Survey of responsible handling of local anesthetic in Indian dental operatory

Thavarajah Rooban1,2, Umadevi Krishnamohan Rao1, Elizabeth Joshua1, Kannan Ranganathan1
1Department of Oral and Maxillofacial Pathology, Ragas Dental College and Hospital, Uthandi, 2Marundeeshwara Oral Pathology Services and Analytics, Tiruvanmiyur, Chennai, Tamil Nadu, India

Address for correspondence: Dr. Thavarajah Rooban, Department of Oral and Maxillofacial Pathology, Ragas Dental College and Hospital, 2/102 East Coast Road, Uthandi, Chennai, Tamil Nadu - 600 119, India. E-mail: t.roobanmds@gmail.com

Abstract

Background: Dental operatory 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

Introduction

Millions of local anesthetic (LA) injections are being given daily worldwide. Standard protocols have been advocated for delivery of LA injection in dental operatory for various invasive procedures. There have been reports of unintended injection of formalin instead of LA. There are several reasons given for such instances such as wide spread practice of using LA in bottles, reuse of LA bottles in dental operatory, non-availability of professionally trained or educated dental assistants (as certified by competent authority) and improper handling techniques. However such isolated incidents highlight the necessity to increase the awareness of responsible handling of fluids, especially toxic like monomers, formalin etc., in dental operatory.

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. 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.

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 any transparent processes of accountability. 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.

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
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. 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. This study was undertaken to survey the existing situation, awareness, responsible handling and
Table 3: Influence of age on the outcome variables

| 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

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

Rooban, et al.: Responsible handling of LA solution

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 (54.29)  | 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

| LA handling done in LA operatory by | Urban | Semi-urban | Rural | P value |
|------------------------------------|-------|------------|-------|---------|
| 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) | 1 (0.16) | 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

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. There had been a dearth of qualified dental assistants and about 40% dentists still are assisted by unqualified assistants as reported in literature. This is contradictory to code of ethics, 1976 laid down by the Dentist Act of India provision. 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 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 7: Influence of gender on the outcome variables

| LA handling done in LA operatory by | Male | Female | P value |
|------------------------------------|------|--------|---------|
| 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 (48.13) | 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

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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 it 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 operatories 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.\(^{[16]}\)

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 paradental 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.

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