

# The Quantitative Importance of DASRI in the Regional Hospital Center of Tetouan City, Morocco

Raoui Sidi Mohammed, Bougatouch Youssef, Chadli Brahim, Errachidi Faouzi, Chadli Nouredine

**ABSTRACT-** This work determined the quantitative importance of the daily production of hospital waste and the share of safe waste and DASRI in the 18 units of care of the Tetouan Regional Hospital Center over a period of four weeks (April 2017). The results showed a total monthly production of DASRI were 5985 Kg. The daily production was 0.92 Kg/bed/day. The typology of the DASRI revealed a dominance of infectious objects whose weight ranged from 130.50 Kg to 276.70 Kg. The placentas was 71.80 Kg to 87.50 Kg and the sharpness ranged from 0.60 Kg to 16.80 Kg. The average production of DASRI in the different units of care of the hospital has been variable. The high amounts were recorded in hemodialysis service (P = 50.33 Kg/day), emergencies (P = 36 Kg/day) and obstetrics (P = 30.77 Kg/day). The low productions were observed in ophthalmology and men's and women's surgery services.

**Index Terms-** Medical waste, production, DASRI, hospital, Tetouan city, morocco.

## I. INTRODUCTION

Hospital medical and pharmaceutical waste (DMP), by its nature and constitution, represents an infectious risk in a hospital environment and a source of pollution for the environment [1]. The demographic evolution, the progress of the medical technology and the improvement and the extension of the health care have led to an increase of the quantity of the production of the DMP [2]. The quantifying importance of medical and pharmaceutical waste produced in hospitals was discussed on World Standards Day 2012 by the International Organization for Standardization [3]. The interest in quantifying daily waste production in each health care facility lies in the knowledge of the weight and volume of waste produced daily [4]. In a hospital, waste production is related to the level of national income and the type of structure [5].

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This production depends on several parameters: litter capacity, the bed occupancy rate, the number of consultations per day, the degree of specialization of care practiced, the technical platform, the use of disposable equipment and management methods [6].

In Morocco, with a national litter capacity (public and private sectors) of 33.30 beds and the national average occupancy rate is 56%, health care facilities produce more than 21000 tons per year of DMP [7] of which 5979 tons per year are hazardous medical waste or DASRI (about 28%) [8]. The ad hoc evaluation of the quantity of medical and pharmaceutical waste is linked to the diversity of the institution's services and the use of disposable objects [9]. The regional hospital of Tetouan suffers as a whole from a number of human, material, financial and organizational constraints. There are no detailed and official statistics on the exact quantities and composition of medical and pharmaceutical waste produced at the Tetouan Hospital. To make an inventory of the DMP close to reality, it would therefore be more reasonable to quantify the DMP produced in this regional hospital in Tetouan.

## II. MATERIAL AND METHODS

### Study environment

This study was carried out at the level of all the care units of the regional hospital center of the city of Tetouan in northern Morocco. We proposed to study the DMP at this hospital for the following reasons: the city of Tetouan has one of the largest industrial units (ATHISA company) waste treatment in Africa, a processing capacity of 500kg per hour. This hospital is the largest health care institution in the Tangier-Tetouan-Al Hoceima region. It serves a population of approximately 612 and receives patients from five other provinces. It offers diagnostic services and specialized care, its functional litter capacity reached 330 with a bed occupancy rate of 65.98% in 2017. The characteristics and indicators of this hospital are shown in Appendix I.

### Methods

This study focused only on solid DMP weighed daily using a suspended scale every morning before evacuating them for a period of one month (April 2017). Other wastes are excluded (radioactive, chemical, large anatomical parts ...).

The DMP used are of two types : The DASRI or infectious waste, contained in the red bags, are represented by infectious objects (bandages,

contaminated dressings, swabs, tubing, gans ...), sharp and sharp objects (needles, blood collection and infusion equipment, broken bulbs ...) and anatomical waste (placentas). Risk-free DMP are contained in black bags, are represented by ordinary garbage, packaging, paper, uncontaminated items and rest of meal ...). Questionnaires were distributed to health personnel and semi-structured interviews were conducted with some stakeholders in the management of the DMP : the head of the hospital hygiene, the head of the nursing service, the head of the health department ATHISA company who offered us an observation sheet linked to the objectives of our work. Respect for confidentiality of information and anonymity has been guaranteed.

### III. RESULTS

At the Regional Hospital of Tetouan, during the month of April 2017, the quantity produced of the total DMP was 24220 Kg (mean = 807.33 kg/day). Safe waste represented an output of 18235 Kg (mean = 607.83 Kg/day) representing more than 75% of total DMP. The amount produced from infectious DASRI was 5985 Kg (mean = 199.50 Kg/day) and represented 24.71% of total DMP (Table I)

**Table I : Weekly production of without risk DMP and DASRI**

	total DMP (Kg)	without risk DMP (Kg)	%	DASRI (Kg)	%
week 1	5132	3687	71.84%	1445.20	28.16%
week 2	4200	3025	72.02%	1175.00	27.98%
week 3	6822	5510	80.77%	1312.10	19.23%
week 4	8066	6013	74.55%	2052.70	23.45%
monthly total	24220	18235	75.29%	5985	24.71%
average Kg/day	807.33	607.83	75.29%	<b>199.50</b>	24.71%

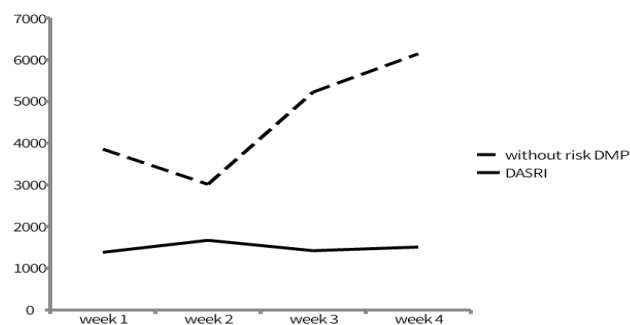
By reporting on the average bed occupancy rate and functional litter capacity, the total amount of DMP generated at the Tetouan regional hospital was 3.71 Kg/bed/day. The risk-free DMP produced were 2.79 Kg/bed/day. DASRI production was 0.92 Kg/bed/day (Table II).

**Table II : Production of without risk DMP and DASRI per occupied bed per day (Litter capacity = 330, bed occupancy rate = 66%)**

	weight (Kg)	production (Kg/bed/day)	%
total DMP (Kg/day)	807.33	3.71	100%
without risk DMP (Kg/day)	607.83	2.79	75.40%
DASRI (Kg/day)	199.50	<b>0.92</b>	24.60%

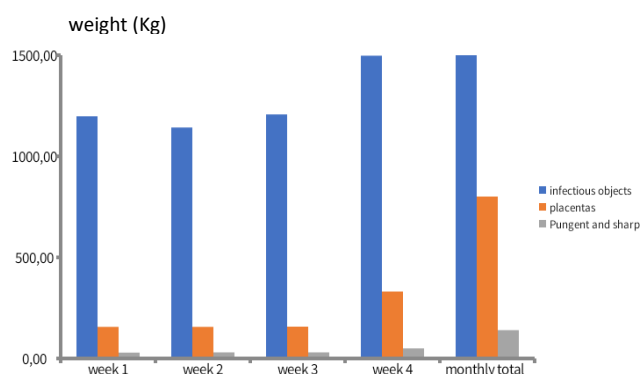
The weekly evolution of waste production showed safe quantities of DMP that increased during the fourth week of the month, while DASRI production remained almost constant throughout the study period (Fig 1).

weight (Kg)



**Fig1 : Weekly variations in quantities of DASRI and without risk DMP**

During the study period, the average proportion of DASRI by type revealed a significant amount during the fourth week (Fig 2).



**Fig 2 : Weekly quantity of DASRI types**

The daily production of infectious objects varied from 130.50 to 276.70 Kg (mean = 168 Kg/day), that of placentas varied from 71.80 to 87.50 Kg (mean = 76.70 Kg/day) and for quills and cutters from 0.60 to 16.80 Kg (mean = 4.66 Kg/day) (Table III).

**Table III : Daily production of DASRI types in Tetouan regional hospital during April 2017**

Today's date	DASRI (Kg)			Total (Kg)
	infectious objects	Pungent and sharp	placentas	
01et 2*	236.00	16.80	71.80	324.60
3	140.60	-	-	140.60
4	264.30	4.80	-	269.10
5	156.60	0.60	84.60	241.80
6	259.30	4.80	-	264.10
7	140.40	2.40	-	142.80
8-9*	232.30	16.20	73.50	322.00
10	163.20	-	-	163.20
11	217.60	4.80	-	222.40
12	138.40	3.00	83.20	224.60
13	245.20	6.00	-	251.20
14	145.70	-	-	145.70
15-16*	251.40	16.80	73.80	342.00
17	159.20	0.60	-	159.80
18	242.10	5.40	-	247.50
19	130.50	0.60	83.50	214.60

20	276.70	4.80	-	281.50
21	147.20	2.40	-	149.60
22-23*	265.60	16.20	87.30	369.10
24	155.70	-	81.50	237.20
25	263.80	5.40	-	269.20
26	135.50	0.60	74.50	210.60
27	269.40	8.40	-	277.80
28	166.00	2.40	-	168.40
29-30*	241.40	16.70	87.50	345.60
Total	5044.10	139.70	801.20	5985.00
average (Kg/day)				199.50

(\*) week end

The average weekly production of DASRI at the different hospital care units has been variable. The high amounts were recorded in the hemodialysis departments (mean = 50.33 Kg/day), emergencies (mean = 36 Kg/day) and obstetric service (mean = 30.77 Kg/day) (Table IV). The low productions were observed in ophthalmology and men's and women's surgery departments.

**Table IV : Weekly production of DASRI in hospital care units**

Units of care	DASRI (Kg)				Total	average Kg/day
	week 1	week 2	week 3	week 4		
Medicine man	23.50	20.90	23.30	39.10	106.80	3.56
Medicine weman	28	25.50	29.40	44.90	127.80	4.26
man surgery	18.40	21.30	18.20	19.80	77.70	2.59
weman surgery	19.40	18	17.80	24.60	79.80	2.66
ophthalmology	4.80	0.00	470	17.60	27.10	0.90
infant surgery	10.20	12.20	11.80	23.60	57.80	1.93
Traumatology	18.10	21.10	22.80	41.20	103.20	3.44
Reanimation	102	84	81	126	393	13.10
Cardiology	24.30	19.80	20.30	28.60	93	3.10
Pediatrics	30.20	31.10	32	36,80	130,10	4.34
Obstetrics	232	165	208	318	923	30.77
Gynecology	61.50	49.20	62.80	86.50	260	8.67
Emergency	240	266.60	229	351	1086.60	36.22
Hémodialysis	385	276	317	532	1510	50.33
Blood transfusion	87.00	47.30	87.70	142	364	12.13
Laboratory	19.40	18.70	18.80	45.80	102.70	3.42
Block Surgery	86.30	59.50	75.10	105	325.90	10.86
Emergency block	55.10	38.80	52.40	70.20	216.50	7.22
Total DASRI (Kg)	1445.20	1175	1312.10	2052.70	5985	199.50

## IV. DISCUSSION

By reporting on the results recorded during this study, we can see that the regional hospital of the city of Tetouan, generates significant amounts of the DMP, which exceed the average value registered at the national level. In our hospital, the huge production of hospital-level at-risk PMDs is clearly reflected in our results. The monthly amount of total DMP produced is 24220 Kg, of which DASRI is 5985 Kg, highlighting a major infectious risk for the health staff and the environment. These quantities could be explained by the general specificity of this hospital which provides important benefits and care activities. Indeed, this hospital represents the largest health facility in the region of northern Morocco, comprising six provinces, which receives a multitude of patients from various sources. This is observed by a high rate of litter occupation (66%) which exceeds that recorded in several Moroccan regional hospitals. NKUNA MUSEKELA argued that bed occupancy is a critical indicator of hospital performance, efficiency and effectiveness [10]. The production is revealed important in the hemodialysis and emergency departments that are recognized by their intense activity and are considered hot hospital services a high and regular admission rate. In our study, the daily production of the DASRI far exceeds that observed at the regional hospital of Meknes where the DASRI products were 0.24 Kg/day [11]. Average production at the national level is estimated at 3 Kg/bed/day, with variations, depending on the hospital discipline ranging from 1.5 to 4.5 Kg/bed/day [12]. The average production of DMP varies from one country to another. In Japan, it is 1.5 Kg/bed/day, in France it reaches 3.5 Kg/bed/day and 7 to 10 Kg/bed / day in the United States [13],[14]. The interest in quantifying daily waste production in each health care facility lies in the knowledge of the weight and volume of waste produced daily [15]. A study conducted in Algeria, at 69 establishments, showed that the average production of DASRI varied from 0,5 Kg/bed/day to 1 Kg/bed/day depending on the specificity of the establishments [16].

## V. CONCLUSION

The production of medical and pharmaceutical waste is a real danger to the Tetouan regional hospital and its environment. Daily production of DMPs increases over time. The recorded values (3.82 Kg/bed/day) exceed the average value observed at the national level. This production is very important in hemodialysis, emergency and obstetric services.

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## APPENDIX I

### Characteristics of the regional hospital centre of Tetouan

\*hospital creates : 1931

\*opening date : 1939.

\* Area : 9120 m<sup>2</sup>

\* Number of hospitalization services : 21

\* Number of laboratories : 02

\* Number of disciplines : 28

\* Humain resources

Staff category	Effective (2017)
medical staff	84
engineers	05
medical assistant	04
nursing staff	218
administrative staff	48
maintenance staff	10
<u>total</u>	369

\* Performance indicators of the regional hospital center

Indicators	year 2017
Regional population	612000
Functional litter capacity	330
Bed occupancy rate	66%
Number of admissions	23421
Day of hospitalization	79467
Average length of stay	3,4
Rotation interval	71
Turnover rate	1,75
Number of surgical interventions	Central block : 3463
	Ophtalmo block : 1086
	Emergency block : 1648
	Caesarean : 1387