

Quantification and Charecterization of Bio-Medical Waste at Satna City M.P. India

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Abstract: Hospitals are a place where patient's problems are designed, analyzed and treated. During these activities generation of solid waste is unavoidable. This solid waste describe with the term "hospital waste" refer to all waste, biological or non-biological that is discarded and will never be used again. Hospital waste consists of mainly three group waste: medical waste, infections waste and domestic waste. "Medical waste" refers to materials accumulated as a result of patient diagnosis, treatment or immunization of human being. "Infection waste" refers to the portion of medical waste that is in contact with a patient who has infections disease and it is capable of producing an infection disease. Most of the time medical waste is considered to be infectious waste. If all the waste is mixed then the hospital waste is presumed to be infectious waste. Hospital waste has not attracted the attention as other type of wastes, particular in developing countries, despite the fact that the medical waste is labeled as hazardous because it poses serious and direct threat to human health.

Key Words: Bio-medical, Category, BOD, COD and Suspended Solid.

I. Introduction

The present study was carried out in Satna city. Satna is located at longitude 80°21' and 81°23' east latitude 23°58' and 25°12' north. It is one of the important business centers of Madhya Pradesh, situated on Mumbai – Hawrah railway main line at a distance of 187 Km from Allahabad (U.P.) and 190 Km from Jabalpur (M.P.). Satna district is a pilgrim and centre of national importance and an industrial place, rich in lime stone, bauxite, white clay, geru, ramraj and flagstones.

Bio-medical waste means any solid and/or liquid waste including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research pertaining thereto or in the production or testing thereof. (Bio-medical waste management and handling rule, 1998). Medical care is vital for our life, health and well being. But the waste generated from medical activities can be hazardous, toxic and even lethal because of their high potential for diseases transmission (Agarwal 1998).. The hazardous and toxic parts of waste from health care establishments comprising infectious, bio-medical and radio-active material as well as sharps (hypodermic needles, knives, scalpels etc.) constitute a grave risk, if these are not properly treated / disposed or are allowed to get mixed with other municipal waste. Its propensity to encourage growth of various pathogen and vectors and its ability to contaminate other nonhazardous/ non-toxic municipal waste jeopardizes the efforts undertaken for overall municipal waste management. With better planning and management, not only the waste generation is reduced, but overall expenditure on waste management can be controlled (Singh 2005). The rules framed by the Ministry of Environment and Forests (MoEF), Govt. of India, known as 'Bio-medical Waste (Management and Handling) Rules, 1998,' notified on 20th July 1998, provides uniform guidelines and code of practice for the whole nation.

Components of Bio-medical waste are divided into following category-

- Cat.1- Human anatomical waste (tissues, organs, body parts etc.),
- Cat.2- Animal waste (as above, generated during research/experimentation, from veterinary hospitals etc.),
- Cat.3- Microbiology and biotechnology waste, such as, laboratory cultures, micro-organisms, human and animal cell cultures, toxins etc.
- Cat.4- Waste sharps, such as, hypodermic needles, syringes, scalpels, broken glass etc.,
- Cat.5- Discarded medicines and cyto-toxic drugs
- Cat.6- Solid waste, such as dressing, bandages, plaster casts, material contaminated with blood etc.,
- Cat.7- Solid waste (disposable items like tubes, catheters etc. excluding sharps),
- Cat.8- Liquid waste generated from any of the infected areas,
- Cat.9- Incineration ash,
- Cat.10-Chemical waste

Hazards of improper handling of Bio medical wastes may be Injuries, Infections, Environmental impact, and Special hazards others.

Objectives-

1. To identify and categorize of different type of bio-medical waste.
2. To quantify the solid BMW of different category.
3. Qualitative study of liquid BMW.

II. Material and Method

Satna city has number of small to large health care center and many more specialty hospitals and nursing homes are being proposed to come-up in near future. Presently there are two major hospitals in Satna city with bed capacity of 150 etc. In this study the waste generation and characterization of these two major hospitals namely District Hospital and Birla Vikas Hospital was undertaken.

Quantification of Bio-medical waste:

Hospital waste is divided into ten categories. In present study cat.1, cat.4, cat.5, cat .6 and cat.7 waste were studied. The solid biomedical waste generated from these hospitals was collected categorically segregated and weighed according to standard method (Management and Handling Rules, 1998).

Analysis of waste water

To study the waste water quality pH, SS (Suspended Solid), BOD, COD, Oil and Grease were analyzed as per APHA, AWWA, WPCP, 1995

Table.1-Category wise Solid Waste Generation from Two Major Hospital of Satna in 2012.

S.No.	Month	Total no. of hospital/bed	Category wise CBMW (Kg/month)					Total
			01	04	05	06	07	
1.	January	02/302	38.35	35.05	2.50	86.80	25.72	188.42
2.	February	02/302	36.85	28.95	1.80	74.53	24.15	166.28
3.	March	02/302	27.20	34.00	1.70	97.40	40.23	200.53
4.	April	02/302	35.90	28.70	2.70	71.45	24.74	163.49
5.	May	02/302	36.50	29.05	1.50	70.93	24.85	162.83
6.	June	02/302	32.50	28.25	1.05	69.85	23.03	154.68
7.	July	02/302	32.55	27.30	1.20	65.76	20.23	147.04
8.	August	02/302	26.80	26.86	2.68	68.70	26.20	151.24
9.	September	02/302	31.75	28.30	1.68	67.95	24.50	154.18
10.	October	02/302	30.25	27.75	1.40	72.10	21.72	153.22
11.	November	02/302	32.50	28.75	1.74	73.61	25.30	161.9
12.	December	02/302	29.75	27.75	2.49	68.73	21.92	150.64
Mean			32.58	29.23	1.87	73.98	25.22	162.88
Average per bed/day	@ 60% Bed occupancy 181		234.58 gm	208.80 gm	13.46 gm	532.66 gm	181.58 gm	1171.58 gm
Total/bed/day (gm/day)								

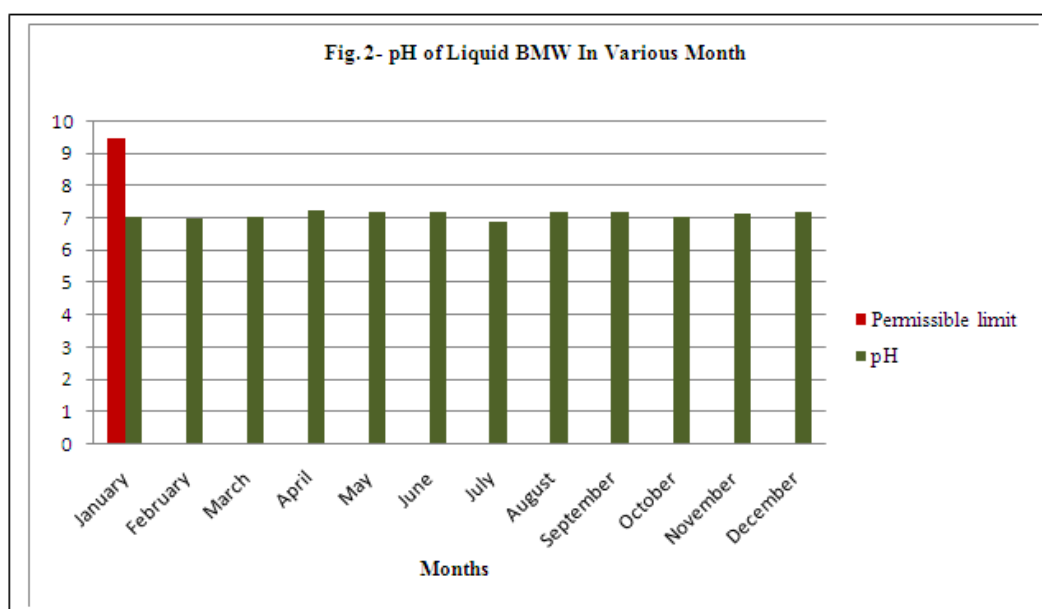
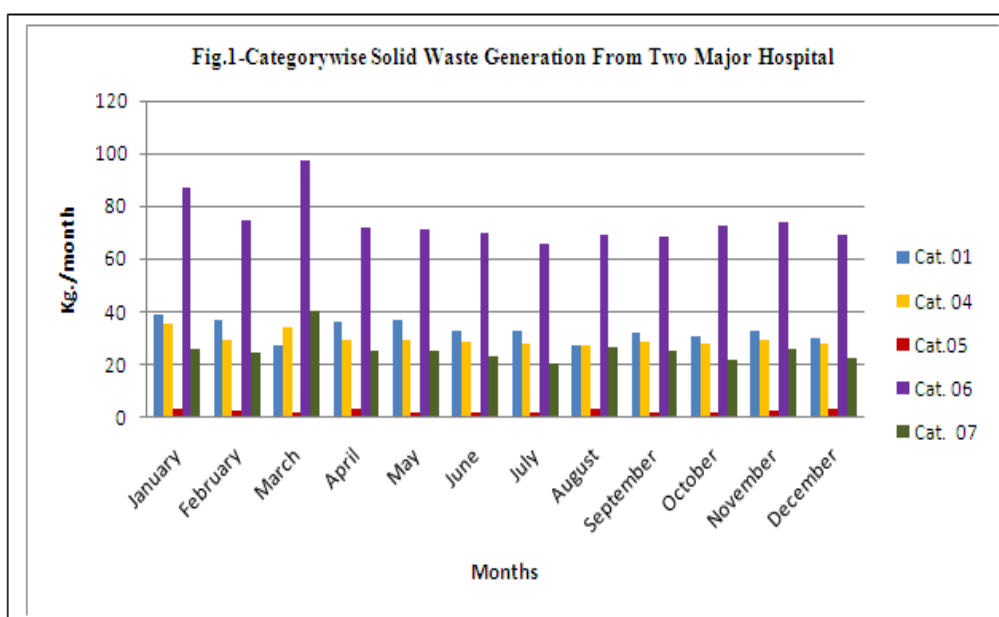
Table.2-Waste Water Characteristics of Two Major Hospital at Satna in 2012.

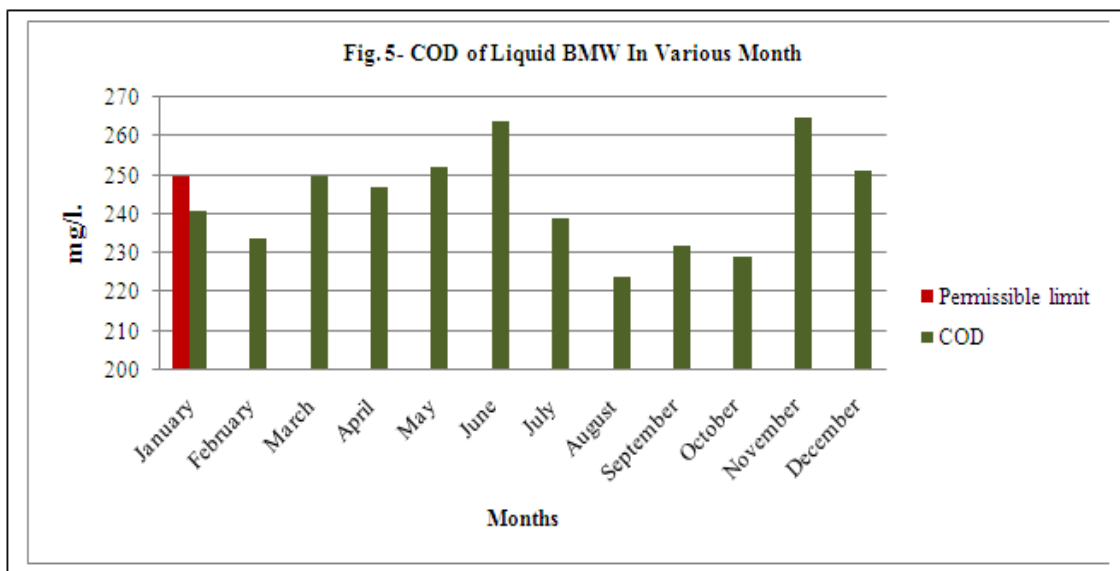
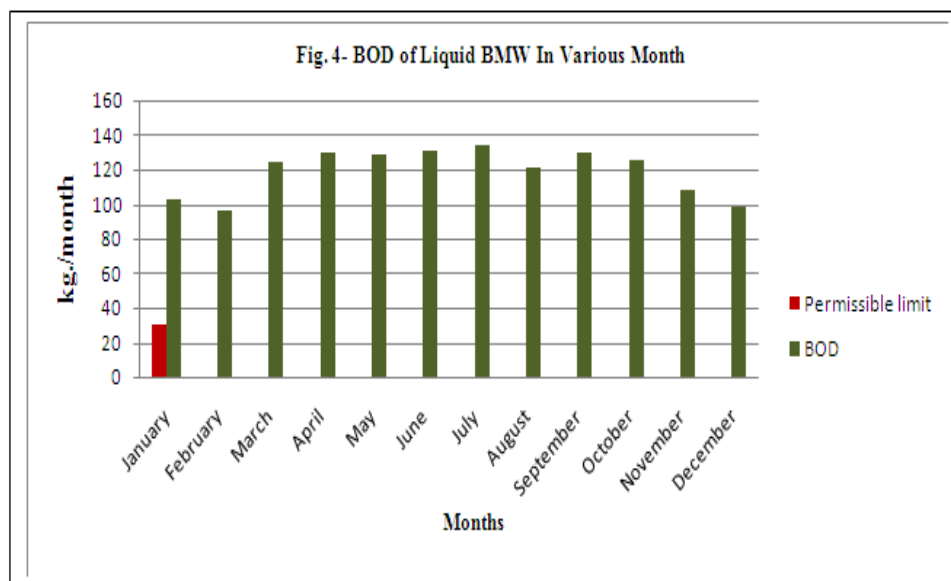
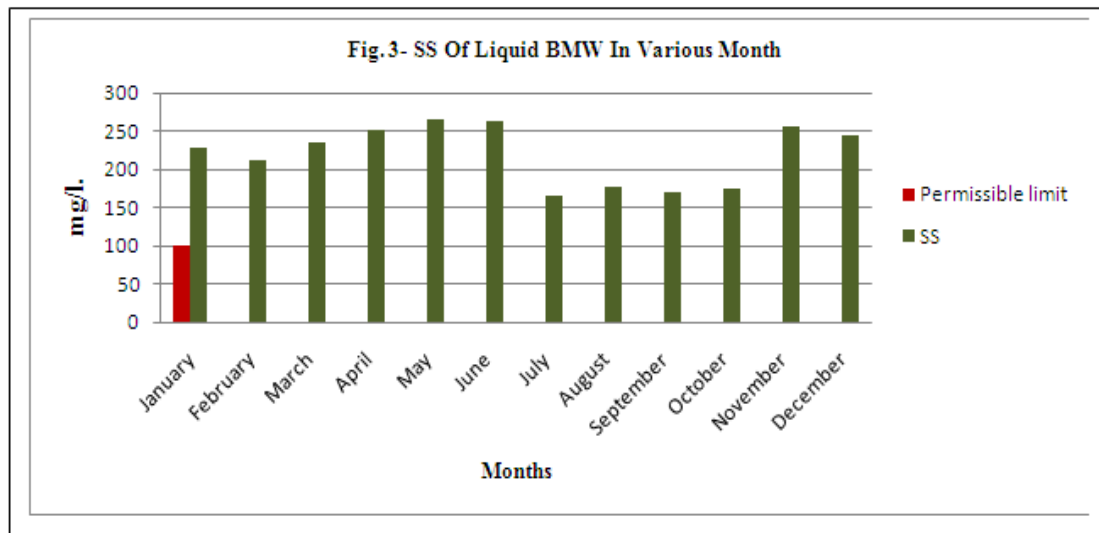
Month	Parameter				
	pH	SS (mg/l)	BOD (mg/l)	COD (mg/l)	O & G (mg/l)
January	7.05	229.00	103.00	241.00	13.50
February	7.00	212.00	96.00	234.00	11.00
March	7.05	235.00	124.00	250.00	13.70
April	7.25	251.00	130.00	247.00	11.00
May	7.20	264.00	129.00	252.00	12.50
June	7.20	263.00	131.00	264.00	12.50

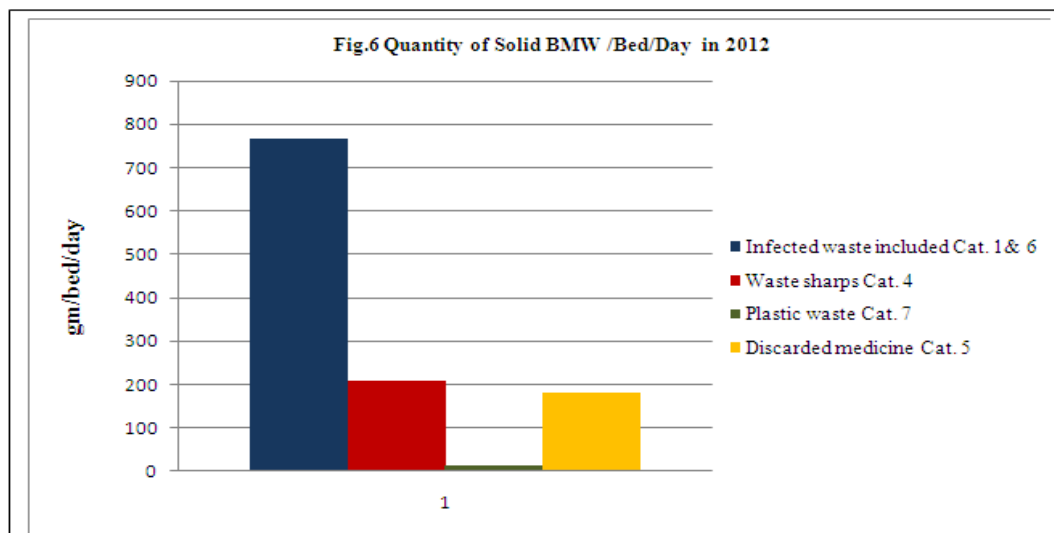
July	6.90	166.00	134.00	239.00	10.50
August	7.20	176.00	121.00	224.00	9.00
September	7.20	170.00	130.00	232.00	9.50
October	7.05	175.00	125.00	229.00	8.40
November	7.15	255.00	108.00	265.00	11.00
December	7.20	244.00	98.00	251.00	10.50
Average	7.12	220.00	118.92	244.00	11.08

Table-3. Summary of Quantitative Categorization of Solid BMW per Bed/Day in 2012

S. No.	Details	Quantity 2012
1.	1. Infected waste included Cat. 1& 6	767.24 gm
2.	2. Waste sharps Cat. 4	208.80 gm
3.	3. Plastic waste Cat. 7	181.58 gm
4.	4. Discarded medicine Cat. 5	13.46 gm
Total		1171.58 gm







III. Result & Discussion-

From the table-1 it was observed that from two major hospital of Satna City, cat. 1 waste generated 234.58 gm per bed/day, Cat. 4 waste 208.80 gm per bed/day, Cat. 5 waste 13.46 gm per bed/day, Cat. 6 waste 532.66 gm per bed/day and Cat. 7 waste 181.58 gm per bed/day and thus total 1171.58 gm per bed/day waste generated from two major hospital of Satna City. Ruoyan et al. 2009 reported 1.17 kg/bed/day in Chaina, Patil and Pokhrel 2005 reported 2.31 kg/bed/day waste generation from hospital. Our observed values were quite below than these reported values. It is indicating that waste generation was increased in 2012. Minimum quantity of waste was observed for plastic waste (Cat.7) discarded medicine waste quantity was 13.46 gm while maximum quantity of waste was observed 767.24 gm for infected waste.

The liquid waste analysis of sample from two major hospital (Table-2) shows pH 7.12, Suspended Solid 220.00 mg/l, BOD 118.92 mg/l, COD 244.00 mg/l and Oil & Grease 11.08 mg/l. in 2012. The permissible limits of pH are 9.5 and the pH value was observed within the limit. The SS were found in higher concentration. Similarly the BOD values were also found higher than the permissible limit but COD value were found mostly within the permissible limit but only in June & November, COD was found higher than the permissible limit.

IV. Conclusion & Recommendation-

The studies conducted on the disposal and management of liquid and solid of bio-medical waste .Best management and best disposal is must necessary for best hospital environment. It is a fundamental right of common people/citizen. Sometimes hospitals are source of bacterial, viral and chemical infection. It is a not only inside but may be outside the campus without safe disposal and management of hospital waste or contaminated liquid and solid wastes.

The liquid waste management needs more attention and effluent treatment facility needs to be viewed seriously for hospital in general. The segregation of waste at source is the key step and reduction, reuse and recycling should be considered in proper perspectives. The liquid waste generated from various group of hospital was collected and analyzed for various parameters like pH, SS, BOD, COD, and Oil & Grease. The permissible limits of pH are 9.5 and the pH value was observed within the limit. The SS were found in higher concentration. Similarly the BOD values were also found higher than the permissible limit but COD value were found mostly within the permissible limit but only in June & November, COD was found higher than the permissible limit.

V. Recommendation-

Reduction of the waste production can be done at the point of generation consideration and utilization, pre-treatment of waste is the main source of health care waste reduction.

Raising awareness and training the hospital workers about risks associate with health-care waste will improve the waste management systems in the hospitals, using of safe methods and being careful in health care waste separation.

Pre treatment of the waste should be done inside the hospital premises before the final disposal. Infectious waste should be treated before it is taken to the land fill as it reduces soil and water contamination. Paramedical staff was unaware regarding BMW therefore proper training was required for the staff.

Infectious waste should be treated before it is taken to the land fill as it reduces soil and water contamination.

The container for segregation should be with lid and the container has the proper colour and leveling so the staff or patients and care taker can easily distinguish. Poor segregation is cited as the number one cause for increased risk from bio-medical waste management.

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