



## Association Between Gender and Open Apex Among Patients Visiting A Private Dental College

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### ABSTRACT

Traumatic injuries in childhood may disrupt root development leading to a tooth with open apex. When permanent teeth with incomplete roots undergo pulpal necrosis they develop roots which are very short, these roots contain very thin walls. They also have a tendency to show inadequate crown-root ratio, which leads to poor prognosis of the tooth. The current study aims to evaluate the association between gender and open apex. The study participants included the patients visiting the out patient department of a private dental college from June 2019 to March 2020. A total of 86,000 case sheets and radiographs associated with the case sheets were reviewed and the data of the 47 patients diagnosed with open apex were further analysed. The data was formulated by reviewing the case sheets of the patients and the data was statistically analysed using Statistical Product and Service Solution software. Within the limits of the study, open apex is more predominant among the male population(83.0%) when compared to the female population (17.0%) and it can be seen that the incidence of open apex is higher for all the teeth in males (11-75.0%, 12-60.0%. 21-89.5%, 22,31,36,41-100%). Chi-square analysis was done and there was no statistically significant association between gender and incidence of open apex. (Pearson chi-square value-4.594; df- 6 ; p-value =0.597>0.05).

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Gender, Incidence, Male, Open apex, Trauma.

### INTRODUCTION

As the teeth erupt and root formation commences there is a constant change in the anatomy of the apical foramen. The series of events leading to the completion of root development and the closure of the apex takes up to three years after eruption. During this period, in immature permanent teeth, presence of caries or trauma can trigger the loss of

pulpal vitality as well as directly affect root development, resulting in short roots with very thin walls producing a greater risk of fracture. [1,2] The reasons for incidence of open apex could be of inflammatory origin or could be due to immature apex of early necrosed teeth.[3,4] Open apex can also occur in adults with completely formed roots due to certain pathological or iatrogenic causes.[5-

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9] The teeth eventually tend to show thin radicular walls which are more susceptible to fracture, the wide lumen makes it difficult to retain the restorative material. [7,10,11][10-12]

Hertwig's epithelial root sheath (HERS), are derived from the epithelial cells in the apical region of the tooth and play an important role in the development of the tooth. When there is an interaction between the HERS and the dental papilla cells, these cells are induced and differentiate into odontoblasts. When the HERS interacts with the dental follicle cells, they are induced and differentiate into cells of the periodontal ligament including the cementoblasts, fibroblasts and osteoblasts [13]. Therefore, the fate of root development depends on the survival of HERS after trauma[14]. Any prominent destruction to this entity will lead to incomplete or complete termination of further root development. The etiology for this damage might be associated with trauma inflicted during intrusion, replantation after avulsions and fractures of the jaw [15,16]. The formation of the root dentin after the trauma is dependent on the survival of odontoblasts along the root canal wall. With the combined development of pulp necrosis in contusion injuries of the The injuries of various nature to HERS along with it's the sequelae of pulp necrosis, leads to root thinning and fracture and crack susceptibility functional loading (less proprioception due to loss of pulp), which eventually leads to the loss of tooth[17].

Teeth with necrotic pulp and open apex bring about several challenges to clinicians due to the lack of natural apical constriction and the thin root walls that are prone to fracture [Trope, 2006, Camp, 2008]. Open apices also pose a problem for root canal treatment because they lead to the extravasation of sealer or the irrigating solution into the periradicular tissues which will act as a negative influence in the healing process.[18] In the attempt to confine filling materials into the root canal space and prevent overfilling, the closure of the apex and/or the placement of an artificial apical barrier are necessary before obturation of the root canal system [19,20]. The conventional approach to handle cases with open apex is by multiple-visit apexification treatment with the use of calcium hydroxide (CH) which serves as an intracanal medicament [21]

Previously our team had conducted numerous clinical trials and lab studies and in-vitro studies [22-37] over the past 5 years. In this study we aim to evaluate the association between gender and open apex among the patients visiting a private dental college.

## **MATERIALS AND METHOD:**

### **Study Setting**

The present retrospective study was carried out in an institutional setting study with an advantage of a wide range of data available. It was conducted to evaluate the association between gender and open apex among the population visiting a private dental college from June 2019 to March 2020. Ethical clearance for this study was obtained from the Institutional Ethical Committee with the ethical approval number being SDC/SIHEC/2020/DIASDATA/0619-0320. The population included in the study were 47 patients who were diagnosed to have open apex by the Department of Conservataive dentistry and endodontics of a private dental college. Two examiners were involved in the study.

### **Study design**

The study was designed based on the set inclusion criteria of patients from the out patient department who were diagnosed with open apex. Cases which did not fall under this inclusion criteria were excluded from the study.

### **Sampling**

The study was based on non probability convenience sampling. To minimize the sampling bias, all the case sheets of patients with apical root resorption were reviewed and included.

### **Data Collection and Tabulation**

It is a retrospective study where the data was collected by reviewing the case records of the patients visiting the out patient department of a private dental college from June to March. The collected data included the following parameters: Patients details- Name, Age, Gender, Patient identification number and the presence of open apex were recorded. A total of 86,000 case sheets and radiographs associated with the case sheets were reviewed and the data of the 47 patients diagnosed with open apex were further analysed. Cross verification of the data was done by a reviewer.

## **RESULTS AND DISCUSSION**

When there is an acute transmission of impact energy to a tooth and its supporting structures it is termed as dental trauma. Six types of injuries to the periradicular tissues (i.e. luxation injuries), seven types of tooth fractures, and their combinations have been described in the literature. The tissue integrity is disrupted when the dental pulp, the periradicular and the surrounding soft tissues are affected by trauma. The tissues respond with an inflammatory reaction at the local level to defend the body against infection and foreign substances and also to dispose of the necrotic damaged tissues,

which re-establishes the integrity by facilitating repair and regeneration from adjacent viable tissues.

The investing periradicular tissues which support the tooth comprise of the PDL, the cementum, the alveolar bone lining the tooth socket (the alveolar bone proper) and the dentogingival junction.[38] In the young permanent teeth, Hertwig's epithelial root sheath (HERS) determines the continuation of root growth and development. [39,40]The periradicular tissue is a complex mixture of mineralized and non-mineralized tissue which are of ectomesenchymal origin. These structures are derived from the dental follicle (except the dentogingival junction, which is derived from the reduced enamel epithelium of enamel organ origin)[41]. In an antagonistic environment like the oral cavity, an effective immune response plays a primary role in dental wound healing and to protect the sterile periradicular tissues from invading bacteria[42]. When the immune cells like the neutrophils, lymphocytes, macrophages and osteoclasts are activated it may lead to bone resorption, as well as root resorption. Ischaemia or contusion of the PDL leads to repair-related replacement resorption or ankylosis. The final result of the periradicular healing depends on the race between the rate of cell growth of each periradicular tissue, as well as bacterial invasion to the damaged root surface[43]. The highest incidence of dental injuries in the permanent dentition are between 8 to 10 years and the maxillary central incisors. In this age group, the permanent incisors would have incomplete roots, especially in boys, with relatively short roots, thin root dentine walls and open apices [15][44].

According to our observation it can be seen that open apex is more prevalent among males (83.0%) when compared to females (17.0%)[Table 1][Figure 1] and It can be observed that open apex is the most prevalent in 12 among females (40.0%) and the prevalence of open apex is higher for all the teeth in males (11-75.0%, 12-60.0%. 21-89.5%, 22,31,36,41-100%). Statistically, there was no significant association between gender and incidence of open apex. (Pearson chi-square value-4.594; df- 6 ; p-value =0.597>0.05)[Table 2] [Figure 2]. Similar observations have been made by Glendor et al [45] and Andersson et al [46]. A study by Plascencia et al[47] shows that there was no gender predilection in open apex and claims that the results could be due to the increase of participation of women in contact sports.

The open apices have the advantage of a possibility of revascularization of the pulp when compared to the completely developed teeth with closed apices; but the incompletely developed short and thin-walled roots become a disadvantage as the structural integrity of the root is affected as it's

development cessates in cases of pulpal necrosis and in cases of infection. Such teeth will have a poor prognosis due to the lack of dentin in the root structure, with significant impact on the aesthetics and psychological implication of a growing child [15][44]. The other problem associated with open apex is the extrusion of endodontic material into the periodontal tissue. Treatment of open apex can be done in single sitting and can avoid the risk of root canal contamination and the possibility of a root fracture and can optimise the time of endodontic treatment.[48-54] A recent treatment option is by the usage of MTA which has a good osteogenic activity and good bone tissue tolerance. [55-59]

## CONCLUSION

Within the limits of the study, we can see that open apex is more prevalent among the male population and it can be seen that the prevalence of open apex is higher for all the teeth in males. This could be related to the increased involvement of men in contact sports.

## AUTHOR'S CONTRIBUTION

First author (Geethika.B) performed the analysis, and interpretation and wrote the manuscript. Second author (Dr. Adimalapu Hima Sandeep) contributed to conception, data design analysis, interpretation and critically revised the manuscript. Third author (Dr. Manjary Chaudhary) participated in the study and revised the manuscript. All the authors have discussed the results and contributed to the final manuscript.

## CONFLICT OF INTEREST

Nil

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Self.

## ETHICAL CLEARANCE

It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number-SDC/SIHEC/2020/DIASDATA/0619-0320)

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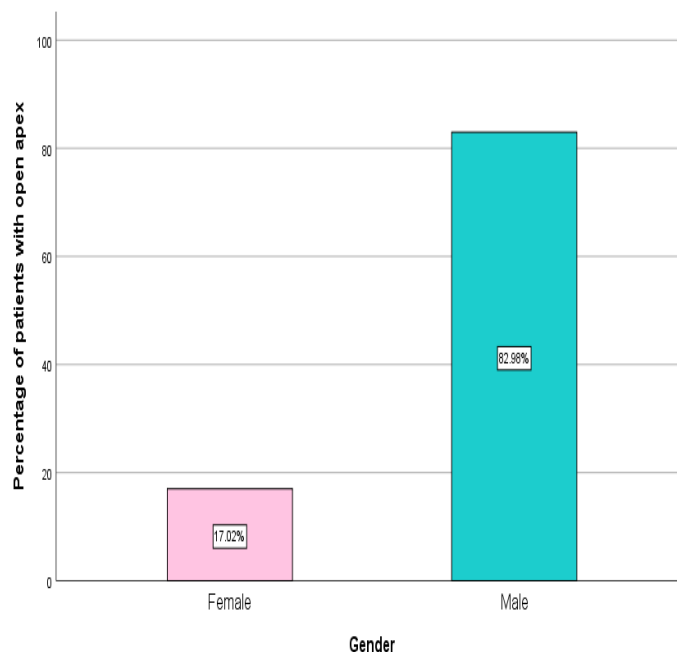
**TABLES AND GRAPHS**

**Table 1. This table shows the prevalence of open apex among both the genders.**

| Gender | Number | Percentage |
|--------|--------|------------|
| Female | 8      | 17.0%      |
| Male   | 39     | 83.0%      |

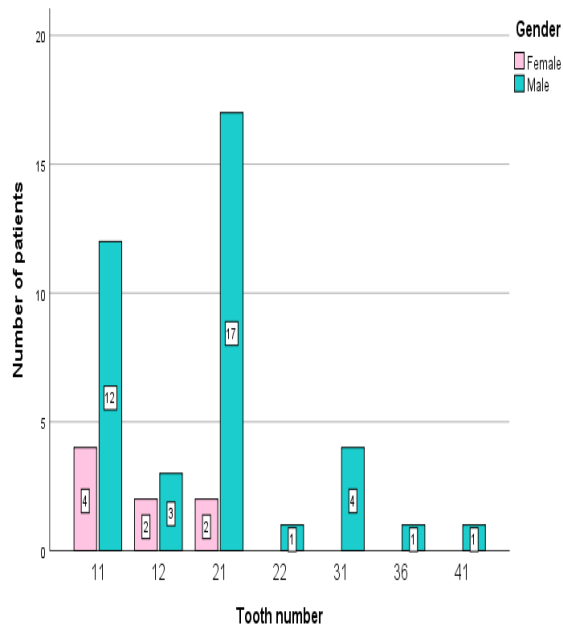
**Table 2. This table shows the association between gender and the tooth number with regard to open apex. It can be seen that the prevalence of open apex is higher for all the teeth in males (11-75.0%, 12-60.0%, 21-89.5%, 22,31,36,41-100%) Chi-square analysis was performed and there was no statistically significant association between gender and incidence of open apex (Pearson chi-square value-4.594; df- 6 ; p-value =0.597>0.05).**

| Tooth Number | Gender (%) |        | Statistical values |    |         |
|--------------|------------|--------|--------------------|----|---------|
|              | Female     | Male   | Pearson chi-value  | df | p-value |
| 11           | 25.0%      | 75.0%  | 4.594              | 6  | 0.597   |
| 12           | 40.0%      | 60.0%  |                    |    |         |
| 21           | 10.5%      | 89.5%  |                    |    |         |
| 22           | 0.0%       | 100.0% |                    |    |         |
| 31           | 0.0%       | 100.0% |                    |    |         |
| 36           | 0.0%       | 100.0% |                    |    |         |
| 41           | 0.0%       | 100.0% |                    |    |         |



**Figure 1. This bar chart shows the percentage of each of the gender associated with open apex. X axis represents the gender and Y axis represents the percentage of patients. The male population(Blue) shows a higher percentage of prevalence (62.98%) when compared to the female population (Pink).**





**Figure 2: This bar chart shows the association between gender and the incidence of open apex in various teeth. X axis represents the tooth number and Y axis represents the number of patients. Male patients (Blue); Female patients (Pink). Chi-square test was done and it was found to be that there was no statistical significant association. Pearson chi-square value - 4.594; df- 6 ; p-value =0.597>0.05. It can be seen that the incidence of open apex is higher for all the teeth in male population with no statistical significance.**