

Knowledge On Histology Of Cementum Among Undergraduates - A Cross Sectional Survey

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ABSTRACT

Aim:

The aim is to assess the knowledge about histology of cementum among undergraduate dental students.

Background:

Cementum is a mineralised avascular connective tissue covering the anatomical roots of teeth. The cementum is the part of the periodontium that attaches the teeth to the alveolar bone by anchoring the periodontal ligament.

Materials and method:

The present study was a questionnaire based cross sectional study among undergraduate dental students in a private dental college. The participants were selected by random sampling to minimize the sampling bias. A questionnaire consisting of 10 questions about histology of cementum were circulated through the online survey mode undergraduates. The collected data were analysed using spss software version 23.

Result:

In our study, 59% of the population were aware that cementocyte were the entrapped cells of cementum and 53% of the participants were aware that cementum has a high fluoride content. The association between year of study and response for formative cells of cementum was evaluated using Pearson chi- square test where majority (42%) were the first years who were aware about the cementoblast when compared to the second (22%), third (16%), and final year students (7%) and the p value is 0.013 and it is statistically insignificant.

Conclusion:

The present study concluded that first year students have more knowledge about the histology of cementum when compared to second, third and final year students.

Key words: cementum, intrinsic, extrinsic, sharpey fibers, cementocytes, novel method

INTRODUCTION:

Cementum is a mineralized tissue covering the entire root surface and furcation of multi rooted teeth of all teeth . It functions as a tooth-supporting device along with the periodontal principal fibers and alveolar bone. Cementum is avascular, does not undergo remodeling, and increases in thickness throughout life. Cementum is composed of water, 50% of organic matrix which are mainly collagen fibers and minerals (1).

There are two types of cementum namely acellular and cellular (2). Both acellular and cellular consists of calcified interfibrillar matrix and collagen fibrils. The acellular extrinsic fiber cementum (AEFC) extends from cervical margin to apical one third. It is only one cementum seen in single rooted teeth. The cellular cementum is also known as secondary cementum as this is formed later than the AEFC. The cellular cementum found in the apical third(3).

A thin layer of cementoid can usually be observed on the cemental surface . This cementoid tissue is lined by cementoblasts. Hypercementosis is an abnormal thickening of cementum which affects all teeth of the dentition, be confined to a single tooth, or even affect only parts of one tooth (2,4). Students must know about the histology of cementum to rule out various pathological conditions involving cementum. Our team has extensive knowledge and research experience that has translate into high quality publications (5),(6),(7),(8),(9),(10),(11),(12),(13),(14),(15),(16),(17),(18),(19),(20),(21),(22),(23),(24). Thus the aim of the study is to assess the knowledge about histology of cementum among undergraduates.

MATERIALS AND METHODS:

This is a questionnaire based cross sectional study. The survey was conducted among 100 dental students at a private dental college and a simple random sampling was done for choosing the participants. Questions were prepared regarding histology of cementum and distributed among dental students through online based survey forms (i.e.,google forms). The responses were collected and tabulated in MS excel sheet and data entered in SPSS software 23 and the results were represented in a bar graph and pie charts. Chi square test was used to analyze and comparative bar graphs were plotted and it is statistically significant only if the p value is less than 0.05

The questions in the questionnaire are as follows;

1. Do you know which of the following are the entrapped cells of cementum?
2. Do you know which of the following are formative cells of cementum?
3. Do you know which of the following are Incremental lines of cementum?
4. Do you know which of the following has high fluoride content?
5. Which of the following do you think the canaliculi of cementocytes are directed towards?
6. Do you know which of the following contains alternating layers of acellular extrinsic and cellular intrinsic ?
7. Do you know which of the following is avascular?
8. Do you know which of the following forms cementum?
9. Are You aware which of the following cementum is devoid of cells and fibres?
10. Do you know which of the following is not true about cellular cementum?

RESULT:

The present study has observed that out of 100 participants, 42% were first year students, 25% were second years, 24% were third years and 9% were final year students. In our study, 59% of the population were aware about entrapped cells of cementum whereas 41% were unaware about it (**Figure 1**). Only 87% of the population were aware that cementoblasts are formative cells of cementum (**Figure 2**). In the present study, 58% of the population were aware about incremental lines of cementum (**Figure 3**) and 54% of the population were aware that cementum has high fluoride content. (**Figure 4**). According to the study, 47% of the population were aware that canaliculi of cementocytes are directed towards the periodontal ligament (**Figure 5**). In our study, only 26% of the population were aware that alternating layer acellular extrinsic and cellular intrinsic is the cellular mixed stratified cementum. (**Figure 6**). Only 61% of the population were aware that

cementum is avascular(**Figure 7**).According to the study, 41% of the population were aware about cementum, whereas 46% Stellate reticulum, 13% stratum medium were unaware about root sheath of Hertwig (**Figure 8**). Only 38% of the population were aware that acellular afibrillar cementum is devoid of cells and fibres(**Figure 9**) and 49% of the population were aware that cellular cementum is found in apical one-third of root(**Figure 10**).The Pearson chi-square test was used to determine the relationship between year of study and number of respondents who were aware of formative cells of cementum and 42% of first year students followed by 22% of second year students, 16% of third year students, 7% of final year students were aware about formative cells of cementum and p value is 0.013, ($p < 0.05$) hence it is not statistically significant(**Figure 11**).The Pearson chi-square test was used to determine the relationship between year of study and number of respondents who were aware of cementum and 29% of first year students followed by 13% of second year students, 11% of third year students, 7% of final year students were aware about cementum and p value is 0.287, ($p < 0.05$) hence it is not statistically significant (**Figure 12**).The Pearson chi-square test was used to determine the relationship between year of study and number of respondents who were aware of canaliculi of cementocyte and 23% of first year students followed by 10% of second year students, 8% of third year students, 5% of final year students were aware about canaliculi of cementocyte and p value is 0.366, ($p < 0.05$) hence it is not statistically significant (**Figure 13**).

Do you know which of the following are the entrapped cells of cementum?

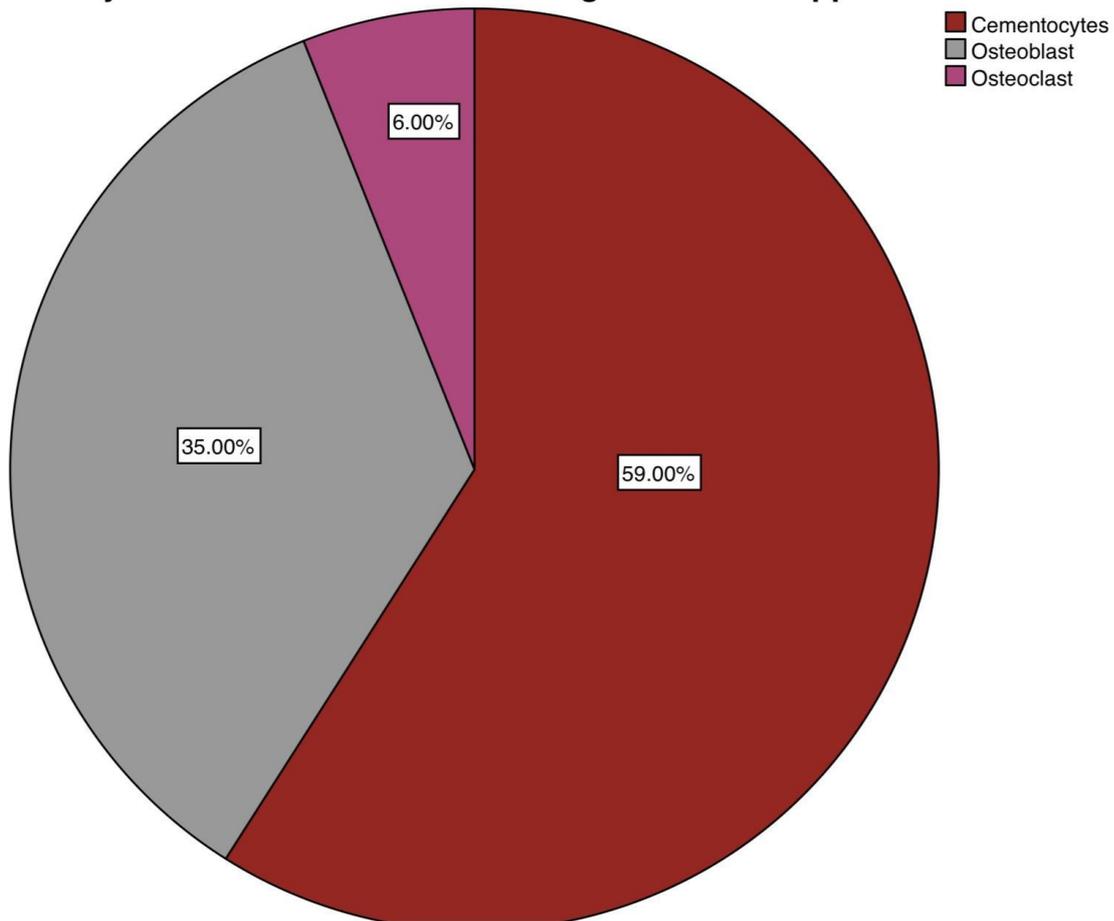


Figure 1: Pie chart shows the response of the students who were aware about the entrapped cells of cementum. Here red colour indicates cementocytes, grey colour indicates osteoblast, pink colour indicates osteoclast. Majority (59%) of the population were aware whereas 35% (osteoblast), and 6% (osteoclast) were unaware about the entrapped cells of cementum.

Do you know which of the following are formative cells of cementum?

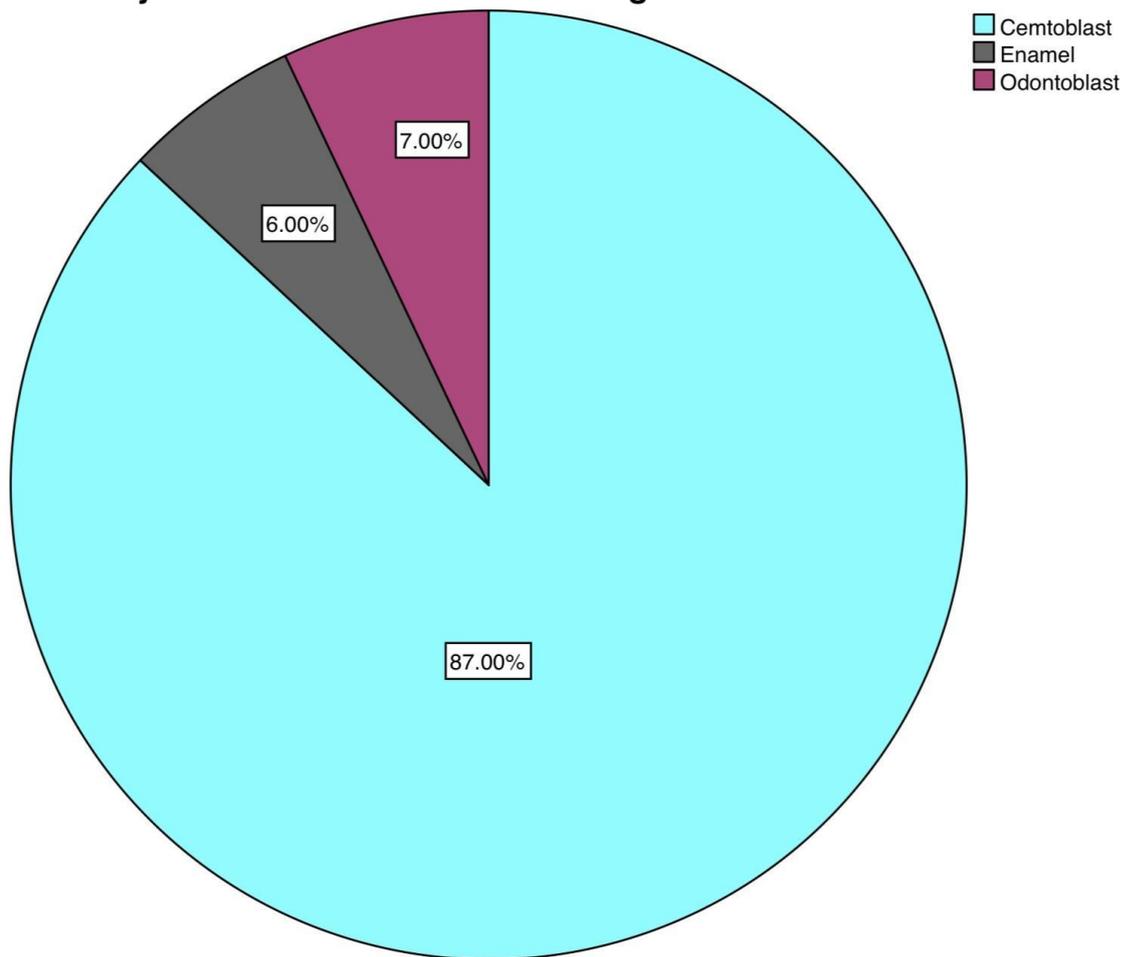


Figure2: Pie chart shows the response of the students who were aware about the formative cells of cementum. Here aqua blue colour indicates cementoblast , brown colour indicates enamel, pink colour indicates odontoblast . Majority (87%) of the population were aware whereas 6% (enamel), and 7% (odontoblast) were unaware about the formative cells of cementum.

Do you know which of the following are the Incremental lines of cementum?

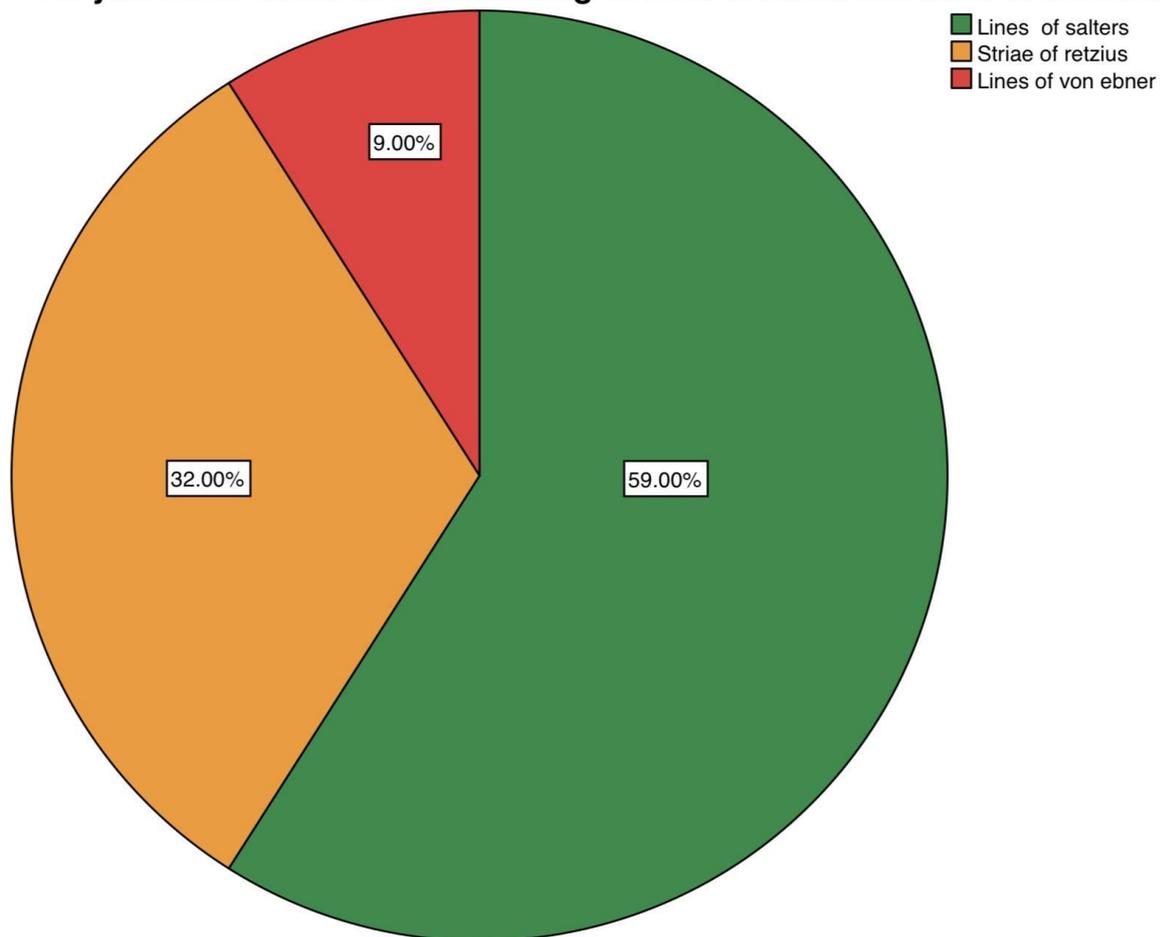


Figure3: Pie chart shows the response of the students who were aware about the incremental lines of cementum. Here green colour indicates lines of salters , yellow colour indicates striae of retzius ,red colour indicates lines of Von ebner. Majority (59%) of the population were aware, whereas 32%(striae of retzius), and 9% (lines of von ebner) were unaware about the incremental lines of cementum.

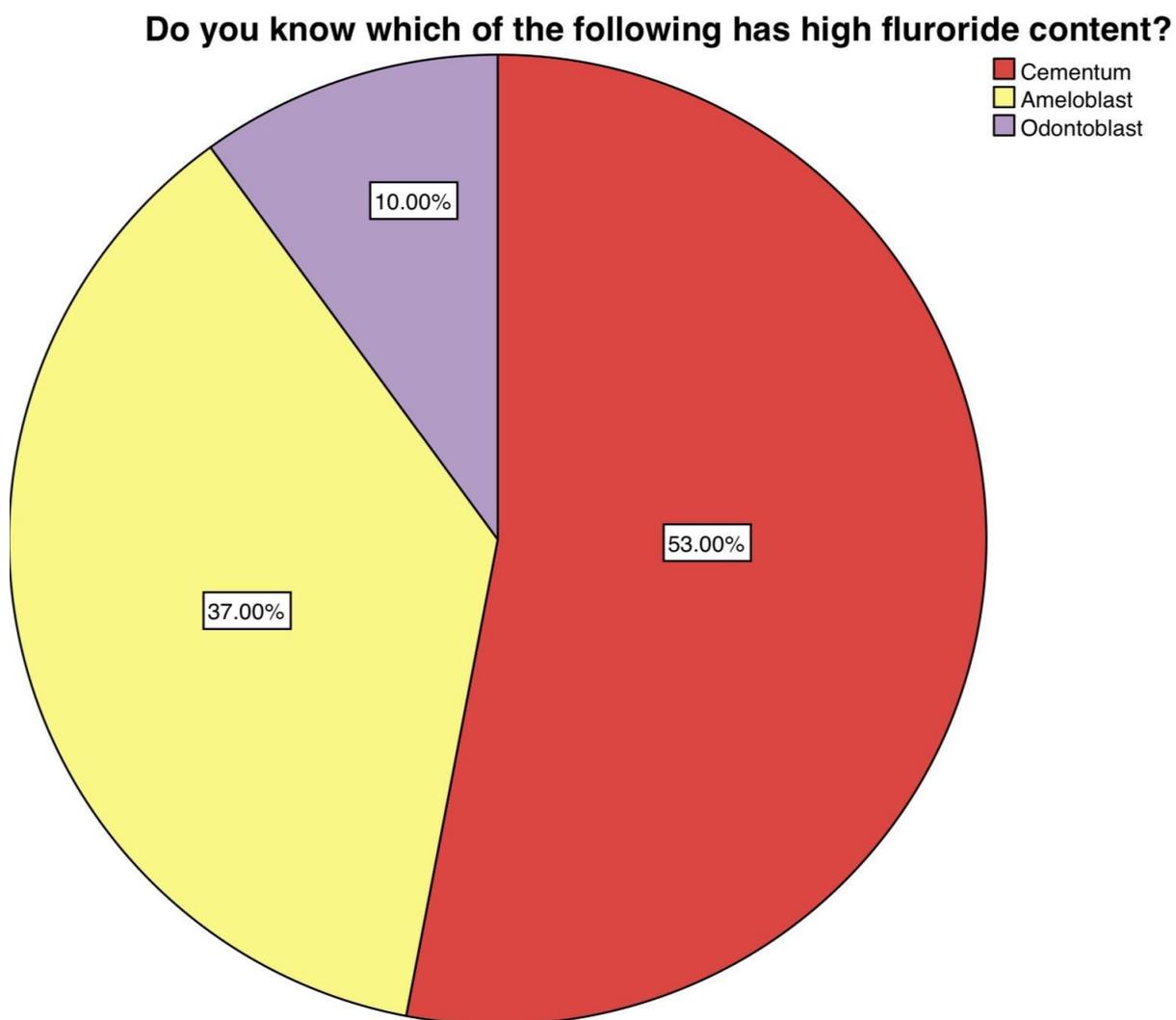


Figure4: Pie chart shows the response of the students who were aware of a hard tissue with high fluoride content. Here red colour indicates cementum , yellow colour indicates ameloblast, violet colour indicates odontoblast . Majority (53%) of the population were aware, whereas 37% (ameloblast) , and 10% (odontoblast) were unaware about the high fluoride content.

Which of the following do you think the Canalliculi of cementocytes are directed towards?

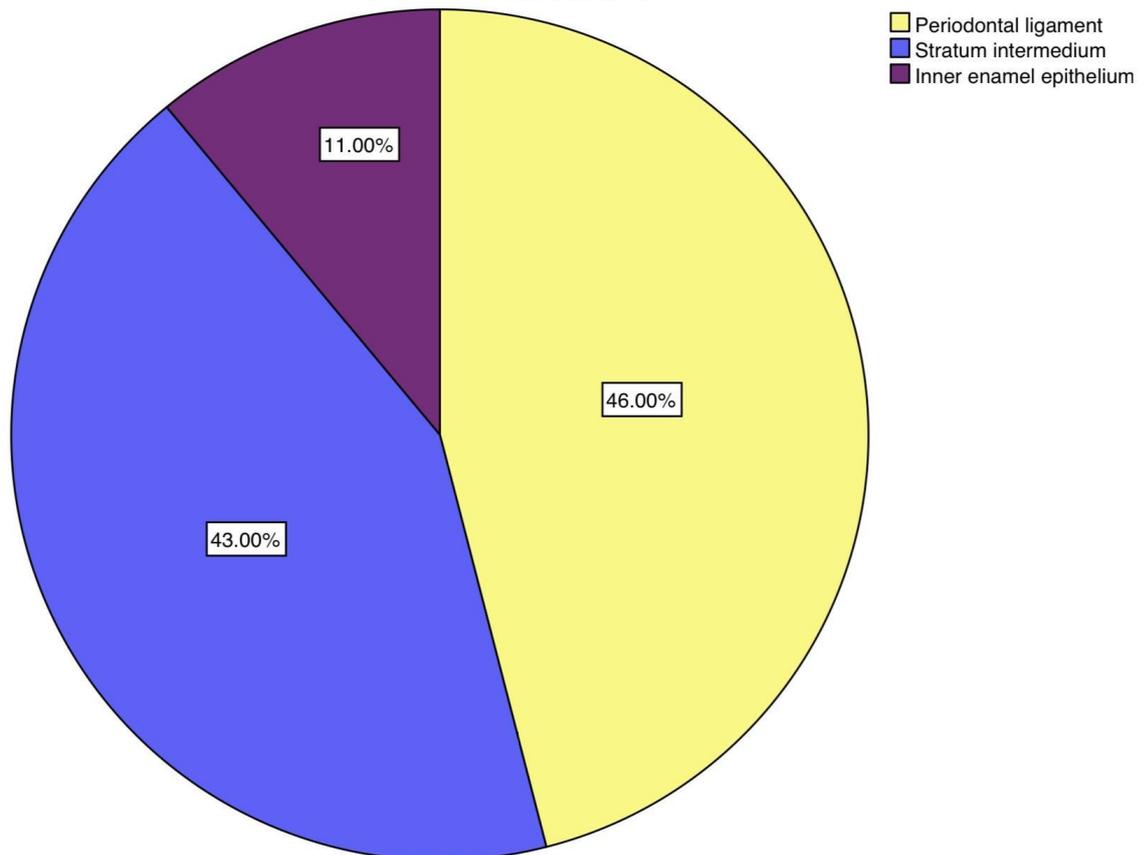


Figure5: Pie chart shows the response of the students who were aware about the canalliculi of cementocytes are directed towards. Here yellow colour indicates periodontal ligament, blue colour indicates stratum intermedium, purple colour indicates inner enamel epithelium. Majority (46%) of the population were aware, whereas 43% (stratum intermedium), and 11% (inner enamel epithelium) were unaware that the canalliculi of cementocytes are directed towards the periodontal ligament.

Do you know which of the following contains alternating layers of acellular extrinsic and cellular intrinsic ?

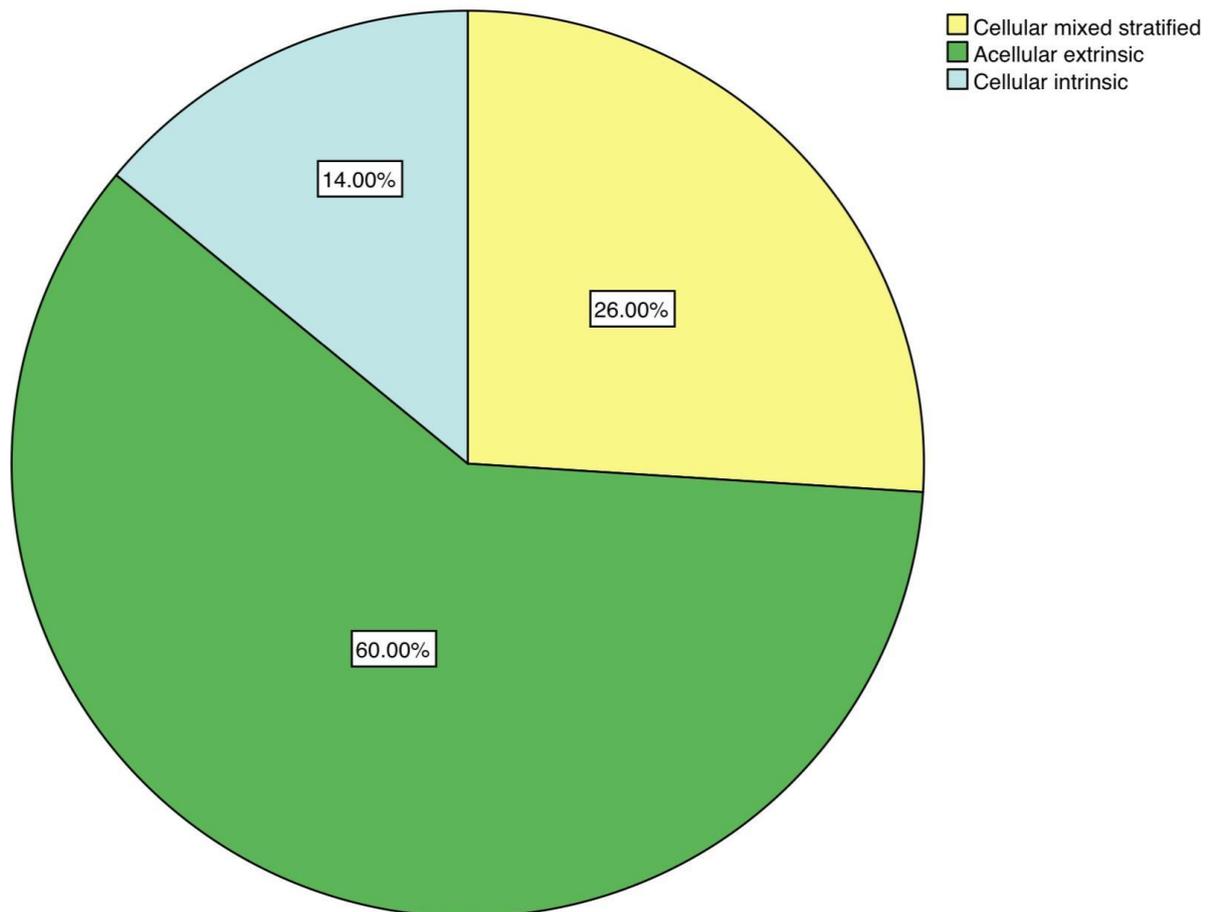


Figure6: Pie chart shows the response of the students who were aware about alternating layers of acellular extrinsic and cellular intrinsic . Here yellow colour indicates cellular mixed stratified, green colour indicates acellular extrinsic , blue colour indicates cellular intrinsic. Only(26%) of the population were aware ,whereas 60% (acellular extrinsic) , and 14% (cellular intrinsic) were unaware about the alternating layers of acellular extrinsic and cellular intrinsic fibers.

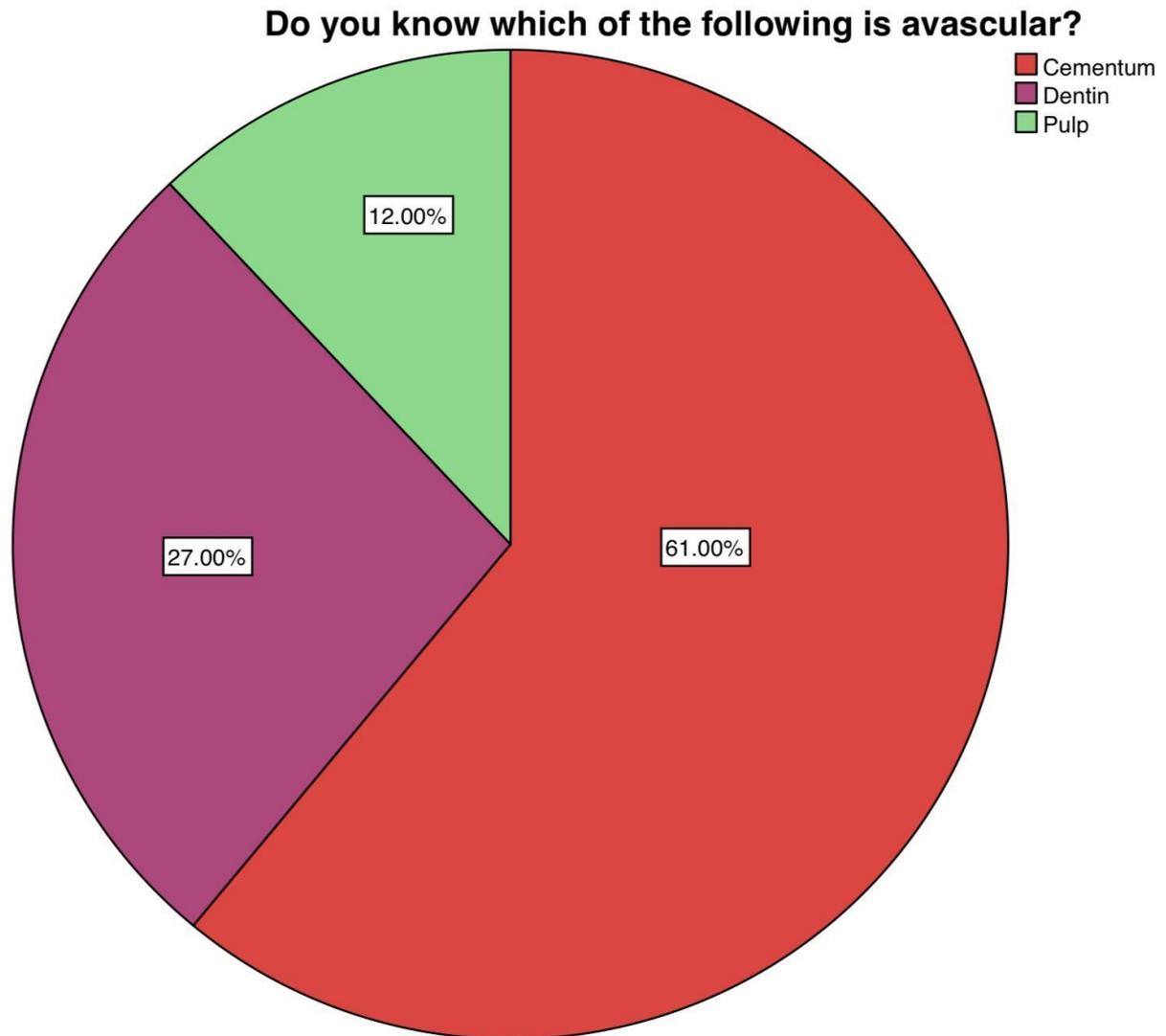


Figure7: Pie chart shows the response of the students who were aware about the avascular tissue. Here red colour indicates cementum , pink colour indicates dentine, green colour indicates pulp. Majority (61%) of the population were aware, whereas 27% (dentine) , and 12% (pulp) were unaware that cementum is avascular.

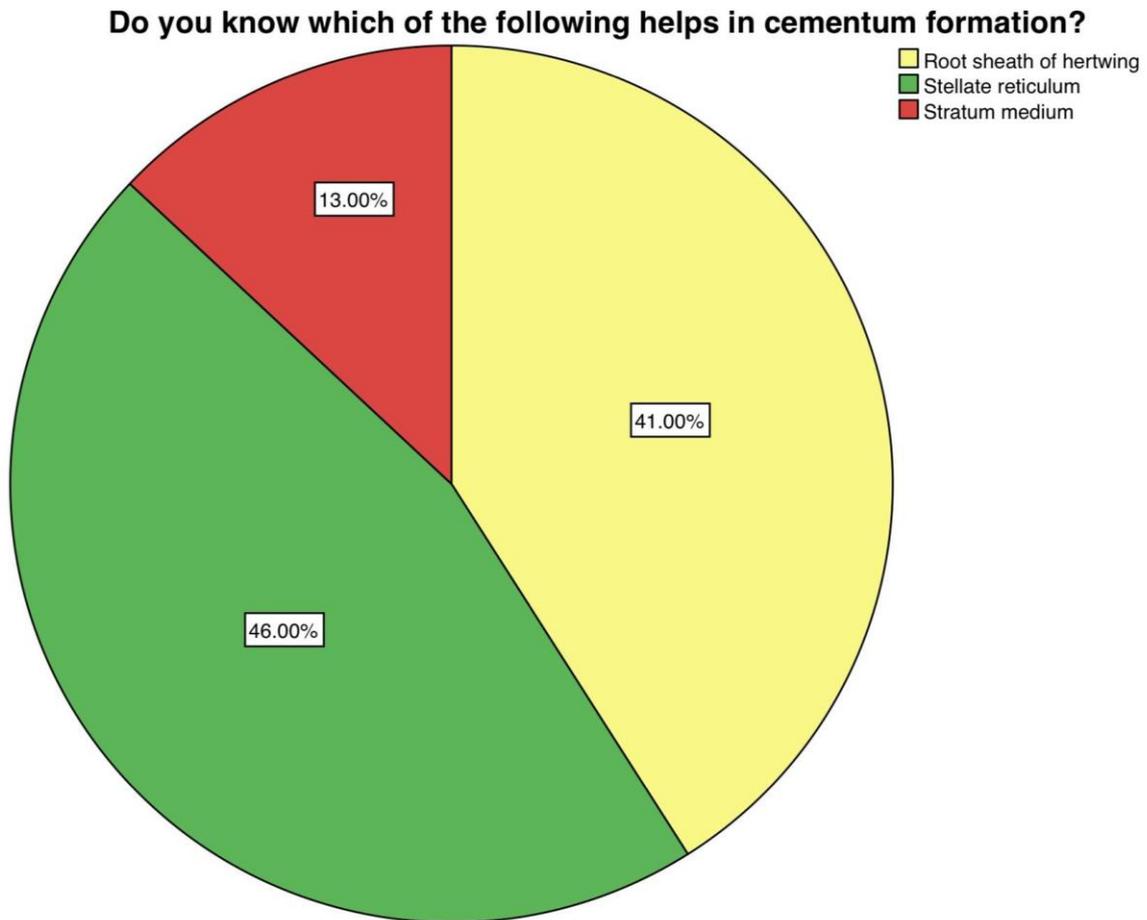


Figure 8: Pie chart shows the response of the students who were aware about cells that help in cementum formation. Here yellow colour indicates root sheath of Hertwig, green color indicates Stellate reticulum, red colour indicates stratum medium. Only (41%) of the population were aware, whereas 46% (stellate reticulum), and 13% (stratum medium) were unaware that Hertwig's root sheath helps in cementum formation.

Are you aware which of the following cementum is devoid of cells and fibres?

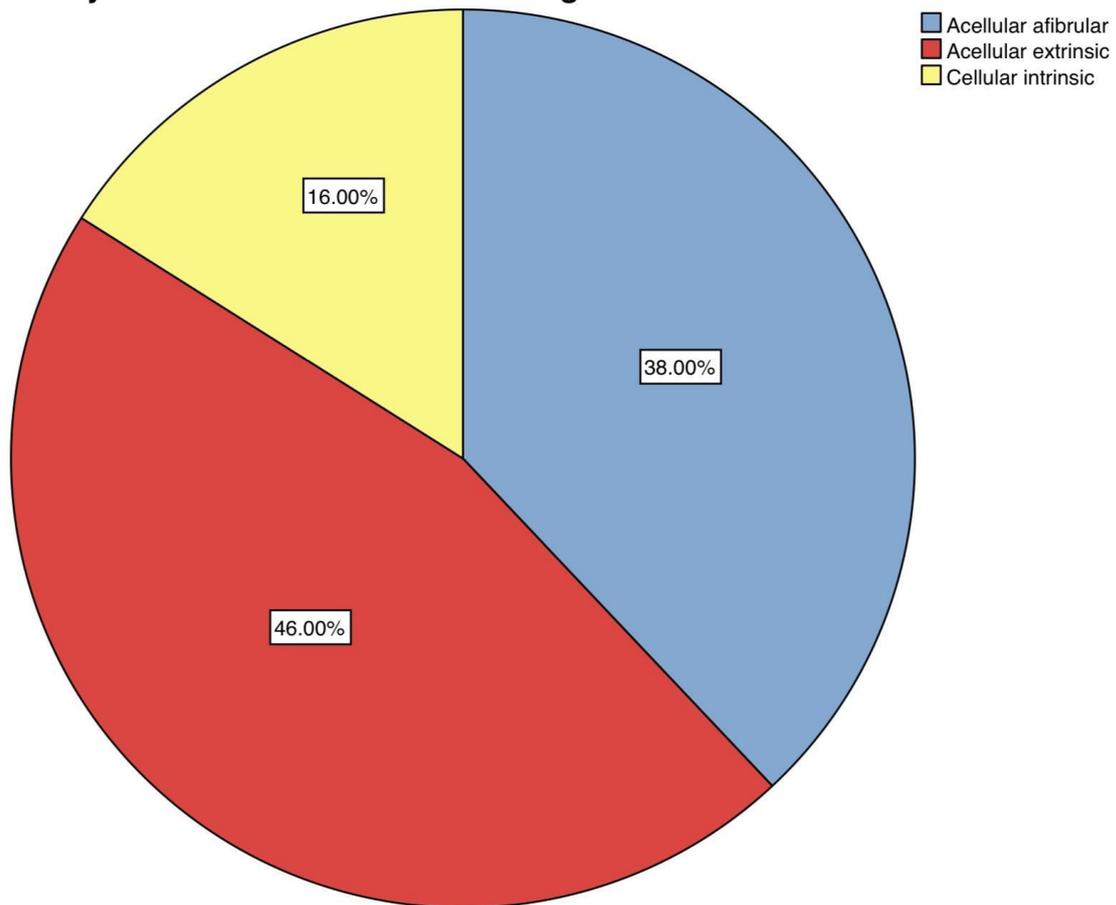


Figure9: Pie chart shows the response of the students who were aware of devoid cells and fibre. Here blue colour indicates acellular afibrillar, red colour indicates acellular extrinsic, yellow colour indicates cellular intrinsic. Only (38%) of the population were aware, whereas 46% (acellular extrinsic), and 16% (cellular intrinsic) were unaware about cementum is devoid cells and fibre.

Do you know which of the following is not true about cellular cementum?

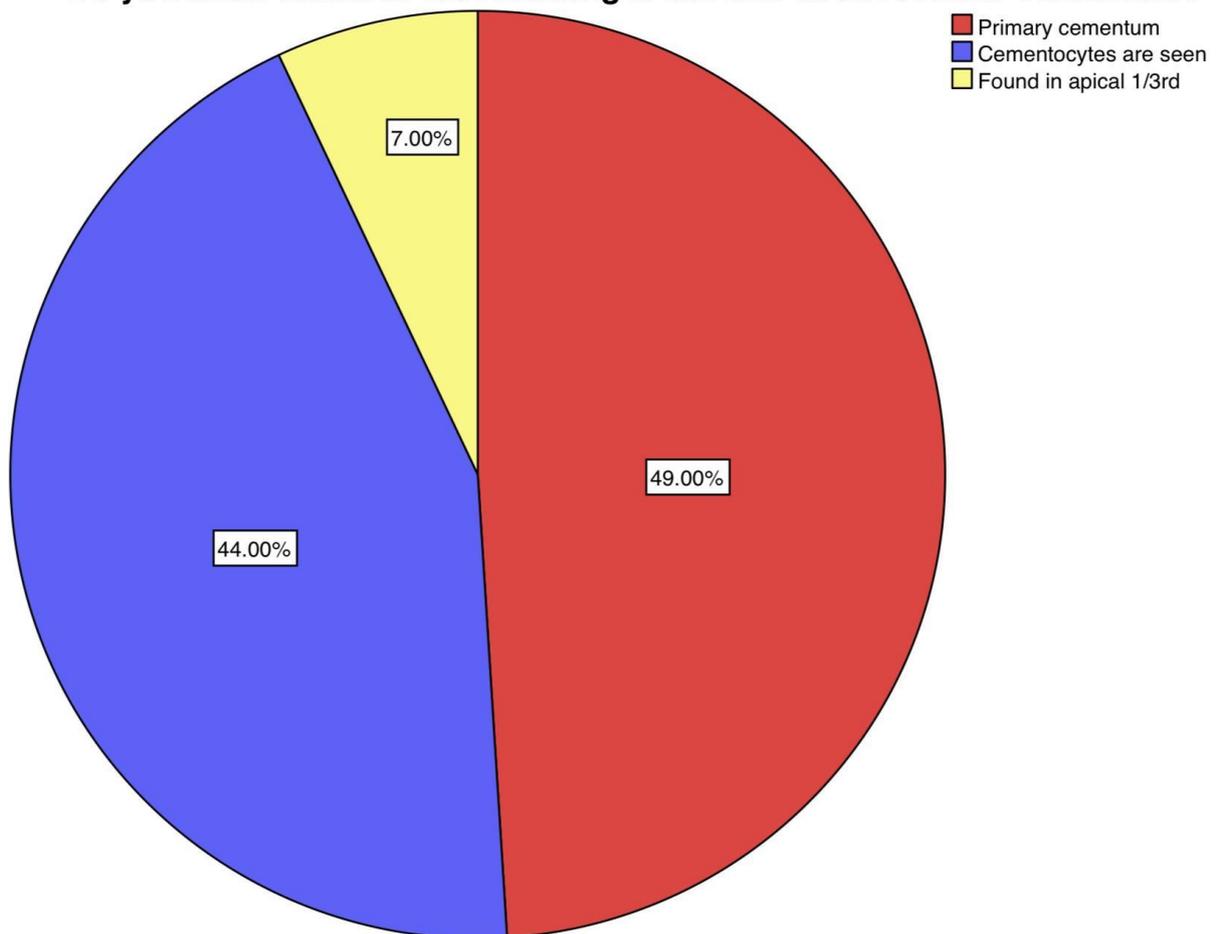


Figure10: Pie chart shows the response of the students who were aware about cellular cementum. Here red colour indicates primary cementum, blue colour indicates cementocyte are seen, yellow colour indicates found in apical 1/3rd . Majority (49%) of the population were aware, whereas 44% (cementocytes are seen), and 7% (found in apical 1/3rd) were unaware about cellular cementum.

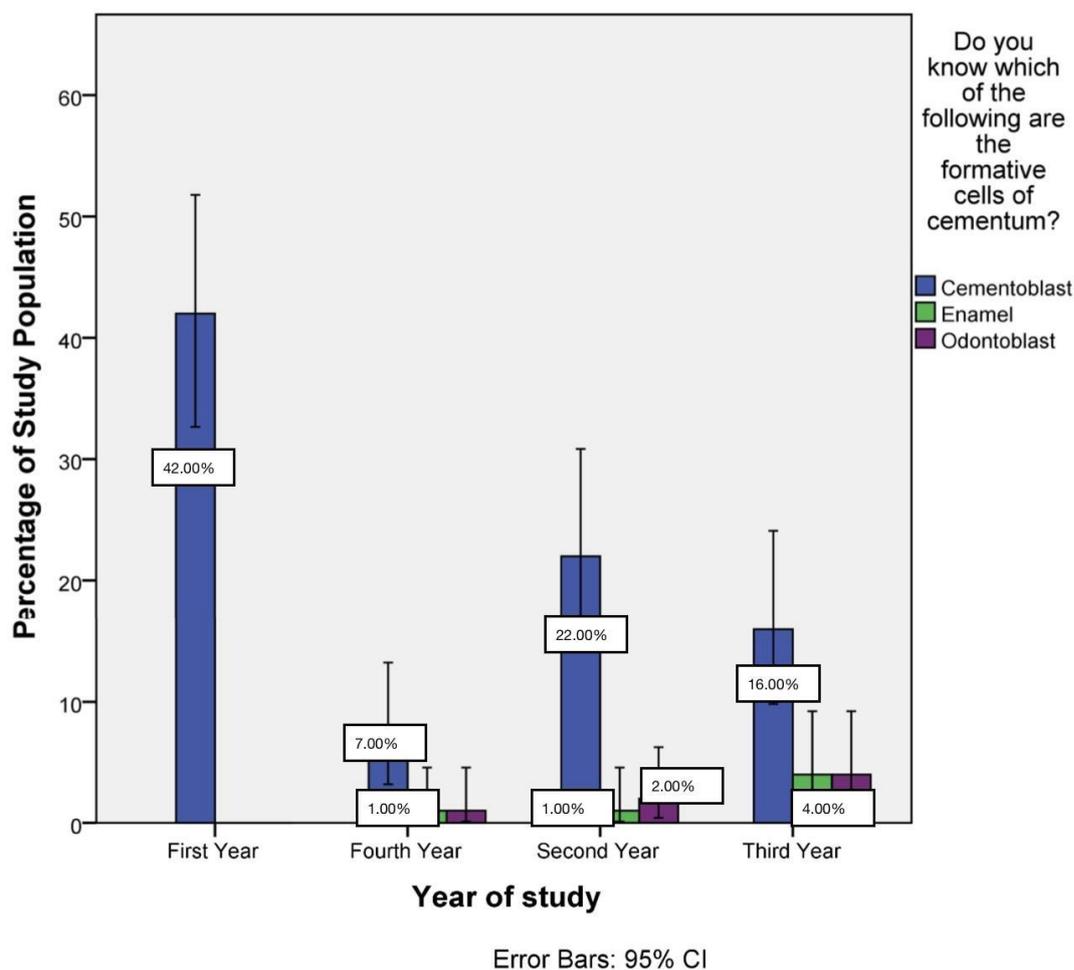


Figure 11. The bar graphs represent the association between year of study and the respondents who were aware of formative cells of cementum. X-axis represents the year of study and Y- axis represents the percentage of the responses overall. Here Blue denotes formative cells of cementum , Green denotes enamel, Violet denotes odontoblast. Cementoblast were most commonly marked as the formative cells of cementum by all year.Majority (42%) were the first years who were aware about the cementoblast when compared to the second (22%), third (16%), and final year (7%). Pearson chi square test shows p value is 0.013 (p value > 0.05) hence it is not statistically significant.

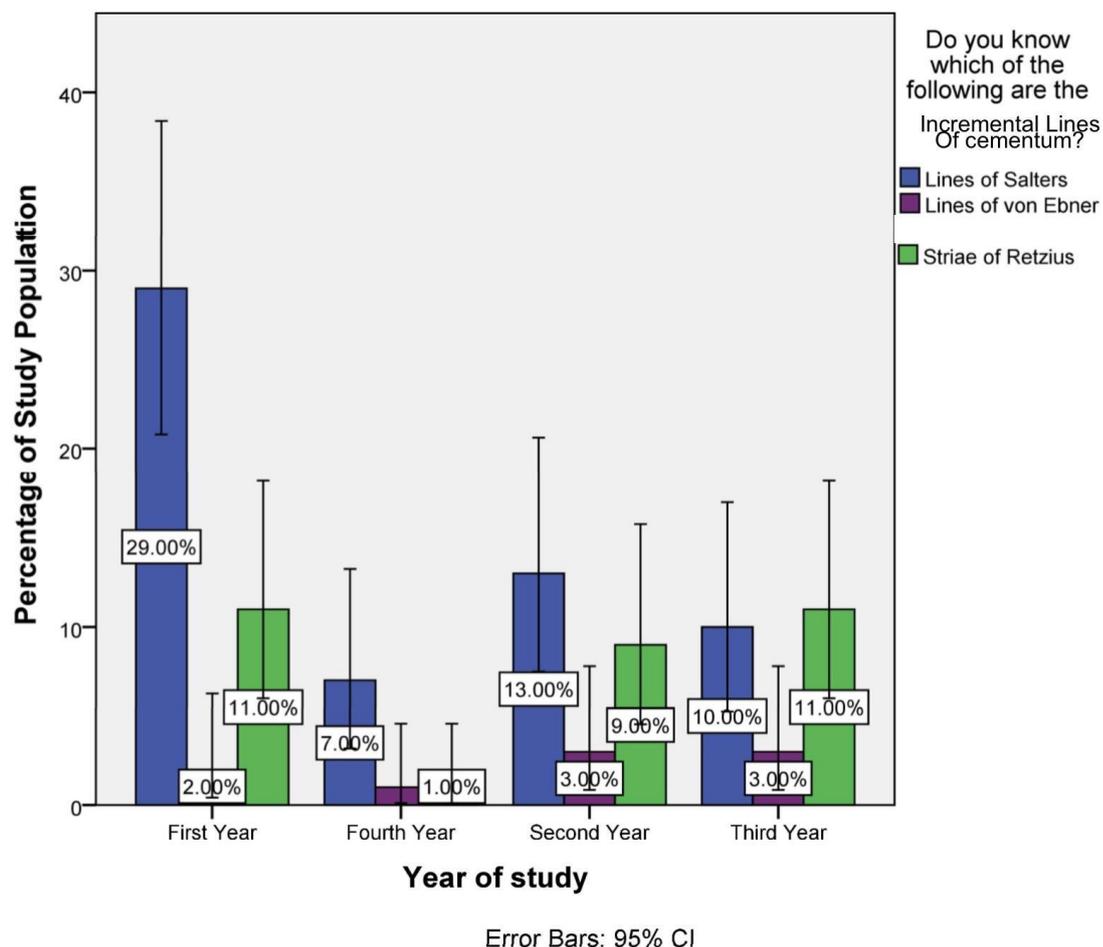


Figure 12 : The bar graphs represent the association between year of study and the respondents who were aware of lines of salters. X-axis represents the year of study and Y- axis represents the percentage of the responses overall. Here Blue denotes lines of salters, Green denotes striae of retzius , Violet denotes lines of Von ebner.Lines of salters were most commonly marked as the incremental lines of cementum by all year. Majority (29%) were the first years who were aware about the lines of salter when compared to the second year (13%), third year (10%),and fourth year (7%) . Pearson chi square test shows p value is 0.287 (p value > 0.05) hence it is statistically not significant.

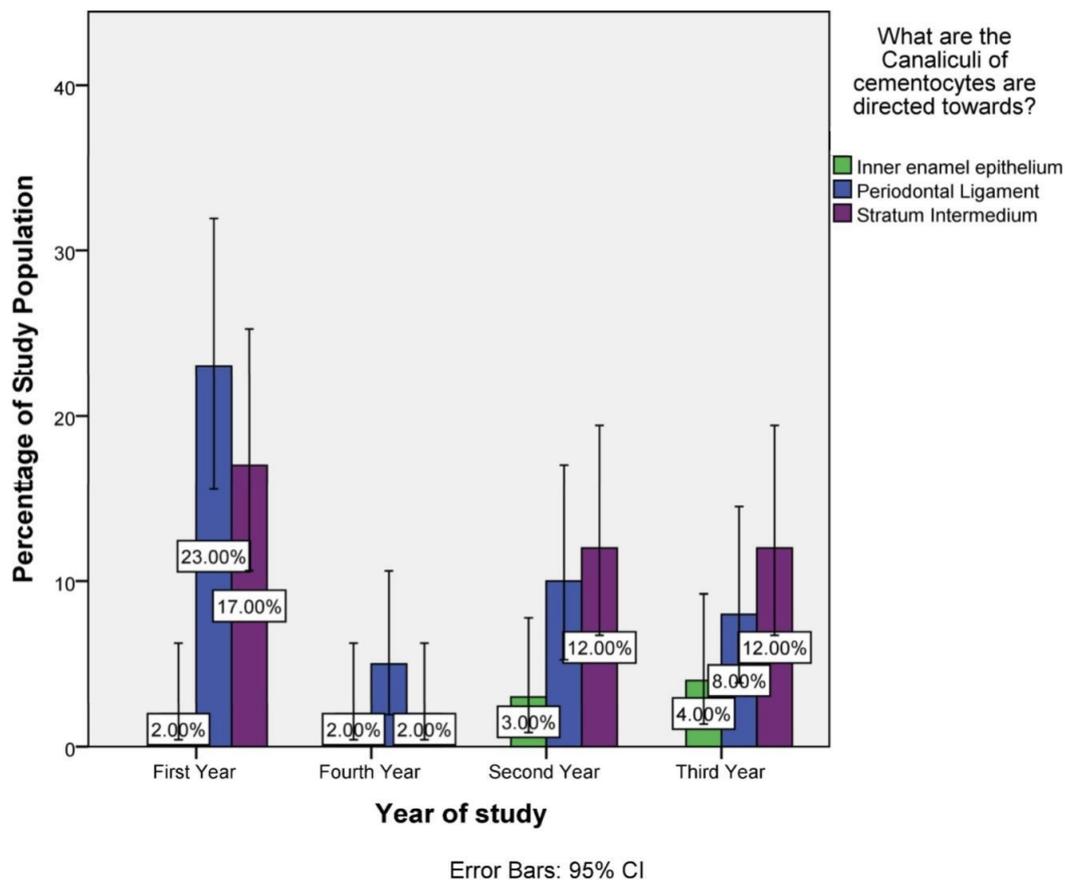


Figure 13 :The bar graphs represent the association between year of study and the respondents who were aware of canaliculi of cementocytes are directed towards. X-axis represents the year of study and y-axis represents the percentage of the responses overall. Here Blue denotes periodontal ligament, Violet denotes stratum intermedium, Green denotes Inner enamel epithelium. Periodontal ligament were most commonly marked as the canaliculi of cementocytes are directed towards by all year. Majority (23%) are the first years who were aware about the canaliculi of cementocytes when compared to second (10%), third (8%), and final year (5%). Pearson chi square test shows p value is 0.366 (p value > 0.05) hence it is statistically not significant.

DISCUSSION:

In the present survey, the majority of students' responses were from their first year (2%) pursued by their second (45%), third (44%), fourth year (19%). This study found that 29% of first year students were aware of lines of salters, followed by 33% of second year students, 91% of third year students, and 7% of final year students. (62%) of first year students were aware of cementoblast, followed by 42% of second year students, 26% of third year students, (17%) of final year students. (93%) of first

year students were aware of periodontal ligament, followed by (22%) of second year students,(4%) of third year students, (6%) of final year students.As a result of current study, it is evident that first year students are more aware of cementum .

Cementum is a mineralized tissue covering the entire root surface and furcation of multi rooted teeth. It functions as a tooth-supporting device along with the periodontal principal fibers and alveolar bone. Cementum is avascular, does not undergo remodeling, and increases in thickness throughout life. Cementocytes are called entrapped cells. The cementocyte resembles the osteocytes and the lacunae of cementocyte vary from being ovoid or tubular ,but the osteocytic lacunae are invariably oval. (25) In our study, 40% of the population were aware about cementocytes, and 50% were not aware about it. Cementoblasts are highly differentiated mesenchymal cells of the periodontal ligament (PDL) that build up cementum. cementoblast cells form cementum(26). In our study(89%) of the population were aware about cementoblast and (23%) were not aware about it

Continue apposition of cementum will cause deposition of cementum and resting of cementum will appear as incremental deposition of cementum. In our study, 68% of the population were aware about incremental lines of salters and 31% were not aware about it. Fluoride concentrations were highest at or near the surface and decreased towards the interior of cementum, dentine and alveolar bone in both control and experimental groups. Fluoride concentrations in cementum were higher than those of dentine and alveolar bone(27). In our study 44% of the population were aware that cementum has a high fluoride content and 56% were not aware about it.

Cellular Mixed Stratified is composed of multiple interposed layers of acellular extrinsic fiber cementum and cellular intrinsic fiber cementum , which is mainly deposited on the apical root surface area and in the furcation areas (28). In our study, 36% of the population were aware about cellular mixed stratified and 44% were not aware about it. Acellular afibrillar cementum is located mainly around the cemento-enamel junction covering further small enamel areas. Its distribution pattern varies from tooth to tooth and along the cemento-enamel junction of the same tooth(29). In our study, 58% of the population were aware about acellular afibrillar and 42% were not aware about it.

The knowledge about formation of cementum, cells present in the cementum, types of cementum along with their location and the majority of the questions were answered correctly by

the first year students. This could be because of their simultaneous histology classes. Slide viewing along with the histological classes can be administered in order to make the sessions more interactive and memorable. The survey was conducted among only 100 participants and a simple random sampling method was used to select the participants. Hence the same study has to be conducted with more participants. Slide viewing along with the histological classes can be administered in order to make the sessions more interactive and memorable.

CONCLUSION:

The present study concluded that first year students have more knowledge about the histology of cementum when compared to second, third and final year students. This study involves only a small population and hence can be done in a larger population, involving many students from various dental colleges for better accuracy.

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AUTHOR CONTRIBUTIONS:

A.Ruhina hussaini: Literature search, survey, data collection, analysis, manuscript writing.

Dr.Priyadarshini : Study design, Data verification

Dr. Suganya : Data verification, manuscript drafting

CONFLICTS OF INTEREST:

The authors declare that there are no conflicts of interest in the present study

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