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Prevalence of irreversible pulpitis among male and female children - a retrospective study

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Abstract: Dental caries is one of the most common chronic diseases of adults and children in both developed and developing nations. The incidence of caries can cause irritation to the pulp and periradicular tissues which may result in inflammation. Inflammation over an extended period of time on the other hand can cause irreversible damage to the pulp. This study focuses on the prevalence of irreversible pulpitis among different genders of children. A retrospective cross-sectional study was conducted using the patient case records of a University hospital from June 2019 until March 2020, and children who were diagnosed with irreversible pulpitis were selected. Data was collected and then subjected to statistical analysis. Microsoft Excel 2016 data spreadsheet was used to collect data and later exported to the SPSS software. Among 244 children, males recorded slightly higher frequency with irreversible pulpitis, about 54% while females recorded approximately 46%. Based on age, 4-6 years children were more prevalent to irreversible pulpitis, surpassed 50% overall. The prevalence of irreversible pulpitis among children in this study seems to be slightly higher in males than female children.

Keywords: Caries, Endodontic, Irreversible pulpitis, Primary dentition

INTRODUCTION

Oral health can affect the quality of life [(Gerritsen *et al.*, 2010)]. Dental caries is commonly known as a chronic disease involving both the children and adults. Despite knowing the aetiology and prevention of this disease, it still becomes the most encountered situation that causes head and neck pain in humans [(Willmott, 2008)][(Jeevanandan, 2017)]. Caries can also alter the growth and well-being of young children [(Sheiham, 2006)]. Incidence of caries can cause irritation to the pulp and periradicular tissues which may result in inflammation. Bacteria originating from caries, micro leakage from restorations cause an infection which create routes of entry into the pulp [(Govindaraju, Jeevanandan and E. M. G. Subramanian, 2017a)]. A healthy pulp is capable of self-repairing. However, due to over extended and repeating irritation, pulp tissue becomes compromised due to a condition called inflammation or fibrosis [(Kiranmayi, Anumala and Kirubakaran, no date)]. When this occurs, injury to the pulp results in cell death. Intensity and severity of tissue damage depends on the degree of inflammation. Deprived or no inflammation in the pulp results from incipient caries [(Virdi, 2012)][(Govindaraju, Jeevanandan and E. M. G. Subramanian, 2017b)]. On the other hand, severe inflammatory changes can occur when there is deep caries, extensive operative procedures, or persistent irritation [(Somasundaram *et al.*, 2015)]. Pulpal responses range from transient inflammation or reversible pulpitis to irreversible pulpitis which when left untreated lead to total necrosis. In most scenery, patients are unable to acknowledge the changes as they may not experience pain [(Hargreaves, Goodis and Tay, 2012)][(Jeevanandan and Govindaraju, 2018)].

Invasion of the pulp most commonly due to bacterial provocation from the caries. Inflammatory lesions arise due to action of various substances that are actively involved in destruction of tooth structure. Irritation may be held when it attacks the primary dentin but vulnerable once involved the reparative dentin or pulp tissue. This in return jeopardized the vitality of the tooth [(Govindaraju, Jeevanandan and E. Subramanian, 2017)]. As in normal occasion, caries involved the dentin during early phase that results in changes of the pulp and incited to respond in early phase lead to inflammatory response. The pulp response varies depending on caries

progression, either acute caries when it progresses rapidly or chronic pulpitis when it progresses slowly [('Principles And Practice Of Endodontics', 2010)][(Ravikumar, Jeevanandan and Subramanian, 2017)].
90% of the children seeking urgent dental concerns are mostly affected by pulp or periodontal diseases [(Drinnan, 1987)][(Hasler and Mitchell, 1963)]. The aetiology of pulpitis are physical, chemical and bacterial. Physical factors can be further classified into mechanical, thermal and electrical injuries. Mechanical injuries include trauma that can be accidental or iatrogenic dental procedures, cracked tooth syndrome, barodontalgia and pathologic wear. Electrical injury can be due to galvanic current from dissimilar metallic [(Veerale Panchal, Jeevanandan and Subramanian, 2019)]. Chemical factors are phosphoric acid, acrylic monomer or erosion (acid). Bacterial factors that are most commonly lead to pulpal damage include toxins associated with caries, direct invasion of pulp from caries or trauma, and microbial colonization in the pulp by blood borne microorganisms [(Gopikrishna and Suresh Chandra, 2014)][(Christabel and Linda Christabel, 2015)].
Irreversible pulpitis is defined as a persistent inflammatory condition of the pulp that may be symptomatic or asymptomatic in which the pulp is incapable of healing [(Packiri, Gurunathan and Selvarasu, 2017)]. The pain is severe and lasts longer, spontaneous pain, boring, gnawing or throbbing in later stages and experienced sharp, piercing or shooting pain. In asymptomatic irreversible pulpitis or chronic irreversible pulpitis, there are no clinical symptoms and likely to respond normally towards thermal testing but had a history of trauma or deep caries that can cause exposure after removal [(Govindaraju and Gurunathan, 2017)][(Damyanova, Angelova and Andreeva-Borisova, 2018)].
The treatment of pulpitis includes complete removal of pulp or pulpectomy, and emergency procedures such as removal of coronal pulp or pulpotomy can be done in posterior teeth. The prevalence of pulpitis may be varied among different populations and genders. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; V. Panchal, Jeevanandan and Subramanian, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)
Therefore, this study is conducted to determine the prevalence of irreversible pulpitis among different genders of children.

MATERIAL AND METHODS

This retrospective study was conducted by reviewing 86,000 patient case records of the author's University hospital from June 2019 to March 2020. A total of 244 case records with irreversible pulpitis underwent pulpectomy were sorted of which case records of patients with age below 17 years with signed informed consent were retrieved. Systemic diseases, physical and mental disabilities were excluded from the selection process.
The data on patients age, gender and history of irreversible pulpitis and pulpectomy done collected from the 244 case records were entered. Collected data was subjected to statistical analysis using SPSS version 20.0. Frequency distribution was performed to find the prevalence of irreversible pulpitis based on gender. Chi-square test was used to test associations between categorical variables. P value < 0.05 was considered statistically significant. Chi-square association was done to find the association between gender and irreversible pulpitis.
The outcome of the current study was to determine the patients with pulpal inflammation of irreversible state through proper case history with detailed both clinical and radiographic examination recorded in the hospital case records. Further diagnosis were confirmed with radiographic examination in which the teeth were examined for widening of PDL space, pulpal involvement or presence of any periapical pathology.

RESULTS AND DISCUSSION

This study included 244 children who reported in the outpatient department of University hospital. The outcome of the study was to record the prevalence of children diagnosed with irreversible pulpitis and underwent pulpectomy enumerated through the case records of the University hospital. Dental caries incidence is a common dental disease reported in children globally. Thus, delayed treatment can cause progression to occurrence of pulpitis and early loss of teeth.
As displayed in Figure 2, the age group that showed the highest rate of irreversible pulpitis was five years children, slightly above 25%. There was an increase in prevalence of irreversible pulpitis as age increases, reaching the highest incidence among five years children, then later declining as age increases. Two years children presented with less than 1% incidence and significant rise seen among three years children, 10%. Four and five years children presented with nearly equal distribution, 23% and 26% respectively. A declining rate seen among six years; 15%, seven years;12%, eight years;8%, nine years;3%, 10 years;2% and recorded the lowest prevalence in 11 years children about 1%. Statistically non-significant difference seen as $p=0.46$ ($p>0.05$).

Age in addition to gender also may contribute to the prevalence of irreversible pulpitis as age determines the time of eruption of dentition. In the present study, 4-6 years age groups were reported to be higher than other age groups. Based on Al-Madi et al. 2018, the frequency of irreversible pulpitis increases as age increases [(Al-Madi *et al.*, 2018)]. Chompu et al reported the mean average of children's prevalence with pulpitis was 9-11 years age group [(Chompu-Inwai *et al.*, 2018)]. The results reported in each study served as ascertainment of the studies that pulpal inflammation is common in that age interval. Present study in relation to the teeth eruption in children explains the high occurrence of dental caries incidence as the teeth erupts into the oral cavity [(Nair *et al.*, 2018)].

Based on teeth predilection, both first and second primary molars greatly affected showing higher frequency in comparison to any other dentition. Occurrence of irreversible pulpitis presented the highest in maxillary first molars as well as mandibular second molars. Low prevalence of irreversible pulpitis presented by teeth number 51;6%, 52;3%, 53;1%, 55;3%, 61;1%, 62;0.8%, 63;1.2%,65;4%, 73;1.2% and 83;3%. Greater incidence was observed in 54;13%, 64;10%, 74;12%, 75; 14%, 84;13% and 85;14.3%. No significant difference presented as p=0.50 (p>0.05).

In terms of teeth prevalence, current study showed molars in all quadrants were mostly affected in most index age groups. Based on Al-Madi et al. 2018, both maxillary and mandibular molars recorded most cases with reversible pulpitis. Mandibular first molar reported the highest incidence. This study agrees with the statement that molars are more susceptible to caries due to its morphological and functional characteristics [25]. In adults, dental caries progression also mainly affects the molars as they are the first permanent teeth to erupt into the oral cavity.

As we all are aware that incidence of dental caries and other hygiene related diseases are increasing globally. Thus parents especially should play an important role in both prevention and treatment. Proper oral hygiene practices should be practised at home to prevent the risk of tooth decay. Routine dental check-up must be performed regularly to maintain good oral health and fluoride application as well as pit and fissure sealant shall be implemented to protect the teeth from initiation of tooth decay [(Gurunathan and Shanmugaavel, 2016)].

The present study showed several limitations that can cause unreliable results. Demographic features, small sample size and population as well as unequal distribution of participants among genders lead to bias in data analysis. Further investigations should be done such as radiographic examination as well as pulp vitality and sensibility test to obtain proper diagnosis for accurate treatment planning. Racial and genetic differences as well may contribute to dissimilarities to previous studies, thus need to be taken into consideration.Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Mathew *et al.*, 2020)

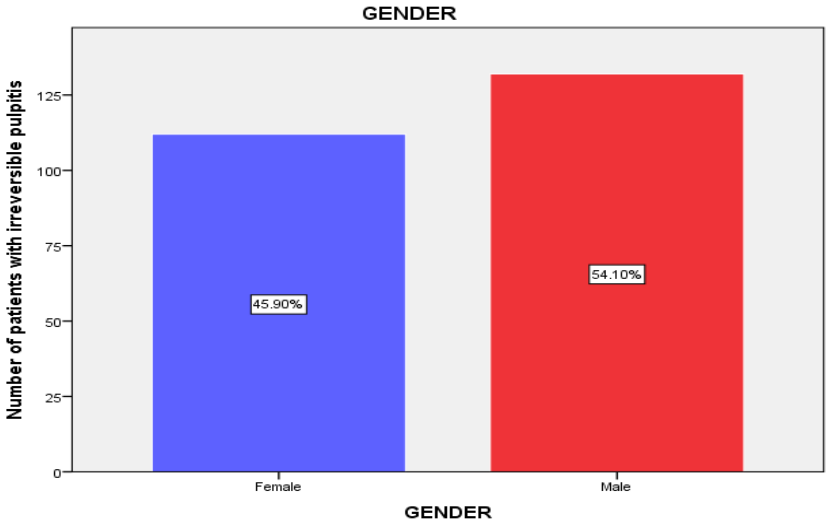

Fig.1: Bar chart represents the association between irreversible pulpitis and gender. X axis shows gender and Y axis shows the number of patients. Chi-square test was done and was found to be statistically insignificant [Chi-square value-; p=0.44 (p>0.05)]. Even though it is statistically non-significant, Males (red) show higher percentages of irreversible pulpitis (54.1%) in comparison to females (blue) which is found to be 45.9%.

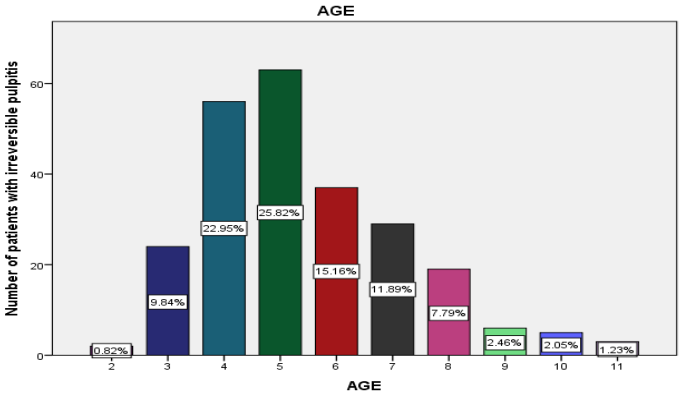

Fig.2: represents the associations between irreversible pulpitis and age groups. X axis represents the different age groups and Y axis represents the number of patients with irreversible pulpitis. Chi-square test was done and was found to be statistically insignificant [Chi-square value-; p=0.46 (p>0.05)]. Even though it is statistically non-significant, children at the age of 5 years (green) had more irreversible pulpitis compared to other age groups .

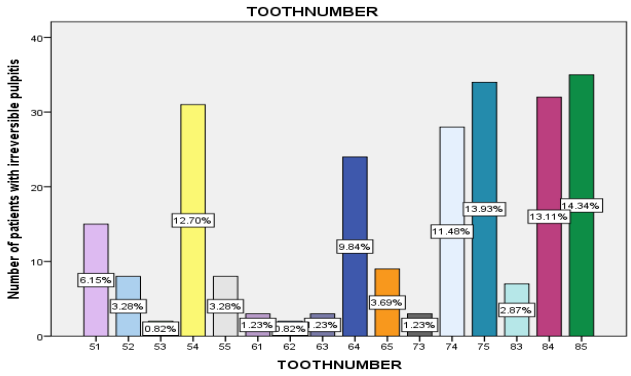

Fig.3: Simple bar chart shows frequency distribution of irreversible pulpitis based on tooth number. X axis represents different tooth numbers and Y axis shows the number of children with irreversible pulpitis. Chi-square test was done and was found to be statistically insignificant [Chi-square value-; p=0.50 (p>0.05)]. Even though it is statistically non-significant, the most affected tooth with irreversible pulpitis was 85 (green, 14.34%) and the least affected tooth was 53 (purple, 0.82%%) and 62 (brown, 0.82%).

CONCLUSION

Prevalence of primary dentition with pulp involvement was found to be very high especially in relation to molars. Within the limitation of this study, it was revealed that the prevalence of irreversible pulpitis among different genders seemed to be higher in males than females. Considering the prevalence of disease in the younger population is common, understanding the factors and preventive measures at the earliest should be acknowledged especially by parents. Further investigations and preventive management are needed to evaluate the occurrence of irreversible pulpitis.

Author contribution

All authors have equal contribution in bringing out this research work

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Conflict of interest

Nil

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