

# Medicines Wastage at a Tertiary Hospital in Dar Es Salaam Tanzania

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## ABSTRACT

Medicines wastage is a problem in health care delivery systems, however the extent of this wastage and associated factors in many health care settings is less known. The objective of this study was to assess medicines wastage and its associated factors in a hospital setting in Dar es Salaam city Tanzania. Specifically to determine major types of medicines wasted and to identify factors contributing towards the wastage. A cross sectional study was carried out at a tertiary hospital, where patient files were analyzed for last admission treatment information for the year 2012. Results show that about 56.3% of medicines prescribed were dispensed to patients. Out of the dispensed medicines, 730 medicines dosages were wasted. Anti-infective medicines wastage was 18.9%, cardiovascular medicines (8.9%) and the other categories was 23.7% of the total medicines dispensed. The factors contributing to medicines wastage were excess (44%), pilferage (26.5%), patient death and change/stop of medicines. Excess supply and pilferage were the major contributing factors. Measures should therefore be taken to mitigate the sources of wastage identified by this study so as to ensure availability of medicines and their rational use in hospital settings.

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## INTRODUCTION

Medicines are important in health care delivery system and when available and managed well have been shown to improve customer satisfaction and patient attendance. Improper management of medicines leads to medicine wastage. A number of studies done in developed countries have verified that medicine wastage is a big problem to healthcare delivery systems. In Germany and New-Zealand, 10,603 and 1399 of unused packages of medicines were collected respectively (Bronder & Klimpel, 2001; Braund *et al.*, 2008). Medication wastage investigated in developed countries is mainly on medicines returned to pharmacies. Studies show that the volume and cost of medicines that are returned to pharmacies represent only a small proportion of the overall medicines waste; for example only 23% in USA and 22% in New-Zealand of unused medicines were returned to pharmacies (Braund *et al.*, 2009). In developing countries the magnitude of medicine wastage is less known, in these countries medicines which remain unused due to various reasons such as patient death, side effects, change in prescriptions etc are normally retained in community (people's homes) for future use.

This was observed by (Jassim, 2010) who found an average of 15 medicines being stored per household out of which 45% was declared as leftovers and 23% were kept for future use.

The pattern of pharmaceutical categories of medication wastage also differs among countries. In Alexandria 657 drugs were returned to pharmacies, and majority of the medicines returned were cardiovascular and anti-infective medicines (Ibrahim *et al.*, 2012). A similar trend was found by (Al-azzam *et al.*, 2012). The quality of these medications is also debatable, a study done in a Malaysian community found that about 69% of medicine possessed did not have names while 91% of them did not have expiry dates (Saleem *et al.*, 2012). Factors contributing towards medicine wastage are diverse. They depend upon the form of the medicine wastage investigated and features of the healthcare delivery system. Household surveys or returns to pharmacies pointed out patient death, medicine expiration, stop or change of prescription, patient felt better, side effects and patient adherence as the major contributing factors towards medicine wastage (Cameron, 1996; Cromarty and Downie, 2001; Braund *et al.*, 2008; Trueman *et al.*, 2010). Not much is documented regarding factors associated with medicine wastage in hospital settings. In Tanzania, the scale of medicine wastage both in community as well as in health care settings is less known. Therefore the purpose of this study was to assess medicines wastage and factors underlying this wastage at a tertiary hospital in Dar es Salaam Tanzania.

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## METHODS

This was a cross sectional hospital based study. It involved reviewing of patient medical files for the year 2012. The study was carried out at the internal medicine department of a tertiary referral hospital, situated in Dar es Salaam city.

Ten percent of the total annual admissions in the medical wards from January to December 2012 was used as sample size, this gave a count of 614 patient files. Patient's demographic and treatment information was retrieved from the files, including treatment history of the patient in which medicine prescribed during hospital stay, their outcome together with their dispensing status was recorded. The dispensing status of medicines from medical files was supplemented with dispensing status of the hospital pharmacy database. The database was used to provide information on the list of all the medicine dispensed, to whom it was dispensed and quantity the dispensed. Any discrepancy that arose was noted. The treatment charts were used to ascertain whether medicines were actually administered to patients. Medicines wasted in this study was defined as medicines which have been dispensed to a patient but were unused by the patient.

This was obtained using the following formula:

$$\text{Medicines wastage [W]} = \sum [D] - \sum [C]$$

$$\text{Proportion of medicines wasted [P\%]} = \frac{\sum [W]}{\sum [D]} \times 100$$

Where by:

D = Medicines dispensed to patients

C = Medicines dispensed to patients which were fully consumed

W = Medicines wasted

P = Proportion of medicines wasted

Ethical clearance was obtained from Muhimbili University of health and Allied Sciences (MUHAS) Ethical Review Committee. Permission to conduct the study at the hospital was obtained from the Executive Director of the hospital.

Data was analyzed using SPSS version 20. Frequency of change/shift of the prescribed regimen as well as percentage of medicines used without being documented was used to find out if there was medicines wastage. The wasted medicines were then grouped into pharmacological categories as well as dosage form categories for better analysis of the wastage. Other descriptive parameters such as mean, standard deviation, minimum, maximum, and range were calculated for different variables.

Statistical analysis to find out an association of different variables under investigation was done using chi square ( $\chi^2$ ) test or Fisher Exact test when appropriately required. Confidence interval of 95% was applied and a p value of less than 0.05 was considered statistically significant.

## RESULTS

The mean age of the study population was 44 years (SD 18.5), with minimum age of 11 years and maximum of 88years. Hospital stay for these patients ranged from 0 to 104 days with

median of 4 days. One thousand four hundred and eighteen medicine dosages (1418) were dispensed, out of which 730 (51.5%) medicines were not used. Two kinds of medicine wastage were identified, these were leftovers and non leftover medicines. Leftovers were those medicines dispensed to patients and remained unused while non-leftovers were those dispensed out but were not used by patients as they were not in the treatment regimen. The percentage of non leftover medicines was 13.8%.

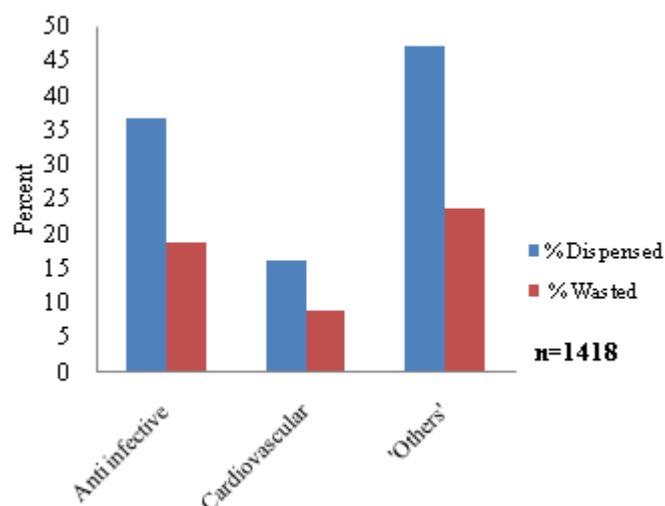


Fig. 1: Proportion of medicine categories dispensed and wasted.

Medicines wasted in this study were categorized into three major groups i.e anti-infective medicines, cardiovascular medications and 'others' medicines. Out of the total medicines dispensed (n=1418), it was found that anti-infective medicines were wasted by 18.9% followed by cardiovascular medicines and others as shown in figure 1. Factors contributing to medicine wastage were identified as excess, pilferage, change and death. Excess was a major factor leading to wastage for all medicines wasted in this study. ('excess' which may also be called 'excess supply' refers to medicines dispensed to patients which exceeded the amount needed for the treatment duration prescribed). The percentage contribution to wastage for each factor is shown in figure 2.

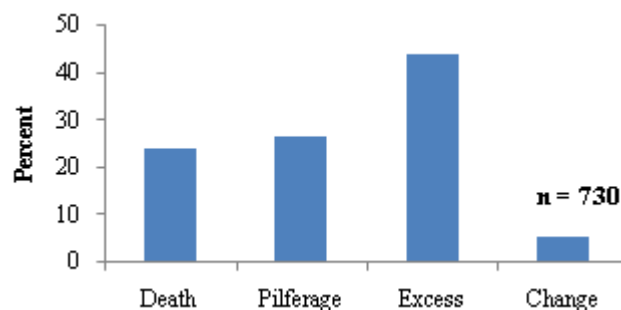


Fig. 2: Factors contributing to medicines wastage.

The influence of different factors on medicines wastage for the different categories of medicines is shown in the figure 3. Overall

anti-infective medicines were pilfered more while cardiovascular and the 'other' categories had medicines in excess as a major contributing factor to wastage.

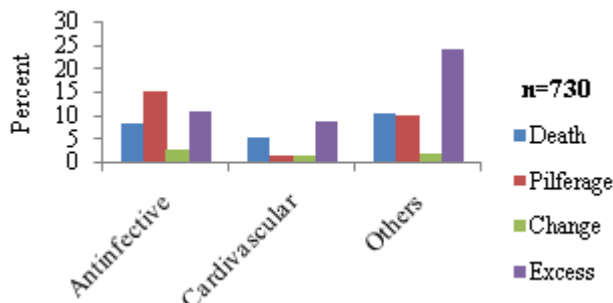


Fig. 3: Factors leading to wastage for different categories of medicines.

Major sources of wastage for antifungals are shown in fig 4. For antibiotics pilferage, excess, and death contributed much to the wastage the rest are shown in figure 4.

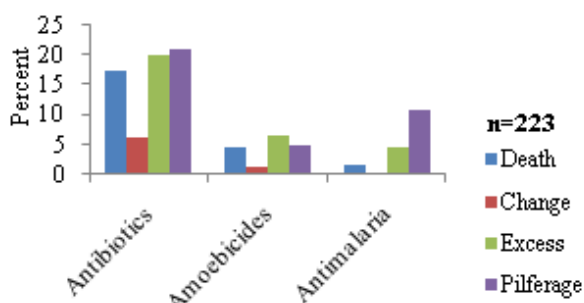


Fig. 4 : Factors leading to wastage of anti-infective medicines.

About 16.3% (n=231) of medicines dispensed were the cardiovascular medicines, in which 54.5% of cardiovascular medicines were wasted. Major causes of wastage for all cardiovascular medications were by excess quantities followed by death (fig 5).

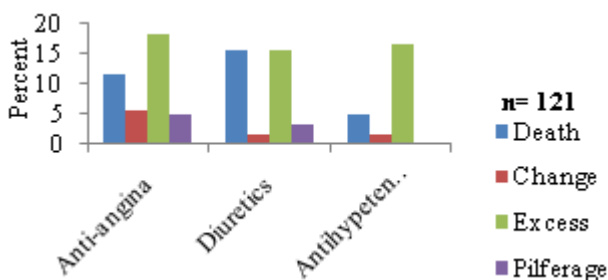


Fig. 5: Sources/causes of wastage for cardiovascular medicines.

For 'other' categories of medicines the major contributors of wastage for this category were excess medicines.

Analyzing Medicines wastage by dosage forms showed that four types of dosage forms were dispensed to patients, these were oral solids, injections, topical preparations and oral liquids. In general oral solids medicines had high percentage of wastage (40.6%) followed by injections (9.2%) figure 6. Analysis of medicine wastage with demographic information revealed the following:

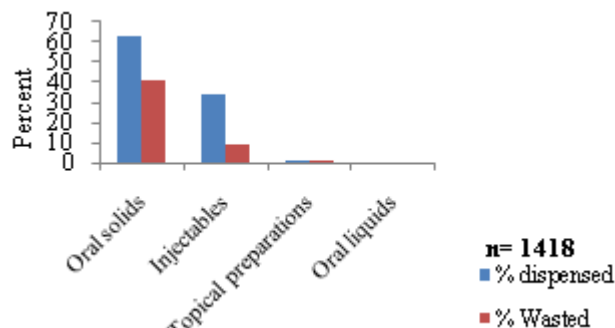


Fig. 6: Medicines wastage by dosage forms.

**Sex**

In general medicines were dispensed more to female patients (51.1%) compared to male patients. Overall female patients had more wastage than male patients and the proportional difference was statistically significant (p=0.001) (Table 1).

**Hospital stay**

Medicine wastage for the patients who stayed briefly in medical wards was greater (64.8%) than those who stayed longer. It was noted that Medicine wastage decreased as length of hospital stay increases (p=0.0001) (Table 1).

Table. 1: Medicine wastage with respect to sex, discharge outcome, age and hospital stay.

			Wastage	No wastage	Total	P value
Sex	Male	n(%)	326 (47.1)	367 (52.9)	693 (100)	0.001
	Female	n(%)	404 (55.7)	321 (44.3)	725 (100)	
Outcome	Discharged	n(%)	535 (53)	493 (47)	1048 (100)	0.061
	Dead	n(%)	175 (47.3)	195 (52.7)	370 (100)	
Age group	1 - 14 yrs	n(%)	13 (37.1)	22 (62.9)	35 (100)	0.023
	15-24 yrs	n(%)	114 (50.9)	110 (49.1)	224 (100)	
	25-44 yrs	n(%)	251 (49.3)	258 (50.7)	509 (100)	
	45-64 yrs	n(%)	201 (50.5)	197 (49.5)	398 (100)	
	65+ yrs	n(%)	151 (59.9)	101 (40.1)	252 (100)	
Hospital stay	<7 days	n(%)	385 (64.8)	209 (35.2)	594 (100)	0.0001
	7+ days	n(%)	345 (41.9)	479 (58.1)	824 (100)	

n = frequencies of medicines.

**DISCUSSION**

This study aimed at investigating medicines wastage and associated factors in a hospital setting. Frequency of medication wastage was 51.5% out of the total medicines dispensed. A study by (Trueman *et al.*, 2010) which assessed wastage in community and in home care settings indicated that 20% of the community possessed medicines, and at least one of the kept medicines was unused. While a study done by Al-azzam revealed that about 34.7% of the medicines found in homes were not in use (Al-azzam, 2012). Two kinds of the medicines wastage were observed in our study and these were the leftovers and non-leftovers. The leftovers were those medicines that remained unused, these accounted for two third of the total wastage and the non-leftovers (pilferage) contributed to one third of the total wastage. With other studies sources of wastage observed mostly were medicine leftovers (Al-azzam *et al.*, 2012; Cameron, 1996; Saleem *et al.*, 2012) and to a lesser extent medicines used by patients without being documented (Nava-Ocampo *et al.*, 2004). Medications

which were wasted more in this study were the anti-infective and cardiovascular medicines. It is well known that the leading causes of morbidity in medical wards of developing countries are characterized by both infectious and non-infectious diseases. HIV/AIDs, TB, Pneumonia, malaria are the most leading infectious diseases, whereas cardiovascular disorders and diabetes mellitus are the major non-infectious diseases in medical wards (Mengistu, 2005) thus these conditions necessitate more utilization of these medications. Similar trends have been reported in other studies which assessed medicine wastage at household level and those medicines returned to pharmacy. Ibrahim *et al.* (2012) reported the return of anti-infective and cardiovascular medicines to community pharmacy to be 19 % and 19.4% respectively. In Jordan the most leading wasted categories were anti-infective, muscle-skeletal agents, while cardiovascular medicines were the least wasted (Al-azzam *et al.*, 2012). In developed countries categories of medicines wasted differ significantly from those of developing countries. Trueman *et al.* (2010) reported that the most wasted medicines categories in UK were gastro intestinal medicines, medicines for skin, pain medications and cardiovascular medicines. Four factors were identified in this study as the main contributors towards medicine wastage. These were patient death, excess, change/stop of medicines and pilferage. Excess supply contributed more to wastage with oral solids and also with 'other' medicine categories apart from anti-infective and cardiovascular medications and this was statistically significant ( $p=0.0001$ ). Reasons underlying this are likely to be poor tracking and documentation of medicines dispensed to patients, this resulted to patients' prescriptions being refilled before their due date. Shortage of human resource also could play a role in patients receiving excess medicines due to increased patient work load and hence decreases check and balance of the medicines during dispensing process.

Fourteen percent of the medicines dispensed were pilfered and were categorized as non-leftovers. These non-leftover medicines were not administered to patients as they were not in patient's treatment regimen. Most of these medicines were oral antibiotics, and topical preparations, cardiovascular medications were less pilfered compared to others and this was statistically significant ( $p=0.0001$ ). In literature pilfering tendencies has been encountered in systems where inventory management is weak. It contributes between 4 to 9% of overall waste in supply systems (Management Sciences for Health, 2010). In this hospital the inventory control has been shown to be accurate (Kagashe and Massawe, 2012), the possible cause of the pilferage may be due to weakness of the distribution system at the ward level which failed to detect unusual pattern of medicine use.

Patient death was the third cause for medicine to remain unused. This was also noted with other studies (Cameron, 1996; Al-azzam *et al.*, 2012; Saleem *et al.*, 2012). It is a fact that death is inevitable in hospital settings, yet the amount of medicine wasted can be minimized. In this study, injections remaining unused as a result of death were 52% of the total wastage and about 45% of the injections wasted had the duration of issue being more than the

prescribed course of treatment. Pharmacy department at this hospital had an in house dispensing strategy of initial dispensing of five days for oral solids with the exception of analgesics and three days for all injections in order to combat medicine wastage, to some extent this may have contributed to the excess amount of medicines especially during the refilling of prescriptions.

Medicine wastage caused by stop/change of medicines was only six percent, out of which anti-infective and cardiovascular medicines were most wasted. One of the reasons for change over could be an availability of the medicines. Other possible reasons revealed by other studies were adverse effects of medicines (Cameron, 1996; Al-azzam *et al.*, 2012) and inconvenience/difficult following instructions (Braund *et al.*, 2008).

## CONCLUSION

The study identified the existence of medicine wastage in medical wards. Medicine categories wasted were those commonly utilized by patients. These were the anti-infective and cardiovascular medications. Factors that contributed towards wastage were excess supply of medicines, death, pilferage and change/stop of medicines. Death and change/ stop of medicines are inevitable in hospital settings and these contributed less than one third of the total wastage observed. Excess supply and pilferage were the major contributing factors. Measures should therefore be taken to mitigate the sources of wastage identified by this study so as to ensure availability of medicines and their rational use in hospital settings.

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