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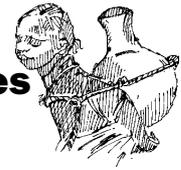
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## Characterization and management of solid hospital wastes

A.O. Coker, K.A. Sikiru, M.K.C. Sridhar and A.Y. Sangodoyin, Nigeria

GENERALLY, THERE HAS been a paucity of reliable data on the characterisation and generation rate of hospital wastes in Nigeria. Close to the dawn of the third millennium, there is no definite environmental policy on hospital waste management in Nigeria. Yet, the populace continue to experience the adverse impacts of poor management of hospital waste evident by littering of streets with used syringes, discarded blood vials, needles, empty prescription bottles etc. Worse still, hospital wastes otherwise called medical wastes have been listed as infective and hazardous wastes (Hrudey, 1992). The hazards arising from generation of wastes has generally been of great concern to environmental health engineers in developing countries (Sangodoyin and Osaigbovo, 1992). The fact that a sizable 60 per cent of the hospitals in Ibadan, Nigeria are privately-owned does not help the matter, as such private owners are rather keen on maximising profits than giving due attention to the menace of hospital wastes (Coker et al, 1998). Given the importance of basic data on waste generation for effective management of hospital waste in Ibadan, Nigeria, an investigation was carried out in 1998 to collect basic information and data such as generation rate and composition of wastes from three strategically selected hospitals in this Nigeria's vast city. This paper summarizes the results of the field investigation and survey.

### Methodology

Due to the constraints of finances and logistics, only three major hospitals - one private hospital and two public hospitals in Ibadan metropolis were chosen for the survey. Alafia Hospital (Alafia), a large-sized hospital, and the oldest in Ibadan (established in 1938) was the private hospital while the names of the two medium-sized and large-sized public hospitals were respectively, Oni Memorial Children's Hospital (Oni) and Ring Road State Hospital (Ring Road).

The field investigation was carried out using the two techniques, of questionnaires administration and participant observation strategy. The questionnaires were administered to both the hospitals administrators and the hospital staff ranging from the Head of the hospitals to the minimum paid worker. The existing waste management of the premises with respect to storage, collection, transportation and final disposal was evaluated. Information, regarding the staff strength, services available, type of wards/units, number of beds, average bed occupancy rate, existing waste management system, adequacy of the protective wear provided, profile of wastes handlers, gender issues, financial

aspects and so on were collected through the administered questionnaires. The participant observation strategy entailed the analysis of the medical wastes. The solid medical wastes generated in each ward or unit of the hospitals were collected (with the assistance of the cleaners and nurses who are largely women) in labelled polythene bags. The staff of each shift were instructed (having got the firm commitment and cooperation of the hospital administration) to place all the wastes being generated inside the labelled bags as appropriate. After twenty four hours, the bags were collected by the research team members and replaced with new labelled polythene bags till the end of the 7-day monitoring exercise. Later on, the sorting of the wastes on a sorting plate was carried out by wearing thick rubber gloves. The composition of the wastes from each hospital was estimated by sorting into eleven main categories namely domestic wastes; human anatomical wastes; swabs and absorbants; glass; beddings, shavings, paper and faecal matter; gauze, pads, garments and cellulose; sharps and needles; fluids and residuals; plastics, PVC and syringes; alcohols and disinfectants; and finally infectious wastes. The sorted wastes were then weighed. The characterisation was also done as per whether general waste or infectious waste.

### Results and discussion

Table 1 summarises the detailed data on generation rate for seven to fourteen wards or units of different categories of the three selected hospitals. It is apparent from Table 1 that the average waste generation rate per head per day ranges from 13g/h/d at the Injection room to 632.5g/h/d at the Labour ward for Alafia hospital. It also shows that the minimum generation rate of 3.84g/h/d at Oni occurred at the Child Health Clinic while a peak of 229g/h/d was obtained at the Neonatal ward. From the Table, the average generation rate varies from 2.4g/h/d at the Eye clinic to 567.9g/h/d at the Maternity unit of Ring Road. The considerably minute quantity of solid hospital wastes generated at the eye clinic is not surprising given the fact that the kinds of therapy usually prescribed there do not lead to generation of much wastes. Generally speaking, the variation in the waste generation rate from one ward or unit to another within each hospital is normal as expected, as it depends upon the nature of activities in a specific ward. For example, majority of the patients attending the injection room at Alafia were out-patients, generating typical light-weight wastes such as needles, whereas relatively heavy and moisturised wastes such as soaked swabs, gauze, pads,

disposable napkins etc were generated by the largely in-patients at the labour ward. Similar reason accounts for the high value of waste generation rate at the Neonatal ward at Oni.

The average generation rate in g/head/day for the two public hospitals, Oni and Ring Road varying from 97.5 to 167 gives an average of 132.3 as against the value of 186.9 (about 41 per cent higher) obtained from the private sector Alafia hospital. This is comparable to the 50 per cent higher value obtained for a private hospital in Karachi vis-a-viz the average for four public hospitals in the same country (Waseem et al, 1995). In the Nigerian context, it appears that the higher value of solid medical waste in the privately-owned Alafia hospital is due to the fact that most private hospitals are generally patronised by the middle class and high class citizens who can afford the more exorbitant charges compared to the public sector hospitals owned largely by the governments. Medical treatment in such public hospitals are substantially free with minimal charges payable. Since such public hospitals are largely patronised by the poverty-stricken masses, anything goes. For example some women patients were seen keeping the used needles and syringes at Ring Road with the intention of reusing. As a matter of fact, scavenging of used materials was noticed to be commencing from the wards at Oni hospital prior to the extensive practice at the unmanaged dump site located behind the hospital.

The field investigation revealed useful findings on the state of things in the three surveyed hospitals. Hospital waste management in all the surveyed hospitals were in a deplorable state. Alafia had just an open dump site where the bulk of the solid medical wastes were being burnt openly. It was thus a common place for scavengers (largely women) to pick some of the disposed wastes for resale and reusing particularly since the dump site is not fenced. Moreover, the disposal site produces leachates which is likely to be contaminating the nearby water source.

At Oni hospital, the adjacent open dump used to dispose the solid medical wastes is an eyesore. Being located in a fairly-densely populated district in Ibadan, the adverse effects of the dump site is being seriously felt. Since unfenced, the activities of wind and rain aggravate the situation. The situation at the government-financed Ring Road Hospital is hardly better. The cleaners collect the wastes produced in each ward in drums which are moved by wheel barrows to the dump site behind an unused building in the hospital's premise. Here, the wastes are burnt without regards to the effect of the smoke on the environment.

With a sound appreciation of the increasing problem of hospital waste management in Nigeria at the back of our minds, each of the three surveyed hospitals was approached on feasible ways of combating the problem. Quite surprisingly, the best response was got from the authority of the privately-owned Alafia hospital. Using the collected data supplemented with other relevant designed information, a simple incinerating device of 0.17m<sup>3</sup> capacity (volume of waste feed at a cycle) was designed for Alafia. Incorporated

in the device was a cyclone separator, which enhanced the deposition of heavier particles of the flue gases in the conical portion of the separator, the exhaust gas being later discharged at an height of 6m above ground level into the atmosphere.

In the case of the public hospitals - Oni and Ring Road, it was found out that the Cleaners and Ward Maids designated for the collection exercise need were neither trained nor equipped. This was apparent from the questionnaires and our observations. They are also highly exposed to risks of infection or contamination due to non-provision of protective materials. It was also found out that the skip provided by the government to collect the hospital wastes are rarely used; largely because clearance of collected wastes from the skip may not be done for weeks. They are supposed to be cleared daily or on alternate days and transported to the dumping site at Aba-Eku, a village near Ibadan. This is supposed to be a sanitary landfill but has been literally turned to an open dumping site, with the residents of Aba-Eku seriously complaining at the moment.

## Conclusions and recommendations

Based on the above presentation, the following conclusions can be drawn:

1. Average generation rate for the hospital waste based on the measurement of three major hospitals was found to be about 150g/head/day for Ibadan, Nigeria.
2. It is likely that a large-sized private hospital following well established standard international practice of patient care and hygiene will generate more wastes than a public hospital running on limited facilities.
3. No proper waste management practice exists in all the surveyed hospitals, which are major hospitals in the city of Ibadan.
4. Lack of relevant training and equipments for the waste handlers was a common feature in all the surveyed hospitals, particularly in the public hospitals. This portrays the lip-service approach to the menace of hospitals waste problem in Nigeria.

It is therefore, recommended that:

- a. A nationwide consultation (perhaps starting on a city wide basis) on the management of hospital waste be organised to give room to the various concerned stake holders to address the issue as it affects Nigeria.
- b. Extensive research on the subject matter of hospital waste be funded at various levels to be able to have reliable data bank that will be useful for effective management of the wastes.

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**Table 1. Ward wise generation rate in Ibadan hospitals**

S/No.	Wards/Units	Generation Rate (g/head/day)		
		Alafia Hospital	Oni Hospital	Ring Road Hospital
1.	Medical Out Patient Unit/Injection Room/Immunization	13.0	-	23.4
2.	Post-natal	625.1	-	-
3.	Female Medical	127.5	-	124.3
4.	Dressing Room/Surgical/Out-patient	14.4	-	9.0
5.	Operation Theatre	93.4	-	407.0
6.	Male Surgical	78.9	-	290.2
7.	Special Room	77.2	-	-
8.	Laboratory	19.9	99.6	431.9
9.	Labour Room/Maternity	632.5	-	567.9
10.	Orthopaedic	-	-	20.8
11.	Psychiatric	-	-	20.3
12.	Casualty/Emergency Treatment Unit	-	73.7	-
13.	ENT/Eye Ward	-	-	66.7
14.	Haematology	-	-	50.7
15.	Physiotherapy	-	-	13
16.	Eye Clinic	-	-	2.4
17.	Family Planning	-	81.9	-
18.	Neonatal ward	-	229	-
19.	Ward I (Age 1-10years)/Paediatrics	-	48.7	-
20.	Ward II (1month - 1 year)	-	145.8	-
21.	Child Health Clinic	-	3.8	-
22.	Female Surgical	-	-	310.4
	Average	186.9	97.5	167.0

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