last most comprehensive estimation of medical waste generation from health facilities across the provinces of South Africa was done in 2006 and it showed that public facilities generate more waste than the private and Gauteng and KwaZulu-Natal Provinces generate more waste than other provinces [19] (Fig. 2). There has been a progressive increase in the quantity of medical waste being generated across South Africa from 42,000 tons per annum in 2007 to 45,000 tons per annum in 2013 [20]. Furthermore, an estimated increase in the generation of medical waste of 1.5% per annum has been envisaged due to the actual 1.06% growth rate of the human population [19].

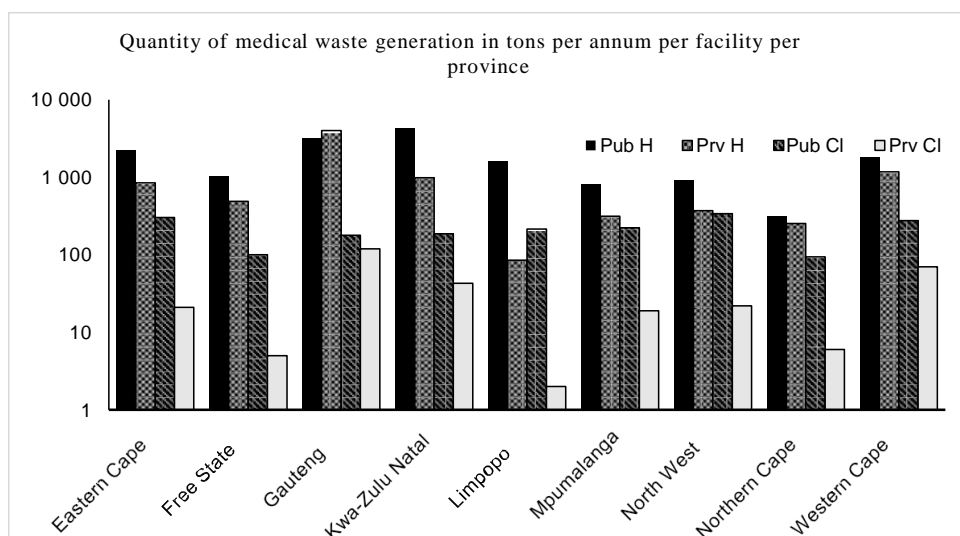


Fig. (2). Estimated quantities of waste generation at health facilities: Pub H – public hospital, Prv H- private hospital, Pub Cl – public clinic, Prv Cl- private clinic [19].

3.2. National Policies Relating to the Medical Waste Management

Development and enforcement of a National Policy to guide the management of medical waste in a country is supposed to be spearheaded by the Department of Health [21] and supported by other relevant departments like the Department of Environment [22]. The policy should define in clear terms the different categories of medical waste and how to manage each of the categories; it should also address the important issues of training and provision of the necessary equipment. This will ensure uniformity in practice in all provinces of the country [7].

A review of the South African Department of Health Annual Reports in the last decade shows that the issue of medical waste has not been accorded the priority it deserves by the Department. There was no mention at all of the word “waste” in the reports of the years 2007/08 to 2010/11 [23 - 26]. In the report of 2011/12, “waste” was just mentioned in passing without any definition, plans or budget [27]. In 2013/14 annual report, it was documented that the Regulations for medical waste management were developed and approved for publishing in the government's Gazette for public comment [28], finalised in 2014/15 [29], approved by the Minister on 13 May 2015, but yet to be gazetted as at the time of writing the report in September 2016 [30]. This shows an obvious drag in the publishing and implementation of this policy while the health facilities continue to increase and generate more waste in the country which is not being properly managed. Furthermore, the Regulations exclude radioactive waste which is also generated in some health facilities in the urban centres where tests and treatments relating to radiation are carried out [30]. The exclusion of radioactive waste in the Regulation is of concern because an improper disposal of radioactive waste poses a health risk to the workers and the public at large once it is released into the environment [31].

In South Africa, some of the national policies which can be applied to medical waste management include:

- Act 108 of 1996: This Act accorded every citizen of South Africa a right to a safe environment that is not harmful [32]. Improper disposal of medical waste infringes on this right because it may result in the pollution of land, water and air which renders the environment harmful;
- National Environmental Management: Air Quality Act 39 of 2004: This aims to protect the quality of air in the Republic by prevention of air pollution and environmental degradation. The regulation of emission standards of incinerators being used in medical waste disposal in South Africa falls under this Act;
- National Environmental Management: Waste Act 59 of 2008: This is concerned with the licensing process for specified waste activities, including medical waste in the Republic; and
- South African National Standards on Health Care Waste Management: This Standard deals with all aspects of medical waste management from generation to disposal of waste and also includes a guide to the training of staff; According to the Standard, medical waste must be separated at source of generation according to the risks they pose and temporarily stored in colour-coded containers; it also indicates that each health facility must ensure that their workers are trained in the identification and separation of various types of medical waste and contract the final treatment and disposal to an authorized company which should in return hand the facility a certificate of safe disposal [2, 33].

3.3. Medical Waste Management Chain

Key steps that have been identified in the management of medical waste [34] include segregation of waste from its source and storage in appropriate containers; transportation within and out of the health facilities; treatment and final disposal (Fig. 3). There are challenges at each of the steps along this chain in South Africa.

3.3.1. Medical Waste Segregation and Storage

This first step in the waste management chain is the most important step because it determines the eventual quantity of waste that is to be treated and disposed of. In order to avoid accumulation of medical waste in the wards, theatres and other sites where they are generated, there is a need for designated storage areas within each of the wards and a central storage site for all the wards within the health facility where they can be temporarily stored before they are transported offsite [35]. The World Health Organization (WHO) prescribed that medical waste should be sorted and dumped into separate waste containers from the source, and afterwards stored in a safe place inaccessible to rodents and unauthorized people for a maximum of 48 hours and then transported to the treatment or disposal site [36]. If this guideline is strictly followed, the quantity of medical waste which is eventually passed to treatment/disposal facilities will be small and manageable. South African health facilities generate about 45,000 tons of medical waste annually, out of which only about 4,500 tons are hazardous [20]. But, while the waste is all mixed together, it becomes necessary to

treat it as hazardous and cannot be recycled and reused without pre-treatment [20, 37]. The Department of Environmental Affairs and Tourism (DEAT) reported that health facilities in eight out of the nine provinces in South Africa do not classify or segregate their medical waste from source; thus, it is difficult to identify the categories of the waste being generated and make a proper budget on the materials needed for temporary storage and transportation out of the health facilities [38]. A poor knowledge of the characteristics of medical waste may be responsible for the poor segregation practice [39]. Most health facilities in Gauteng, Western Cape and Northern Cape Provinces have temporary storage areas in the facilities in the wards and central locked temporary storage facilities while other provinces only have central storage facilities and none in the wards [35].

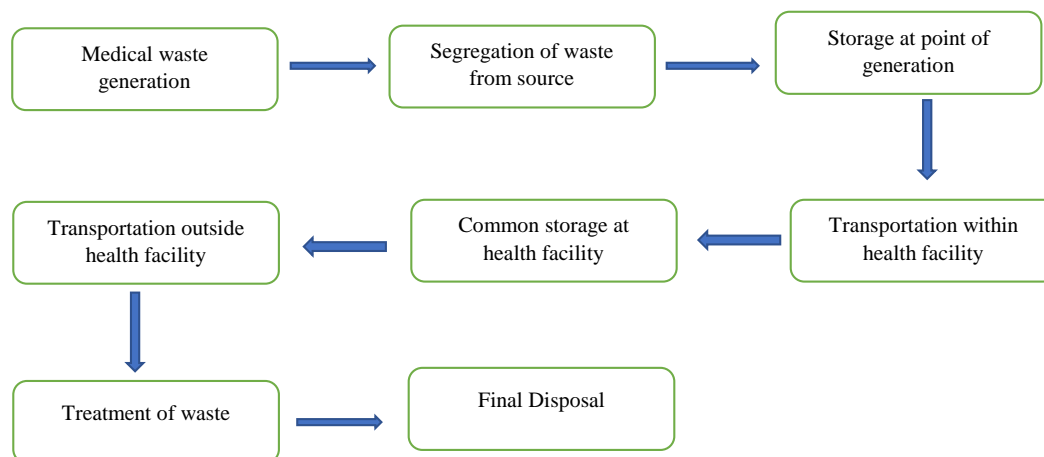


Fig. (3). A flow chart showing the medical waste management chain “from cradle to grave”.

3.3.2. Medical Waste Transportation

Transportation of medical waste within the health facility should be by means of trolleys and carts which are not used for any other purpose, and out of the facilities by suitable vehicles marked with biohazard symbol [36]. The frequency of collection of the waste from the wards to the temporary storage area within the facilities and out of the temporary storage area to the final treatment/disposal site will depend on the size of the hospital, a number of available equipment and workers. The workers involved in the transportation of medical waste should be trained on the different classification of the waste and their containers to help them in the handling of the waste and prevent them from mixing together different categories of waste which were previously segregated [35]. As at 2009, health facilities in only four Provinces (Gauteng, Western Cape, Eastern Cape and Northern Cape) had dedicated trolleys for the transportation of waste within and outside their facilities while in other provinces, health facilities make use of any available containers for the lack of dedicated equipment. However, in all but Limpopo province, there is a fixed collection schedule for the transportation of waste out of the facilities [36].

3.3.3. Medical Waste Treatment and Disposal

The methods which have been adopted for medical waste treatment and disposal include the traditional open dumping on lands or water bodies, deep burial, burning and the modern incineration, autoclaving, shredding, superheated steam sterilization, microwave disinfection, wet oxidation technology and electron beam gun technology [3]. Though the World Bank permits open burning of toxic waste as the last resort on the condition that the site of burning is in the rural area, far away from busy complexes to limit the number of people being exposed to the adverse effects of the event [40]; however, an indiscriminate burning of waste where it affects any person violates the constitution of South Africa (Act 108 of 1996).

Modern methods which are more environmental-friendly were developed in order to minimize the risks posed to people and the environment by the traditional methods. However, many of the modern methods are very expensive and not available in many developing countries [7]. Though some of the new methods are being employed in some parts of the country, especially in the Gauteng Province, a larger part of South Africa still employ the traditional methods of open dumping, burning and the lowest standard of incineration to dispose of their medical waste [19]. While some facilities dispose their waste within the health facility compound, others outsource the disposal to licensed treatment facilities [35]. However, there have been reports of sudden malfunctions, breakdown, planned and unplanned

maintenances of equipment which interfere with proper waste disposal by the treatment facilities [41]. In Gauteng and Western Cape Provinces, all the facilities use reusable materials while in Mpumalanga, all the facilities use incineration, but in the other provinces, different practices were observed in different health facilities [35]. Also, medical waste has been discovered indiscriminately and illegally dumped into water bodies, veld, the backyard of brick factories and even a beach parking lot in South Africa [42].

3.4. Techniques for Medical Waste Treatment and Disposal

The World Health Organization recommended that the choice of the mode of treatment and disposal of medical waste should be guided by cost-effectiveness, easy implementation and environmental friendliness [15]. The unique characteristics of the constituent of medical waste make it imperative that it be treated effectively before final disposal to make the end-product of the waste safe to the handlers and the public. Different modes of treatment have been employed for specific constituents of medical waste. That is why segregation at the point of generation is vital to make it easy for each group of waste to be passed to their different treatment sections. Final disposal is usually in a landfill.

The techniques which have been documented for treatment and disposal of medical waste include:

- a. Open dumping/burning: This method is widely employed in many developing countries because it is cheap and easily available. However, open dumping/burning constitute a great risk to the public because it renders the dumped waste accessible to the public and scavengers. Burning is usually used to reduce the volume of waste and prevent its spread. However, toxic gasses can be released into the atmosphere during the burning process. The waste dump is also usually a source of injury to the community whether through direct contact or indirectly through land, water and air pollution [43].
- b. Incineration: This is the choice of treatment for pathological wastes, sharps and other clinical wastes that cannot be reused, recycled or disposed of in a landfill. A standard incinerator uses high temperature to convert the waste into a minimal residue in the form of residual gases and ashes [15]. However, many incinerators being used in developing countries are made locally, designed poorly to use coal as fuel and are unable to achieve complete combustion of the waste; thus, resulting in an enormous quantity of ash [43]. The unburned waste and ashes are eventually disposed of at a landfill.
- c. Autoclaving: A cheaper alternative treatment method to incineration is autoclaving. Autoclaving sharps and medical wastes contaminated with blood and other human secretions at an optimum temperature of 160°C help to rid the waste of bacteria. However, the autoclaved waste still need to be retreated using another means before final disposal [44]. Besides, there is a limit to the type of waste that can be autoclaved – large quantities of waste, large body parts and waste from chemotherapy treatment cannot be autoclaved because of the length of time required for the wastes to achieve the required optimum temperature [15].
- d. Microwave disinfection: This is a modification of waste autoclaving which involves the use of microwaves to provide heat for disinfection of medical waste. However, wastes containing metal objects cannot be microwaved to prevent the generation of dangerous sparks [45].
- e. Landfilling: Standard landfilling requires more than a simple burial of waste in a shallow pit, it must be located and constructed in an authorized site approved by the government and not within the reach of unauthorized persons [3]. However, in many developing countries, landfills are operated like open dumping where all forms of waste are dumped and later burned [15]. Where the landfill is not properly constructed, erosion may cause the washing of the waste into water bodies, thus contaminating the water.

3.5. Medical Waste Management Practices in South African Provinces

In this section, the practices of medical waste management which have been documented in each of the provinces of South Africa is examined (Table 1). It should be noted that all the characteristics recorded per province may not be applicable to all the health facilities in the province, it only shows what was observed as at the time of different studies in the health facilities that were surveyed. However, many of the observations may be applicable to all health facilities in a particular province since the health facilities studied were selected randomly in order to increase their chances of being representative of the other facilities in the provinces.

Table 1. Medical waste management practices and challenges in South African provinces.

Province	Segregation	Temporary Storage Area	Transportation	Treatment and Disposal	Major Challenges	Reference
Eastern Cape	Inadequate	Insecure storage areas	Onsite transportation marginally adequate. Inconsistent transportation offsite	Open burning on site, illegal disposal on general landfills	Lack of policy, low budgeting, lack of staff training	Vumase (2009) Maseko (2014) [35, 7]
Free State	Inadequate	Storage areas are compliant with standards	Insufficiently dedicated trolleys for onsite transportation. Inconsistent transportation offsite	Burning	Lack of budget and training	Vumase (2009) Mahasa & Ruhiiga (2014) [35, 48]
Gauteng	Adequate	Storage areas are compliant with standards	Dedicated trolleys are available for onsite transportation. Inconsistent transportation offsite	Out-sourcing to private companies		Vumase (2009) [35]
KwaZulu -Natal	Inadequate	Storage areas not compliant with standards	Insufficiently dedicated trolleys for onsite transportation. Inconsistent offsite transportation	Illegal dumping, burning	Lack of equipment	Vumase (2009) Gabela & Knight (2010) Hangulu & Akinola (2017) [35, 50, 17]
Limpopo	Inadequate	Storage areas are compliant with standards	Insufficiently dedicated trolleys for onsite transportation. Inconsistent offsite transportation	Burning, incineration, out-sourcing	Lack of training	Vumase (2009) Mashao (2013) Raphela (2014) [35, 51, 52]
Mpumalanga	Inadequate	Storage areas are compliant with standards	Insufficiently dedicated trolleys for onsite transportation. Inconsistent offsite transportation	Incineration	Lack of training and equipment	Vumase (2009) Makhura, <i>et al.</i> (2016) Ream, <i>et al.</i> (2016) [35, 53, 54]
Northern Cape	Inadequate	Different available sites are used for storage	Onsite transportation marginally adequate. Inconsistent transportation offsite	Out-sourcing	Lack of treatment facilities	Vumase (2009) Motlatla (2015) [35, 46]
North West	Adequate	Storage areas not constructed and operated according to standards	Dedicated trolleys are used onsite. Inconsistent transportation offsite	Out-sourcing	Insufficient personal protective equipment	Mudau (2007) Vumase (2009) [47, 35]
Western Cape	Inadequate	Poorly sanitized storage areas	Dedicated trolleys are used onsite. Daily transportation offsite	Incineration, autoclave, out-sourcing	Lack of manual for staffs	Abor (2007) Vumase (2009) [55, 35]

3.5.1. Eastern Cape

In a nationwide study to evaluate the operational and administrative procedures for healthcare waste management in public district hospitals, this province was ranked lowest in terms of budgeting for medical waste management such as consumables, trolleys, buildings and collection [35]. In terms of segregation of hazardous from non-hazardous waste, health facilities in this province were found to be inadequate. They dispose of their medical waste through open burning on site [35]. A more recent study at the province identified other problems along the medical waste management chain including lack of policy, lack of training of staff and lack of equipment. Ignorance, poor segregation and handling of waste and lack of medical waste storage facilities expose the health workers to the hazardous effects of improperly managed medical waste [7].

3.5.2. Free State

The nationwide study conducted in 2009 identified the following problems regarding medical waste management in the province; instruction manuals were not provided to staff and medical waste was not being adequately segregated at the point of generation [35]. Though there were inconsistencies in the disposal methods across health facilities in the province, most of the facilities dispose of their waste by burning. Many health workers in this province blamed the poor practices of medical waste management on lack of budget and training [35]. A recent study in the province revealed that; medical personnel do not strictly follow the official guidelines in the treatment of medical waste; formal training for personnel was yet to be given a priority; there is a low level of environmental awareness; treatment of medical waste was inappropriate at some sites; and the budget allocations for medical waste management was still grossly inadequate

[48].

3.5.3. Gauteng

This province is one of the provinces in South African which developed provincial guidelines for medical waste management in their health facilities. The health facilities in this province were reported to be practising adequate segregation of hazardous from non-hazardous waste at the point of generation. However, the province was considered only marginally adequate in terms of provision of the medical staff with manuals on the proper handling of medical waste. All the health facilities studied in this province employ reusable containers for medical waste treatment. Final disposal is usually by out-sourcing to private companies or other bigger health facilities [35].

3.5.4. Kwazulu-Natal

A study done in this province in 2004 reported that about 45% of all medical waste generated in the province was unaccounted for, suggesting that the waste could have been illegally dumped, burned or buried in an undisclosed site [49]. Another study rated this province the best in the country with regards to the provision of immunization programmes for the health workers to protect them against the diseases which can be contracted from improper medical waste management and reported that the preferred method of medical waste disposal here is burning [35].

Recent study conducted in a community based clinic in Durban where care is given to highly dependent patients many of whom are incontinent and/or bedridden reveals a gross misconduct as far as medical waste management is concerned [17]. The health workers were observed to sometimes expose themselves to hazardous waste by not wearing Personal Protective Equipment (PPE) like gloves while carrying out their caregiving roles. Also, the waste was not segregated at the point of generation and was temporarily stored in the bin meant for municipal waste [17]. This study identified a problem of transportation of waste offsite as the main reason for burying and burning medical waste within the compound of the health facility. The workers blamed the government for not providing the gloves, colour-coded plastics and dedicated vehicles for the transportation of waste from the health facility [17]. It was reported that all 30 clinics at a rural district in KwaZulu-Natal do not segregate medical waste at the point of generation and four of the clinics practice burning and burying of waste in shallow pits within the health facilities [50]. Some health workers have complained of inconsistent removal of waste from the health facilities by the municipality which sometimes results in waste being blown away by wind or scattered by dogs, exposing the infectious materials to the public and some children have been found scavenging on such waste in order to find “toys”, like gloves which they use as balloons. Commercial waste scavengers also visit the scattered waste in search of recyclable materials and are thus exposed to sharps and other infectious materials. This constitutes a great health risk to the community especially because many of the patients that were being cared for in these homes are infected with HIV, Hepatitis B, Tuberculosis and other contagious diseases [17]. A report has been made of 48 children having to be treated with antiretroviral drugs at a South African hospital after they were pricked with dumped used needles and some ate potentially lethal pills they found dumped at a field in Elsie’s River [16].

3.5.5. Limpopo

No uniformity of medical waste management was reported among the various health facilities in Limpopo province by previous national study conducted in South Africa [35]. Each facility seems to practice what is feasible based on available resources, especially since there are no national or provincial policies. Assessment of medical waste is carried out by the general orderlies and waste collectors since there are no infection control officers in the health facilities [35]. In another study conducted in selected health facilities in this province in 2008, non-separation of waste from the point of generation as well as an open dumping of incinerator ash were reported [43]. A later study conducted at a health facility in Waterberg district in 2013 showed that less than half (43%) of the health workers have adequate knowledge regarding the proper management of medical waste and only 49% of them practice “safe disposal” of medical waste [51]. Later, a walk-through survey conducted at clinics in Polokwane city reported that medical waste is not being segregated at the point of generation in many of the health facilities, there is insufficient transportation of waste offsite and some rural clinics were burning all kinds of waste within the health facilities [52].

3.5.6. Mpumalanga

A recent study in this province showed an inadequate knowledge of health staff regarding medical waste disposal. Some of the staff who claim to have adequate knowledge also admitted to poor disposal practices on account of lack of

appropriate equipment [53]. More needle prick injuries among health workers were reported in this province than other provinces [35]. Needle pricks injuries were even reported among ward cleaners who do not handle needles; this suggest that they must have been injured by the needles that were disposed inappropriately by other staff that make use of needles, especially because they are the ones responsible for the transportation of the waste from the point of generation to the temporary storage areas [54]. In another study, it was observed that there is an inadequate budget for consumables, resulting in non-procurement of the needed equipment, segregation of medical waste at the point of generation is not being satisfactorily done and incineration is being used for final waste disposal [35].

3.5.7. Northern Cape

A report on a nationwide survey revealed that some urban health facilities in this province have infection control officers, but where they are not available, waste is assessed by the general orderlies, waste handlers, or most times (60% of the times), the waste are not assessed at all [35]. Most staff at the health facilities admitted a poor management of medical waste and attributed this to lack of budget [35]. A recent study conducted in 11 health facilities in the province revealed that 63.3% of the health workers correctly segregate medical waste at the point of generation [46]. However, many of the facilities do not have dedicated sites for onsite temporary storage of medical waste and transportation of the waste offsite is not carried out regularly [46]. The province do not have any treatment facilities, and thus have to transport their waste to other provinces for treatment and disposal [46].

3.5.8. North West

This province seems to be one of the best in the country in terms of medical waste management. A nationwide survey accorded it the highest score of 67% among the provinces in the area of budget for medical waste management necessities and the health staff were recorded to be practicing segregation of medical waste from source [35]. However, a disparity was recorded on the type of containers being used in the facilities across the province in the treatment of medical waste; while some facilities use disposable containers, others adopt the reusable ones. Some facilities dispose of their waste through other hospitals, while the rest outsource it to private companies [35].

3.5.9. Western Cape

An earlier study identified no quantification, no proper segregation of waste and non-labelling of containers with biohazard symbol as problems of medical waste management in this province [55]. A later study rated the province as being marginally adequate in the provision of manuals on medical waste handling for its medical staff with an improvement in the practice of segregation of hazardous from non-hazardous waste at the point of generation [35]. The province was also found to be marginally adequate in the provision of the required immunization for its staff. Reusable containers are being used by all the health facilities for medical waste treatment because of the availability of a provincial policy [35].

CONCLUSION

This study has shown that medical waste is being poorly managed in many health facilities in all the provinces of South Africa. An absence of a national policy to guide all the provinces in applying uniform practice of medical waste management may have contributed much to this, however, in the provinces and health facilities where guidelines have been developed to manage medical wastes, the guidelines are either not being enforced or there is no sufficient equipment to manage the waste as recommended by the guidelines. This shows a need for formulation and enforcement of the national policy, the adequate budget for medical waste by the national government and the provincial government, regular training of health staff and waste handlers as well as construction and monitoring of treatment facilities and disposal sites.

In the course of this study, very few publications which detailed practices of medical waste management in South African health facilities were found; this necessitated consultation of unpublished dissertations and theses. On the contrary, more materials are available on the management of general waste. This suggests that there are fewer studies conducted on medical waste compared with general waste and that many studies on medical waste are not published. In the light of the dangers posed to the public posed by improperly managed medical waste, it becomes imperative that more studies be conducted in both rural and urban health facilities of all the provinces to discover the current practices and challenges of medical waste management. Results of such studies should be widely disseminated so as reach all stakeholders in order to improve the management of medical waste in South Africa.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

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