

# Patients' Reactions to Local Anaesthetic Application Devices in Paediatric Dentistry

Elmedin Bajrić<sup>1</sup>, Sedin Kobašlija<sup>1</sup> and Hrvoje Jurić<sup>2</sup>

<sup>1</sup> University of Sarajevo, Faculty of Dental Medicine, Department of Pediatric and Preventive Dentistry, Sarajevo, Bosnia and Herzegovina

<sup>2</sup> University of Zagreb, School of Dental Medicine, Department of Pedodontics, Zagreb, Croatia

## ABSTRACT

*Local anaesthesia is the most common medium for pain control in most dental treatments. Physical appearance of syringe itself can be considered as a provoking factor for the emergence of dental fear and anxiety (DFA). In this research the patient reactions to local anaesthesia application devices, as one of the main causes for DFA emergence, were inquired. The sample comprised of 120 patients, divided in three age groups, formed of 40 patients aged 8, 12 and 15 years. DFA prevalence was quantified by Children Fear Survey Schedule–Dental Subscale (CFSS-DS). Three different syringes were offered to the patients. Reasons for choosing one of the syringes were detected. Patients assigned statistically highest rank to plastic syringe. Boys chose metal and intraligamental syringe statistically more often than girls. Patients with higher CFSS-DS scores chose metal syringe as last option. None of the reasons for selection was dominant, except pain that could be caused by usage of any of the three syringes. A large number of patients did not mention any of the reasons for choosing particular syringes. Plastic syringe represented the most acceptable device for local anaesthetic application to our patients. Patients often linked pain with dental syringes.*

**Key words:** dental syringes, paediatric dentistry, patients' reactions.

## Introduction

Dental fear refers as specific fear of dentist, fear of receiving dental treatment and presence in dental office<sup>1</sup>. This specific fear is related to a particular concrete object and indicates reaction to referred external annoying/threatening stimulus<sup>2</sup>. Dental anxiety represents a general, non-specific disinclination, dislike, toward dentists and dental care, presence in dental office, and is not related to a particular object<sup>3</sup>.

Researchers, who are dealing with dental fear and dental anxiety problems, do not separate these clinical and psychological terms during their inquiries. Furthermore, they imply their commonality and their mutual comparability, and talk about one common term—dental fear and anxiety (DFA)<sup>2</sup>. DFA prevalence is going from 5.7 to 25%, and even up to 43% in different age groups, depending on methodological and cultural differences in several studies<sup>4–6</sup>.

Pain control is an exceptionally important segment in pediatric dentistry, primarily due to the fact that experiencing pain is one of the main stress factors for DFA emergence. Dental treatment, except for general fear and anxiety,

is often linked with experience of painful interventions in childhood. Consequently, this could lead to partial or total lack of cooperation with the therapist.

Local anaesthesia is the most common medium for pain control in most dental treatments. However, a paradox occurs, and that is that one of the fear forms in patients, which could cause DFA, is the fear linked with general notion of local anaesthesia (most commonly fear of syringe and/or needle). Early painful invasive dental treatments in childhood (local anaesthesia, cavity preparation, teeth extraction) represent main factors for DFA emergence<sup>7</sup>. There are only a few studies mentioning the frequency of appearance of local anaesthesia fear, and it is also well known that 12 billions syringes is used on a yearly basis<sup>8</sup>. Agras et al. reported that the incidence of what they called common fears of injections was about 13% among 10- and 20-year olds<sup>9</sup>. Vika et al. reported that local anaesthesia fear prevalence during dental treatment was 17% among 1385 18-year olds<sup>10</sup>. On the other side, even dentists considered this intervention at least unpleasant. For example, Dower et al.<sup>11</sup> in their study reported that 16% of dentists stated for local anaesthesia

administration to the children to be the most stressful intervention for them. Other study said that sometimes the reason why some dentists chose to end their career could be that they refused to administer local anaesthesia to the patients<sup>12</sup>.

There are several aspects of local anaesthesia fear, and they are the general fear of injections (including pain of injection), fear related to local anaesthetic solution, fear of acquired disease and fear of physical injury<sup>12</sup>. The physical appearance of a dental syringe with needle itself may be considered as provoking factors for DFA emergence, resulting in higher pain perception<sup>13</sup>.

Due to the above facts the patient reactions to local anaesthesia application devices as one of the main causes for DFA emergence were investigated in this research.

## Materials and Methods

### Sample

Sample comprised of 120 healthy children aged 8, 12 and 15 years, who visited Department or Clinic for Preventive and Pediatric Dentistry of Faculty of Dentistry of Sarajevo University for any reason. Every age group counted 40 patients. Patients with current signs and symptoms of acute odontalgia or any other urgent state in dentistry (bleeding, swelling, orodontal trauma) were excluded from the sample. The study was undertaken with the understanding and written consent of parent of each child and approved by the Ethical Committee of Faculty of Dental Medicine of University of Sarajevo.

### Questionnaire

DFA prevalence was determined by Children's Fear Survey Schedule–Dental Subscale (CFSS-DS)<sup>14</sup>. CFSS-DS is consisted from 15 dental and other situations, ranged by Likert scale from 1 to 5 (1–do not afraid; 5–very afraid). Total score is from 15 to 75. Cut-off score for DFA presence evaluation was  $\geq 38$ .

### Syringes with needles

The reactions of patients to local anaesthesia application devices considering their age (8, 12 and 15 years), and presence or absence of DFA were inquired. Three combinations of local anaesthesia application devices were offered to all patients. The combinations were:

- plastic Luer syringe, with 22G needle (0.7x40 mm),
- metal syringe, with 27G needle (0.4x38 mm), and
- syringe for intraligamental anaesthesia (pencil like), with 30G needle (0.3x12 mm).

The needle in every combination was covered with plastic factory cowl. Anesthetic solution was not present in the syringes. Sequence of these devices, that were set in front of every patient, was randomly selected, not considering the patients' age, DFA presence or their previous local

dental anaesthesia application experience. During the examination children were allowed to see and to touch these syringes with needles. Patients were questioned about the rank of their preference of these devices in case that local anaesthesia was eventually administered to them (what is their first, second or third choice of selection). They were also questioned about the reasons for that kind of ranking during their selection of devices (offered reasons in questionnaire were: assumed or experienced pain caused by any of devices, previous good or bad experiences with them, certain aroused feeling eventually caused by any of devices, syringe size, syringe shape, material that syringe is made of, and needle size).

In order to complete this research, all the patients were questioned for presence or absence of their previous experience with local dental anaesthesia application. Presence or absence of previous experience implied that patients previously did or did not receive local anaesthetic solution by syringe and needle with some of the local anaesthesia application techniques. It was also inquired whether previous experiences with local anaesthesia application were negative ones (for example experience of pain, unpleasantness or irritation during receiving of local anaesthesia in upper or lower jaw).

### Statistical analysis

All statistical methods were performed by SPSS statistical software package, version 17.0, for Windows operative system. Descriptive statistics were used for presentation of age and sex distribution of sample, for presentation of syringes with needles selection and for presentation of reasons for selection of a specific syringe. Friedman test was used for testing differences in patients' ranking of the syringes.  $\chi^2$  test was used for testing differences in selection of syringes with needles in relation to patients' age and sex. Mann-Whitney U test was used for determining correlation between the selection of syringes with needles and previous experience with receiving of local dental anaesthesia. Point-biserial correlation coefficient was used for determining correlation between the selection of syringes with needles and previous negative experience, and correlation between the selection of syringes with needles and CFSS-DS scores.

## Results

### Sex and age sample distribution

There were 120 patients in the sample, divided in three age groups of 8, 12, and 15 years. Age groups were consisted of 40 patients. There were 66 boys (55%) and 54 girls (45%).

### DFA and their prevalence in the sample

There were 11.7% (N=14) patients with DFA presence in the sample. Number of boys (N=6) and girls (N=8) with

DFA presence was almost equal. Finally, most patients with DFA presence were in the youngest age group (n=9).

### *Selection of syringes with needles*

Since the local dental anaesthesia was also considered as one of the important factors for DFA emergence, it was important to closely examine the relationship of our patients towards local anaesthesia application devices (syringes mainly). Table 1 shows the frequency of selection of syringes with needles made by our patients (Table 1).

### *Determination of selection ranking of syringes with needles*

Differences in selection ranking for the syringes of the patients were determined by Friedman test (Table 2). Statistically significant differences were determined. The statistically highest rank was given to the plastic syringe. Other two syringes had almost equal rank during selection.

### *Frequency of selection of syringes with needles regarding patients' age and sex*

Table 3 shows frequency of syringes with needles selection regarding patients age and sex in the study. It also shows results for determination whether there are differences in syringes with needles selection regarding patients age and sex.  $\chi^2$  test determined statistically significant differences in selection between boys and girls for metal syringe and syringe for intraligamental anaesthesia. Plastic Luer syringe was ranked equally by boys and

**TABLE 1**  
FREQUENCY OF SELECTION OF SYRINGES

selection rank	metal syringe		plastic Luer syringe		syringe for intraligamental anaesthesia	
	f	%	f	%	f	%
1	22	18.3	82	68.3	16	13.3
2	45	37.5	22	18.3	53	44.2
3	53	44.2	16	13.3	51	42.5
Total	120	100.0	120	100.0	120	100.0

f – frequency, 68.3% of patients chose plastic Luer syringe as the first one

**TABLE 2**  
SELECTION RANKING DIFFERENCES OF THE PATIENTS

Type of syringe – choice	average rank	N=120
Metal syringe – choice	2.26	$\chi^2$ 54.517
Plastic Luer syringe – choice	1.45	Df 2
Syringe for intralig. anest. – choice	2.29	p 0.001

Friedman test:  $\chi^2=54.517$ ,  $p<0.001$  (for the plastic Luer syringe)

girls. There were no significant statistical differences in selection considering the age of our patients (Table 3).

### *Frequency of reasons for selection of syringes with needles*

In this section reasons for selection of three offered syringes with needles were presented. The needles of the

**TABLE 3**  
FREQUENCY OF SYRINGES WITH NEEDLES SELECTION REGARDING PATIENTS AGE AND SEX

Type of syringe – choice	Selection	age			sex		$\chi^2$	age	sex
		8	12	15	m	f			
Metal syringe – choice	1	8	7	7	13	9	p	0.913	0.023*
	2	16	16	13	31	14	$\chi^2$	4.035	0.730
	3	16	17	20	22	31			
Plastic Luer syringe – choice	1	24	28	30	43	39	df	4	2
	2	10	5	7	13	9	p	0.401	0.694
	3	6	7	3	10	6	$\chi^2$	3.662	7.066
Syringe for intraligamental anaesthesia – choice	1	8	5	3	10	6			
	2	14	19	20	22	31	df	4	2
	3	18	16	17	34	17	p	0.454	0.029*

m – boys, f – girls, f – frequency

$\chi^2=7.553$ ;  $p<0.05$  (differences between boys and girls for metal syringe)

$\chi^2=7.066$ ;  $p<0.05$  (differences between boys and girls for syringe for intraligamental anaesthesia)

syringes were covered with original plastic cowl, so that the needle itself could not influence the final results.

**Metal syringe:** 35% of the patients believed that receiving of local dental anaesthesia with this syringe would be painful, 21.7% of them thought that it would be unpleasant, and 28.3% of them considered this syringe was big. 45% of the patients did not believe that aroused feelings eventually caused by this syringes were important as a reason for their selection, because they did not answer anything considering it. Even 83.3% of the patients did not believe the previous experience with these syringes was a reason for syringe selection, because they also did not answer anything. It was the same situation with syringe size as a reason for selection (70% of patients did not answer anything), the material that this syringe was made of (74.2% of the patients), and the syringe shape (90.8% of the patients).

**Plastic Luer syringe:** 45.8% of the patients believed that receiving of local dental anaesthesia with this syringe would not be painful, while 42.5% of the patients did not believe that aroused feelings eventually caused by this syringes were important as a reason for their selection, because they did not answer anything considering it. 35% of the patients considered that this syringe was not big, while 61.7% of the patients did not believe that this reason was important for selection, because they did not answer anything considering syringe size as a reason for syringe selection. It was the same situation with the previous experience as the reason for syringe selection (80.8% of the patients did not answer anything), about the material that this syringe was made of (71.7% of the patients did not answer anything), about the feeling that this syringe eventually could induce (73.3% of the patients did not answer anything) and about the syringe shape (95% of the patients did not answer anything).

**Syringe for the intraligamental anaesthesia:** 33.3% of the patients considered that receiving local dental anaesthesia with this syringe would be painful (although they did not have any previous experience with this syringe), 30% of them believed it would be unpleasant, while 20% of the patients assumed that this syringe was big. 53.3% of the patients did not believe that eventually caused pain was important for syringe selection, because they did not answer anything considering pain that this syringe could

induce as a reason for syringe selection. 68.3% of the patients believed the same about the syringe size, 80% of the patients about the material that this syringe was made of, 85.8% of the patients about the previous experience with the syringes, and 90.8% of them about the shape of this syringe.

#### ***Correlation between the selection of syringes with needles and previous experience with receiving of local dental anaesthesia***

It was wanted to be determined whether previous experience with receiving of local dental anaesthesia influenced the selection of one of the three syringes with needles, using Mann-Whitney U test (Table 4).

#### ***Correlation between the selection of syringes with needles and previous negative experience***

It was further wanted to be determined if there was a certain statistically significant correlation between the selection of syringes with needles and previous negative experience during receiving of local dental anaesthesia in the upper/lower jaw. It was not determined that this correlation existed (Table 5).

#### ***Correlation between the selection of syringes with needles and CFSS-DS scores***

Finally, it was important to be explored if there was a statistically significant correlation between the selection of syringes with needles and CFSS-DS scores (Table 6). There was a statistically significant correlation between metal syringe with 27G needle and CFSS-DS scores, namely patients with higher CFSS-DS scores selected metal syringe as the last option.

## **Discussion**

Physical characteristics of syringes for local dental anaesthesia and reactions of children to them were the focus of interest in researches of Kuşcu and Akyuz<sup>13</sup>. 34

**TABLE 4**  
INFLUENCE OF PREVIOUS EXPERIENCE TO THE SELECTION OF SYRINGES WITH NEEDLES

Type of syringe	Previous experience	N	M	SD	M <sub>R</sub>	Σ <sub>R</sub>	Mann-Whitney U	p
Metal syringe	yes	31	2.13	0.806	55.32	1715.00	1219.000	0.298
	no	89	2.30	0.729	62.30	5545.00		
Plastic Luer syringe	yes	31	1.55	0.810	63.63	1972.50	1282.500	0.478
	no	89	1.42	0.688	59.41	5287.50		
Syringe for intraligamental anaesthesia	yes	31	2.32	0.653	61.47	1905.50	1349.500	0.844
	no	89	2.28	0.707	60.16	5354.50		

Test results showed that there were no statistically significant differences.

**TABLE 5**  
CORRELATION BETWEEN THE SYRINGES SELECTION AND PREVIOUS NEGATIVE EXPERIENCE

Types of negative experiences during local anesthesia application in one of the jaws	Metal syringe – choice	Plastic syringe – choice	Syringe for intraligamental anesthesia – choice
a) During anesthesia application, in upper jaw – pain	0.069	0.022	–0.100
b) During anesthesia application, in upper jaw – discomfort	0.007	–0.003	–0.005
c) During anesthesia application, in upper jaw – irritation	–0.127	–0.007	0.149
d) During anesthesia application, in lower jaw – pain	0.108	–0.013	–0.107
e) During anesthesia application, in lower jaw – discomfort	0.090	–0.018	–0.082
f) During anesthesia application, in lower jaw – irritation	–0.101	0.026	0.086

There were not statistically significant correlations according to results of point-biserial correlation coefficient

**TABLE 6**  
CORRELATION BETWEEN THE SELECTION OF SYRINGES AND OBTAINED CFSS-DS SCORES

Selection	CFSS-DS scores
Metal syringe – choice	0.182(*)
Plastic Luer syringe – choice	–0.110
Syringe for intraligamental anaesthesia – choice	–0.072

Point-biserial correlation coefficient; =0.182;  $p < 0.05$

children aged from 7 to 11 years participated in their study. Four syringes were offered to the examinees. Syringe for Wand was the first choice in children (56%), then the plastic syringe (29%), while metal syringe had the rarest selection of first choice (3%). On the contrary, in this study it was determined that examinees gave the highest statistically significant rank to the plastic syringe (average rank of 1.45,  $\chi^2=54.517$ ,  $p < 0.0001$ ), while metal syringe (average rank of 2.26) and syringe for intraligamental anaesthesia (average rank of 2.29) had almost equal selection ranking. Boys chose metal and syringe for intraligamental anaesthesia statistically more often than the girls in our study. It is important to emphasize that syringe for Wand was not used in this study, opposite to the study from Turkey.

When selection sequence in children with DFA presence in relation to those without DFA presence in study of Kuşcu and Akyuz was observed, the first choice of syringe was significantly different in DFA group than in the group without DFA presence. Most of the children with DFA presence preferred syringe for Wand (84%), some of them chose Citoject as the first syringe (8%), and metal one as the first syringe (8%), while nobody from DFA group chose plastic syringe as the first one. The first choice of syringes for children without DFA presence was presented in the following sequence: plastic syringe (48%) and syringe for Wand (38%). In our study it could not be determined whether there were statistically significant correlations between patients with and without DFA presence. But, it was determined that there was statistically significant correlation between the selection of metal syringe and

CFSS-DS scores, so that the patients with higher CFSS-DS scores chose metal syringe as the last option.

Kuşcu and Akyuz further stated that syringe for Wand was the first choice for group without DFA presence (57%), and for the group with DFA presence (86%), among examinees who did not have experience with local dental anaesthesia receiving (N=14). It was determined in this study that neither statistically significant influence of previous experience of local dental anaesthesia receiving on selection of one of the three syringes, nor statistically significant correlation between the selection of syringes with needles and previous negative experience during local dental anaesthesia receiving in the upper and/or lower jaw existed.

As for the reasons for selection of syringes, which were showed in our research, it could generally be concluded that no one of the reasons for selection (pain, experience, feeling, syringe size, syringe shape, material that syringe is made of) was dominant. However, in this matter it should anyway be emphasized that pain eventually caused by use of some of the three syringes, and, to a lesser extent, the feeling that the syringe produced and syringe size could be sorted out. Following that, metal syringe was the first to be considered to be able to cause pain (35%), followed by syringe for intraligamental anaesthesia (33.3%). In this context examinees mostly believed the plastic syringe (45.8%). It was evident that most of the patients did not answer anything regarding the offered reasons for selection of the syringes, except in the case of pain. That could mean that no one of the reasons was considered to be too important for the final selection of syringes. In 2008 Kuşcu and Akyuz<sup>15</sup> published research about pain that could be caused by local dental anaesthesia receiving. Plastic syringe and syringe for Wand were used for the research. Authors investigated whether the syringe itself, or experienced DFA in examinees caused pain during local dental anaesthesia application. They determined that DFA played a very important role in children reactions to pain, and that pain perception was more important than the syringe itself which was used. Milgrom<sup>12</sup> said that some of the patients considered local dental anaesthesia receiving as the most painful, and some of them believed that receiving was the only painful part of dental treatment. This could lead to avoiding of visits

to the dentist in extreme cases. In this study during assessing of DFA prevalence in patients it was found that injection is on the second place in terms of the level of the average value of arithmetic mean ( $M=2.28$ ). This finding could also give a proof that the syringe was one of the determining factors for DFA emergence.

## Conclusions

Patients statistically more often chose plastic syringe than metal and syringe for intraligamental anaesthesia, while metal syringe had the rarest level of selection by the patients with higher average CFSS-DS scores. The only

reason for selection that stood out among others was the pain that could be caused by use of some of the offered syringes.

It is important to explain reasons for selection of syringes with needles in paediatric dentistry, so that we could understand the nature of children attitudes toward syringes and needles and consecutive emergence of DFA.

## Acknowledgements

This study was supported by great human efforts of complete staff of Clinic for Preventive and Paediatric Dentistry of Faculty of Dentistry of Sarajevo University.

## REFERENCES

1. KLEINKNECHT RA, THORNDIKE RM, MCGLYNN FD, HARKAVY J, *J Am Dent Assoc*, 108 (1984) 59. — 2. KLINBERG G, *Eur Arch Paediatr Dent*, 9 Suppl 1 (2008) 11. — 3. MILGROM P, WEINSTEIN P, KLEINKNECHT R, GETZ T, *Treating Fearful Dental Patients – A Patient Management Handbook* (Reston Publishing Company, Reston, 1985). — 4. KLINGBERG G, BROBERG AG, *Int J Paediatr Dent*, 17 (2007) 391. — 5. LULIĆ DUKIĆ O, RADIONOV D, DUKIĆ W, KEROS J, *Coll Antropol*, 22 Suppl (1998) 267. — 6. MAJSTOROVIĆ M, ŠKRINJARIĆ T, SZIROVICZA L, GLAVINA D, VEERKAMP JSJ, *Coll Antropol*, 31 (2007) 573. — 7. MAJSTOROVIĆ M, ŠKRINJARIĆ I,

GLAVINA D, SZIROVICZA L, *Coll Antropol*, 25 (2001) 493. — 8. LUBY S, *Emerg Infect Dis*, 7 Suppl 3 (2001) 535. — 9. AGRAS S, SYLVESTER D, OLIVEAU D, *Compr Psychiatry*, 10 (1969) 151. — 10. VIKI M, RAADAL M, SKARET E, KVALE G, *Eur J Oral Sci*, 114 (2006) 122. — 11. RAM D, PERETZ B, *Int J Paediatr Dent*, 12 (2002) 80. — 12. MILGROM P, *J Am Dent Assoc*, 128 (1997) 756. — 13. KUŠCU OO, AKYUZ S, *J Dent Child (Chic)*, 73 (2006) 116. — 14. CUTHBERT MI, MELAMED BG, *ASDC J Dent Child*, 49 (1982) 432. — 15. KUŠCU OO, AKYUZ S, *Int J Paediatr Dent*, 18 (2008) 139.

E. Bajrić

*University of Sarajevo, Faculty of Dental Medicine, Department of Pediatric and Preventive Dentistry, Bolnička 4a, 71000 Sarajevo, Bosnia and Herzegovina*  
e-mail: elmedinbajric@gmail.com

## REAKCIJE PACIJENATA NA SREDSTVA ZA APLIKACIJU LOKALNOG ANESTETIKA U STOMATOLOGIJI

### SAŽETAK

Lokalna anestezija jeste najčešće sredstvo za kontrolu boli u većini stomatoloških tretmana. Fizikalna pojava šprice same po sebi se može smatrati provocirajućim čimbenikom za nastanak dentalnog straha i anksioznosti (DSA). U ovom su se istraživanju željele ispitati reakcije pacijenata na sredstva za aplikaciju lokalne anestezije, kao jednog od glavnih uzroka za nastanak DSA. Uzorak se sastojao od 120 pacijenata podijeljenih u tri dobne skupine od po 40 pacijenata uzrasta od 8, 12 i 15 godina života. Prevalencija DSA je kvantificirana pomoću Dentalne podskale pregledne skale dječijeg straha (engl. Children Fear Survey Schedule–Dental Subscale /CFSS-DS/). Pacijentima su ponudene tri vrste šprica. Pri tome su bilježeni razlozi za odabir pojedinih šprica. Pacijenti su dali statistički značajno najviši rang pri izboru plastičnoj šprici. Dječaci su statistički značajno češće birali metalnu špricu i špricu za intraligamentarnu anesteziju od djevojčica. Pacijenti sa višim skorovima postignutim na CFSS-DS skali su birali metalnu špricu kao zadnju opciju. Nijedan od razloga za odabir šprica nije bio dominantan, izuzev boli koja bi mogla biti uzrokovana upotrebom bilo koje od tri šprice. Veliki broj pacijenata nije pomenuo niti jedan od razloga prilikom odabira neke od šprica. Plastična šprica je našim pacijentima predstavljala najprihvatljivije sredstvo za aplikaciju lokalnog anestetika. Pacijenti su često osjećaj boli povezivali sa dentalnim špricama.