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Assessment of Knowledge, Attitude And Practice of Iatrogenic Injuries Occurring To Patients In Clinical Posting By Undergraduate And Postgraduate Students of Dental College In Vadodara: A Questionnaire Study.

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Abstract : *Students are the guiding light of our generation. Educating and nurturing them to achieve their best goal is the job of a facilitator. Awareness of iatrogenic injuries among students helps them to deal with unfortunate incidences and teach them to be better and compassionate doctor. A Questionnaire survey was conducted among 310 students comprising of final year students, interns and post graduates of a dental college in Piparia, Vadodara, Gujarat which consisted of 14 closed ended questions. The responses of students were documented and descriptive and inferential statistical analysis was done. All of the students gave correct answers for term the 'iatrogenic' and more than half of the students agreed that the patient should be reported about any unwanted injury caused by them so that its severity and complications can be managed. Most of the injuries that were seen were due to the usage of burs; about 50% of students substantiated that skill, experience and up to date knowledge can prevent iatrogenic injury. The role of iatrogenic injuries when taught and addressed among the students can lead to a better dental treatment outcome and increases the confidence among students.*

Keywords: *Awareness, Dental Students, Dental Procedure, Iatrogenic Injuries, Questionnaire Study*

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I. Introduction

The quality of training at any institution can best analyzed by taking the students perceptions into consideration [1]. Students can provide valuable feedback, which can be beneficial to review the curriculum and improve the overall standard of training, as well as patient care [2]. Dentistry is an extensive program that requires lot of efforts, encouragement, and clinical exposure. Few of possible stress factors could be competition, frequent examination, comparison between students, teacher/student relationships, patient/student relationship, and clinical application of theoretical knowledge [3-7]. During the course of clinical posting there maybe injuries caused to the tooth or surrounding soft tissue which can be avoided by due diligence from the students.

Dental iatrogenic treatment can produce an injury either on the tooth or the soft tissues or both. Any dental treatment during any phase can become iatrogenic. When carrying out treatment in the area of the mouth and face; especially when working on supine patients, there is an ever present risk of collateral injury to the other oral and facial tissues. Not only is the oral environment a confined space, with restricted access, but the very nature of the dental tissues and the materials used to restore them requires powerful instrumentation that needs to operate in the immediate proximity of vulnerable soft tissues. Iatrogenic factors are defined as inadequate dental procedures that contribute to the deterioration of periodontal ligament tissues. These factors include: Overhanging of restorations, Damage of tooth during preparation of adjacent class II cavity, Injury to adjacent teeth during tooth extraction, Jaw dislocation during tooth extraction, Displacement of root in sinus during tooth extraction, Laceration of gingiva during various dental procedures, Overextension of removable prosthesis, Loss of retention of removable prosthesis, Exposure of pulp during cavity preparation and Nerve injury during deposition of local anaesthesia. Hence there is a need to assess the knowledge, attitude and practice among dental students about iatrogenic injuries in order to minimize them for successful outcome of any dental therapy.

II. Materials & Methods

This is a questionnaire institutional study conducted in K. M. Shah Dental College and Hospital, Sumandeep Vidyapeeth, Piparia, Vadodara, Gujarat, India.. Total sample size for this study is 310 where the Participants were Final year [FY] [Batch (2014-2015), (2013-2014)], Interns [Batch (2013-2014), (2012-2013)] and post-graduate students [PGs] [Batch (2015-2018)] of recruited in the study. Students not willing to take part in the study were excluded from the study. Students absent for more than 3 consecutive days were omitted from this study. Incomplete questionnaire was omitted from the study. Approval for the study was taken from institutional ethics committee (No. 17154).

All the participants were selected according to the defined selection criteria, from the Dental College and Hospital. Participants were evaluated by their response to questionnaire. The questionnaire is formulated in English language in a close-ended format. The questionnaire forms were taken to them by principal investigator personally and the participants were explained about the study and asked to fill the questionnaire after obtaining consent. Questions in this study were of the following areas: (i) knowledge (ii) attitude and (iii) practice regarding iatrogenic injuries. Majority questions in the questionnaire are based on practice. Content validity and reliability was not done in this study as the questionnaire was taken from the study authored by Madhavan S et al [8].Permission was taken from the author to use the questionnaire.

Once questionnaire were filled by all the participants data was entered in the Excel and was subjected for statistical analysis. Statistics used in the study were Descriptive and inferential which included Pearson Chi-square test. P-value of less than 0.05 was taken as statistically significant.

III. Results

This is an Epidemiological study conducted on students during their clinical posting in a Dental College in Vadodara. Out of 312 students; 310 students completed the questionnaire i.e. 99% of respondents took part in the study. In this study 82 were post graduates, 119 were interns and 109 were final year Bachelor of Dental Surgery (BDS) students. The respondent's age ranged from 20 to 27 which average of 23.5 years. The study was conducted to evaluate students' knowledge, attitude and practice on iatrogenic injuries during their clinical postings.

All the values were brought to the nearest whole number. 100% of the post graduate students and interns, 99% of the final year students gave the correct response for the explanation of term 'iatrogenic'. 45% post graduate students, 37% interns and 43% final year students agreed to have caused an iatrogenic injury. 55% post graduates, 63% interns and 51% final year students reported about the injury and damaged caused by them to the patient.84% post graduates, 70% interns and 78% final year students did gauging of pulpal floor. 84% post graduates, 70% interns and 76% final year students caused perforation and 82% post graduates, 66% interns and 78% final year students created ledges during endodontic procedures. (Table1) 34% post graduates, 40 interns and 26% final year students found laceration as an iatrogenic injury to gingiva or oral mucosa during dental procedures. 6% post graduates and 11% final year students found contution as an iatrogenic injury to gingiva or oral mucosa during dental procedures. 60% post graduates, 61% interns and 63% final year students found abrasion as an iatrogenic injury to gingiva or oral mucosa during dental procedures. (Table 2)

100% post graduates, interns and final year students found mechanical injury to be the most common type of iatrogenic damage. 3% final year students found proper isolation to be a preventive measure to avoid iatrogenic injury. 45% post graduates, 37% interns and 40% final year students found careful handling of materials and instrumentation to be a preventive measure to avoid iatrogenic injury. 6% of final year students found information about procedures and give proper instructions to follow during procedures to be a preventive measure to avoid iatrogenic injury.55% post graduates, 63% interns and 51 % final year students found skill, experience and up-to-date knowledge to be a preventive measure to avoid iatrogenic injury.22% post graduates, 27% interns and 17% final year students found concussion to be the iatrogenic injury to periodontal tissue during dental procedures. 6% post graduates and 11% final year students found subluxation to be the iatrogenic injury to periodontal tissue during dental procedures. 34% post graduates, 40% interns and 26% final year students found extrusive luxation to be the iatrogenic injury to periodontal tissue during dental procedures.38% post graduates, 34% interns and 47% final year students found avulsion to be the iatrogenic injury to periodontal tissue during dental procedures.38% post graduates, 34% interns and 48% final year students found fracture to maxillary alveolar socket as iatrogenic injury to supporting bone during extraction. 34% post graduates, 40% interns and 25% final year students found fracture to mandibular alveolar socket as iatrogenic injury to supporting bone during extraction. 6% post graduates and 11% final year students found fracture to maxillary alveolar process as iatrogenic injury to supporting bone during extraction. 22% post graduates, 27% interns and 17% final year students found fracture to mandibular alveolar process as iatrogenic injury to supporting bone during extraction. (Table 2)

According to 45 % post graduates, 37% interns and 43 % final year students the site that is likely to get damaged during Class II cavity preparation is mucosa and gingiva. While 39% post graduates, 41% interns and

40 % final year students adjacent tooth was the most common site damaged during class II cavity preparation. As stated by 16% post graduates, 22% interns and 17 % final year students tongue was the most common site damaged during class II cavity preparation. 100% post graduates, interns and final year students found root canal procedures most likely to cause iatrogenic damage. 100% post graduates, interns and final year students found iatrogenic injury was most common using burs. (Table 3)

Significant difference was found among the groups (P value = 0.004) for preventive measures, injuries to periodontal tissues during dental procedures (P value = 0 .002), damage to supporting bone during extraction (P value = 0.001), injuries to gingival mucosa/oral mucosa (P value =.003) and ledge formation during root canal treatment (P value = 0.029).

IV. Discussion

As a dental student graduates from preclinical postings to clinical postings one starts to face various difficulties when they practice on patients but in due time eventually repetitive practice results in fewer teething troubles.

In order to identify the level of knowledge and awareness towards iatrogenic injuries of the students, the survey was conducted. The third year students were not included in the study as they are not sufficiently exposed to the clinical work as compared to final year, interns and post graduate students. Iatrogenic injury can also occur while administrating local anaesthesia, during extraction procedure, scaling, and chemical materials such as drugs and various agents which come in contact with oral cavity (Dilsiz, 2010) [9]. Dental adhesives have been shown to be toxic to gingiva fibroblast (Huang et al., 2002: Szep et al., 2002) [10]. Residual monomers may cause gingival irritation and inflammation. Phosphoric acid, used as an etching material and a root surface modifier, has necrotizing effects on periodontal tissues (Blomlof and Lindskog, 1995) [11]. Restorative procedures done during class II cavity preparation and class V cavity are like to cause injury to adjacent tooth, gingiva, oral mucosa and other soft tissues present in the oral cavity. Periodontal tissues can also be harmed due to mishandling of instruments which can result in laceration of gingiva or abrasion or even contusion.

IV.1 Knowledge and Awareness

The study mainly focused on the iatrogenic injuries and maximum number (100%) of students who participated in the study gave correct answer about the term ‘iatrogenic’ which is caused by the dentist to patients which is in accordance with the study done by Madhavan S (2016) [8] in which 82% of practioners gave the correct answer. Students accepted that iatrogenic injuries had been caused by them; highest was caused by post graduates (45.1%) and final year (43.1%) as they are adapting to the new environment from undergraduates to postgraduates and pre-clinical work to clinical work respectively.

IV.2 Practice

As the depth of practice increased the chances of iatrogenic injury decreases, maximum final year students (85/109) had led to gauging of pulpal floor, perforation and ledge formation during endodontic procedures compared to interns (83/119) and postgraduates (69/82) respectively. Contradictory results were seen in a similar study done by Mirza M B (2015) [12] which reported to rarely caused ledge, perforation and gauging of pulpal floor by students. The soft tissues present in the oral cavity that includes the tongue, cheeks, gums and lips are sensitive and exquisite and easily prone to damage [8]. Reviewing the response of the students for injuries caused to gingival or oral mucosa reported abrasion to be the common injury followed by laceration and contution seen on the affected tissue. Maximum number of soft tissue injuries was caused due to abrasion by final years (63.3%) as they are new to the clinical work followed by interns (60.5%) and post graduates (59.8%).

In the oral cavity, the dental student needs to work in a confined area with lot of hindrances around the tooth structure. All the students felt mechanical injury to be more common which was in accordance to the study conducted by Madhavan S et al.(2016)[8]. Bur is used for safe and effective removal of dental hard tissues and caries which also maximizes ergonomics of the dentist such as in prosthodontics for crown preparation, for restorative procedure in conservative and even use in various other fields. Usage of burs could be the challenging job for both under graduates and post graduates, pre-clinical and clinical practicing students but can be eliminated by practicing. In the results of this survey in which all the students found using burs can cause maximum iatrogenic injuries to the surrounding tissue.

Concussion is the injury to periodontal ligaments or nerves and blood vessels at tip of the tooth’s root due to trauma. Subluxation is traumatic injury in which tooth has increased mobility but has not been displaced from its original position of the cavity. Extrusive luxation is traumatic injury caused to the tooth where it gets partially displaced from its socket. Avulsion of tooth occurs during a traumatic injury in which the tooth gets completely displaced from alveolar bone or soft tissue socket. Maximum students found extrusive luxation

[Interns (39.9%>PGs (34.1%)> FY (25.7%)] and avulsion [FY (46.8%)>PGs (37.8%)>Interns (33.6%)] to be the most common iatrogenic injuries to the periodontal tissues during the dental procedure.

Dental extraction is the procedure in which injury can be caused even by skilled professionals; injury can occur leading to fracture of maxillary or mandibular alveolar socket or maxillary or mandibular alveolar process hence in our study the post graduates (37.8%) and final years (47.7%) reported fracture of maxillary alveolar socket and interns (39.5%) reported fracture to mandibular alveolar socket which was in accordance to the study conducted by Zaleckiene V et al. (2014)[13].

In class II cavity preparation the dental student has to work around the mucosa, gingiva, adjacent tooth, tongue, lips and palate. Maximum students felt mucosa and gingiva [PGs (45.1%), Interns (37%) and FY (43.1%)] and adjacent tooth [PGs (39%), Interns (41.2) and FY (40.4)] to likely damage during class II cavity preparation. The common procedures which are likely to cause injuries to mucosa and gingiva are crown preparation, extraction which fractures surrounding structures like alveolar bone and process of maxilla and mandible and other soft or hard tissues, endodontic procedures are likely to cause injury, restorative procedures wherein burs can cause injury to soft tissues or surrounding structures, scalers can even cause injury to supporting structures during periodontal procedures. All (100%) of the students responded that root canal procedures caused maximum injury which was contradictory to the results of the study conducted by Ngo H et al. (2013) [14] and Madhavan S et al.(2016) [8] which showed crown preparation procedures to likely cause iatrogenic damage to soft and hard dental tissues.

IV.3 Preventive measures taken to avoid iatrogenic injuries

Dentist work is not only to relieve patient's pain and complaints but also to show empathy towards them and to prevent any unwanted maltreatment to the patient. Maltreatment of patient can be avoided by taking preventive measures like proper isolation, handling of materials and instrumentation carefully, guiding patients during procedure with proper instruction and the skill, experience and up to date knowledge. In this study most of the students found that the preventive measures could be taken by carefully handling of material and instrumentation, (37.0% Interns < 40.4% FY < 45.1% PGs) and proper skill, experience and up-to-date knowledge (63.0% Interns > 54.3% PGs > 51.4% FY).

V. Tables

TABLE 1: Knowledge and Awareness on Iatrogenic Injuries

QUESTIONS			GROUP			TOTAL	p value
			PGs	Interns	Final year BDS		
Has any iatrogenic injury been caused by you?	Yes	N %	37 45.1%	44 37%	47 43.1%	128 41.3%	0.458
	No	N %	45 54.9%	75 63%	62 56.9%	182 58.7%	
Reporting to the patient about injury/damage caused?	Yes	N %	45 54.9%	75 63%	55 50.5%	175 56.5%	0.152
	No	N %	37 45.1%	44 37%	54 49.5%	135 43.5%	
Gauging of pulpal floor during dental procedures	Yes	N %	69 84.1%	83 69.7%	85 78%	237 76.5%	0.055
	No	N %	13 15.9%	36 30.3%	24 22%	73 23.5%	
Perforation during dental procedures	Yes	N %	69 84.1%	83 69.7%	83 76.1%	235 75.8%	0.064
	No	N %	13 15.9%	36 30.3%	26 23.9%	75 24.2%	
Ledge formation during endodontic procedures	Yes	N %	67 81.7%	79 66.4%	85 78%	231 74.5%	0.029
	No	N %	15 18.3%	40 33.6%	24 22%	79 25.5%	

TABLE 2: **Knowledge and Practice on Iatrogenic Injuries**

QUESTIONS			GROUP			TOTAL	p value
			PGs	Interns	Final year BDS		
Are you familiar with the word iatrogenic?	Accidental harm that results from activities of doctor	N %	82 100%	119 100%	108 99.1%	309 99.7%	0.397
	Damage from surrounding area	N %	0 0%	0 0%	1 0.9%	1 0.3%	
	Trauma caused to dentist by patient	N %	0 0%	0 0%	0 0%	0 0%	
	Deliberate self-harm	N %	0 0%	0 0%	0 0%	0 0%	
Which iatrogenic trauma is more common?	Thermal	N %	0 0%	0 0%	0 0%	0 0%	-
	Mechanical	N %	82 100%	119 100%	109 100%	310 100%	
	Electrical	N %	0 0%	0 0%	0 0%	0 0%	
	Chemical	N %	0 0%	0 0%	0 0%	0 0%	
Preventive measures taken?	Proper isolation techniques	N %	0 0%	0 0%	3 2.8%	3 1%	0.004
	Careful handling of materials and instrumentation	N %	37 45.1%	44 37%	44 40.0%	125 40.3%	
	Information about procedures and give proper instructions to follow during procedures	N %	0 0%	0 0%	6 5.5%	6 1.9%	
	Skill, experience and up-to-date knowledge	N %	45 54.9%	75 63%	56 51.4%	176 56.8%	
Iatrogenic injuries to periodontal tissues during dental procedures	Concussion	N %	18 22%	32 26.9%	18 16.5%	68 21.9%	0.002
	Subluxation	N %	5 6.1%	0 0%	12 11%	17 5.5%	
	Extrusive luxation	N %	28 34.1%	47 39.5%	28 25.7%	103 33.2%	
	Avulsion	N %	31 37.8%	40 33.6%	51 46.8%	122 39.4%	
Iatrogenic injuries to supporting bone during extraction	Fracture to maxillary alveolar socket	N %	31 37.8%	40 33.6%	52 47.7%	123 39.7%	0.001
	Fracture to mandibular alveolar socket	N %	28 34.1%	47 39.5%	27 24.8%	102 32.9%	
	Fracture to maxillary alveolar process	N %	5 6.1%	0 0%	12 11%	17 5.5%	
	Fracture to mandibular alveolar process	N %	18 22%	32 26.9%	18 16.5%	68 21.9%	
Injuries to oral mucosa?	Laceration	N %	28 34.1%	47 39.5%	28 25.7%	103 33.2%	0.003
	Contution	N %	5 6.1%	0 0%	12 11%	17 5.5%	
	Abrasion	N %	49 59.8%	72 60.5%	69 63.3%	190 61.3%	

Table 3: Iatrogenic Injuries adjacent to the tooth

QUESTIONS			GROUP			TOTAL	p value
			PGs	Interns	Final year BDS		
Site likely to be damaged during class II cavity preparation?	Mucosa & Gingiva	N %	37 45.1%	44 37%	47 43.1%	128 41.3%	0.691
	Adjacent tooth	N %	32 39%	49 41.2%	44 40.4%	125 40.3%	
	Tongue	N %	13 15.9%	26 21.8%	18 16.5%	57 18.4%	
	Lips	N %	0 0%	0 0%	0 0%	0 0%	
	Palate	N %	0 0%	0 0%	0 0%	0 0%	
Procedure likely to cause iatrogenic damage	Crown preparation	N %	0 0%	0 0%	0 0%	0 0%	-
	Extraction	N %	0 0%	0 0%	0 0%	0 0%	
	Root canal procedure	N %	82 100%	119 100%	109 100%	310 100%	
	Restorative Procedure	N %	0 0%	0 0%	0 0%	0 0%	
	Periodontal procedure	N %	0 0%	0 0%	0 0%	0 0%	
Iatrogenic injury is common with	Using burs	N %	82 100%	119 100%	109 100%	310 100%	-
	During administration of local anesthetic agent	N %	0 0%	0 0%	0 0%	0 0%	
	Extraction	N %	0 0%	0 0%	0 0%	0 0%	
	Scalers	N %	0 0%	0 0%	0 0%	0 0%	
	Chemical materials	N %	0 0%	0 0%	0 0%	0 0%	

VI. Conclusion

Literature on iatrogenic injuries caused by dental students in various databases was like Google Scholar, Pubmed and Cochrane Databases was scarce. All the respondent students had knowledge about injuries caused by the operator to the patient. According to them the procedures likely to cause iatrogenic injuries are: Endodontia > Prosthdontia > Oral Surgery > Periodontia which could be avoided by taking preventive measures but that is only possible if student is aware of the iatrogenic injuries. Limitations of the study were the small sample size and the respondent bias. Various qualities like patience, politeness, empathy, patient handling, time management, precision, accuracy, decision making power for better treatment; also treating the complications if encountered during the treatment and ensuring patient about the benefit from the procedure without any unsolicited side effects after the treatment should be cultivated in students as this would be beneficial to them.

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