

▶ INTERNATIONAL PERSPECTIVES

Solid Waste Management Problems in Secondary Schools in Ibadan, Nigeria

Although most of the information presented in the Journal refers to situations within the United States, environmental health and protection know no boundaries. The Journal periodically runs International Perspectives to ensure that issues relevant to our international constituency, representing over 60 countries worldwide, are addressed. Our goal is to raise diverse issues of interest to all our readers, irrespective of origin.

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Abstract Inappropriate solid waste management practices in schools in less-developed countries, particularly in major urban communities, constitute one of the major factors leading to declining environmental health conditions. The objective of the authors' descriptive, cross-sectional study was to assess solid waste management problems in selected urban schools in Ibadan, Nigeria. Eight secondary schools with average pupil populations not less than 500 per school were selected randomly. Four hundred questionnaires (50 per school) were administered. In addition, an observational checklist was used to assess the physical environment. Paper and plastics were the most frequently generated wastes. Common methods of solid waste disposal reported were use of dustbins for collection and open burning. Major problems perceived with current refuse disposal methods by the study students were odors, pest infestation, and spillages. Littering and spillages of solid waste were also common features reported. Data suggested inadequate waste management facilities and practices in study schools. The lack of refuse bins may have contributed to waste spillages and the burning practices. Odors may have arisen from both the decay of overstored organic waste rich in moisture and emissions from refuse burning. This scenario poses a community environmental health nuisance and may compromise school environmental quality.

Introduction

Solid waste is an unavoidable by-product of human activities. Solid waste may be regarded as any reject material resulting from domestic activity and industrial operations for which there is no economic demand and thus must be disposed (Sridhar, 1998). Economic development, urbanization, and improved living standards in cities increase the quan-

tity and complexity of generated municipal solid waste (MSW). If accumulated, MSW leads to degradation of an urban environment, stresses natural resources, and leads to health issues (Central Pollution Control Board [CPCB], 2000).

Cities worldwide are facing higher level of pollution to multiple environmental media. The situation in less-developed countries

(LDCs) is more acute, partly caused by inadequate provision of basic services like sanitation facilities, transport infrastructure, and waste collection (United Nations Center for Human Settlements, 2001). Municipal corporations of LDCs are not able to handle the increasing quantity of MSW, which leads to uncollected MSW on roads and in other public places.

From the days of primitive society, humans and animals have used the resources of the earth to support and to dispose of wastes. Historically, the disposal of human and other wastes did not pose a significant problem because the population was relatively small and the land available for assimilation of waste was relatively large (Tchobanoglous, Theisen, & Vigil, 1977). The present day problem, however, has reached a great proportion in LDCs including Nigeria.

In Nigeria, the rate of generation of solid wastes increases by the day with increases in urban populations. An estimated 44 pounds (20 kilograms) of MSW is generated per capita per year in Nigeria (Olafusi, 2004). The majority of this is collected and dumped on the surface of the ground, and is mostly transferred from one location to the other rather than being properly disposed of, a practice known to pose serious health hazards to the community (Nigerian Environmental Action Study Team, 1989). Similarly, Mabogunje (1980) and Filani (1987) documented how severe unsanitary conditions characterized urban centers. Inadequate provisions exist for dealing with MSW, which leads to air and water pollution.

Every school generates waste arising from routine activities such as classwork, sweeping, serving of food, and bush cutting. The common types of solid wastes found in various schools in LDC communities include paper, grass, nylon (in the manufacture of pure water bags and biscuits, lollypops, ice cream, and sweet or candy wrappers), sugar cane, maize or corn cobs, and groundnut shells (Wahab, 2003). Other forms of wastes may also be found on school premises, and these may not have even been generated directly by pupils and teachers.

Economic development, urbanization, improved living standards in cities, and increase in enrollments of schoolchildren due to government policies in LDCs increase the quantity and complexity of generated solid waste in schools. If accumulated, this class of MSW may lead to degradation of the urban environment, stresses on limited natural resources, and may lead to various health issues (CPCB, 2000). Globally, most public schools are facing a high level of pollution. The situation in LDCs such as Nigeria is more acute, partly because of the lack of adequate solid waste disposal facilities (Fajehisan, 1998).

The problems associated with the disposal of wastes in public places including schools are numerous and they include littering of food remains and other discarded materials. This can lead to the breeding of rats and other vectors of public health importance, i.e., biological agents of exposure (Sridhar & Ojediran, 1983). Rats can also destroy school materials such as paper and valuable documents. The U.S Public Health Service, for example, published results tracing the relationship of 22 human diseases to improper solid waste management (Mabogunje, 1968). In Nigeria, sanitation including proper MSW management is commonly thought of as one of the indicators of available primary health care services in the country.

After the home, schools constitute the next most important place of learning and where children spend most of their time, in particular indoors for study and outdoors while at play. Therefore, the purpose of our study was to assess knowledge and awareness of the problems associated with MSW management in selected secondary schools in Ibadan, a rapidly growing city in southwestern Nigeria, to help plan future, appropriate, and remedial measures.

Materials and Methods

Study Area

Ibadan is the capital of Oyo State in southwestern Nigeria and is the largest city in West Africa after Lagos, Nigeria. An indigenous African town historically, Ibadan the present day city lies between latitude 7° and 9°30' east of prime meridian (Fajehisan, 1998). Ibadan covers a land area of about 7.5 miles (12 km) radius at an altitude ranging from approximately 500 to 700 ft. (about 150 to 210 m) with isolated ridges and peaks rising to about 900 ft. (about 270 m). The present population of Ibadan is over 3 million. Ibadan presents a typical picture of many African cities, each known for having the old town area (inner core), the transitional area, and peripheral areas due to urban sprawl. Most of the people are engaged in petty trading and small-scale business and trading, while others are civil/public servants. Ibadan has several public, private, and social amenities such as hospitals like the University Teaching Hospital, banks, industries, post office, institutions of higher education like the University of Ibadan, research institutes such as the International Institute for Tropical Agriculture, a water corporation, and over 300 schools made up of both public and private nursery, primary, and secondary educational facilities.

Study Design

Our study was a descriptive cross-sectional design. It included participant questionnaire administration, focus group discussions, key informant interviews, and a structured technician walk-through observations checklist.

Sample Selection

Eight secondary schools with an average population of not less than 500 students were randomly selected for the study. The schools, which are all located in the Ibadan metropolitan area, are defined as Bishop Philips Academy (BPA), Ikolaba Grammar School (IGS), Bashorun Ojoo High School (BOHS), Oba Akinbiyi High School (OAHS), Mount Olivet Grammar School (MOGS), Loyola College (LC), Anglican Commercial Grammar School (ACGS), and Aperin Boys High School (ABHS).

Questionnaire Administration

Four hundred questionnaires (50 in each school) were administered to respondents from participating schools. Respondents were selected through stratified random sampling from a sampling frame of the number of classes available in the selected schools. Consent was sought and obtained from the school administration, and participating students and staff, based on interest expressed, before the surveys commenced. The questionnaire was divided into three sections: sociodemographic information, environmental characteristics, and health conditions. The technician walk-through observations checklist was comprised mainly of environmental indicators expected in a school environment (Shendell et al., 2002; Shendell, 2003).

Data Analysis

Data were analyzed using the SPSS 15 statistical package. Frequency distributions and other descriptive statistics such as percentages were used for the present data summary.

Results and Discussion

Student Demographic Distribution

The students consisted of 213 (53%) females and 187 (47%) males. This was slightly different than in an earlier study by Sridhar and Ojediran (1983) on the problems and prospects of refuse disposal in Ibadan city, which recorded a higher male student enrollment in some schools in Ibadan. The respondents were in the age range of 15–17 years consisting mainly of students in the senior class (S.S. 1–S.S. 3), which is equivalent to 10th to 12th grades in the U.S.

Waste Characteristics in the Schools

Paper appeared to be the most commonly generated form of MSW on campus across study schools at waste collection points (Table 1), followed by plastics such as cups, plates, and nylon bags. BOHS, OAHS, and ABHS reported leaves as part of the waste generated in their schools. None of the schools reported wood as part of waste generated in the schools. Food waste and grit were also observed in the school environments, especially in waste collection points.

TABLE 1

Components of Solid Waste Generated at the Study Schools, Ibadan, Nigeria

Components of Solid Wastes	Name of Study School								Total # (%)
	BPA	IGS	BOHS	OAHS	MOGS	LC	ACGS	ABHS	
Paper	45* (90%)	45 (90%)	25 (50%)	10 (20%)	30 (60%)	50 (100%)	48 (96%)	44 (88%)	297 (74.3)
Plastic	5 (10%)	5 (10%)	2 (4%)	1 (2%)	20 (40%)	-	2 (4%)	3 (6%)	38 (9.5)
Glass	-	-	-	5 (10%)	-	-	-	2 (4%)	7 (1.8)
Leaves	-	-	15 (30%)	34 (68%)	-	-	-	1 (2%)	50 (12.5)
Cans	-	-	2 (4%)	-	-	-	-	-	2 (0.5)
Nylon	-	-	6 (12%)	-	-	-	-	-	6 (1.5)
Total	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	400 (100.0)

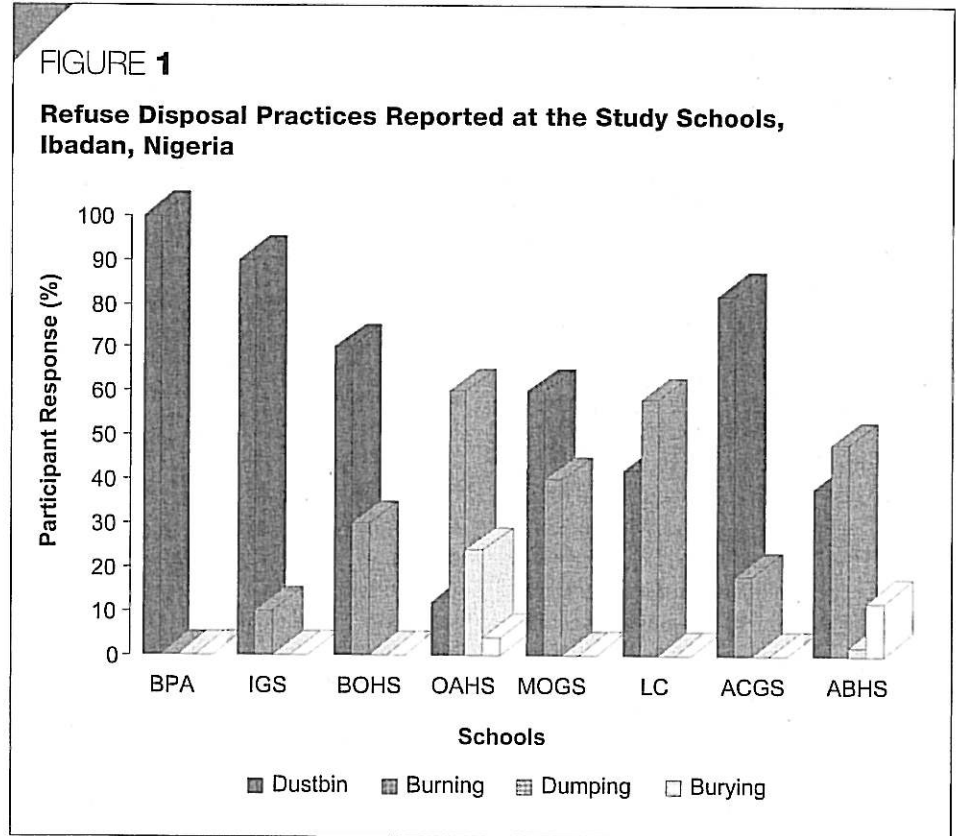
*Number of waste collection sites.

Solid Waste Disposal Practices

Results of the various data collections instruments previously described documented how the use of dust bins and open burning were the major methods of solid waste disposal (Figure 1) in the school premises across the eight study schools. The waste disposal facilities were situated in the school premises, in general within about 160 ft. (about 50 m) of occupied school buildings. The result of direct observations using the checklist suggested open burning was the major form of waste disposal in the school premises with the exception of BPA, which had an improvised incinerator. The majority (62%) of the respondents across the eight study schools reported MSW disposal facilities were situated in general at a distance less than about 30 ft. (about 10 m) from occupied school buildings within the school premises (Table 2).

Other Problems Associated With Solid Waste Management in Selected Schools

Other issues associated with MSW management in these study schools were reported to be odors, pests, and spills. At IGS, 18% reported odors, another 32% reported pest attraction, and 10% reported spills. At BOHS, 56%, 20%, and 5% reported odors, pest infestation, and spills, respectively, while 14% reported other issues. At OAHS, 80% reported odors and 5% reported pest attraction while 2% reported spills and 8% reported other issues. At MOGS, 40% reported odors,



30% reported pest attraction, 20% reported spills, and 10% other issues. At LC, 28% reported odors, 48% reported pest infestation, 20% reported spills, and 2% reported other issues. At ABHS, 40% reported odors, 10% reported pest infestation, 40% reported spills, and 6% reported other issues. For ACGS, 18% reported odors, 16% reported

pest attraction, and 62% reported spills, while only 4% reported other issues. Only BPA had no reported or observed record of issues associated with refuse disposal at the time of our study.

The potential health and environmental quality issues associated with these have a potential for grave consequences. Open

TABLE 2

Access to Solid Waste Disposal Facilities Reported at the Study Schools, Ibadan, Nigeria

Access to Disposal Facility	Name of Study School								Total
	BPA	IGS	BOHS	OAHS	MOGS	LC	ACGS	ABHS	# (%)
<10 m	27* (54%)	22 (44%)	30 (60%)	8 (12%)	30 (60%)	19 (38%)	37 (74%)	19 (38%)	192 (48.0)
10 m	15 (30%)	16 (32%)	10 (20%)	30 (60%)	20 (40%)	7 (14%)	9 (18%)	24 (48%)	131 (32.8)
>10 m	8 (16%)	12 (24%)	10 (20%)	12 (24%)	0 (0%)	24 (48%)	4 (8%)	7 (14%)	77 (19.2)
Total	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	50 (100%)	400 (100.0)

*Number of waste collection sites.

dumping of solid wastes generates various environmental and health hazards. The decomposition of organic materials produces methane, which can cause fire and explosions, and contributes to global climate change. The biological and chemical processes likely taking place in open dumps produce strong leachates, which pollute both surface water and groundwater sources. Fires periodically break out in open dumps, generating smoke and contributing to air pollution. In the Mexican city of Tampico, on the Gulf of Mexico coast, an inferno occurred for over six months at the local open dump. Fires at open dumps often start spontaneously by the methane and heat generated from biological decomposition (Medina, 2003). This situation is also dangerous because in that study, and in our study, most of the open burning usually occurred near the classrooms.

In addition, a situation characterized by persistent financial resource constraints represents one of the factors hampering MSW management in Nigeria, especially in public urban areas including schools (Adewole, 1992; Enugu State Environmental Sanitation Agency, 1991; Lagos State Waste Disposal Board, 1991; United Nations Development Program, 1978; Zubairu, 1992). Unlike in developed countries, which typically receive enough revenue allocation from the state or federal budget, most state agencies in LDCs like Nigeria operate with little subsidy from the state or federal governments. Apart from funding, Hasan (2004) reported public awareness, community participation, appropriate legislation, and strong technical

support are key components to successful MSW management.

Subramanian (2005) argued environmentally sound management of MSW has received a prime focus by both the international community and most national governments. This is evidenced by recent papers about MSW in other LDCs on various continents or island nations (Fiorucci, Minciardi, Robba, & Sacile, 2003; Goorah, Esmyot, & Boojhawon, 2009; Henry, Yongsheng, & Jun, 2006; Nasrabadi, Hov-eidi, Bidhendi, Yavari, & Mohammadnejad, 2008). Thus, a comprehensive MSW management regime should include administrative, financial, legal, planning, and engineering functions (Ramachandra & Varghese, 2003). This system, if well implemented, could reverse the current modicum of standards in MSW management present in most urban centers where many schools are located.

Conclusion

Our study in secondary schools in Ibadan, Nigeria, suggested waste management facilities are inadequate. Waste sorting and segregation is not practiced and as a result recycling and other proper disposal practices become cumbersome or are not practiced. Improved hygiene education and sanitation are important requirements, and if their introduction would be mainstreamed into the school system then the resulting increase in proper MSW management would reduce disease burden and hence enhance the environmental public health status of the community and its schoolchildren. A clean, safe, secure, and enabling learning

environment is an indispensable prerequisite to ensure the optimization of a child's academic potential. Government and other stakeholders should provide the necessary support in terms of infrastructure improvements and MSW management amenities, including financial, human, and technological resources, to make schools more conducive for learning and to promote good health. 🗑️

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