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Evaluation of biomedical waste management status in Andhra Pradesh state of India

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Abstract: *Health Care Facilities (HCFs) are the places for generation of Bio Medical Waste (BMW) all over the globe. From 1970s to till date the usage of disposable stuff in health care environment is gradually increasing. Therefore increase of Bio hazardous medical waste is being exponentially increased. This prompted to aim on the study of BMW scenario in the state of Andhra Pradesh. A comprehensive study was carried out to see the number of private and Government HCFs and their BMW generation. Based on the results there were 3,834 Private HCFs with 72,745 bed strength in Andhra Pradesh. Similarly 392 Government HCFs are accommodating 61,200 beds. As a result 14,733.95 kgs of BMW is being generated per day. The estimated BMW generation would be very high than this figures. Recently there is an exponential growth in HCFs all over the country. If the BMW generation continues in same rate there is an urgent need for proper disposal of this hazardous waste otherwise this would be a big threat to living ecosystems.*

Keywords: Biomedical waste, Hospital waste, Biohazards

Introduction

Healthcare is an important area of human care. The very process of modern healthcare is also be carried with risk and damaging practices. One of this is Bio Medical Waste generation in treatment of human beings; apart from other species. This Bio Medical Waste generation warrants proper Bio Medical Waste management. Therefore proper attention is needed on disposal of Biomedical waste to avoid infectious and contagious diseases to human beings. Biomedical waste harbours several vectors and pathogens, as a result environment will be contaminated (Keene, 1991) and this would join with municipal waste to cause health hazards to the living organisms.

Biomedical waste is a dangerous threat to the occupational healthcare workers, rag pickers and also public (Neveu and Matus, 2007) due to improper disposal and segregation methods. Opportunistic infections like AIDS (HIV), Hepatitis B, Tuberculosis and Cholera would prevail as a result of unplanned disposal of healthcare waste among health care workers as well as public (Yoshikawa et al., 2013 and 2007, Fitzsimons et al., 2008). The health risk for occupational employees and public can be considerably reduced with judicious planning and management. (Okulicz et al., 2013) Previous research reports clearly indicate that about three fourths of the total waste generated in healthcare establishments is non-hazardous and non toxic, rest is infectious and hazardous. (Kaiser et al., 2001) Therefore rigorous regime of segregation of hazardous waste at source is essential to reduce health risk.

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The rules framed by the Ministry of Environment and Forests (MOEF), Government of India, known as Bio-medical waste (Management and Handling) Rules, 1998, notified on 20th July 1998 provide uniform guidelines and code of practice for the whole nation. It is clearly mentioned in this rule that the occupier (a person who has control over the concerned institution) of an institution (e.g., hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank etc.,) generating Bio Medical Waste shall be responsible for taking necessary steps to ensure that such waste is handled without any adverse effect to human health and the environment(Orias & Perrodin ,2013 and Pant, 2012).

Similarly, better planning and management will reduce the overall expenditure and burden of infections to the public as well as to the Occupational groups. This would rely on existing statistics of Biomedical waste generation. So far no comprehensive data is available on entire state of Andhra Pradesh. Therefore an attempt was made to see the status of biomedical waste generation in Andhra Pradesh in relation to healthcare units and available beds.

Need of the study

In order to evaluate the distribution of both Government and Private Health Care Facilities and also to assess the waste generation rate among hospitals of entire Andhra Pradesh state, the present study was undertaken. The comprehensive assessment of waste generation would help authorities to take appropriate steps to prevent biohazards. In this context, this kind of studies are gaining importance for policy making.

Objectives of the study

1. To evaluate the distribution of both Government and private Health Care Facilities in Andhra Pradesh state, India.
2. To examine the Bio Medical Waste generation rate in entire state of Andhra Pradesh, India.

Data Collection Sources

The present study was based on secondary data. Data was collected from District Medical and Health Offices of each district, A.P. Pollution control board and also from A.P. Private nursing homes association.

To estimate the distribution of both private and public Health Care Facilities, the number was collected from different sources as mentioned above in the data collection sources. The data on number of beds which were registered with A.P. Pollution control board was obtained from Government of India.

Population

The Study was undertaken in the entire Andhra Pradesh state. The population chosen for the study was all Health Care Facilities both private and public which are registered with Government.

Statistical Tools used

The data was processed by using M.S Excel. Descriptive statistical tools like percentages were carried out to know the Bio Medical Waste Generation rate and distribution of Health Care Facilities.

Scope and Limitations of the study

The data represents entire state therefore good statistical tools may not be used. Few years data is insufficient to derive long term planning goals. Availability of beds registered from each Health Care Facility with the Government varies in reality. Hence the Biomedical Waste Generation varies from the calculated assessment. Government Primary Health Centers (PHC) do not have beds. Therefore they were not considered for data.

Data Analysis

Distribution of Private Specialized Health care Facilities (HCFs) in Andhra Pradesh (A.P.)

Andhra Pradesh (A.P.), one of the southern states of India, is India's 4th largest state by area and 5th largest by population. As per details from Census 2011, h total population of Andhra Pradesh is 84,580,777 of which male and female are 42,442,146 and 42,138,631 respectively. Total area in which the state of Andhra Pradesh is spread is 275,045 (sq.km). 308 persons / sq km is the density of state. The state has 23 Districts with Hyderabad as capital city. Other prominent cities include Visakhapatnam, Vijayawada, Tirupati, Srikakulam etc. the present chapter deals with the status of HCFs, BMW generation in A.P. State.

The data on number of HCFs, both Government and Private was obtained from the District Medical Health Office (DM&HO), Government of Andhra Pradesh, India. The waste generation rate has been calculated for each District of Andhra Pradesh state.

Percentage of availability of Private HCFs in each District has also been calculated. Data from 22 Districts has been taken into consideration for both Private and Government HCFs. The Districts are Adilabad, Anantapur, Chittoor, Cuddapah, East Godavari, Guntur, Hyderabad, Karimnagar, Khammam, Krishna, Kurnool, Mahaboobnagar, Medak, Nalgonda, Nellore, Nizamabad, Praksam, Srikakulam, Vizayanagaram, Visakhapatnam, Warangal and West Godavari. All Private HCFs have been categorized into 15 specialized HCFs in the entire State. They are General (Gen), Surgery (Sur), Pediatric (Ped), Cardiology (Car), ENT, Gynecology (Gyn), Diabetes (Dia), Maternity (Mat), Multispecialty (Mul), Dermatology (Der), Orthopedics (Orth), Psychiatry (Psy), Neurology (Neu). Urology (Urol), Nephrology (Nep) and Others.

All Government HCFs were categorized into Area Hospitals (AH), Community Health Centres (CHC), District Head Quarter Hospital (DHQH) and District Medical Education Centre (DME). All these categories are having bed capacity as per Government norms. Whereas Primary Health Centers (PHC) do not have beds. Therefore they were not considered for data.

From the Table 1, it is clear that 8,001.95 Kgs of BMW is generated per day out of which Greater Hyderabad contributes the highest amount i.e, 2,241.69 kgs per day, whereas Adilabad (71.28 kgs) and Vizayanagarm (92.07 Kgs) Districts are contributing the lowest amount of BMW. Similarly bed strength is also observed for each District. This also corroborates with the above trend. As far as bed strength is concerned, the average bed strength is the highest among HCFs located in Guntur District (24.88) followed by Hyderabad (23.98), Anantapur (23.32), Nellore (22.36) and Nalgonda (20.13) Districts, whereas the lowest average bed strength was observed in Cuddapah District (12.62) and Adilabad District (12.71).

The table No:2 presents the number of Private HCFs available in each District. In Andhra Pradesh 5,533 Private HCFs were present in the year 2011 - 2012. Among them, Greater Hyderabad District stands first by having the highest number of HCFs (850) followed by East Godavari (402), Krishna District (296) and Chittoor (251)etc,. The lowest number of HCFs was recorded in Adilabad District (51) and Mahaboobnagar (51). From the 16 recognized specialized

HCFs, General Category HCFs contribute more in number followed by Surgery, ENT, Gynecology, Ortho and others. General category HCFs ranged from 58.1% to 94.3% among all categories of HCFs in AP State. Visakhapatnam District stands first in having more number of Private General Hospitals (94.3%) whereas Karimnagar District is having 58.1% of Private General Hospitals. The same trend was observed in each District of Andhra Pradesh. When Surgery HCFs were taken into consideration, Kurnool District tops by having 21.7% and the lowest percentage was observed in Cuddapah District with 2.3%. Remaining categories of HCFs were observed in less number for all the Districts. Same trend was also observed for number of beds in A.P. State in Table No:3. Percentages were calculated for specialized HCFs and number of beds present in each category. (Table No: 1, 2 & 3.)

Table 1: Distribution of Private HCFs in A.P. State, India, for the year 2011-2012

Sl.No.	District	Private HCF's	No. of Beds	Average bed strength / HCF	BMW generated Kg/day	Percentage
1	2	3	4	(5) = (4/3)	(6) = (4*0.11)	%
1	Adilabad	51	648	12.71	71.28	0.89
2	Anantapur	74	1726	23.32	189.86	2.37
3	Chittoor	251	4189	16.69	460.79	5.76
4	Cuddapah	129	1540	11.93	169.4	2.12
5	East Godavari	402	6686	16.63	735.46	9.19
6	Guntur	161	4006	24.88	440.66	5.51
7	Hyderabad	850	20379	23.98	2241.69	28.01
8	Karimnagar	186	3009	16.18	330.99	4.14
9	Khammam	146	2538	17.38	279.18	3.49
10	Krishna	296	5485	18.53	603.35	7.54
11	Kurnool	106	2096	19.77	230.56	2.88
12	Mahaboobnagar	51	764	14.98	84.04	1.05
13	Medak	83	1205	14.52	132.55	1.66
14	Nalgonda	99	1993	20.13	219.23	2.74
15	Nellore	70	1565	22.36	172.15	2.15
16	Nizamabad	166	2254	13.58	247.94	3.10
17	Prakasam	85	1819	21.4	200.09	2.50
18	Srikakulam	63	922	14.63	101.42	1.27
19	Vijayanagaram	53	837	15.79	92.07	1.15
20	Visakhapatnam	158	2716	17.19	298.76	3.73
21	Warangal	201	3952	19.66	434.72	5.43
22	West Godavari	153	2416	15.79	265.76	3.32
	Total	**3834**	**72745**	**19**	**8001.95**	**100.00**

Hyderabad includes Greater Hyderabad region i.e., Rangareddy, Secunderabad & Hyderabad.

* 0.11kg/ bed is the average BMW generated in A.P. State which was calculated as per the APPCB, Govt. of A.P. data.

Table 2: Distribution of Private Specialized HCFs in A.P. State, India, for the year 2011 – 2012

Sl. No.	District		Gen	Sur	Pe	Car	ENT	Gyn	Dia	Mat	Mul	Der	Orth	Psy	Neuro	Urol	Nep	Others	Total	%
1	Adilabad	N	32	11	1		2						2					3	**51**	1.3
		%	62.7	21.6	2.0	0.0	3.9	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	5.9	**100**	
2	Anantapur	N	55	7	3	1		1	3				2	1	1				**74**	1.9
		%	74.3	9.5	4.1	1.4	0.0	1.4	4.1	0.0	0.0	0.0	2.7	1.4	1.4	0.0	0.0	0.0	**100**	
3	Chittoor	N	185	32	10	1	9	3	5				3	1	1			1	**251**	6.5
		%	73.7	12.7	4.0	0.4	3.6	1.2	2.0	0.0	0.0	0.0	1.2	0.4	0.4	0.0	0.0	0.4	**100**	
4	Cuddapah	N	97	3	4		10	7	3				2					3	**129**	3.4
		%	75.2	2.3	3.1	0.0	7.8	5.4	2.3	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	2.3	**100**	
5	East Godavari	N	334	26	8		4	5	1	5	4	1	2					9	**402**	10.5
		%	83.1	6.5	2.0	0.0	1.0	1.2	0.2	1.2	1.0	0.2	0.5	0.0	0.0	0.0	0.0	2.2	**100**	
6	Guntur	N	120	7	8	3	5	3			2		4					4	**161**	4.2
		%	74.5	4.3	5.0	1.9	3.1	1.9	0.0	0.0	1.2	0.0	2.5	0.0	0.0	0.0	0.0	2.5	**100**	
7	Hyderabad	N	734	41	27		13	21	2				8	2	2				**850**	22.2
		%	86.4	4.8	3.2	0.0	1.5	2.5	0.2	0.0	0.0	0.0	0.9	0.2	0.2	0.0	0.0	0.0	**100**	
8	Karimnagar	N	108	24	14		4			10			2		1	1		22	**186**	4.9
		%	58.1	12.9	7.5	0.0	2.2	0.0	0.0	5.4	0.0	0.0	1.1	0.0	0.5	0.5	0.0	11.8	**100**	
9	Khammam	N	110	19	7		1	1			1		2		1			4	**146**	3.8
		%	75.3	13.0	4.8	0.0	0.7	0.7	0.0	0.0	0.7	0.0	1.4	0.0	0.7	0.0	0.0	2.7	**100**	
10	Krishna	N	187	39	13	1	18	14	1	4	2		5		2	1	1	8	**296**	7.7
		%	63.2	13.2	4.4	0.3	6.1	4.7	0.3	1.4	0.7	0.0	1.7	0.0	0.7	0.3	0.3	2.7	**100**	
11	Kurnool	N	75	23	5	2								1					**106**	2.8
		%	70.8	21.7	4.7	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	**100**	
12	Mahaboob Nagar	N	36	6			2	1	1	1	1		3					1	**51**	1.3
		%	70.6	11.8	0.0	0.0	3.9	2.0	2.0	2.0	2.0	0.0	5.9	0.0	0.0	0.0	0.0	2.0	**100**	
13	Medak	N	63	9			1			2	1		2					5	**83**	2.2
		%	75.9	10.8	0.0	0.0	1.2	0.0	0.0	2.4	1.2	0.0	2.4	0.0	0.0	0.0	0.0	6.0	**100**	
14	Nalgonda	N	77	4	5		4	5		1			2					1	**99**	2.6
		%	77.8	4.0	5.1	0.0	4.0	5.1	0.0	1.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	1.0	**100**	
15	Nellore	N	53	8	4			2	1				2						**70**	1.8
		%	75.7	11.4	5.7	0.0	0.0	2.9	1.4	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	**100**	
16	Nizamabad	N	132	20	5		3	2							1	2		1	**166**	4.3
		%	79.5	12.0	3.0	0.0	1.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.2	0.0	0.6	**100**	
17	Prakasam	N	65	4	3	1	1	2			2	2	1			1		2	**85**	2.2
		%	76.5	4.7	3.5	1.2	1.2	2.4	0.0	0.0	2.4	2.4	1.2	0.0	0.0	1.2	0.0	2.4	**100**	

18	Srikakaulam	N	48	7			1	2		1	1		2						**62**	1.6
		%	77.4	11.3	0.0	0.0	1.6	3.2	0.0	1.6	1.6	0.0	3.2	0.0	0.0	0.0	0.0	0.0	**100**	
19	Vijayanagaram	N	41	7	2			2										1	**53**	1.4
		%	77.4	13.2	3.8	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	**100**	
20	Vishakapatnam	N	149	5				1		1	1		1						**158**	4.1
		%	94.3	3.2	0.0	0.0	0.0	0.6	0.0	0.6	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	**100**	
21	Warangal	N	141	19	11		7			4	2		8		1	2		6	**201**	5.2
		%	70.1	9.5	5.5	0.0	3.5	0.0	0.0	2.0	1.0	0.0	4.0	0.0	0.5	1.0	0.0	3.0	**100**	
22	West Godavari	N	126	17	3	2		4					1						**153**	4.0
		%	82.4	11.1	2.0	1.3	0.0	2.6	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	**5533**	100

Source: DM&HO, Govt. of A.P. from each District.

Table No: 3: Distribution of Beds in Private Specialized HCFs in A.P. State, India, for the year 2011 – 2012

Sl. No.	Districts		Gen	Sur	Pe	Car	ENT	Gyn	Dia	Mat	Mul	Der	Orth	Psy	Neuro	Urol	Nep	Others	Total	% of AP
1	Adilabad	N	304	221	15		18						50					40	**648**	0.89
		%	46.9	34.1	2.3	0.0	2.8	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0	6.2		
2	Anantapur	N	1354	122	27			8			70		33	52	20			40	**1726**	2.37
		%	78.4	7.1	1.6	0.0	0.0	0.5	0.0	0.0	4.1	0.0	1.9	3.0	1.2	0.0	0.0	2.3		
3	Chittoor	N	3280	431	141	20	137	26	72				35	7	20	20			**4189**	5.76
		%	78	10	3	0	3	1	2	0	0	0	1	0	0	0	0	0		
4	Cuddapah	N	1302	42	47		57	47	0				20					25	**1540**	2.12
		%	84.5	2.7	3.1	0.0	3.7	3.1	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	1.6		
5	East Godavari	N	5712	342	80		75	62	20	33	196	6	65					91	**6686**	9.19
		%	85.4	5.1	1.2	0.0	1.1	0.9	0.3	0.5	2.9	0.1	1.0	0.0	0.0	0.0	0.0	1.4		
6	Guntur	N	2487	398	107	90	297	50			285		110	32		65		85	**4006**	5.51
		%	62.1	9.9	2.7	2.2	7.4	1.2	0.0	0.0	7.1	0.0	2.7	0.8	0.0	1.6	0.0	2.1		
7	Hyderabad	N	17712	718	1096		182	377	51				91	44	108				**20379**	28.02
		%	86.9	3.5	5.4	0.0	0.9	1.8	0.3	0.0	0.0	0.0	0.4	0.2	0.5	0.0	0.0	0.0		
8	Karimnagar	N	1777	491	152		31			127			18		12	16		385	**3009**	4.14
		%	59.1	16.3	5.1	0.0	1.0	0.0	0.0	4.2	0.0	0.0	0.6	0.0	0.4	0.5	0.0	12.8		
9	Khammam	N	1902	363	94		5	20			50		30		12			62	**2532**	3.48
		%	75.1	14.3	3.7	0.0	0.2	0.8	0.0	0.0	2.0	0.0	1.2	0.0	0.5	0.0	0.0	2.4		

10	Krishna	N	3202	442	121	100	226	181	8	48	886		96		23	23		129	**5485**	7.54
		%	58.4	8.1	2.2	1.8	4.1	3.3	0.1	0.9	16.2	0.0	1.8	0.0	0.4	0.4	0.0	2.4		
11	Kurnool	N	1591	405	50	45								5					**2096**	2.88
		%	75.9	19.3	2.4	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0		
12	Mahaboob Nagar	N	567	94			14	10		20	13		34					12	**764**	1.05
		%	74.2	12.3	0.0	0.0	1.8	1.3	0.0	2.6	1.7	0.0	4.5	0.0	0.0	0.0	0.0	1.6		
13	Medak	N	945	101			9			25	50		29					46	**1205**	1.66
		%	78.4	8.4	0.0	0.0	0.7	0.0	0.0	2.1	4.1	0.0	2.4	0.0	0.0	0.0	0.0	3.8		
14	Nalgonda	N	1672	65	79		33	105		1			33					5	**1993**	2.74
		%	83.9	3.3	4.0	0.0	1.7	5.3	0.0	0.1	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.3		
15	Nellore	N	1307	136	21			21	19				61						**1565**	2.15
		%	83.5	8.7	1.3	0.0	0.0	1.3	1.2	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	0.0		
16	Nizamabad	N	1834	274	53		14	32							10	22		15	**2254**	3.10
		%	81.4	12.2	2.4	0.0	0.6	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.0	0.0	0.7		
17	Prakasam	N	1141	110	43	16	2	40			51	20	15					381	**1819**	2.50
		%	62.7	6.0	2.4	0.9	0.1	2.2	0.0	0.0	2.8	1.1	0.8	0.0	0.0	0.0	0.0	20.9		
18	Srikakaulam	N	601	115			110	25		10	45		16						**922**	1.27
		%	65.2	12.5	0.0	0.0	11.9	2.7	0.0	1.1	4.9	0.0	1.7	0.0	0.0	0.0	0.0	0.0		
19	Vijaya-nagaram	N	668	96	45			18										10	**837**	1.15
		%	79.8	11.5	5.4	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2		
20	Vishakapat-nam	N	2450	86				15		100	50		15						**2716**	3.73
		%	90.2	3.2	0.0	0.0	0.0	0.6	0.0	3.7	1.8	0.0	0.6	0.0	0.0	0.0	0.0	0.0		
21	Warangal	N	2953	269	135		68	38		55	218		57		6			153	**3952**	5.43
		%	74.7	6.8	3.4	0.0	1.7	1.0	0.0	1.4	5.5	0.0	1.4	0	0.152	0	0	3.871		
22	West Godavari	N	2064	213	64		12	53					10						**2416**	3.32
		%	85.4	8.8	2.6	0.0	0.5	2.2	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	**72739**	100

Table 4: Distribution of Government HCF's in A.P. State for the year 2011 – 2012

Sl.No	District	Government HCF's	No. of Beds	Average bed strength / HCF	BMW generated Kg/day	Percentage
1	2	3	4	(5) = (4/3)	(6) = (4 X 0.11*)	%
1	Adilabad	17	2100	123.53	231	3.4
2	Anantapur	18	2350	130.56	258.5	3.8
3	Chittoor	23	5650	245.65	621.5	9.2
4	Cuddapah	15	2100	140	231	3.4
5	East Godavari	26	4350	167.31	478.5	7.1
6	Guntur	20	3950	197.5	434.5	6.5
7	Hyderabad#	17	6950	408.82	764.5	11.4
8	Karimnagar	22	3550	161.36	390.5	5.8
9	Khammam	18	2300	127.78	253	3.8
10	Krishna	16	2950	184.38	324.5	4.8
11	Kurnool	22	3400	154.55	374	5.6
12	Mahaboobnagar	20	2500	125	275	4.1
13	Medak	11	1700	154.55	187	2.8
14	Nalgonda	16	2350	146.88	258.5	3.8
15	Nellore	18	1950	108.33	214.5	3.2
16	Nizamabad	14	700	50	77	1.1
17	Prakasam	18	2100	116.67	231	3.4
18	Srikakulam	19	1350	71.05	148.5	2.2
19	Vijayanagaram	13	1700	130.77	187	2.8
20	Visakhapatnam	17	3200	188.24	352	5.2
21	Warangal	17	2000	117.65	220	3.3
22	West Godavari	15	2000	133.33	220	3.3
	Total	**392**	**61200**		**6732**	**100.0**

Source : DM&HO, Govt. of A.P.

Hyderabad includes Greater Hyderabad region i.e., Rangareddy, Secunderabad& Hyderabad

* 0.11kg/bed is average BMW generated in A.P.State which was calculated as per the data of APPCB, Govt. of A.P.

Distribution of Government HCFsin A.P. State, India, for the year 2011-2012

Table 4 shows the distribution of Government HCFs in each District of A.P. State. There were 392 Government HCFs with 61,200 bed capacity. From these HCFs, 6,732 Kgs of BMW per day is being generated. The highest number of Government HCFs is present in East Godavari District (26) followed by Karimnagar (22), Kurnool (22) and Mahaboob nagar (20). The lowest number of Government HCFs were found in Medak District (11). Though the number of HCFs is more in East Godavari District, bed strength (6950) is high in Greater Hyderabad. This is because of more number of District Medical Education Centres in Hyderabad. Though the lowest number of HCFs were recorded in Medak, number of beds were very low in Nizamabad District among Government General Hospitals. Nizamabad District has also recorded for lowest average bed strength (50 per HCF) among all Districts of Andhra Pradesh state. Highest average bed strength (408.82 per HCF) was observed in Hyderabad Government General HCFs. Same trend was observed for BMW generation among all the Districts.

Conclusion

The primary goal of the present study is to assess (i) Bio Medical Waste generation rate (ii) Number of HCFs and beds in HCFs. The results obtained from the secondary data of India and Andhra Pradesh was linked to check the precision of BMW generation and management practices in HCFs.

The data on number of private specialized HCFs and their bed strength in entire Andhra Pradesh State aid to know the distribution of beds among different categories of Private HCFS. Greater Hyderabad was brooding the highest number of HCFs with 28.02 percent bed strength. Among all the HCFs of Greater Hyderabad, 86.9 percent beds were from General Category followed by Pediatrics (5.4 percent) and Surgery (3.5 percent) HCFs (Table No:2 & 3). East Godavari District stands second highest place with 9.19 percent bed strength followed by Krishna District with 7.54 percent of bed strength. The lowest percentage of bed strength was found in Adilabad district with 0.89 percent. Among all specialized HCFs in Adilabad district, 46.9 percent were from General Category followed by Surgery with 34.1 percent and Orthopedics with 7.7 percent. Majority of Private specialized HCFs were centralized in either cities or urban localities, where population was high. It seems all HCFs were established based on the population. Hence the present study found that more number of beds in Private HCFs was identified in Greater Hyderabad followed by East Godavari and Krishna District. The highest number of Government HCFs was also identified in Greater Hyderabad followed by Visakhpatnam, Guntur and Chittoor. This also seemed to be distributed based on the population.

BMW generation was also high in Greater Hyderabad followed by Visakhapatnam whereas the lowest amount of BMW generation was observed in Cuddapah district followed by Nizamabad, Karimnagar and Warangal Districts. Same trend was also identified in BMW generation from each bed/day. Average BMW that was being generated per bed per day was derived from the State data (data from APPCB, Hyderabad) and found that it was 0.11 kg/bed/day. Based on this, it can be inferred that from 3,834 Private HCFs with 72,745 beds, 8001.95 kgs/day of BMW is generated from the entire Andhra Pradesh (Table No:1). Similarly, 392 Government HCFs with 61,200 beds were generating 6,732 kgs/day of BMW in Andhra Pradesh (Table No:4). The total amount of BMW generated from Private and Government HCFs of Andhra Pradesh State is 14,733.95 kgs/day. As per the survey data, majority HCFs responded that 0.4 kgs/bed/day of BMW is generated (Tesfahun et al., 2014). If this amount of BMW is implied to know the exact waste generation in Andhra Pradesh, then it would be 53578 kgs/day.

However the Government has established outsourcing facility called Common Bio Medical Waste Treatment Facility (CBMWTF) to treat BMW. As per the APPCB data for the year 2011-2012, there were 5,449 HCFs with 95,327 beds were registered for outsourcing. As a result, 13,018 kgs/day BMW was being treated in CBMWTFs (Sarojini et al., 2007). Therefore, it is evident that (53578 – 13,018) 7,124.42 kgs/day of BMW waste was left untreated and there was no information on the management of untreated waste either from HCFs or from the Government (Gupta & Boojh, 2006). This is an alarming situation for environment and this needs immediate attention for proper environmental management to safeguard the biotic and human health.

BMW management is not only a technical problem but also strongly influenced by economic conditions of the Health Care industry and Nation (Patil and Shekhar , 2001). As a result, only enactment of legislation will not be sufficient but sustainable solutions can be drawn or effected by involving researchers from Health Care industry.

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