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Knowledge, Attitude and Practices of Health Care Professionals Regarding Biomedical Waste Management in Indian Oral Pathology Laboratories.

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ABSTRACT

The treatment of this biomedical waste may now a days serious public health consequences and a noteworthy brunt on environment. Most laboratories, Institutions have no infection control programs due to the lack of awareness of the problem or absence of properly trained personnel. Biohazardous wastes may lead to cross infection because they may contain pathogenic organisms causing transmission of diseases such as Hepatitis B and HIV especially in the presence of open wounds. Material waste that contains chlorine e.g. gloves, when burnt even by incineration produce dioxin. From each state in India, pathologists were selected randomly from the list and 800 questionnaires were sending to them. Of these, 523 responded; out of which 466 questionnaires were included in the analysis, remaining were some types of errors. Identity of the respondents was kept confidential. A total of 800 questionnaires were distributed. Of these, 523 (65.4%) responded. Out of these, 466 questionnaires were included in the analysis, remaining were some types of errors. Knowledge, attitude, practices and facilities were available for waste management in the Laboratories. Universal work precautions involve the use of protective barriers such as gloves, gowns, aprons, masks, or protective eyewear, which can reduce the risk of the health care worker's skin or mucous membranes to potentially infective materials. It is recommended that all health care workers take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices. The present study revealed appreciable knowledge and attitude regarding infection control procedures and biomedical waste management among Indian Pathologists. Improved compliance with recommended infection control measures is required for all dentists in all the categories.

Keywords: Biomedical waste, Public health, Hazardous wastes, Pathologists

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INTRODUCTION

Biomedical waste has become a serious health hazard in many countries, including India. Infection control in commercial laboratories has attracted increasing interest in the past 18 to 24 months as evidenced by new laboratory control programs that have been recently initiated. In pursuing their aims of reducing health problems and eliminating potential risks to people's health, health care services inexorably create enormous amount of biomedical waste, which creates a high potential for infection and injury. Inadequate and inappropriate treatment of this waste may have serious public health consequences and a noteworthy brunt on environment [1].

The use of procedures to control infection and universal precautions in laboratories is effective in preventing and is strongly supported by organizations such as the Centers for Disease Control and Prevention [2]. However, infection control policies in developing countries have not been widely documented [3]. Most laboratories have no infection control programs due to the lack of awareness of the problem or absence of properly trained personnel [4].

Biohazardious wastes may lead to cross infection because they may contain pathogenic organisms causing transmission of diseases such as Hepatitis B and HIV especially in the presence of open wounds [1]. Numerous surveys and studies have shown that incidence of hepatitis B developing after needle stick injuries from HbsAg patients is approximately 2.0% compared with estimate of 0.4% following similar exposure to the HIV [5]. Material waste that contains chlorine e.g. gloves, when burnt even by incineration produce dioxin. Dioxin can cause cancer, reproductive and developmental defects other effects include neurotoxic, hormonal and immune system disorders [6].

Although many surveys about cross-infection control procedures have been carried out in several countries, there is no report in recent literature about how Indian pathologists manage the control of cross-infection and biomedical waste management in their practice. Centers for disease control and prevention (CDC) have recommended guidelines that include precautions and transmission based isolation precautions that aid in coffer- like working environment and prescribes the transmission of infections [7]. The endeavour of this study was to contrive comprehensive information about the knowledge, attitude and practice of pathologists working in laboratories regarding biomedical waste management and controlling cross-infection.

METHODOLOGY

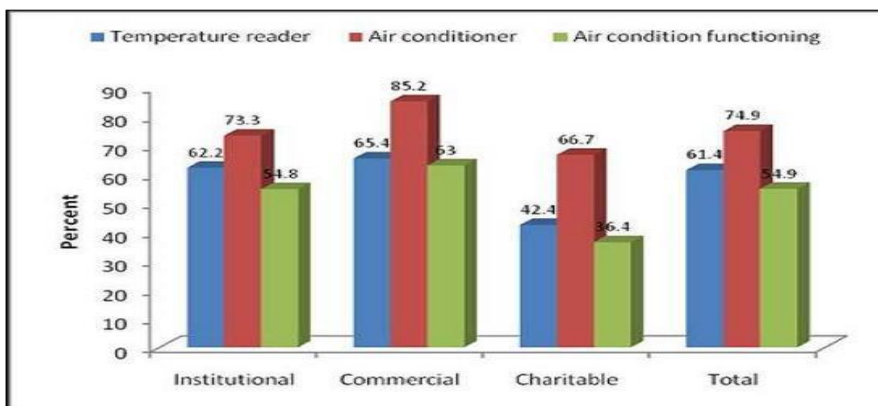
This study was conducted as a national survey among institutional, commercial and charitable pathology laboratories whether working in government or private sector in India. A self-administered questionnaire was designed to obtain knowledge, attitude and practice about procedures used for biomedical waste management and prevention of cross-infection in laboratories. The questionnaire was pre-tested, revised, and retested before use. The study population included pathologists of India who were contacted through email addresses and postal addresses respectively. From each state in India, pathologists were selected randomly

from the list and 800 questionnaires were sending to them. Of these, 523 responded; out of which 466 questionnaires were included in the analysis, remaining were some types of errors. Identity of the respondents was kept confidential. The questionnaire included data on sociodemographic characteristics, biomedical waste management practice, knowledge, practice of infection control procedures, sterilization, wearing of gloves, mask, disposal method of contaminated materials, disposal method of sharps along with temperature control mechanisms etc.

Questionnaire data was entered into a computer and analyzed by statistical software (SPSS 12.0 for Windows, SPSS Inc., Chicago, USA). The accuracy of input data was verified by entering it twice with subsequent comparison of two data sets. No discrepancies were found in the data.

RESULTS

A total of 800 questionnaires were distributed. Of these, 523 (65.4%) responded. Out of these, 466 questionnaires were included in the analysis, remaining were some types of errors. Tables 1,2,3,4 discuss the knowledge, attitude, practices and facilities available for waste management in the Laboratories. Also figures 1 and 2 highlight the temperature control mechanisms and alternate power supply used commonly in the Indian Pathological Laboratories.



Fig

1: Temperature control mechanism in the Lab

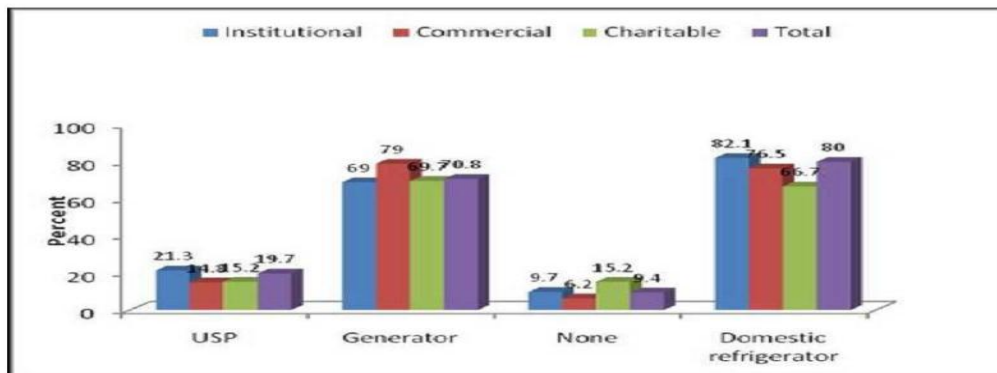


Fig 2: Alternate Power Supply

Table-1: Knowledge about infection control in oral pathology labs

Knowledge	Type of Labs						Total (n=466)	
	Institutional (n=352)		Commercial (n=81)		Charitable (n=33)			
	No.	%.	No.	%.	No.	%.	No.	%.
Waste management guidelines	348	98.9	64	79.0	30	90.9	442	94.8
Any legislation to the lab waste management	128	36.4	29	35.8	4	12.1	161	34.5
Authorization	197	56.0	35	43.2	12	36.4	244	52.4
Bloody waste (blood soaked cotton, extracted tooth, incised tissue) disposal method								
Incineration	220	62.5	47	58.0	24	72.7	291	62.4
Sterilization	8	2.3	2	2.5	1	3.0	11	2.4
Burn	76	21.6	24	29.6	5	15.2	105	22.5
Sewage	0	0.0	0	0.0	0	0.0	0	0.0
Did not know	44	12.5	8	9.9	3	9.1	55	11.8
Deep burial	4	1.1	0	0.0	0	0.0	4	0.9
Hazardous of sharps (needle, BP blade etc)	300	85.2	60	74.1	29	87.9	389	83.5
Importance of washing hands before and after patient care								
Very high	344	97.7	70	86.4	32	97.0	446	95.7
High	8	2.3	11	13.6	1	3.0	20	4.3
Intermediate	0	0.0	0	0.0	0	0.0	0	0.0
Low	0	0.0	0	0.0	0	0.0	0	0.0
No importance	0	0.0	0	0.0	0	0.0	0	0.0
Importance of washing hands before and after using gloves								
Very high	265	75.3	52	64.2	21	63.6	338	72.5
High	75	21.3	29	35.8	11	33.3	115	24.7
Intermediate	12	3.4	0	0.0	1	3.0	13	2.8
Low	0	0.0	0	0.0	0	0.0	0	0.0
No importance	0	0.0	0	0.0	0	0.0	0	0.0

Table-2: Attitude towards infection control in oral pathology labs

Attitude towards	Type of Labs						Total (n=466)	
	Institutional (n=352)		Commercial (n=81)		Charitable (n=33)			
	No.	%.	No.	%.	No.	%.	No.	%.
The risk of cross-infection from the patients to themselves and their lab assistants	341	96.9	78	96.3	33	100.0	452	97.0
All the patients have to be accepted as being infectious and universal precautions must apply to all of them								
Agree	287	81.5	57	70.4	28	84.8	372	79.8
Disagree	49	13.9	21	25.9	4	12.1	74	15.9
No idea	16	4.5	3	3.7	1	3.0	20	4.3
Importance to follow the set guidelines for dentist								
Yes but tedious	201	57.1	35	43.2	19	57.6	255	54.7
Yes not tedious	143	40.6	35	43.2	13	39.4	191	41.0
Not interested	8	2.3	2	2.5	1	3.0	11	2.4
Not practical	0	0.0	9	11.1	0	0.0	9	1.9
Waste should be segregated into different categories	352	100.0	73	90.1	31	93.9	456	97.9
Attending a programme on laboratory waste management	316	89.8	78	96.3	29	87.9	423	90.8
Safe management of health care waste is the responsibility of government								
Agree	266	75.6	57	70.4	29	87.9	352	75.5
Disagree	37	10.5	8	9.9	0	0.0	45	9.7
No comment	49	13.9	16	19.8	4	12.1	69	14.8
The waste management is team work/no single class of people is responsible for safe management								
Agree	345	98.0	72	88.9	32	97.0	449	96.4
Disagree	4	1.1	9	11.1	1	3.0	14	3.0
No comment	3	0.9	0	0.0	0	0.0	3	0.6
The safe management efforts by laboratory increases financial burden on management								
Agree	92	26.1	29	35.8	8	24.2	129	27.7
Disagree	232	65.9	50	61.7	23	69.7	305	65.5
No comment	28	8.0	2	2.5	2	6.1	32	6.9
The safe management of health care waste is an extra burden on work								
Agree	67	19.0	16	19.8	4	12.1	87	18.7
Disagree	262	74.4	62	76.5	28	84.8	352	75.5
No comment	23	6.5	3	3.7	1	3.0	27	5.8

Table-3: Practices about infection control in oral pathology labs

Practices	Type of Labs						Total (n=466)	
	Institutional (n=352)		Commercial (n=81)		Charitable (n=33)			
	No.	%.	No.	%.	No.	%.	No.	%.
Sterilization methods followed								
Autoclave	234	66.5	57	70.4	16	48.5	307	65.9
Dry heat sterilization	35	9.9	13	16.0	3	9.1	51	10.9
Cold chemical solution	8	2.3	2	2.5	0	0.0	10	2.1
Boiling water	75	21.3	9	11.1	14	42.4	98	21.0
Time since last servicing of the sterilization devices								
One week	116	33.0	37	45.7	11	33.3	164	35.2
Four weeks	44	12.5	14	17.3	4	12.1	62	13.3
Six weeks	21	6.0	0	0.0	1	3.0	22	4.7
Twelve weeks	17	4.8	3	3.7	0	0.0	20	4.3
More than twelve weeks	154	43.8	27	33.3	17	51.5	198	42.5
Method of handling hazardous wastes								
Puncture resistant containers	257	73.0	47	58.0	17	51.5	321	68.9
Plastic bottles	12	3.4	1	1.2	2	6.1	15	3.2
Dust bin	77	21.9	33	40.7	7	21.2	117	25.1
No preferred method	6	1.7	0	0.0	7	21.2	13	2.8
Methods for pre-sterilization cleaning and asepsis storage								
Disinfecting solution and detergents	150	42.6	30	37.0	12	36.4	192	41.2
Ultrasonic cleaner	12	3.4	1	1.2	0		13	2.8
Scrubbing	75	21.3	15	18.5	4	12.1	94	20.2
Anti corrosive agent	1	0.3	5	6.2	2	6.1	8	1.7
Packaging	41	11.6	6	7.4	8	24.2	55	11.8
Water washing	73	20.7	24	29.6	7	21.2	104	22.3
Preferred method to use barrier technique								
Gloves	295	83.8	70	86.4	25	75.8	390	83.7
Masks	24	6.8	4	4.9	6	18.2	34	7.3
Protective spectacles	25	7.1	5	6.2	1	3.0	31	6.7
None	8	2.3	2	2.5	1	3.0	11	2.4
Attended training on management of biomedical waste	264	75.0	57	70.4	22	66.7	343	73.6
Method of disposing sharps								
Incineration	61	18.8	8	9.9	8	25.8	77	17.6
Sharp container	248	76.3	60	74.1	22	71.0	330	75.5
With general waste	16	4.9	13	16.0	1	3.2	30	6.9
Management responsibilities included descriptions in the job	297	84.4	73	90.1	29	87.9	399	85.6
Person who did the segregation								
Doctor/Dentist	117	33.2	17	23.3	15	48.4	149	32.7
Lab technician/Histotechnician	32	9.1	13	17.8	2	6.5	47	10.3
Lab Assistant	81	23.0	18	24.7	2	6.5	101	22.1
Lab attendant	122	34.7	25	34.2	12	38.7	159	34.9
Followed the coding the waste for disposal	269	76.4	68	84.0	20	60.6	357	76.6
Labeled the infection waste	203	57.7	56	69.1	17	51.5	276	59.2

Table-3: Practices about infection control in oral pathology labs (Contd.)

Practices	Type of Labs						Total (n=466)	
	Institutional (n=352)		Commercial (n=81)		Charitable (n=33)		No.	%
	No.	%.	No.	%.	No.	%.		
Place of disposing biomedical waste								
Dumping in corporation bin	141	40.4	35	43.2	15	45.5	191	41.3
Dumping in corporation bin	15	4.3	1	1.2	0	0.0	16	3.5
Any authorized hospital/clinic waste collection	135	38.7	16	19.8	10	30.3	161	34.8
Any other specify	58	16.6	29	35.8	8	24.2	95	20.5
Maintaining register for waste disposal	119	33.8	17	21.0	9	27.3	145	31.1
Washing hands before and after patient care								
Always	322	91.5	78	96.3	32	97.0	432	92.7
Often	30	8.5	3	3.7	1	3.0	34	7.3
Sometimes	0	0.0	0	0.0	0	0.0	0	0.0
Seldom	0	0.0	0	0.0	0	0.0	0	0.0
Never	0	0.0	0	0.0	0	0.0	0	0.0
Washing hands before and after using gloves								
Always	329	93.5	59	72.8	32	97.0	420	90.1
Often	23	6.5	13	16.0	0	0.0	36	7.7
Sometimes	0	0.0	9	11.1	1	3.0	10	2.1
Seldom	0	0.0	0	0.0	0	0.0	0	0.0
Never	0	0.0	0	0.0	0	0.0	0	0.0
Keeping Slides for smear if reused								
Washed with detergent/hypochlorite followed by detergent wash and autoclaved at 121 ^o C for 1 hour.	183	52.0	41	50.6	19	57.6	243	52.1
Washed with detergent and reused	3	.9	8	9.9	2	6.1	13	2.8
Washed with enzymatic solution	0	0.0	0	0.0	0	0.0	0	0.0
Fresh slides are always used	166	47.2	32	39.5	12	36.4	210	45.1
Keeping Glass tubes (EDTA/Fluoride vials) if reused								
Washed with detergent/hypochlorite followed by detergent wash and autoclaved at 121 ^o C for 1 hour	173	49.1	30	37.0	16	48.5	219	47.0
Washed with detergent	11	3.1	2	2.5	0	0.0	13	2.8
Washed with enzymatic solution	0	0.0	8	9.9	2	6.1	10	2.1
Fresh slides are always used	168	47.7	41	50.6	15	45.5	224	48.1
Keeping Tips of pipettes if reused								
Washed dried	22	6.3	3	3.7	2	6.1	27	5.8
Washed with enzymatic solution	3	.9	8	9.9	2	6.1	13	2.8
Washed with liquid detergent	6	1.7	0	0.0	0	0.0	6	1.3
Discarded and fresh tips always used	321	91.2	70	86.4	29	87.9	420	90.1
Keeping Syringe and gloves if reused								
Washed dried	3	.9	0	0.0	0	0.0	3	.6
Washed with enzymatic solution	58	16.5	9	11.1	2	6.1	69	14.8
Washed with liquid detergent	8	2.3	1	1.2	1	3.0	10	2.1
Discarded and fresh tips always used	283	80.4	71	87.7	30	90.9	384	82.4
Discarding tissues during grossing								
Discarded in red container	130	36.9	18	22.2	19	57.6	167	35.8
Discarded in yellow container	89	25.3	16	19.8	7	21.2	112	24.0
Discarded with remaining waste	8	2.3	2	2.5	0	0.0	10	2.1
Not discarded and kept with remaining tissues	125	35.5	45	55.6	7	21.2	177	38.0

Table-4: Facilities available for waste management in the Lab

Facilities available	Type of Labs						Total (n=466)	
	Institutional (n=352)		Commercial (n=81)		Charitable (n=33)			
	No.	%.	No.	%.	No.	%.	No.	%.
Facilities available for waste management								
Segregation	224	63.6	38	46.9	19	57.6	281	60.3
Containment	129	36.6	21	25.9	12	36.4	162	34.8
Burial	66	18.8	9	11.1	4	12.1	79	17.0
Deep burial	42	11.9	7	8.6	3	9.1	52	11.2
Burning	135	38.4	22	27.2	12	36.4	169	36.3
Autoclave	240	68.2	39	48.1	25	75.8	304	65.2
Incineration	128	36.4	32	39.5	9	27.3	169	36.3
Temperature control mechanism in the Lab								
Temperature reader	219	62.2	53	65.4	14	42.4	286	61.4
Air conditioner	258	73.3	69	85.2	22	66.7	349	74.9
Air condition functioning	193	54.8	51	63.0	12	36.4	256	54.9
Alternate power supply								
USP	75	21.3	12	14.8	5	15.2	92	19.7
Generator	243	69.0	64	79.0	23	69.7	330	70.8
None	34	9.7	5	6.2	5	15.2	44	9.4
Domestic refrigerator	289	82.1	62	76.5	22	66.7	373	80.0

DISCUSSION

The workers in laboratories generally are faced with many occupational risks at work and his/her health and safety may be severely jeopardized if adequate preventive protective measures are not taken. These hazards can be physical, chemical and biological. The prevention of occupational hazards in laboratories requires a thorough knowledge of the risks and practical measures to be taken (Ogunbodede, 1996) [8]. Universal work precautions involve the use of protective barriers such as gloves, gowns, aprons, masks, or protective eyewear, which can reduce the risk of the health care worker’s skin or mucous membranes to potentially infective materials. In addition, it is recommended that all health care workers take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices. In the present study, almost all the respondents had knowledge about waste management guidelines and 34.5% respondents were aware about any legislation to the lab waste management. However, in a study (Ejilemele and Ojule, 2005) [9], gross deficiencies were found in the knowledge, attitudes and practice of laboratory safety by laboratory staff in areas of use of personal protective equipment, specimen collection and processing, centrifuge-related hazards, infective hazards waste disposal and provision and use of First Aid Kits. In the present study, majority (72.5%) of the respondents had knowledge about the importance (very high) of washing hands before and after using gloves. This was almost similar among the respondents of institutional (75.3%) commercial (64.2%) and charitable (63.6%). The ultimate responsibility for laboratory safety within an institution lies with its Superintendent, who, along with all

immediate associates should have a continuing, overt, commitment to the safety program. It has been shown that perception of senior management support for safety programmers was the most significant factor influencing compliance with infection control and reducing exposure incidents. It has been reported that health workers are generally not aware of what form of prophylaxis measures to be taken in the event of exposure to blood and body fluids. Many needle and sharp injuries can be avoided with proper knowledge and good practices (Odusanya, 2003; Lunding et al, 1998) [10, 11]. In the present study, most of the respondents preferred boiling water in comparison to autoclaving as method for sterilization of the instruments and they did get servicing of their sterilizing device within specified time. This showed their attitude towards cross-infection control practices in their practice. Center of disease and control recommend that sterilization devices like autoclave; boiler must be checked at four weeks interval. The practice of washing hands before and after using the instrument was significantly higher among the respondents. More than one third (41.2%) of the respondents were using disinfecting solution and detergents method for pre-sterilization cleaning and asepsis storage. This practice was higher among the respondents of institutional (42.6%) followed by commercial (37%) and charitable (36.4%) labs. The level of awareness about universal work precautions amongst laboratory technicians is low as only 20.8% of them had heard about the term and only 37.5% of these could correctly state the objectives. The attitude and practices of the laboratory health workers towards universal Precaution call for a lot of concern as 45.6% of them rate in the laboratory and this is comparable with 41.0% rate observed amongst laboratory scientist in Ibadan, Nigeria (Omokhodion, 1998) [13] and greater than 5.6% amongst workers in Lagos State Emergency Services (LASEMS) in Lagos (Odusanya, 2003) [10].

In the present study, about half (52.1%) of the respondents were washing slides for smear detergent/hypochlorite followed by detergent wash and autoclaved at 1210C for 1 hour, if reused. More than one third (47%) of the respondents were keeping Glass tubes (EDTA/Fluoride vials) after washing with detergent/hypochlorite followed by detergent wash and autoclaved at 1210C for 1 hour, if reused. This practice was almost similar among the respondents of charitable (48.5%), institutional (49.1%) and commercial (37%) labs.

CONCLUSIONS AND RECOMMENDATIONS

The present study revealed appreciable knowledge and attitude regarding infection control procedures and biomedical waste management among Indian Pathologists. Despite of this, there is deficiency in practice regarding infection control procedures and biomedical waste management. Improved compliance with recommended infection control measures is required for all dentists in all the categories. Continuing education programs and short time courses about infection control procedures are suitable to improve the results. Also, sustainable solutions can be affected by involving local bodies engaged in waste management.

REFERENCES

- [1] MMWR Morbid Mortal Wkly Rep 1991; 40: 377-04.



- [2] Adil MM, Alam AY. J Pak Med Assoc 2005; 55: 88-02.
- [3] Osamong LA, Gathece LW, Kisumbi BK, Mutave RJ. African J Oral Health 2005; 2: 24-05.
- [4] Sharma S, Chauhan SV. J Environ Biol 2008; 29: 159-03.
- [5] Yüzbasıoglu E, Saraç D, Canbaz S, Saraç YS, Cengiz S. J Appl Oral Sci 2009; 17: 565-09.
- [6] Sobayo EL. J Hosp Infect 1991; 18: 388-03.
- [7] Askarian M, Assadian O. Arch Iran Med. 2009; 12: 48-03.
- [8] Ogunbodede EO. Nig J Med 1996; 5: 11-02.
- [9] Ejilemele AA, Ojule AC. Niger J Clin Pract 2005; 8: 102-06.
- [10] Odusanya OO. Niger Med J 2003; 44-01.
- [11] Lunding S, Nielsen TL, Nielsen JO. Ugeskr Laeger 1998; 160: 1789-04.
- [12] Omokhodion FO. Afr J Med Sci 1998; 27: 201-03.