

AWARENESS OF DENTAL PULP STEM CELLS AMONG COLLEGE STUDENTS

¹Shilpa Merlyn Jose, ²A.Jothi Priya, ³Lakshminarayanan Arivarasu

¹Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS)
Saveetha University, Chennai-600077.

²Assistant Professor, Department of Physiology, Saveetha Dental College and Hospitals, Saveetha Institute
of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai-600077.

³Assistant Professor, Department of Pharmacology, Saveetha Dental College, Saveetha Institute of
Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, India

¹151901095.sdc@saveetha.com

²jothipriya.sdc@saveetha.com

³lakshmin.sdc@saveetha.com

ABSTRACT:

Stem cells are undifferentiated or partially differentiated cells which differentiate into various cells and can divide indefinitely to more or less the same type of stem cells. Dental pulp stem cells (DPSCs) are used to treat diseases like leukemia, lymphoma and spinal cord injury, heart failure, loss of hearing, blindness and vision impairment. DPSCs also have the capability to form clones of dental-pulp like cells. Due to its capability of changing into neural cells it can also send impulses to the brain. A well structured questionnaire containing socio-demographic information, knowledge, attitude and perception was framed and circulated through online survey links. The results conclude that the awareness of DPSCs was good among college students. Some of them knew the therapies done using these cells but were not fully aware of its properties and thus further studies can be done to increase the awareness and knowledge of the use of DPSCs.

KEYWORDS: College students;Dental pulp stem cells;DPSC;treatment;vision impairment.

INTRODUCTION:

Stem cells are undifferentiated or partially differentiated cells which can differentiate into various cells and can divide indefinitely to more or less the same type of cells. Dental pulp is an unmineralized is an unmineralized oral tissue which is composed of connective tissue, lymphatic and nervous elements. Dental pulp stem cells (DPSCs) is a pluripotent form of tissue found in embryoid body in-vitro. Studies have stated that DPSCs have 30% higher proliferation rate than other stem cells. Stem cells are the earliest type of cell made up of cell lineage. These cells are found in both embryonic and adult tissues. There are many differences between a stem cell and a progenitor cell. Beyond their natural capacity, stem cells respond to injuries. DPSCs have the potential to differentiate into several types of tissues like odontoblasts, neural progenitors, adipocytes, smooth muscle cells and osteoblasts. It is reported that these DPSCs are used to treat diseases like leukemia, lymphoma and spinal cord injury, heart failure, loss of hearing, blindness and vision impairment. DPSCs are also used in sleep management (Rj and R, 2016). DPSCs have the capability to form clones of dental-pulp like cells (Gronthos *et al.*, 2002). Due to its capability of changing into neural cells it can also send impulses to the brain (Arthur *et al.*, 2008). DPSCs have been proved to have immune privileges and anti-inflammatory abilities (d'Aquino *et al.*, 2008). It was also proposed that DPSCs have accessible sources for the potential use of cell therapeutic paradigms which can be used to treat neurological disease (Arthur *et al.*, 2008). It has been proved that

DPSCs can be used as an alternative for marrow stem cells which can act as a clinical use of neurodegenerative and oral diseases in future (Karaöz *et al.*, 2011). The pulp tissue in the third molar is a rich source of multipotent stem cells which can be used later for tissue engineering (Zhang *et al.*, 2006). DPSCs can sometimes cure Alzheimer's disease (Casagrande *et al.*, 2011). Mesenchymal cells which originated from dental pulp stem cells are effectively used in neurodegeneration (Varga and Gerber, 2014). But these DPSCs can only differentiate into immature neurons and not mature neurons which are functional (Aanismaa *et al.*, 2012). DPSCs are useful for recovery of functions of the body after stroke (Leong *et al.*, 2012).

Over the past year various research done by our team on evaluation of body function (Fathima and Preetha, 2016; Gayatri and Sethu, 2018; Abigail *et al.*, 2019; Timothy, Gayatri Devi and Jothi Priya, 2019), disorders (Harsha *et al.*, 2015; Renuka and Sethu, 2015; Samuel and Devi, 2015; Choudhari and Jothipriya, 2016; Baheerati and Gayatri Devi, 2018), exercise and physical fitness (Swathy and Sethu, 2015; Rj and R, 2016; Shruthi and Preetha, 2018; David *et al.*, 2019) and other fields (Dave and Preetha, 2016; Iyer, Gayatri Devi and Jothi Priya, 2019) there is a lack of much information on the current topic of Dental pulp stem cells. Further studies can be done for more information. Hence, the aim of this study is to analyze the awareness on dental pulp stem cells among college students.

MATERIALS AND METHODS:

This is a cross sectional descriptive survey that was conducted among 111 college students. This survey consists of 13 self administered questions. This was conducted through an online survey, the results were analyzed using statistical analysis. This study was conducted among college students that consists of both male and female population within 18 to 25 years of age . The survey was cast to create and gather data among heterogeneous populations. Simple random sampling was done to eliminate response bias. Demographic information, knowledge, attitude and practice were the output variables. The descriptive statistics was done using SPSS software, Age and gender were independent variables whereas knowledge, attitude and practice were dependent variables. The results conclude that the awareness of DPSCs was good among college students . Some of them knew the therapies done using these cells but were not fully aware of its properties and thus further studies can be done to increase the awareness and knowledge of the use of DPSCs. The data was collected and statistically analysed in SPSS. Chi-Square analysis was performed and $p < 0.05$ was considered as statistically significant.

RESULTS AND DISCUSSION:

In the current study, 37.84% were males and 62.16% of them were females [Figure: 1] 73.9% were aware of DPSC and 26.1% were not aware of DPSC [Figure: 2]. 28.8% of college students think that DPSCs are useful and 53.2% of them think that they are not useful [Figure: 3]. 61.3% of the students were aware of stem cell therapies and 38.7% of them were not aware of the therapies [Figure: 4]. 60.4% of the students were aware that DPSCs have anti-inflammatory property and 39.6% of them were not aware of the anti-inflammatory property [Figure: 5]. 46.8% of the students say that the advantages of DPSCs are regeneration of tissue and production of bone and cementum [Figure: 6]. 59.5% of student's were aware that DPSCs have multiplication property and 40.5% were not aware of the multiplication property [Figure: 7]. 58.6% of the students think that DPSCs are used to treat neurological diseases and 41.4% of them were not aware [Figure: 8]. 36% of them were not aware that DPSCs are present in both permanent and deciduous teeth and 28.8% were aware [Figure: 9]. 40.5% of students think that stem cell therapies are administered to all age groups, 19.8% of students think that stem cell therapies are administered to children, 21.6% of them think that the therapies are administered to adults and 18% to senior citizens [Figure: 10]. 60.4% of the students were aware that stem cells can change into neural-like cells and 39.6% were not aware [Figure: 11]. 33.3% of students think that DPSCs can create whole teeth and 31.5% of

students do not think that DPSC can create whole teeth [Figure: 12]. 31.5% of students were aware that DPSCs can cure liver cirrhosis and 39.6% of them were not aware [Figure: 13]. 73% of the students were that DPSCs can improve the immune system and 27% of them were not aware that DPSCs can improve the immune system [Figure: 14]. We have seen the association between gender and awareness on dental pulp stem cells [Figure: 15], awareness of stem cell therapies [Figure: 16], awareness on stem cells having anti-inflammatory properties [Figure: 17], awareness of stem cells changing into neural like cells [Figure: 18] and awareness on stem cells improving the immune system [Figure: 19].

DPSC transplantation promotes macrophage polarization which in turn promotes the anti-inflammatory phenotype whereas in the current study majority of the students were aware of the anti-inflammatory property (Omi *et al.*, 2016). It has been proposed that DPSC improves ischemic response in our body whereas most of the students were aware that DPSCs can change into neural like cells (Zhang *et al.*, 2018). Stem cells are present in both permanent and deciduous teeth and it was also easier to culture stem cells from permanent teeth however in the current study, only 28.83% of them were aware that DPSCs are present in both deciduous and permanent teeth (Ranganathan and Shekar, 2012). DPSC are grafted along with melatonin which promotes hepatic cell differentiation and thus used for treatment of liver cirrhosis whereas in this study most of the students were not aware of the treatment of liver cirrhosis using DPSCs (Cho *et al.*, 2015). Due to DPSCs regenerative property, it improves immune response in our body, however in this study 79.97% of them were aware of DPSCs improving immune system (Yildirim, 2013).

CONCLUSION:

From this survey, it can be concluded that awareness of stem cells among college students will be useful for future studies and for regeneration of different types of tissues in our body. It can also be used for treating diseases like liver cirrhosis and cancers. Even diseases which cannot be cured can be treated by grafting these DPSCs. Further studies can be done to know more uses of DPSCs. Therefore, from this study, we conclude that the college students were aware of dental pulp stem cells.

CONFLICT OF INTEREST: The author declares that there was no conflict of interest in the present of study.

AUTHOR CONTRIBUTION:

Shilpa Merlyn Jose - data collection, collection of reviews, drafting manuscript.

Jothi Priya A and Lakshminarayanan Arivarasu - structuring study design, revising manuscript, final approval of manuscript

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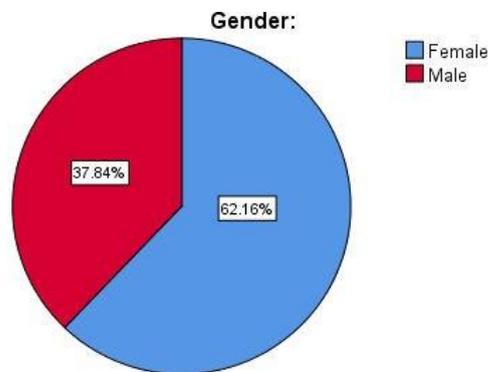


Figure 1: Pie chart representing the percentage distribution of gender. Majority of the participants were female 62.16% (blue) and the remaining were male for about 37.84% (red).

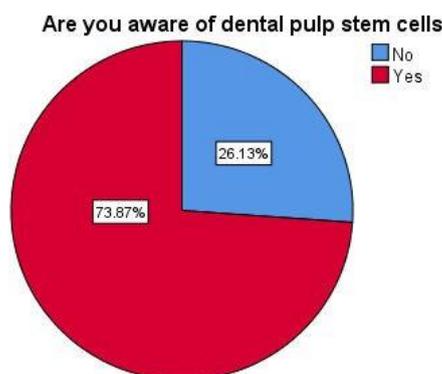


Figure 2: Pie chart representing the percentage distribution of knowledge of dental pulp stem cells. Majority of the participants 73.87% (Red) were aware of dental pulp stem cells and the remaining 26.13% (Blue) were not aware of dental pulp stem cells .

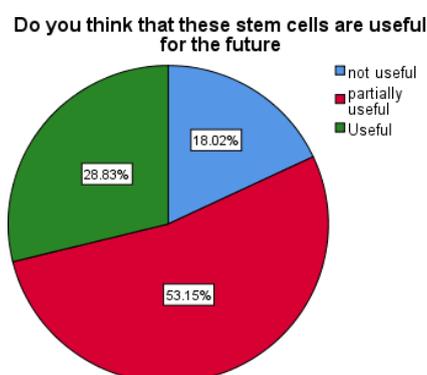


Figure 3: Pie chart representing the percentage distribution of the use of dental pulp stem cells in future. Majority of the participants 53.15% (red) think that DPSCs are partially useful, 28.83% (green) think that DPSCs are useful and the remaining 18.02% (blue) think that DPSCs are not useful.

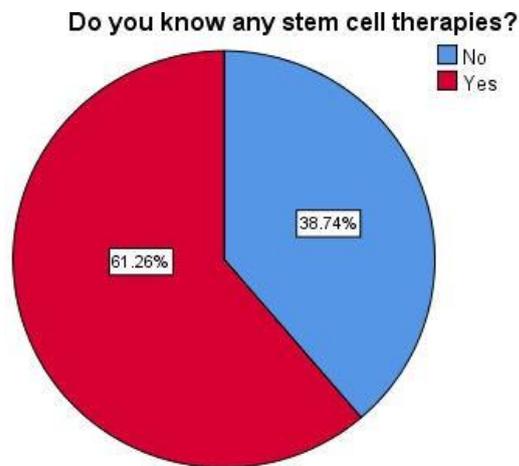


Figure 4: Pie chart representing the percentage distribution of the knowledge of stem cell therapies. Majority of the participants 61.26% (red) were aware of stem cell therapies and the remaining 38.74% (blue) were not aware.

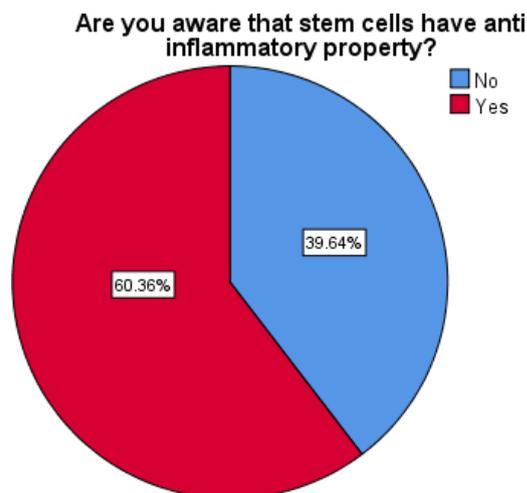


Figure 5: Pie chart representing the percentage distribution of knowledge of stem cells having anti-inflammatory properties. Majority of the participants 60.36% (red) were aware of the anti-inflammatory properties and the remaining 39.64% ((blue) were not aware.

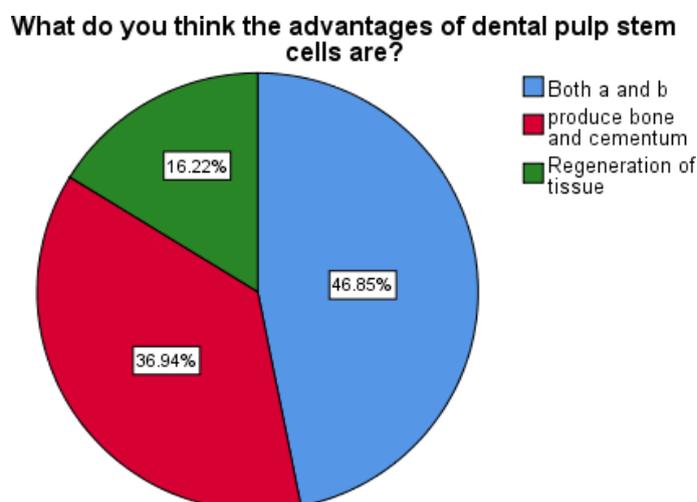


Figure 6: Pie chart representing the percentage distribution on the knowledge of advantages of dental pulp stem cells. Majority of the participants 46.85% (blue) agreed that DPSCs produces bone and cementum and helps in regeneration of tissue, 36.94% (red) agreed that DPSCs produces bone and cementum and the remaining 16.22% (green) agreed that DPSCs help in regeneration of tissue.

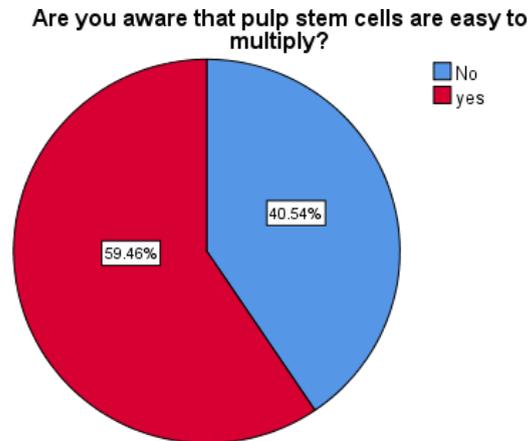


Figure 7: Pie chart representing the percentage distribution on the awareness of the multiplication of dental pulp stem cells. Majority of the participants 59.46% (red) were aware of the multiplication property of DPSCs and the remaining 40.54% (blue) were not aware.

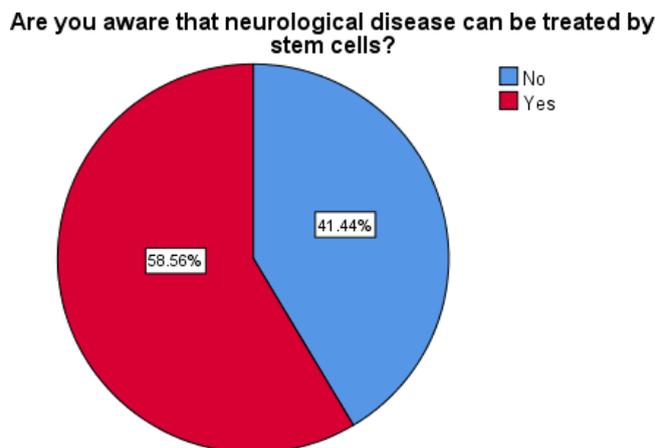


Figure 8: Pie chart representing the percentage distribution of the awareness on the treatment of neurological disorders by dental pulp stem cells. Majority of the participants 58.56% (red) were aware of the treatment of neurological disorders using DPSCs and the remaining 41.44% (blue) were not aware.

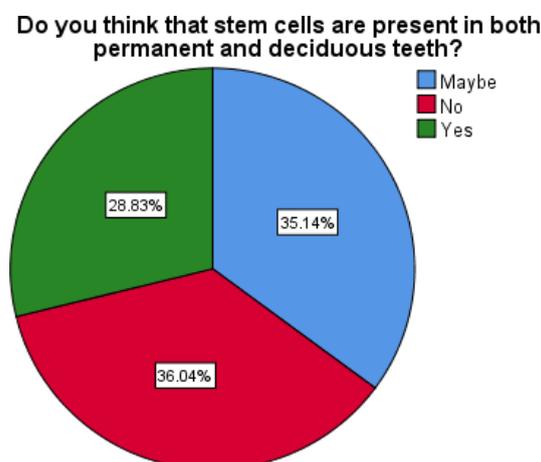


Figure 9: Pie chart representing the percentage distribution of knowledge of dental pulp stem cells in permanent and deciduous teeth. Majority of the participants 28.83% (green) agreed that DPSCs are in both permanent and deciduous teeth.

permanent and deciduous teeth, 36.04% (red) agreed that DPSCs are not in both permanent and deciduous teeth and the remaining 35.14% (blue) agreed that DPSCs may be present in both permanent and deciduous teeth.

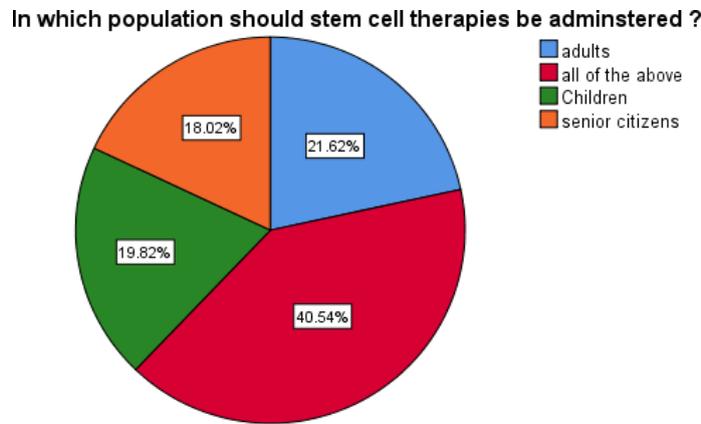


Figure 10: Pie chart representing the percentage distribution of knowledge of the population on administration of stem cell therapy. Majority of the participants 40.54% (red) think that stem cell therapies can be administered to all the types of population, 21.62% (blue) think that adults can be administered with stem cell therapy, 19.82% (green) think that children can be administered with stem cell therapy and the remaining 18.02% (orange) think that senior citizens can be administered with stem cell therapy.

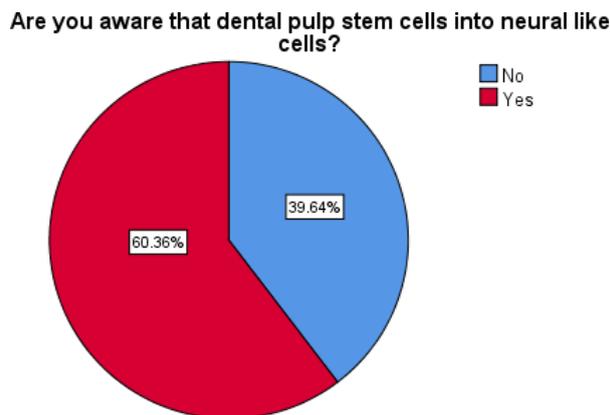


Figure 11: Pie chart representing the percentage distribution of knowledge on the change of stem cells into neural like cells. Majority of the participants 60.36% (red) were aware of stem cells changing into neural like cells and the remaining 39.64% (blue) were not aware.

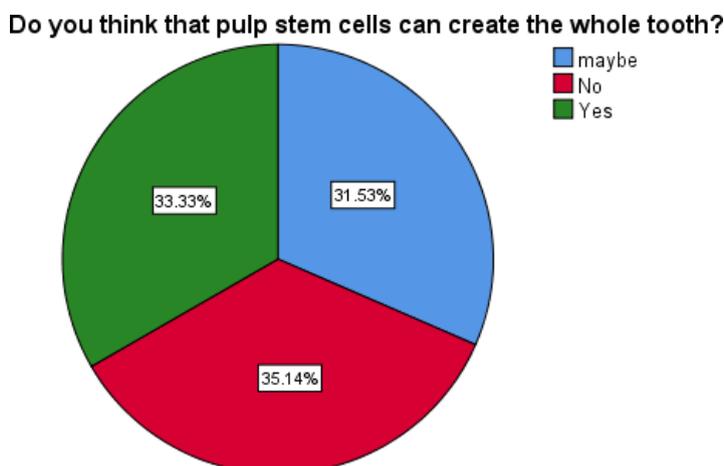


Figure 12: Pie chart representing the percentage distribution of creation of whole teeth by stem cells. Majority of the participants 35.14% (red) think that DPSCs cannot create whole teeth , 33.33% (green) think that DPSCs can create whole teeth and the remaining 31.53% (blue) think that DPSCs may create whole teeth.

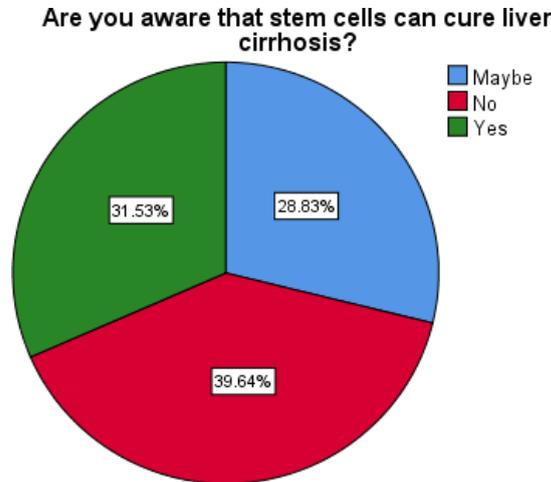


Figure 13: Pie chart representing the knowledge of treatment of liver cirrhosis by dental pulp stem cells. Majority of the participants 31.53% (green) think that DPSCs can cure liver cirrhosis, 39.64% (red) think that DPSCs cannot cure liver cirrhosis and the remaining 28.83% (blue) think that DPSCs may cure liver cirrhosis.

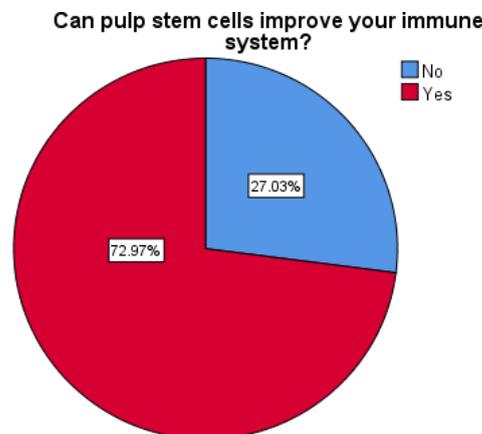


Figure 14: Pie chart representing the distribution of improvement of the immune system. Majority of the participants 72.97% (red) think that DPSCs can improve the immune system and the remaining 27.03% (blue) think that DPSCs cannot improve the immune system.

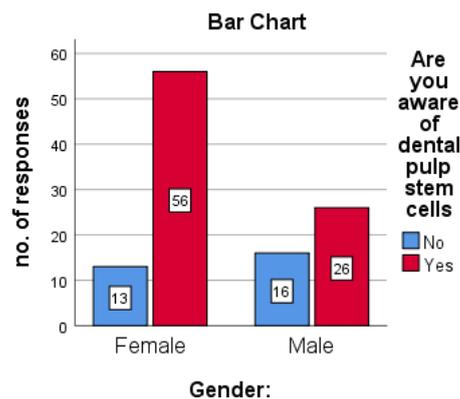


Figure 15: Bar graph representing the association between gender and awareness on Dental pulp stem cells. X- axis represents the gender and the Y-axis represents the number of responses, of which red indicates yes and blue indicates no. Majority of females (56 participants) are aware about the dental pulp stem cells than males, there was statistical significance between gender and awareness on dental pulp stem cells. Pearson's Chi square value : 5.015, p value - 0.025 ($p > 0.05$), hence statistically significant.

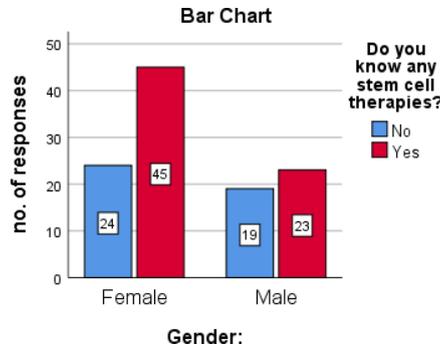


Figure 16: Bar graph representing the association between gender and the awareness of stem cell therapies. X-axis represents gender and Y-axis represents the number of responses, of which red indicates yes and blue indicates no. Majority of females (45 participants) know about stem cell therapies when compared to males. However the difference is statistically not significant, Pearson's Chi square value - 1.203, p value - 0.273, ($p < 0.05$), hence statistically not significant.

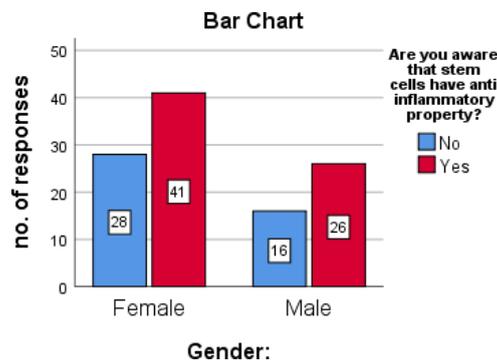


Figure 17: Bar graph representing the association between gender and awareness on stem cells having anti-inflammatory properties. X-axis represents gender and Y-axis represents the number of responses, of which red indicates yes and blue indicates no. Majority of females (41 participants) have the knowledge on the inflammatory property of stem cells rather than males. However the difference is not statistically significant, Pearson's Chi square value - 0.795, p value - 0.67, ($p < 0.05$), hence statistically not significant.

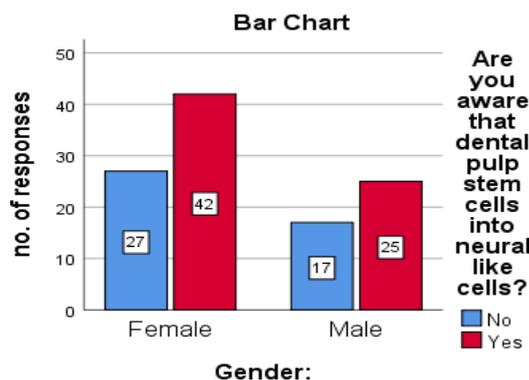


Figure 18: Bar graph representing the association between gender and awareness of stem cells changing into neural like cells. X-axis represents gender and Y- axis represents the number of responses, of which red indicates yes and blue indicates no. Majority of females (42 participants) have a better knowledge of the change of dental pulp stem cells into neural like cells than males. However, the difference is not statistically significant, Pearson's Chi square value - 0.20, p value - 0.888, ($p < 0.05$), hence statistically not significant.

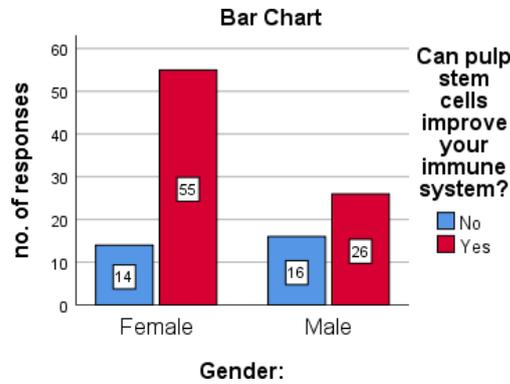


Figure 19: Bar graph representing the association between gender and awareness on the improvement of immune system by stem cells.. X-axis represents gender and Y-axis represents the number of responses, of which red indicates yes and blue indicates no. Majority of females (55 participants) are aware about the improvement of the immune system by stem cells than males. Pearson's Chi square value - 4.197, p value - 0.041, ($p > 0.05$), hence statistically significant, hence proving that females were more aware than males.