TEST Engineering & Management

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

Association of Crown Discolouration and Pulpal Status of Traumatised Primary Tooth in 3 to 8 year old children-A Retrospective study

Nur Qistina Binti Ahmad Fauzi[1], Deepa Gurunathan[2]

[1]Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University Chennai, India. Mail Id: 151501098.sdc@saveetha.com Phone no: 7358248512

[2]Professor, Department of Pedodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University Chennai, India. Mail Id: deepag@saveetha.com Phone no: 9994619386

Article Info
Volume 82
Page Number: 17127 - 17134
Publication Issue:
January - February 2020

Article History
Article Received: *18 October 2019*
Revised: *14 November 2019*
Accepted: *22 December 2019*
Publication: *29 February 2020*

Abstract:

Crown discolouration is one of the complications associated with traumatic dental injuries. It is the external expression which represents the changes occurring in the pulp-dentine complex, making it visible through a translucent enamel. Though some may say it is a sign of internal damage, it is not necessarily an irreparable damage. The aim of this study is to analyse the association of pulp necrosis and crown discolouration in a traumatised primary teeth. A total of 12 paediatric patients who have a history of trauma in relation to their primary teeth was evaluated. Each of the patients age, gender, tooth number, presence of crown discolouration, pulpal status of the tooth, treatment done, length of the root and the presence of soft tissue swelling was obtained through patient records and the data of 86000 patients from the institution between June 2019 to March 2020. In the presence of crown discolouration, it was found that an equal distribution of both asymptomatic and symptomatic pulpitis (50.0%) was seen in the traumatised primary teeth. There was also no statistical significance between the presence of crown discolouration and the pulpal status of the tooth (p=1.00) Within the limits of our study, crown discolouration due to trauma in primary tooth is prominent in both asymptomatic and symptomatic irreversible pulpitis.

Keywords: *crown discolouration, primary teeth, pulpal status, trauma.*

I. INTRODUCTION

Out of the many assets an individual possesses, having a ‘smile’ with beautiful and natural teeth is one of the greatest assets. It continues to be the most common infectious disease in children.(Juneja, Kulkarni and Raje, 2018) If a fractured anterior tooth with an unsightly fracture is left untreated, it can affect the behaviour of the child, his progress in school, which will indirectly cause more impact in their daily living. Functionally, primary teeth is also considered to be a natural space maintainer as it serves as a guide for the eruption of permanent teeth to its proper position in the dental arch. (Panchal, Jeevanandan and Subramanian, 2019) Thus, apart from dental caries or periodontal disease, tooth loss that is caused by trauma, which happens as a result of either violence, accidents, falls or even sport-related activities becomes a main concern especially to young children (Juneja, Kulkarni and Raje, 2018)

Traumatic dental injuries (TDI) is defined as a dental injury to the tooth, periodontium as well as soft tissues. Even though dental caries continues to be the most common disease affecting children,

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

(Govindaraju and Gurunathan, 2017) we should not forget that TDIs is also said to be one of the most prevalent oral pathologies in both children and adolescents.(Petti, Glendor and Andersson, 2018) An estimation of 22.7% of children ranging from 0 to 6 years have TDI during their early childhood involving the primary dentition. (Petti, Glendor and Andersson, 2018) While almost 25% of all school children and adolescents ranging from 7 to 19 years have a TDI involving their permanent dentition. (Glendor, 2008)(Andreasen, Andreasen and Andersson, 2019)

A majority of the dental injuries involve anterior teeth (Kumar et al., 2011). Epidemiological studies indicate that in the near future, dental trauma could be a prominent problem especially in young people such that it will surpass both dental caries and periodontal disease. (Norton and O'Connell, 2012) Traumatic dental injuries are seen to be a serious dental public health problem among children in deprived areas. (Juneja, Kulkarni and Raje, 2018) The incidence of these types of injuries especially to the primary dentition presents as a challenge for the dentist, as it could not only create panic to the parents but could also instil anxiety and fear in the child. (Ravikumar, Jeevanandan and Subramanian, 2017) This issue should be highlighted as parents and responsible adults are the principal people in a child's development in the early years, (Gurunathan and Shanmugaavel, 2016) as it could potentially greatly impact the quality of life for young children. (Subramanyam et al., 2018)

Based on previous studies that were done, the occurrence of dental tissue trauma (either enamel or dentin fracture) will be prone to bacterial invasion in the fracture causing further infection and exposed dentinal tubules can ultimately lead to pulpal inflammation resulting in either repair or necrosis of the pulpal tissues. (Andreasen, Andreasen and Andersson, 2019) Not to mention that the discolouration of the tooth post trauma can negatively impact the Oral Health Quality of Life (OHRQoL) of both children and adolescents. (Ramos-Jorge et al., 2017)(Viegas et al., 2014)

As the result of the fluoridation of community water supplies in India, which is considered as an effective way in dental caries prevention and its progression, ('Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018) this different form of crown discolouration caused by fluoride is also common in children.(Somasundaram et al., 2015) However, unlike the discolouration caused by fluorosis, the one that is caused by TDIs have not shown an exact correlation especially when the pulpal tissues are involved. Nonetheless, crown discolouration is still one of the most common complications related to TDIs. It is the result of external expression which represents the changes occurring in the pulp dentin complex, making it visible through a translucent enamel. Though some might say it is a sign of internal damage, it is not necessarily an irreparable damage.(Enabulele, 2019)

In this study, the aim is to analyse the association between pulp necrosis and crown discolouration in a traumatised primary teeth. The main purpose being that more insight can be provided in the data correlation between the pulpal status and crown discolouration. With this a better diagnosis and treatment planning can be provided followed by a better prognosis.

II. MATERIALS AND METHODS

Out of the 1269 patient records available from the institution, 12 patients in the age group of 3-8 years had a history of trauma in relation to their primary teeth. A record of each patient's age, gender, tooth number, presence of crown discolouration, pulpal status of tooth, treatment done, length of the root and the presence of soft tissue swelling was obtained through patient records and the data of 86000 patients, which included data from June 2019 to March 2020.

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

All available data was included and cross verified with both the preoperative photographs and radiographs. By doing so, it has prevented the presence of bias during the case selection process.

The data was analysed with IBM SPSS Statistical Analyser (23.0 Version). The frequency distribution and the Chi-square tests were done. The correlation between the presence of soft tissue swelling was completed through Pearson Chi-square test and likelihood ratio.

III. RESULTS

In regard to the gender distribution of the sample size, 10 (83.3%) of the paediatric patients are males while the remaining 2 (16.7%) of them are females. [Graph 1] Pulpal Status and The Presence of Crown Discoloration

Based on the pulpal status, in cases of asymptomatic irreversible pulpitis, about 4 (66.7%) patients had evidence of crown discolouration while the remaining 2 (33.3%) patients had no evidence of discolouration.

Similar to the findings in asymptomatic cases, in terms symptomatic irreversible pulpitis, 4 (66.7%) patients presented with crown discolouration clinically while the other 2 (33.3%) patients presented with no discolouration. [Graph 2]

When the chi-square test was done, there was no statistical significance between the pulpal status and the presence of crown discolouration (p=1.00).

The Root Length and Treatment Done

In cases where extractions were done, the highest cases where done when the remaining root length was 6mm (25.0%) while the lowest cases were when the root length was 10mm, 8mm and 7mm (8.3%).

In regard to pulpectomy procedures, it was most commonly done when the root length was 11mm (16.7%) while the least commonly done was in both 10mm and 9m (8.3%). [Graph 3]

Once analysed through the chi-square test, it showed statistical significance between the root length and the treatment done (p=0.05).

Pulpal Status and Presence of Soft Tissue Swelling

When diagnosed with asymptomatic irreversible pulpitis, 5 (41.7%) patients showed no evidence of soft tissue swelling in regards to the traumatised primary tooth with only 1 (8.3%) patient showed evidence in soft tissue swelling.

Similar to that with symptomatic irreversible pulpitis cases, a majority of 4 (33.3%) patients had no evidence of soft tissue swelling while the remaining 2 (16.7%) patients showed presence of soft tissue in relation to the traumatised primary tooth. [Graph 4]

When chi-square tests were done, it showed that there was no statistical significance between the pulpal status and the presence of soft tissue swelling (p=0.50).

Crown Discolouration and Presence of Soft Tissue Swelling

In the presence of crown discolouration, it was found that only 3 (25.0%) cases showed evidence of soft tissue swelling as well while the remaining 5 (41.7%) patients had no such findings.

When no presence of crown discolouration was found, all 4 (33.3%) cases also had no evidence of soft tissue swelling. [Graph 5]

Once analysed through the chi-square test, it was found that there was no statistical significance between the crown discolouration and prevalence of soft tissue swelling (p=0.25).

Based on this study, males showed a higher prevalence in crown discolouration for a

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

traumatised tooth compared to females. Similar to a study done by Cardoso M et al, it also stated the higher rate of crown discolouration in males. However, based on our study such findings could not be truly justified because of the limited sample size. (Cardoso and de Carvalho Rocha, 2010)

In regard to the pulpal status of the traumatised primary tooth, it was found that crown discolouration was equally common in both asymptomatic and symptomatic irreversible pulpitis. Contradicting our study, Cardoso M et al found that a higher association was found between crown discolouration in pulpal necrosis of traumatised primary teeth. The reason behind this is because the timing in which the patient reported to the clinic was prolonged, that resulted in the advancement of pulpal necrosis. (Cardoso and de Carvalho Rocha, 2010)

Based on the root length, it was found that extractions were commonly done for shorter root lengths while pulpectomy was opted in longer root lengths. When dealing with a necrotic primary tooth, early loss of tooth is a main concern in paediatric dentistry. Ideally, pulpectomy should be the treatment option with the sole intent of maintaining the integrity of the facial tissue. (Govindaraju, Jeevanandan and E. M. G. Subramanian, 2017a) However, even though pulpectomy is considered to be the treatment of choice when pulp is involved in the primary teeth, the main reason the root length plays an important role is because there would not be a sufficient radicular structure for pulpectomy to take place. (Jeevanandan, 2017) In future studies related to this topic in hand, the use of rotary instruments should also be included since endodontics is a field that is constantly undergoing evolution.(Govindaraju, Jeevanandan and E. M. G. Subramanian, 2017b) According to a study done by Jeevanandan et al, the usage of rotary instruments in primary teeth not only reduces the instrumentation time, it also provides a better quality obturation. (Jeevanandan and Govindaraju, 2018) Though conventional hand file system is known as the gold standard in the field of paediatric endodontics, (Lakshmanan et al., 2020) further research on this matter would surely lead to the formation of a faster and safer protocol for endodontic treatment in primary teeth. (Govindaraju, Jeevanandan and E. Subramanian, 2017)

In the presence of crown discolouration, we found that it is more commonly associated without the presence of soft tissue swelling. Holen G et al found from their studies that discolouration of the crown is normally associated with the non-vital tooth and rarely the supporting structures. (Holan and Fuks, 1996)

When there is evidence of soft tissue swelling, both the asymptomatic and symptomatic irreversible pulpitis showed no association with it. A study done by Yu CY et al with similar findings explained that when there is minor displacement in the gingival integrity , the marginal periodontium can be re-established due to its ability for regeneration. (Yu and Abbott, 2016)

Throughout our study, there were some limitations that were encountered including a limited sample size with limited follow up (Christabel, 2015) which may in the future lead to unevaluated side effects.(Packiri, Gurunathan and Selvarasu, 2017) At the same time, the duration of study was also short.

In future studies, to provide an even thorough and significant result, a larger sample size should be obtained and a longer duration of study should be implemented.

IV. CONCLUSION

Within the limits of our study, we found that crown discolouration due to trauma in primary teeth is prominent in both asymptomatic and symptomatic irreversible pulpitis. However, teeth with longer root lengths will commonly undergo pulpectomy procedures while teeth with shorter

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

root lengths commonly undergo extraction procedures.

AUTHOR CONTRIBUTIONS

All authors have equal contribution in bringing out this research work.

CONFLICT OF INTEREST

There was no conflict of interest.

V. REFERENCES

[1] Andreasen, J. O., Andreasen, F. M. and Andersson, L. (2019) 'Textbook and Color Atlas of Traumatic Injuries to the Teeth', STOMATOLOGY EDU JOURNAL, p. 279. doi: 10.25241/stomaeduj.2019.6(4).bookreview.3.

[2] Cardoso, M. and de Carvalho Rocha, M. J. (2010) 'Association of crown discoloration and pulp status in traumatized primary teeth', Dental traumatology: official publication of International Association for Dental Traumatology, 26(5), pp. 413–416.

[3] Christabel, S. L. (2015) 'Prevalence of Type of Frenal Attachment and Morphology of Frenum in Children, Chennai, Tamil Nadu', World Journal of Dentistry, 6(4), pp. 203–207.

[4] Enabulele, J. (2019) 'Crown Discoloration as A Sequelae of Traumatic Dental Injuries', Technique of managing a cleft palate in a newborn. doi: 10.31487/j.dobcr.2019.02.05.

[5] Mahesh, R. and Masitah, M. (2018) 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', International Journal of Pharmaceutical Research, 10(4), pp.109-114. doi: 10.31838/ijpr/2018.10.04.017.

[6] Glendor, U. (2008) 'Epidemiology of traumatic dental injuries - a 12 year review of the literature', Dental Traumatology, pp. 603–611. doi: 10.1111/j.1600-9657.2008.00696.x.

[7] Govindaraju, L. and Gurunathan, D. (2017) 'Effectiveness of Chewable Tooth Brush in Children-A Prospective Clinical Study', Journal of clinical and diagnostic research: JCDR, 11(3), pp. ZC31–ZC34.

[8] Govindaraju, L., Jeevanandan, G. and Subramanian, E. (2017) 'Clinical Evaluation of Quality of Obturation and Instrumentation Time using Two Modified Rotary File Systems with Manual Instrumentation in Primary Teeth', Journal of clinical and diagnostic research: JCDR, 11(9), pp. ZC55–ZC58.

[9] Govindaraju, L., Jeevanandan, G. and Subramanian, E. M. G. (2017a) 'Comparison of quality of obturation and instrumentation time using hand files and two rotary file systems in primary molars: A single-blinded randomized controlled trial', European journal of dentistry, 11(3), pp. 376–379.

[10] Govindaraju, L., Jeevanandan, G. and Subramanian, E. M. G. (2017b) 'Knowledge and practice of rotary instrumentation in primary teeth among indian dentists: A questionnaire survey', Journal of International Oral Health, 9(2), p. 45.

[11] Gurunathan, D. and Shanmugaavel, A. K. (2016) 'Dental neglect among children in Chennai', Journal of the Indian Society of Pedodontics and Preventive Dentistry, 34(4), pp. 364–369.

[12] Holan, G. and Fuks, A. B. (1996) 'The diagnostic value of coronal dark-gray discoloration in primary teeth following traumatic injuries', Pediatric dentistry, 18(3), pp. 224–227.

[13] Jeevanandan, G. (2017) 'Kedo-S Paediatric Rotary Files for Root Canal Preparation in Primary Teeth - Case Report', Journal of clinical and diagnostic research: JCDR, 11(3), pp. ZR03–ZR05.

[14] Jeevanandan, G. and Govindaraju, L. (2018)

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

'Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial', European archives of paediatric dentistry: official journal of the European Academy of Paediatric Dentistry, 19(4), pp. 273–278.

[15] Juneja, P., Kulkarni, S. and Raje, S. (2018) 'Prevalence of traumatic dental injuries and their relation with predisposing factors among 8-15 years old school children of Indore city, India', Clujul medical (1957), 91(3), pp. 328–335.

[16] Kumar, A. et al. (2011) 'Prevalence of traumatic dental injuries among 12- to 15-year-old schoolchildren in Ambala district, Haryana, India', Oral health & preventive dentistry, 9(3), pp. 301–305.

[17] Lakshmanan, L. et al. (2020) 'Assessing the quality of obturation and instrumentation time using Kedo-S files, Reciprocating files and Hand K-files', Brazilian Dental Science, 23(1). doi: 10.14295/bds.2020.v23i1.1822.

[18] Norton, E. and O'Connell, A. C. (2012) 'Traumatic dental injuries and their association with malocclusion in the primary dentition of Irish children', Dental Traumatology, pp. 81–86. doi: 10.1111/j.1600-9657.2011.01032.x.

[19] Packiri, S., Gurunathan, D. and Selvarasu, K. (2017) 'Management of Paediatric Oral Ranula: A Systematic Review', Journal of clinical and diagnostic research: JCDR, 11(9), pp. ZE06–ZE09.

[20] Panchal, V., Jeevanandan, G. and Subramanian, E. (2019) 'Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial', Journal of the Indian Society of Pedodontics and Preventive Dentistry, 37(1), pp. 75–79.

[21] Petti, S., Glendor, U. and Andersson, L. (2018) 'World traumatic dental injury prevalence and incidence, a meta-analysis-One billion living people have had traumatic dental injuries', Dental Traumatology, pp. 71–86. doi: 10.1111/edt.12389.

[22] Ramos-Jorge, J. et al. (2017) 'Effect of dark discolouration and enamel/dentine fracture on the oral health-related quality of life of pre-schoolers', European Archives of Paediatric Dentistry, pp. 83–89. doi: 10.1007/s40368-017-0271-2.

[23] Ravikumar, D., Jeevanandan, G. and Subramanian, E. M. G. (2017) 'Evaluation of knowledge among general dentists in treatment of traumatic injuries in primary teeth: A cross-sectional questionnaire study', European journal of dentistry, 11(2), pp. 232–237.

[24] Somasundaram, S. et al. (2015) 'Fluoride Content of Bottled Drinking Water in Chennai, Tamilnadu', Journal of clinical and diagnostic research: JCDR, 9(10), pp. ZC32–4.

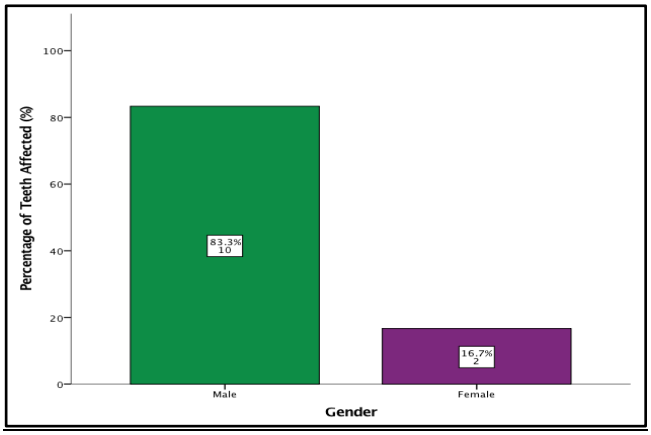
[25] Subramanyam, D. et al. (2018) 'Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries', European journal of dentistry, 12(1), pp. 67–70.

[26] Viegas, C. M. et al. (2014) 'Influence of traumatic dental injury on quality of life of Brazilian preschool children and their families', Dental Traumatology, pp. 338–347. doi: 10.1111/edt.12091.

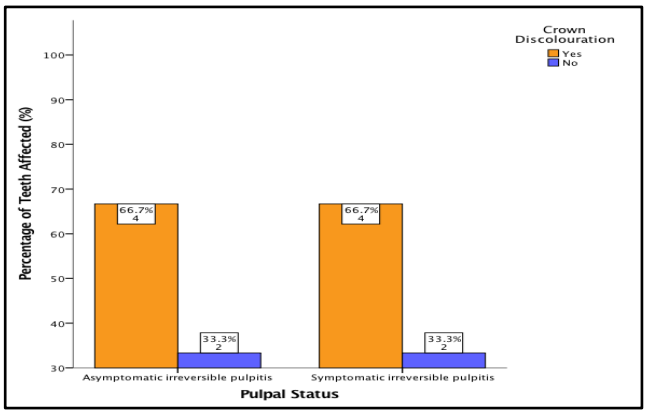
[27] Yu, C. Y. and Abbott, P. V. (2016) 'Responses of the pulp, periradicular and soft tissues following trauma to the permanent teeth', Australian dental journal, 61 Suppl 1, pp. 39–58.

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

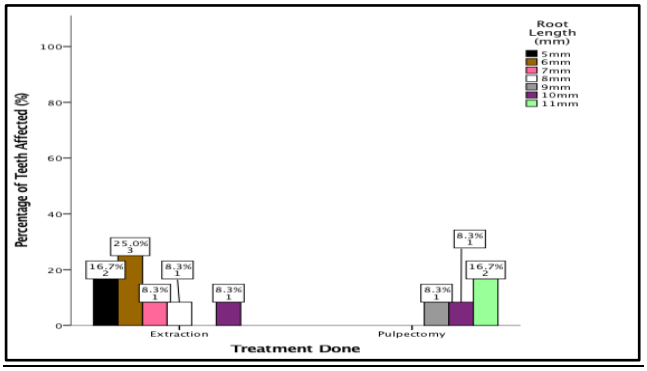
FIGURES



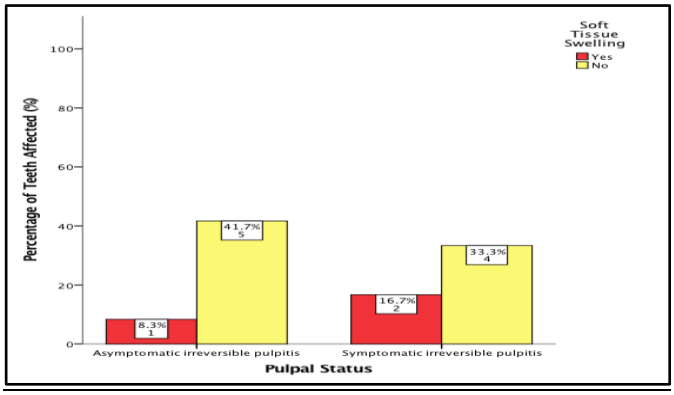
Graph 1: This bar chart represents the distribution of gender in paediatric patients who have a history of trauma in relation to their primary teeth. X-axis represents the distribution in gender. Y-axis represents the percentage of teeth affected that had a history of trauma. The sample size consisted of 83.3% of male patients (dark green) and 16.7% of female patients (purple).



Graph 2: This bar chart represents the association between pulpal status and crown discolouration of traumatised primary teeth. X axis represents pulpal status and Y axis represents the percentage of teeth affected. The presence of crown discolouration (orange) was equal in both asymptomatic and symptomatic irreversible pulpitis (66.7%). Hence, there was no significant association between the pulpal status and crown discolouration (Chi-square test; p-value=0.73-not significant).



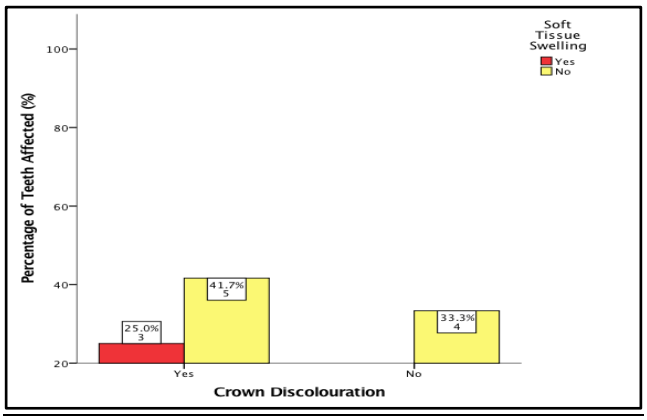
Graph 3: This bar chart represents the association between the treatment done and the root length of traumatised primary teeth. X axis represents the treatment done. Y axis represents the percentage of traumatised primary teeth affected. The longest root length; 11mm (light green) showed a higher predilection for undergoing pulpectomy procedures (50.0%). Traumatised primary teeth with longer root lengths commonly undergo pulpectomy procedures while shorter root lengths commonly undergo extraction procedures. There is significant association between the treatment done and the root length of traumatised primary teeth (Chi-square test; p-value= 0.05-significant).



Graph 4: This bar chart represents the association between the pulpal status and soft tissue swelling. X axis represents the pulpal status and Y axis represents the percentage of traumatised primary teeth affected. The presence of soft tissue (red) swelling is more commonly seen in symptomatic irreversible pulpitis (16.7%) compared to asymptomatic irreversible pulpitis (8.3%). However, there is no significant association between the pulpal status and the presence of soft

January - February 2020
ISSN: 0193 - 4120 Page No. 17127 - 17134

tissue swelling (Chi-square test; p-value= 0.50-not significant).



Graph 5: This bar chart shows the association between the crown discolouration and soft tissue swelling of traumatised primary teeth. X axis represents the crown discolouration and the Y-axis represents the percentage of traumatised primary teeth affected. The presence of soft tissue swelling (red) is commonly seen with the presence of crown discolouration (25.0%) while there was no presence of soft tissue swelling in the absence of crown discolouration (0%). However, there is no significant association between the crown discolouration and the soft tissue swelling in traumatised primary teeth (Chi-square test; p-value=0.25-not significant).