

Survey of responsible handling of local anesthetic in Indian dental operator

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Introduction

Millions of local anesthetic (LA) injections are being given daily worldwide.^[1] Standard protocols have been advocated for delivery of LA injection in dental operator for various invasive procedures.^[2] There have been reports

Access this article online	
Website: www.jfds.org	Quick Response Code
DOI: 10.4103/0975-1475.119785	

Abstract

Background: Dental operator requires handling of numerous toxic fluids such as denture acrylic monomer, alcohol and formalin for effective oral care delivery. The efficacy and responsible handling of such fluids has not been analyzed among Indian dentists and this study aims to address this lacunae. **Materials and Methods:** Closed ended questionnaire was distributed through email to Indian dentists in July 2012. After inclusion/exclusion criteria, 1484 practitioners constituted the study group with a response rate of 52%. **Statistics:** SPSS[®] Version 17.0 (SPSS-IBM Inc., IL, USA) was used to carry out statistical analysis. Descriptive statistics were presented. Chi square test was used to identify the association between the parameters; $P \leq 0.05$ was considered as statistically significant. **Results:** Males (80.8%), undergraduates (78%), exclusive practitioners (81.2%), urban practitioners (68.5%) were the predominant respondents. Predominant of the respondents (97%) used local anesthetic (LA) from bottles. Eight percent have encountered instances of injecting formalin instead of LA in their settings. Safe disposal rules and regulations ($P \leq 0.05$), opinion on injecting the other fluids instead of LA as a severe negligent act ($P \leq 0.05$) were statistically significant between age groups. Educational status did not appear to influence the outcome. Only a third of the respondents were aware of the rules and regulations for safe disposal of empty LA bottles while 49.1% were not aware of them and willing to learn. **Discussion:** The lacunae in responsible handling of toxic fluids need to be addressed to prevent inadvertent and negligence suits against dentists, highlighting the need through continuing dental education programmes.

Key words: Formalin, injection, local anesthetics, responsible handling, safe disposal

of unintended injection of formalin instead of LA.^[3,4] There are several reasons given for such instances such as wide spread practice of using LA in bottles, reuse of LA bottles in dental operator, non-availability of professionally trained or educated dental assistants (as certified by competent authority) and improper handling techniques.^[3,4] However such isolated incidents highlight the necessity to increase the awareness of responsible handling of fluids, especially toxic like monomers, formalin etc., in dental operator.

A section of Indian health care providers are of the view that there is a lack of predefined, uniform standards and protocols regulating the existing health care delivery systems. They also add that continuing medical education is relatively non-existent. They claim that the marginalized segments of the society are often vulnerable to the

unregulated, unmonitored health care providers.^[5] They also have added that in Indian cities there has been a takeover of health services by corporate health care, without any transparent processes of accountability.^[6]

In such situation the onus of responsible handling of fluids in dental operatory rests with the dentists. This study was performed to assess the knowledge and behavior of Indian dentists with regards to responsible handling of LA solutions.

Materials and Methods

A self-reported, anonymous, custom made questionnaire was developed that collected basic demographic details of the respondent without revealing identity, specialty, region or language. Questions concerning their assistant's qualification, storage of LA solution, details of persons handling LA solutions in dental operatory, reuse of empty LA bottles (if yes, nature), instruction to para-dental staffs (professionally trained and certified by competent authority) about toxicity of fluids used in dentistry, safe disposal of empty LA bottles, dispensation of formalin, ideal biopsy containers, test dose (sensitivity testing) for LA as well as opinion on negligence of injecting some other fluid instead of LA were in the format. The questionnaire was uploaded using an online survey tools. Random email IDs of practicing dentists from all parts of the country were collected from online resources including dental practitioner's forums, website advertisements, journal sites and groups. The link of the survey was mailed with a request detailing the aims and objective of the study. A link was included to decline the survey as well as for removal of the IDs from further mailing. The survey was launched on July 1st 2012 and closed on midnight of July 25th 2012. Altogether, 5 customized mails including 2 reminders were sent to potential participants. Anonymity was ensured at all level of communications and the same was stressed in the mail.

In total, 5484 emails were sent. Of this 287 bounced back indicating improper email ID. The total number of effective mails that was delivered was 5197. Of this 128 replied that they were not willing to participate in the survey. The total number of effective potential participants were 5069. Of this 2634 responded with an overall response rate of 51.96%. In these 2634 participants, 1150 dentists who did not provide all demographic parameters and those that did not contain response to 75% of other questions were removed. The remaining 1484 practitioners constituted the study group.

SPSS® Version 17.0 (SPSS-IBM Inc., IL, USA) was used to carry out statistical analysis. Descriptive statistics were presented for the demographic variables of the participants as well as their responses. Chi square test was used to identify the association between age, gender, academic background and practice setting with the persons permitted

to handle LA in dental operatory, reuse of LA bottle, safe disposal rules and regulations and opinion on injecting the other fluids instead of LA as a severe negligent act. A $P \leq 0.05$ was considered as statistically significant.

Results

Of all the 1484 participants, 91.6% were 50 years and below. Males were the predominant respondents (80.8%). Most of the participants (78%) had undergraduate qualification while others were doing post graduation (2.4%) and some had postgraduate qualification (19.6%). Of all the respondents, 81.2% had exclusive practice background while others had academic background. Most of the respondents practiced dentistry in urban areas (68.5%) and 58.2% had qualified or a well-trained dental assistant. Predominant of the respondents (97%) used LA from bottles [Table 1].

Most of the respondents (45%) preferred to store LA bottles under lock and key. Of all respondents, 59.6% of them handled LA or allowed only dentists to handle the LA in their operatory. 63.1% never reused LA bottles. Only a third of the respondents were aware of the rules and regulations for safe disposal of empty LA bottles while 49.1% were not

Table 1: Descriptive statistics for demographical parameters of the respondents

Parameters	N=1484	Percent
Age		
35 years and below	648	43.7
36-50 years	712	48.0
Above 51 years	124	8.4
Gender		
Male	1199	80.8
Female	285	19.2
Qualification		
BDS degree	1158	78.0
MDS student	35	2.4
MDS degree holder	291	19.6
Status		
Student	18	1.2
Practitioner	1205	81.2
Academician	41	2.8
Academician and practitioner	220	14.8
Area of practice		
Urban	1016	68.5
Semi urban	380	25.6
Rural	88	5.9
Assistant		
Professionally trained/qualified*	864	58.2
Not qualified [§]	620	41.8
LA used		
In bottles	1440	97.0
In cartridge	44	3.0

*As certified by competent authority; [§]Not certified by a competent authority; LA: Local anesthetic

Table 2: Response to questions by the study population (n=1484)

Parameters	Frequency	Percent	Valid percent
Store LA bottles			
Shelves (Lock and key)	647	43.6	45.0
Open shelves	310	20.9	21.5
Refrigerator	194	13.1	13.5
In surgical trolley	288	19.4	20.0
Not answered	45	3.0	
LA handling in operatory			
Only dentists	847	57.1	59.6
Only trained/qualified assistants	188	12.7	13.2
Only qualified assistants	41	2.8	2.9
Only trained assistants	120	8.1	8.4
Either of the above	225	15.2	15.8
Not answered	63	4.2	
Reuse of LA bottles			
No	898	60.5	63.1
Yes	526	35.4	36.9
Not answered	60	4.0	
Formalin supplied by lab			
Formalin in labeled containers	829	55.9	60.0
Formalin in unlabeled containers	116	7.8	8.4
Formalin alone	75	5.1	5.4
None	362	24.4	26.2
Not answered	102	6.9	
Container			
Not sure	432	29.1	29.1
Wide mouth	928	62.5	62.5
Narrow mouth	124	8.4	8.4
Container			
Not sure	780	52.6	52.6
Plastic bottle	112	7.5	7.5
White glass bottle	292	19.7	19.7
Amber colored glass bottle	300	20.2	20.2
LA test dose			
Never	464	31.3	32.3
Yes-intranasal	4	0.3	0.3
Yes-Intradermal	214	14.4	14.9
Yes-Intramucosal-palate	65	4.4	4.5
Rarely-only in suspicious cases	689	46.4	48.0
Not answered	48	3.2	
Awareness of regulations for safe disposal of LA bottles			
Not sure	50	3.4	3.7
Yes and I adhere	455	30.7	33.3
yes and I do not adhere	183	12.3	13.4
No and am willing to learn	671	45.2	49.1
No and I am not interested	8	0.5	0.6
Not answered	117	7.9	
Injection of formalin			
Never heard	464	31.3	32.6
Anecdotal	272	18.3	19.1

Contd...

Table 2: Contd...

Parameters	Frequency	Percent	Valid percent
Seen in my setting	113	7.6	7.9
Read in literature	575	38.7	40.4
Not answered	60	4.0	
Is injecting formalin a severe act of negligence			
Not commenting	92	6.2	3.9
Yes	1372	92.5	94.8
No	20	1.3	1.4

LA: Local anesthetic

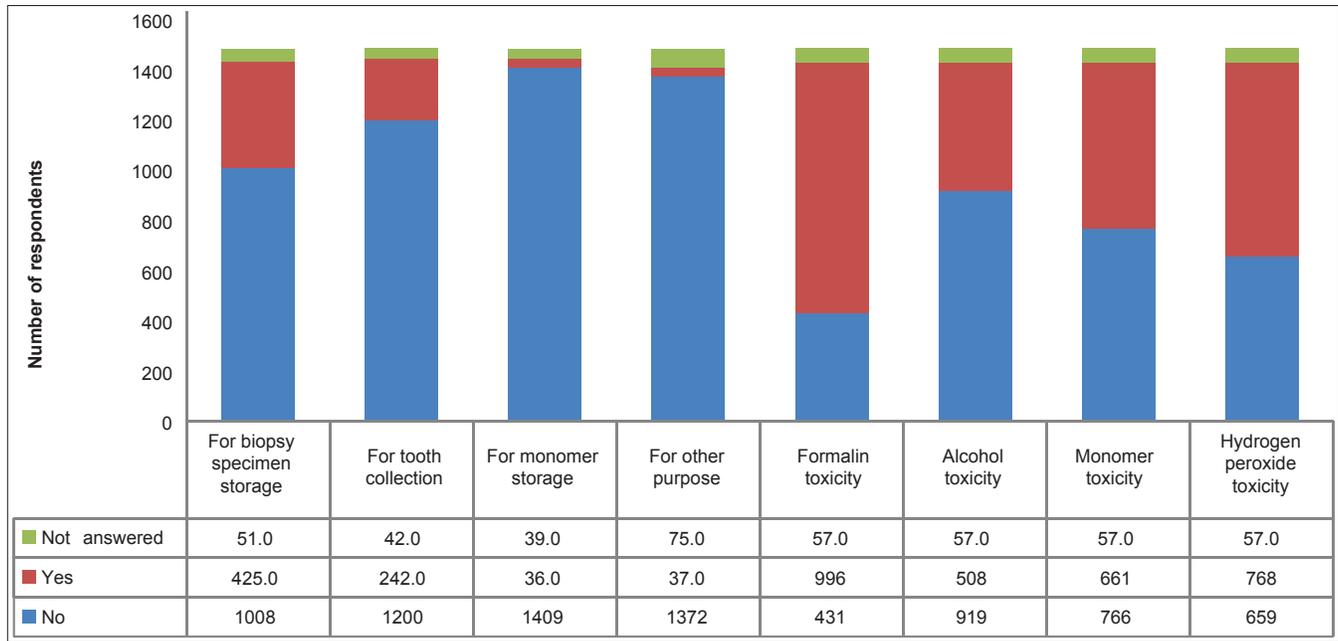
aware of them and willing to learn [Table 2].

To 60% of the respondents, their pathologists or labs gave formalin in labeled containers [Table 2]. However, 28.6% committed that they use LA bottles for storing biopsy specimens [Graph 1]. Of all respondents, 62.5% preferred wide mouth containers as an ideal specimen bottle while only 7.5% preferred plastic bottle. Nearly a third (32.3%) of the respondents never performed LA test while 48% rarely performed it when history was suspicious. Vast majority of respondents (97%) believed that injecting other substances instead of formalin as a severe negligent act. Similarly majority of the dentists had briefed their staffs about toxicity of some commonly used fluids in dentistry [Graph 1]. For collecting tooth for academic purposes, 54.7% used diluted hydrogen peroxide, 28% used formalin and 4.6% used sodium hypochlorite.

On comparing age groups with the persons permitted to handle LA in dental operatory ($P \leq 0.05$), safe disposal rules and regulations ($P \leq 0.05$) and opinion on injecting the other fluids instead of LA as a severe negligent act ($P \leq 0.05$) were statistically significant [Table 3]. Educational status did not appear to influence the outcome [Table 4]. On comparing practice status, reuse of LA bottles ($P \leq 0.05$), safe disposal rules and regulation ($P \leq 0.05$) and opinion on injecting the other fluids instead of LA as a severe negligent act ($P \leq 0.05$) were statistically significant [Table 5]. On comparing area of practice's influence on opinion on injecting the other fluids instead of LA as a severe negligent act ($P \leq 0.05$) was only statistically significant [Table 6]. On comparing gender status, person handling LA in dental operatory ($P \leq 0.05$) and reuse of LA bottles ($P \leq 0.05$) were only statistically significant [Table 7]. Table 8 refers to the LA test dose application with the predictor variables. Age of dentists, academic status and area of practice appear to influence the delivery of test dose.

Discussion

The possibilities and probable sequence of events resulted in injection of formalin instead of LA have been discussed in literature.^[3,4] This study was undertaken to survey the existing situation, awareness, responsible handling and



Graph 1: Number of dentists who regularly use empty local anesthetic bottles and educating the dental assistants about toxicity

Table 3: Influence of age on the outcome variables

	35 years and below	36-50 years	Above 51 years	P value
LA handling done in LA operatory				
Only dentists	422 (67.63)	348 (51.25)	77 (65.25)	0.0000
Only trained/qualified assistants	66 (10.56)	10 (16.05)	13 (11.02)	
Only qualified assistants	24 (3.85)	17 (2.5)	0	
Only trained assistants	24 (3.85)	84 (12.37)	12 (10.17)	
Either of the above	88 (14.10)	121 (17.82)	16 (13.56)	
Reuse LA bottle				
No	380 (60.60)	449 (66.13)	69 (58.48)	0.0660
Yes	247 (39.39)	230 (33.87)	49 (41.53)	
Safe disposal of LA bottles				
Not sure	20 (3.33)	18 (2.73)	12 (11.01)	0.0000
Yes and I adhere	192 (32.05)	215 (32.63)	48 (44.04)	
Yes and I do not adhere	100 (16.7)	77 (11.68)	6 (5.51)	
No and I am willing to learn	283 (47.25)	345 (52.35)	43 (39.45)	
No and I am not interested	4 (0.01)	4 (0.01)	0	
Is injecting some other fluids instead of LA a case of severe negligence				
Not commenting	25 (3.86)	52 (7.3)	15 (12.1)	0.0010
Yes	614 (94.75)	653 (91.71)	105 (84.68)	
No	9 (1.4)	7 (0.01)	4 (3.23)	

LA: Local anesthetic

practice of LA delivery and safe disposal of LA bottles practiced by Indian dentists in their dental operatory.

Delivery of LA is one of the critical aspects of pain control in dentistry and is practiced widely by dentists. The care taken by dentists during LA injections, the safety and efficacy profile of different LAs has been reported. However there is a paucity of studies that have studied the probable mistakes that occurs with LA injections and LA handling. In case reports

where formalin had been injected instead of LA, sensitivity testing has not been performed.^[3,4] In recently reported cases, accidental injection of formalin was associated at two stages. First, an organizational mistake was made. Formalin bottles should never be placed in the dental operatory or along in the surgical trolley. It should be stored in an airtight container, preferably near the areas of sink, where in the spillage, if any to occur, will be limiting. The biopsy specimen should be taken away to the place of such storage and not vice

versa. Second, the executive error occurred – the dentist took the LA bottle given by the assistant/dental student administered the LA without checking the vial content or the label. According to good clinical practice, any drug should be taken from the assistant (nurse) and the vial's content checked before injection. Hence in both the instances, there had been probable ideological, organizational and executive

oversights culminating in these episodes.^[7]

The present study was undertaken to analyze the self-reported responsible behavior of handling of LA and other solutions in the Indian dental operatories. Most of the respondents were aged below 50 years of age and predominantly males. One in five respondents was female.

Table 4: Influence of the level of education on the outcome variables

	BDS	MDS student	MDS	P value
LA handling done in LA operatory by				
Only dentists	655 (59.82)	19 (54.29)	173 (59.45)	0.5210
Only trained/qualified assistants	142 (12.97)	4 (11.43)	42 (14.43)	
Only qualified assistants	30 (2.74)	0	11 (3.78)	
Only trained assistants	98 (8.95)	5 (14.29)	17 (5.84)	
Either of the above	170 (15.53)	7 (0.2)	48 (16.45)	
Reuse LA bottle				
No	700 (63.75)	16 (45.71)	182 (62.54)	0.0920
Yes	398 (36.25)	19 (0.54)	109 (37.46)	
Safe disposal of LA bottles				
Not sure	36 (3.45)	1 (2.94)	13 (4.45)	0.6330
Yes and I adhere	352 (33.72)	8 (23.53)	95 (32.87)	
Yes and I do not adhere	143 (13.7)	8 (23.53)	32 (11.07)	
No and I am willing to learn	507 (48.56)	17 (0.5)	147 (0.51)	
No and I am not interested	6 (0.01)	0	2 (0.01)	
Is injecting some other fluids instead of LA a case of severe negligence				
Not commenting	79 (0.07)	3 (0.09)	10 (0.03)	0.0710
Yes	1067 (92.14)	31 (88.57)	274 (94.19)	
No	12 (0.01)	1 (0.02)	7 (0.02)	

LA: Local anesthetic, MDS: Master of Dental Surgery, BDS: Bachelor of Dental Surgery

Table 5: Influence of academic background on the outcome variables

	Student	Practitioner	Academician	Academician and practitioner	P value
LA handling done in LA operatory by					
Only dentists	10 (55.56)	682 (59.72)	18 (43.90)	137 (62.27)	0.1540
Only trained/qualified assistants	0	148 (12.96)	8 (19.51)	32 (14.55)	
Only qualified assistants	0	33 (2.88)	3 (7.32)	5 (2.27)	
Only trained assistants	2 (11.11)	100 (8.75)	2 (4.88)	16 (7.27)	
Either of the above	6 (33.33)	179 (15.67)	10 (24.39)	30 (13.64)	
Reuse LA bottle					
No	6 (33.33)	732 (63.93)	17 (41.46)	143 (65)	0.0010
Yes	12 (66.67)	413 (36.07)	24 (58.54)	77 (35)	
Safe disposal of LA bottles					
Not sure	1 (5.56)	38 (3.48)	4 (9.76)	7 (3.23)	0.2080
Yes and I adhere	1 (5.56)	369 (33.82)	14 (34.15)	71 (32.72)	
Yes and I do not adhere	4 (22.22)	146 (12.38)	4 (9.76)	29 (13.36)	
No and I am willing to learn	12 (66.67)	531 (48.67)	18 (43.90)	110 (50.69)	
No and I am not interested	0	7 (0.01)	1 (0.02)	0	
Is injecting some other fluids instead of LA a case of severe negligence					
Not commenting	2 (11.11)	80 (6.64)	0	10 (4.55)	0.0100
Yes	16 (88.89)	1112 (92.28)	38 (92.68)	206 (93.63)	
No	0	13 (1.08)	3 (7.32)	4 (1.82)	

LA: Local anesthetic

Table 6: Influence of practice area on the outcome variables

	Urban	Semi-urban	Rural	P value
LA handling done in LA operatory by				
Only dentists	577 (59.79)	222 (60.32)	48 (54.55)	0.2200
Only trained/qualified assistants	134 (13.89)	46 (12.5)	8 (9.09)	
Only qualified assistants	21 (2.18)	16 (4.35)	4 (4.55)	
Only trained assistants	80 (8.29)	32 (8.7)	8 (9.09)	
Either of the above	153 (15.85)	52 (14.13)	20 (22.72)	
Reuse LA bottle				
No	619 (63.95)	235 (63.86)	44 (0.5)	0.0320
Yes	349 (36.05)	133 (36.14)	44 (0.5)	
Safe disposal of LA bottles				
Not sure	33 (3.53)	13 (3.76)	4 (4.71)	0.2020
Yes and I adhere	331 (35.36)	104 (30.06)	20 (23.53)	
Yes and I do not adhere	118 (12.61)	49 (14.16)	16 (18.82)	
No and I am willing to learn	450 (48.08)	176 (50.87)	45 (52.94)	
No and I am not interested	4 (0.4)	4 (1.16)	0	
Is injecting some other fluids instead of LA a case of severe negligence				
Not commenting	75 (7.38)	17 (4.47)	0	0.0020
Yes	931 (91.63)	352 (92.9)	88 (100)	
No	10 (0.98)	11 (2.63)	0	

LA: Local anesthetic

Table 7: Influence of gender on the outcome variables

	Male	Female	P value
LA handling done in LA operatory by			
Only dentists	674 (59.18)	173 (61.38)	0.0500
Only trained/qualified assistants	143 (12.56)	45 (15.96)	
Only qualified assistants	33 (2.9)	8 (2.84)	
Only trained assistants	108 (9.48)	12 (4.26)	
Either of the above	181 (15.89)	44 (15.6)	
Reuse LA bottle			
No	738 (64.62)	160 (56.74)	0.0140
Yes	404 (35.38)	122 (43.26)	
Safe disposal of LA bottles			
Not sure	40 (3.65)	10 (3.68)	0.9800
Yes and I adhere	362 (33.06)	93 (34.19)	
Yes and I do not adhere	148 (13.51)	35 (12.87)	
No and I am willing to learn	538 (49.13)	133 (48.89)	
No and I am not interested	7 (0.64)	1 (0.37)	
Is injecting some other fluids instead of LA a case of severe negligence			
Not commenting	82 (0.07)	10 (0.04)	0.0960
Yes	1100 (91.74)	272 (95.44)	
No	17 (1.42)	3 (1.05)	

LA: Local anesthetic

Most of the respondents had an undergraduate degree and about one-fifth had postgraduate degree. In actual situation, the proportion of postgraduate would be tremendously low. As reported in literature, most of Indian dentists practice in urban/semi-urban areas.^[8] There had been a dearth of qualified dental assistants and about 40% dentists still are

assisted by unqualified assistants as reported in literature.^[4] This is contradictory to code of ethics, 1976 laid down by the Dentist Act of India provision.^[9] Most of dentists used LA in bottles and use of LA cartridge was limited. This probably is associated with the cost effectiveness of LA bottles that costs only about fifteen to twenty Indian rupees.

Most of the dentists store (66.5%) their LA in shelves, while only 13.5% store in refrigerator and one-fifth prefer to keep it near the surgical trolley. It is advised in the product insert that the LA bottles shall be stored away from direct light and in the temperature of about 15-25°C. Moreover, placement of LA bottles in surgical trolleys may invite additional trouble including cross contamination. The advices mentioned in the product insert must be followed with adequate care. The data from the study indicates that most of the respondents adhere to the prescribed norms in this regard. Given the vast variation in room temperature across India and accommodating seasonal variation, proper storage norms should be established.

Sixty percentages of dentists only allow doctors to handle LA whereas others allow other persons to handle LA. Contradictory to claims in literature,^[4] most of the respondents do not allow non-dentist to handle LA bottles within their operatory. This attitude difference was highly significant among the different age groups and the gender. Predominantly, those aged ≤35 years and ≥51 years prefer to handle LA by dentist while those in 36-50 years category allow their trained or qualified assistants to handle LA in their operatory. Similarly, females dentists prefer to handle LA by themselves than their male counterparts.

Table 8: Influence of predictor variables on the use of LA test dose

	No	Yes-intranasal	Intradermal	Intramucosal palate	In suspicious cases	P value
Age						
35 years and below	162 (34.9)	4 (100)	137 (64)	20 (30.8)	308 (44.7)	0.000
36-50 years	257 (55.4)	0	69 (32.2)	37 (56.9)	324 (47)	
Above 51 years	45 (9.7)	0	8 (3.7)	8 (12.3)	57 (8.3)	
Qualification						
BDS degree	363 (78.2)	3 (75)	164 (76.6)	54 (83.1)	528 (76.6)	0.5310
MDS student	10 (2.2)	0	8 (3.7)	3 (4.6)	13 (1.9)	
MDS degree holder	91 (19.6)	1 (25)	42 (19.6)	8 (12.3)	148 (21.5)	
Status						
Student	7 (1.5)	0	3 (1.4)	0	8 (1.2)	0.0080
Practitioner	372 (80.2)	3 (75)	168 (78.5)	58 (89.2)	558 (81)	
Academician	22 (4.7)	1 (25)	9 (4.2)	0	9 (1.3)	
Academician and practice	63 (13.6)	0	34 (15.9)	7 (10.8)	114 (16.5)	
Practice area						
Urban area	295 (63.6)	4 (100)	150 (70.1)	49 (75.4)	481 (69.8)	0.0200
Semi-urban	145 (31.3)	0	44 (20.6)	12 (18.5)	168 (24.4)	
Rural area	24 (5.2)	0	20 (9.3)	4 (6.2)	40 (5.8)	
Gender						
Male	381 (82.1)	2 (50)	166 (77.6)	53 (81.5)	554 (80.4)	0.3600
Female	83 (17.9)	2 (50)	48 (22.4)	12 (18.5)	135 (19.6)	

LA: Local anesthetic, MDS: Master of Dental Surgery, BDS: Bachelor of Dental Surgery

The handling of LA is not influenced by the degree possessed (BDS/MDS), association with dental colleges as well as place of practice (urban/semi-urban/rural). The reasons behind this phenomenon need to be explored further.

Of all respondent dentists, 36.9% reuse LA bottles, mostly for storing biopsy specimens. It is observed in this present study that dentists in academic settings reuse LA bottles often and 58.5% of academicians reuse LA bottles for storing biopsy specimens while 35% of practitioners in academics and 36% of exclusive practitioners reused LA bottles. This difference was statistically significant. Similarly female dentists reused LA bottles more often their male counterparts. The reason behind this need to be further explored. The empty LA bottles need to be treated as a reusable waste and has to be disposed as such.^[10] The LA bottles are often narrow necked and pose an extreme risk during specimen retrieval after its reaches the lab. Still, more than a third of respondents use empty LA bottles for transport of specimens. Storage of formalin in empty LA bottles would be inviting trouble and may accidentally be injected instead of LA.

While collecting natural human tooth for academic purposes, it has been recommended that the best form of sterilization would be to store it in formalin.^[11,12] Less than a third of dentists stored in formalin while 54.7% used hydrogen peroxide. Immersion in 10% formalin for seven days has been identified as a best way to disinfect the tooth and other material proved to be ineffective.^[11,12] The reason probably behind preference of use of hydrogen peroxide is that it helps to remove tissue debris, calculus and bleaches the tooth adding an esthetic appeal to the tooth.

For dental operatories, formalin is usually supplied in labeled containers to 60% of respondents. Of the respondents, 62.5% used wide mouth containers for biopsy specimen transport. More than 50% of dentists were not sure of the material (plastic/glass) of the container in which specimen need to be transported. The biopsy specimen often is required to be transported in 10% formalin; preferably in a transparent plastic bottle as glass bottle might break during transport while amber color will hinder visual acuity during earlier phases of specimen receiving at the lab.

One-third of dentists never employ LA test dose and 48% of them use it only when the history is suspicious. Though mandatory, this aspect is the most neglected and underreported event in minor oral surgery. The use of test dose appears to be influenced only by age, academic status and area of practice with statistical significance. Allergy to LA and adverse reaction to LA components has been reported. While the frequency of allergy and adverse effects are much debated, the standard operating procedure mandates the test dose of LA for all cases irrespective of history.^[2,13] However, in certain instances, this injection of test dose may also prevent injection of noxious agents in large quantities (when signs and symptoms of reactions occurred after noxious substances are injected instead of LA). Of all respondents, 94.8% felt that injecting of formalin instead of LA is a severe form of negligence. Of all dentists, about 7.9% had injected formalin instead of LA in their operatory at least once and 19.1% have heard anecdotal experiences of others. Only a third has never heard about such incident. This data indicates that the "inadvertent" injection of formalin instead of LA is a fairly common

form of severe negligence in dental operatory. However to the best of author's knowledge, none of such events have been sued for negligence. What appears to be reported in literature is a tip of an iceberg and appropriate mechanism need to be installed to protect the interest of the patients. Periodical mandatory check through legally constituted means such as the proposed clinical establishment act shall help in prevention of such preventable issues.^[5,6]

Forty nine percent of dentists reported that they are not aware of safe disposal of empty LA bottles and willing to learn. Only 13.4% are aware of safe disposal methods but feel that they are not practically feasible. Only age appears to influence the degree of awareness and willingness to learn. Dentists aged greater than 51 years followed safe disposal policy while those in 36-50 years were willing to learn safe disposal procedures. There is a substantial number of dentists, though aware of safe disposal procedure, do not implement it as they feel they are practically not feasible. Though literature has evidence and protocols for safer disposal of empty LA bottles,^[10] it has underlined the non-adherence of the same even in advanced point of care settings.^[13] Mandatory rules and regulations that govern the point of health care delivery such as clinics and operatory need to be in force as well as a legally constituted body is the need of the hour to monitor the formation, adherence and related compliance issue of such policies in settings.

Though isolated instances of injection of formalin or other toxic materials instead of LA occurrence has been documented, it appears that it is more common and it is the combined responsibility of the head of the operatory to prevent such instances. Mandatory continuing dental education and periodical review program for dental and parodontal staff may be starting point of the same.

This survey was done only using online resource. As the penetration of internet is still limited in India, even in dental academic institutions,^[14] the response to such survey may represent only an arbitrary, representative value. The actual incidence may be under portrayed in the study owing to inherent limitation. Hence the utilization of the data herein should be done with extreme caution.

Conclusion

This study probably for the first time analyzes the responsible handling procedures of formalin in dental clinics. The chances of mixing up of toxic fluids stored in LA bottles appear to be high. Continuing dental education programs need to include this feature to prevent such

mishaps. The study also underlines the importance of the urgent necessity of a legally sanctioned body that could frame policies, draw specific protocols, monitor implementations, periodically inspect and recommend steps to ensure highest standards of good clinical practice.

Acknowledgment

The authors like to thank the Principal, Dr. S. Ramachandran and Prof. Kanagaraj, Chairman of the institution for their constant motivation, support and encouragement.

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How to cite this article: Rooban T, Rao UK, Joshua E, Ranganathan K. Survey of responsible handling of local anesthetic in Indian dental operatory. *J Forensic Dent Sci* 2013;5:138-45.

Source of Support: Nil, **Conflict of Interest:** None declared