

# Types of Hospital Waste and Waste Generation Rate in Different Hospitals of Faisalabad City, Pakistan

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**Abstract:** Hospital waste has been one of the major problems in underdeveloped and developing countries in recent times. The present study is an attempt to analyze hospital waste generation of Faisalabad city. Forty four hospitals were selected out of which five were public, two were semi-government, six were trust and thirty one were private hospitals with a minimum capacity of ten beds. It was very difficult to acquire exact data related to the waste generated by hospitals as these health care centers were not following the international standards to handle waste generation. The primary data were collected through questionnaire, formal and informal meetings, interviews with the hospital staff and through personal observations. The secondary data were collected from the office of the Executive District Officer Health and Environment Protection Department, Faisalabad. Data analysis showed that about 7646 kg/day waste was generated by these hospitals out of which 6529 kg (85.40%) was non-infectious and 1117 kg (14.60%) was infectious waste. The government hospitals' waste generation rate was 1.51 kg/bed/day, semi government 1.49 kg/bed/day, trust hospitals rate was 1.29 kg/bed/day and private hospitals 0.99 kg/bed/day. The overall waste generation rate of the hospitals of the study area was 1.28 kg/bed/day. It was recommended that the hospital staff must be trained to handle hospital waste so that the garbage should not create problems to human health.

**Keywords:** Hospital waste, waste generation, infectious waste, Faisalabad.

## 1. INTRODUCTION

Hospitals are a place where the problems of the patients are diagnosed, analyzed and treated. Hospital care is much important for individual's health, fitness and well-being. While treating the patients at hospitals, waste is being produced by the usage of medicines, injections and other treatment instruments. The waste which is explained with the word "hospital waste" relates to all waste, biological or non-biological i.e. useless and shall never be used again [1]. Hospital waste primarily comprises of three groups; domestic, medical and infectious waste. "Medical waste" refers to the materials gathered as a result of diagnostic process, healing and vaccination of human beings. "Domestic waste" refers to the part of medical waste that gets in touch with a patient carrying infectious disease and it is liable to produce infectious disease. Often the medical waste is labeled as infectious waste, if it is not collected separately from other waste [2]. Health waste contains all the waste which is produced by health care organization, laboratories and research centers. Moreover, it includes the waste originating from small sources i.e. such as health care centers and medical facilities availed at home like dialysis, insulin injection etc [3].

All the things which are used in hospitals for treatment are disposed off after usage and become a part of hospital waste [4]. Bio-medical waste substances are generated in clinics, dispensaries, nursing homes, blood banks, veterinary centers, research institutions and households [5]. Most of the bio-medical waste (around 75% to 90%) generated by the hospitals is similar to other municipal waste. The residual 10% to 25% of waste can be injurious, particularly for human or animal health. Medical waste plays significance role in the intensification and transmission of diseases [6, 7]. These infectious substances are a source of different diseases like cholera, plague, tuberculosis, AIDS (HIV), hepatitis (HCV), and diphtheria etc. The sanitary workers and sweepers are commonly affected because they directly handle the waste material at the point of generation. According to the WHO [8], 2 million people were infected by HIV and 21 million people were infected by hepatitis B all over the world due to the use of contaminated syringes [9]. Hospital waste contains hazardous and non-hazardous material and it comprises of pathogens that pose severe dangers to the public health, for those who are in contact with it and also dangerous for the environment [10].

There are many types of hospital waste but generally two basic categories of hospital waste are recognized that are infectious or hazardous and non-infectious. The modern health care institutions and

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hospitals use a broad range of drugs including antibiotics, cytotoxic, corrosive chemicals, disposable syringes, gloves, radioactive substances, solid dressings, swabs, cotton with blood, dissected organs, tissues, intravenous fluid bottles, body fluid, catheters, injection vials and needles which eventually become the part of hospital waste. The contributors of these infectious waste materials are hospitals, clinics, autopsy centers, blood banks, mortuaries, veterinary institutions and research institutes [11].

World Health Organization (WHO) classifies hospital waste into ten classes that are highly infectious waste, radioactive waste, genotoxic, sharps, high content of heavy metals, chemical, pharmaceutical, pressurized containers, infectious, pathological and anatomical waste. Present study provides an overview of the types and quantity of hospital waste which would be helpful for the health related personnel for better planning in waste handling.

## 2. DISCRPTION OF STUDY AREA

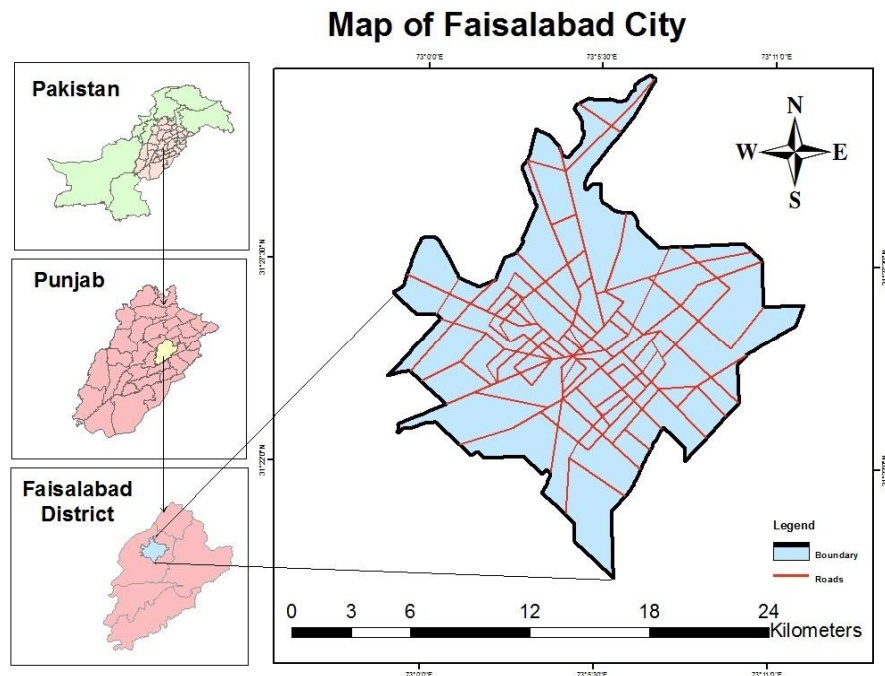
Faisalabad is the 3<sup>rd</sup> largest and a planned city of Pakistan after Karachi and Lahore and it is the second largest city of Punjab province after Lahore. According to the Punjab Development Statistics 2015, estimated population of Faisalabad city was 2.794 million [12]. The Faisalabad district is situated in north-east side of the Punjab province and lies between 30°35'north to 31°47' north latitude and 72°01' east to 73°40' east

longitude, it is about 184 meter (604 ft) high from sea level. The main city covers an area of 213sq/km [13].

There are a large number of hospitals in Faisalabad out of which forty four hospitals have been selected for research in which five are Government sector, two semi-governments, six are trust and thirty one are private sector hospitals which have minimum capacity of ten beds. All the waste generated in these hospitals during health care activities, which is neither discarded nor planned for further use, is termed as hospital waste. It comprises of both the risk and non-risk waste. The current study was designed to assess the hospital waste generation rate and quantity of waste in different types of the hospitals of Faisalabad.

## 3. METHODOLOGY

The current study comprises of both primary and secondary data. Primary data have been obtained through questionnaire. These questionnaire were filled by asking information from the hospital waste management staff, medical superintendents, statistical officers, doctors, nurses, and ward boys of different hospitals in Faisalabad city. Secondary data were obtained from Executive District Officer (Health), Environment Protection Department Faisalabad, NGOs, government reports and journals. EDO Health provided a list of government and private sector hospitals with number of information related to types and quantity of hospital waste. The information



**Figure 1:** Map of Study Area Faisalabad City.

collected from hospitals about the hospital waste and its disposal methods by visiting selected hospitals. Digital camera and GPS (Global Positioning System) tools have been used during the research and data collection in the field for the exact location of the hospital and camera for making pictures of the waste generation points, disposal sites and such other things. SPSS was applied for tabulation and analysis of the data while final maps were produced using GIS.

#### 4. RESULTS AND DISCUSSION

There are a large number of hospitals in Faisalabad city out of which some are public; others are private while some enjoy the status of semi government (Figure 2). Public hospitals are commonly general purpose hospitals which cater all kind of patients while few special purpose hospitals deal only with special kinds of diseases like Faisalabad Institute of Cardiology

and Dialysis Centre. The survey of the study area shows that the private hospitals are more in number instead of government hospitals. Table 1 shows that there are 11.36% general hospitals, 70.45% are private, 13.63% are trust and 4.54% are semi-government hospitals in the study area. The focus of the patients in government hospitals is greater than private due to free and affordable facilities in government hospitals because poor people are not able to pay high fees of private hospitals.

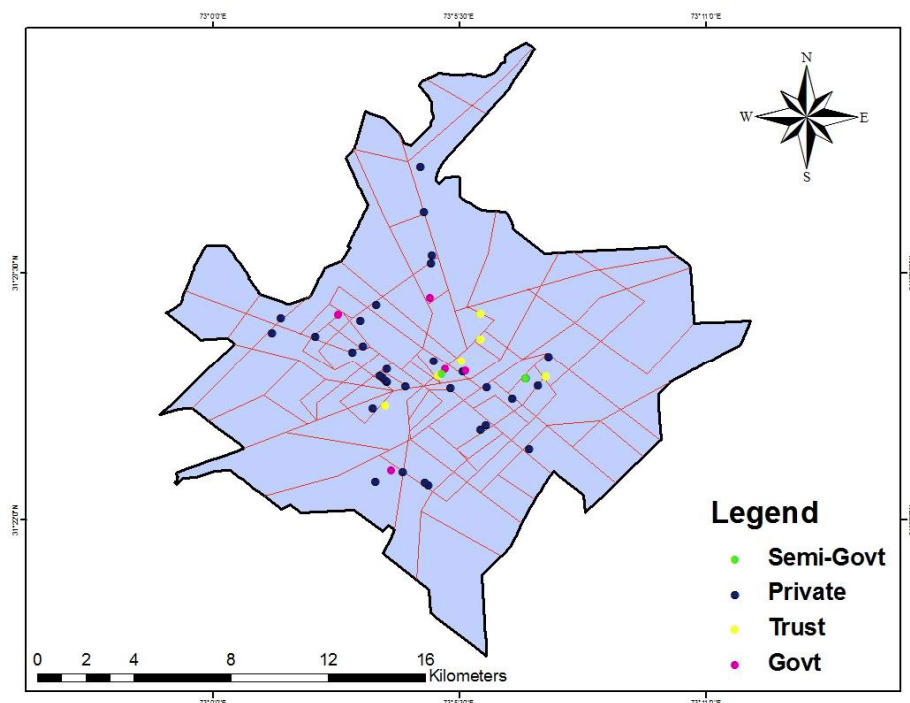
##### 4.1. Occupancy Rate

Occupancy rate in hospitals is a major factor in hospital waste generation. The occupancy ratio in government hospitals is higher than private and trust hospitals. The public sector and semi-government hospitals' occupancy rate is 90% to 87% respectively while rate of occupancy of trust hospitals is 76% and of

**Table 1: Types of Hospitals in Faisalabad City**

Status of Hospital	No. Of Hospital	Percentage
Public	05	11.36%
Private	31	70.45%
Semi Government	02	4.54%
Trust	06	13.63%

Source: Field survey conducted by the author in 2016.



**Figure 2: Location and Status of Hospitals of Faisalabad City.**

**Table 2: Occupancy Rates of Hospitals in Faisalabad City**

Status of hospital	Total Beds	Occupied	Rate %
Government	2737	2460	90%
Private	2225	1356	60%
Trust	725	554	76%
semi-government	242	211	87%
Total	5929	4581	77.26%

Source: Field Survey 2016.

private hospitals is around 60% due to high charges of the private hospitals. Overall occupancy rate of the hospitals of the study area is 77.26%.

#### 4.2. Waste Generation Rate

Rate of waste generation in the hospitals of study area is little different from each other like the government hospital waste generation rate is 1.51 kg/bed/day, semi government 1.49 kg/bed/day, trust hospitals rate is 1.29 kg/bed/day and private hospitals 0.99 kg/bed/day (Table 3). The overall waste generation rate of the hospitals of the study area is 1.28 kg/bed/day. Total waste generated in the hospitals of study area was 7646 kg/day out of which 6529 kg (85.40%) was non-infectious and 1117 kg (14.60%) was infectious waste. Government hospitals generated 4150 kg (53%) waste per day out of which 3527 kg (85%) was non-infectious and 623 kg (15%) was infectious, private hospitals generated 2201 kg (28.78%) waste per day out of which 1898 kg (86.24%) was non-infectious and 303 kg (13.76%) was infectious, trust hospitals produced 935 kg (12.22%) per day out of which 804 kg (86%) was non-infectious 131 kg (14%) was infectious and semi government hospitals generated 360 kg (5%) waste per day out of which 300 kg (84%) was non-infectious and 60 kg (16%) was infectious waste.

The waste generation of 1.28 kg/bed/day in study area is higher than the study done by Saudi Arabia

Health Center in which rate of waste generation was recorded 0.8 kg/bed/day [14]. In contrast with this, the value of waste generation in present study is much lower than Iran where rate of generation was 4.45 kg/bed/day [15]. The differences are due to cultural and socio economic conditions, storage facilities, living standard of the people of the area and ways of waste segregation system [16].

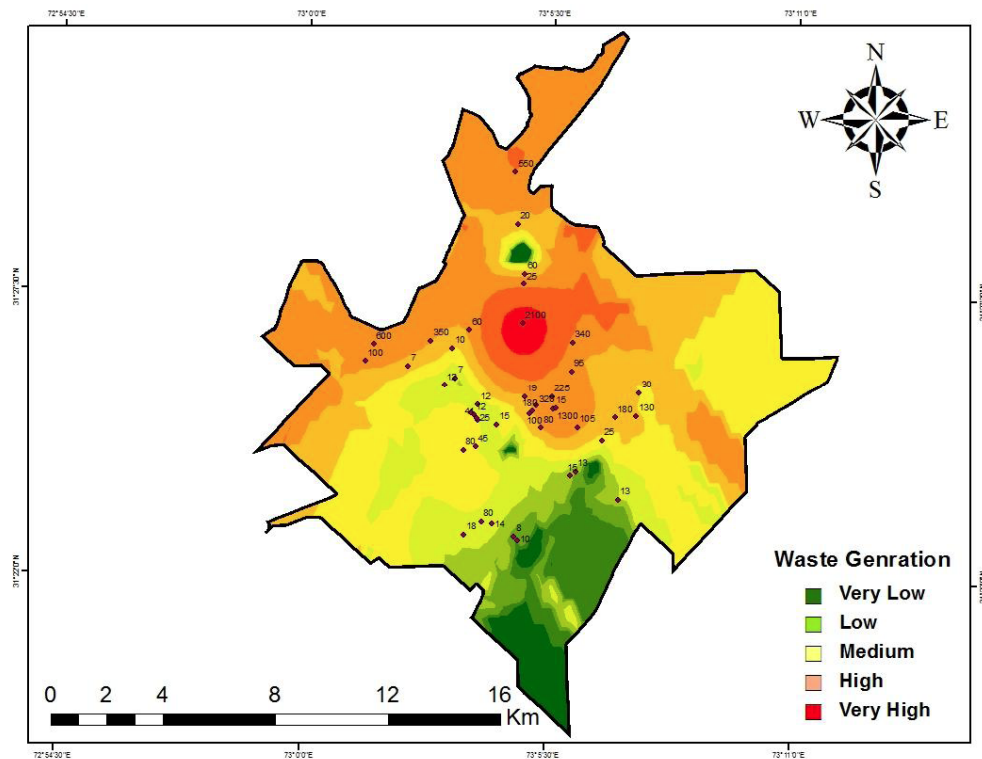
The rate of waste generation in different hospitals of the study area depends upon a number of factors such as social and general conditions of the patients and the area where the hospital is situated, types of health facilities provided by the hospitals, number of beds and bed occupancy rate. The waste generation rate in kg per bed per day was reported differently in different regions of the world; like in Bangladesh average waste production is 0.25 kg/day/bed [16]; in Korea 0.14 kg to 0.49 kg/bed/day [17]; in Brazil 0.57 kg/bed/day [18]; in South Africa 0.60 kg/bed/day [19]; in Greece 0.26 kg to 0.89 kg/bed/day [20]; in Turkey 2.11 kg to 3.83 kg/bed/day [21]; and in Tanzania 0.84 kg to 5.8 kg/bed/day [22].

In current study, forty four hospitals were selected out of which five were public sector hospitals and Allied Hospital was the principal hospital in District Faisalabad having capacity of 1385 beds with an occupancy rate of 90%. It generated 2100 kg waste with an average 1.68 kg/bed/day. Out of forty four,

**Table 3: Total Waste Generation**

Status of Hospital	Total Waste (kg/day)	Infectious Waste (kg/day)	Non Infectious Waste (kg/day)	No. of Beds	kg/bed/day
Government	4150	623	3527	2737	1.51
Private	2201	303	1898	2225	0.99
Trust	935	131	804	725	1.29
Semi-Govt	360	60	300	242	1.49
Total	7646	1117	6529	5929	1.28

Source: Field survey conducted by the author in 2016.



**Figure 3:** Map of Waste Generation Rate.

there were thirty one private hospitals in which Madina Teaching Hospital was the largest hospital having 600 beds with an occupancy rate of 60% and generated almost 550 kg waste daily with an average of 0.91 kg/bed/day.

The interpolation map in Figure 3 is used to show the intensity of waste by different colors. Interpolation map is prepared by three methods known as kriging, IDW and SP Line. In this specific study intensity of waste is shown in the interpolation map by using kriging method to make it self-explanatory. The red color areas in the map indicate the location of government and semi-government hospitals, where the rate of waste generation is very high. The yellow and green color areas show the location of private and trust hospitals, where the rate of waste generation is medium and low.

## 5. CONCLUSION

Present study is an attempt to categorize types of hospital wastes and waste generation in one of the larger cities of Pakistan. It is found that most of the hospitals do not follow the national rules for hospital waste management. It is concluded that common people of Faisalabad and the workers handling hospital waste are not aware of the intensity and the adverse effects of the hazardous waste of the hospitals. Current

study suggests the authorities to train the sweepers and other sanitary workers to handle this garbage. This study provides information regarding capacity and total waste generation of the hospitals and thus will be helpful for the waste handlers, doctors and the trainers who should deliver awareness to the workers, sweepers, and rag pickers as well. It is also suggested that the policies regarding the implementation of waste management rules should be revised according to the international standards.

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