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AWARENESS OF ESTHETIC IMPLANT AMONG DENTAL STUDENTS AND PROFESSIONAL

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ABSTRACT:

Dental implants, and implant abutments are all being made with PEEK as an alternative material in the recent past. PEKK is a newer material that has an 80% stronger compressive strength and superior long-term fatigue capabilities than PEEK without reinforcement. Because of its light weight and compatibility with various veneering materials, PEKK has been employed as the framework material for Implant supported complete and fixed dental prostheses. Although it is gaining popularity due to its production adaptability, there are only a few clinical studies that support its usage. This survey aims to assess the awareness of esthetic implants and spread awareness in dentistry among dental students and practitioners.A questionnaire containing 6 questions was prepared and distributed among Indian dental students and practitioners. Indian dentist knowledge on esthetic implants in the dentistry field was assessed through a series of specially designed proformas and corresponding results were calculated and tabulated. Among 100 samples enrolled in the study 54 were undergraduate students, 28 were postgraduate students, 10 were academicians and 8 were clinicians. 48%of the study population responded that PEEK is used in esthetic implants, 28% responded that Zirconia was used in esthetic implants, 12% for PEKK in esthetic implant supported prosthesis and 12 % was used for all three materials. Awareness should be spread among the students and practitioners on the benefits of using PEKK and also keep them updated on the advancements in PEKK as a dental material by conducting CDE and hands-on workshops.

KEYWORDS: Dental esthetic,Zirconia,Innovation,PEEK,PEKK

INTRODUCTION

An appealing smile is essential in maintaining and improving a person's aesthetic appearance and, as a result, self-esteem (1). Furthermore, a smile has been described as one of the most effective ways to influence people (2). Despite the fact that societies set their own beauty standards, meticulous examination of attractive smiles has revealed that repeatable, quantifiable, and unbiased principles can be methodically

applied to assess and improve dental aesthetics in predictable ways (3). A beautiful smile necessitates the integration of aesthetic concepts that balance dental composition, dental facial aesthetics, and facial aesthetics. Facial height, shape, and profile, particularly the inter-pupillary plane, are among the facial features that have a significant impact on the attractiveness of the smile (4,5).

Lips define the boundaries of the smile, and lip analysis should include the morphology, curvature, and position of the upper lip, the relationship between the maxillary anterior teeth and the lower lip, the parallelism of the anterior incisal curve with the lower lip, and the amount and number of teeth displayed in the smile (5),(6). The position, size, proportion, and shape of the teeth; midline symmetry; and the relationship of the teeth to the gingival tissues and alveolar bone are all aspects of dental composition (7). With the increased demand for dentistry, aesthetic criteria can help to improve the aesthetic condition of the oral and maxillofacial region (8).

Conventional Titanium implants are highly unaesthetic owing to the metal threads being visible through the gingival tissue especially in patients with thin gingival biotype. PEKK, being tooth colored, overcomes this disadvantage and can be used in aesthetic zones effectively. Our team has extensive knowledge and research experience that has translated into high quality publications(9–28). This made us work on further research.

Types of Implant Materials

Titanium and Titanium Alloys

Titanium is frequently regarded as the gold standard for the construction of dental implants, and it can be commercially pure or an alloy. Commercially pure titanium will typically contain trace elements such as iron, nitrogen, oxygen, and carbon, which improves mechanical properties. Titanium alloys are composed of elements such as aluminum and vanadium. The most common titanium alloy contains 6% aluminum and 4% vanadium and is heat-treated to improve strength, resulting in a low-density material that is corrosion and fatigue resistant.

Zirconium

Zirconium incorporates bone just as well as titanium, and its use relieves patient concerns about metal allergies or sensitivities. There is no risk of corrosion with zirconium, and its use eliminates the possibility of metal showing through the gums or becoming exposed due to gum or bone recession. Even though zirconium is thermally non-conductive, it is debatable if a person could feel thermal conductivity from a titanium implant. Because zirconium has only been in use for a short time, its potential for longevity has yet to be proven, and little is known about how it is Osseointegrated.

PEEK

PEEK is a member of the PAEK polymer family, which has high temperature stability as well as mechanical and chemical resistance. It will be the primary replacement for metallic components in orthopedics and trauma. When compared to Ti, PEEK has some clinical advantages as a dental implant material. For starters, it results in fewer hypersensitive and allergic reactions. Titanium has been shown in some studies to be an allergen. Second, it is radiolucent, which results in fewer artifacts on magnetic resonance imaging. Third, it lacks a metallic color; it is beige with a hint of gray and has a more appealing appearance than Ti. Fourth,

PEEK is a versatile foundation material that can be customized for a specific application by modifying its bulk or surface properties. Because the mechanical properties of PEEK and bone are more compatible, it may exhibit lower stress shielding than Ti when used as a dental implant body (29–31).

MATERIALS AND METHODS

Following the approval of the institutional review board, anonymous survey forms were handed out to 100 Dentists, a cross sectional study was conducted among these Indian dentists. Dentists were assessed using a structured questionnaire comprising 5 closed-ended questions. Questions were explained whenever necessary with assurances on confidentiality of their identities and were requested to mark their answers and complete it individually and the results were tabulated.

RESULTS:

Among the 100 sample population enrolled in the study, 54 were BDS students, 28 were MDS students, 8 were clinicians and 10 were academicians as shown in the appendix. As depicted in figure 1, 5% of the total population (UG) answered correctly that all of the mentioned materials can be used in esthetic implant.48% of the study population responded that PEEK is used in esthetic implants, 28% responded that Zirconia was used in esthetic implants, 12% for PEKK in esthetic implant supported prosthesis and 12 % was used for all three materials.Figure 2 shows that only 10% of the population(PG) answered correctly that PEKK has antimicrobial property. 46% of the respondents said that PEEK shows antibacterial property as a polymer, 25% said that the antibacterial properties found in PEKK, 17% thought that PMMA displayed better antibacterial properties than PEKK and 12% thought that both PEKK and PEEK and PMMA has similar antibacterial properties. Figure 3 shows that 16% of the total population which are the UG students said both PEEK and PEKK can be used in spinal cord replacment. Out of the 100 respondents,34% strongly agreed that PEEK can be used in spinal cord replacement, 32% thought that PEEK could be used in spinal cord replacement,32% wasn't sure and 5% strongly disagreed on the use of a PEEK,PEKK for spinal cord replacement. Figure 4 shows that 21% of the population (UG) agrees that the margin color will almost merge with the restoration even after recession as implant is tooth coloured .40% thought that the margin color will almost merge with the restoration even after recession as implant is tooth coloured whereas 27% thinks that the advantage of esthetic implant is osseointegration will be better always,17 % said that placement will be easy and 16% thought that all the above answers has advantages in esthetic implants.Figure 5 shows the 7% of the population(UG) answered correctly that all the mentioned answers are correct. Among the participants of this study, 58% responded that marginal black black hue could be the problem for titanium in esthetic zone whereas 16% thought post recession black margin was the problem.13% thought that soft tissue adhesion to the Ti implant was the issue.To all the above reasons listed 13% percent thought all the reasons were an issue.

DISCUSSION.

Oral implants have assisted clinicians in improving the quality of life for a wide range of patients. Titanium is still the material of choice for dental implants. This metallic implant has aesthetic limitations, particularly when used in anterior regions and in patients with thin biotypes. The complications we are referring to are the appearance of a metallic margin due to recession or grayish colorations due to the metal's translucency through the peri-implant mucosa. Some studies have reported immunological reactions to titanium particles, which lead to biological complications (32–34). Dental implants pierce the oral mucosa, creating a transmucosal connection between the outside world and the inside of the body. Long-term implant success is most dependent on the early formation of a long-lasting biological barrier capable of preventing bacterial penetration through this transmucosal piercing. This soft tissue barrier faces the titanium abutment surface and is divided into two zones: a marginal zone with junctional epithelium and an apical zone with fiber-

rich connective tissue. The properties of the implant components that come into contact with the soft tissues influence the quality of this mucosal attachment (35–37).

The long-term success of a dental implant is primarily determined by minimizing the amount of marginal bone loss during functional loading. Titanium and its alloys, as well as zirconium, are the most commonly used implant materials in modern dentistry. Although studies have shown that these materials are biocompatible, they do have some drawbacks, one of which is the elastic modulus. Because of the gradient difference in the elastic modulus of a titanium implant and its surrounding bone, stress in the implant-bone interface during load transfer may result in peri-implant bone loss. This is known as stress shielding, and it may be one of the major causes of long-term failure of dental implants (38–40). PEEK is the most recent addition to the dental inventory, and it is claimed to have superior properties when compared to existing materials. PEEK/Nano-FHA composite has demonstrated improved biocompatibility and antibacterial activity, as well as improved osseointegration (41). The osseointegration capability of PEEK and CFR-PEEK implants coated with titanium and hydroxyapatite plasma sprayed layers revealed that both materials had increased osseointegration. After 2 and 12 weeks, double coating with a titanium bond layer and a hydroxyapatite top layer produced better results (42).

CAD/CAM Provisional crowns made of PEEK material demonstrated improved marginal fit and fracture strength. Boccaccini and his colleagues proposed that applying PEEK and PEEK Bioglass particles to a NiTi wire would improve its flexibility, as well as its adhesion to the metallic substrate. When cemented to dentin abutments after surface modifications, conditioned PEEK crowns exhibit the highest retention values (43–45).

PMMA has been used as the gold standard biomaterial in several biomedical applications since the mid-1930s. PMMA is commonly polymerized via free radical polymerization, but anionic and coordination polymerization routes are also possible. PMMA is a thermoplastic polymer with a glass transition temperature of 130 °C. It is easily processed into desired shapes due to its amorphous structure, and because it is clear, it is useful in optics as well as applications requiring an aesthetic appeal (46). Due to its proclivity for fatigue failure, poor bending and fracture resistance, thermal instability, and susceptibility to bacterial growth, PMMA has several drawbacks. Improving the drawbacks of PMMA in denture applications will alleviate the burden felt by users, as well as potentially extend the lifetime of dentures and improve patient quality of life. Several strategies have been developed to improve the performance of PMMA, such as the use of copolymers with PMMA, the incorporation of fillers or fibers within the PMMA resins, and curing in various conditions. Embedded fibers are frequently used to improve the flexural properties of PMMA resins, while metal, polymer, or mineral particles are used to provide strength and, in some cases, bacterial resistance to PMMA (47–50).
Because titanium can cast a gray shadow through the gums or cause gingival retraction (which is accelerated by the release of toxic titanium particles), zirconia has proven to be more aesthetically pleasing in implant dentistry. The majority of zirconia implants are A2 in color. As a result, they have an undeniable advantage in patients with a thin biotype. Osseointegration is also considered to be much better in esthetic implants. The aesthetic component is critical to the success of the implant-prosthetic therapy and patient satisfaction. The success of the aesthetic outcome is primarily determined by the optimization of the algorithms specific to the pre-implant and implant stages, as well as the design and technological execution of the future prosthetic restoration. Various factors that influence the aesthetic outcome must be considered by the dental practitioner (tooth position, root position of the adjacent teeth, biotype of the periodontium, tooth shape, smile line, implant site anatomy, implant positioning).

In terms of antibacterial activity, Wang (51)claims that PEKK has less bacterial adhesion on its surface than PEEK used in the orthopedic industry. On the surface of PEKK, Staphylococcus epidermidis adhesion was reduced by 37%. They discovered a 50% reduction in Pseudomonas aeruginosa adhesion and proliferation on PEKK after five days of culture as compared to PEEK without antibiotics. In a rat investigation, Moore et al. (52) discovered that PEKK had a lower inflammatory response than PMMA. Furthermore, some factors (anatomical limits of the implant site, periodontal status, occlusal parameters) that can affect the final aesthetic result must be considered before planning the aesthetic parameters of the future prosthetic restoration.

CONCLUSION

From the response obtained through our survey, it was found that the participants were not as aware that PEKK has antimicrobial properties and can be used in esthetic implants in dentistry. PEKK offers a wide range of advantages in terms of physical, mechanical and biological properties making it an advanced dental material and thus can be used for esthetic implants. Awareness needs to be spread among the students and practitioners on the various benefits of using PEKK and also keep them updated on the advancements in PEKK as a dental material for esthetic implants by conducting CDE and workshops.

APPENDIX.

• Qualification	• Dental UG student (54%) • Dental PG student (28%) • Dental academician (10%) • Dental practitioner (8%)
• What could be the problem for titanium implants in the esthetic zone?	• Marginal black hue (58%) • Post recession black margin (16%) • Soft tissue adhesion to the Ti implant (13%) • All of the above (13%)
• What material can be used as an aesthetic implant ?	• Zirconia (28%) • PEEK (48%) • PEKK (12%) • All of the above (12%)
• Which polymer has antibacterial properties?	• PEEK (46%) • PEKK (25%) • PMMA (17%) • All of the above (12%)
• Which material is used in spinal cord replacement?	• PEKK (29%) • PEEK (34%) • Both (32%) • None (5%)
• What could be the advantage of an esthetic implant?	• Margin color will almost marge with the restoration even after recession as implant is tooth colored. (40%) • Osseointegration will be better alway (27%) • Placement will be easy (17%) • All of the above (16%)

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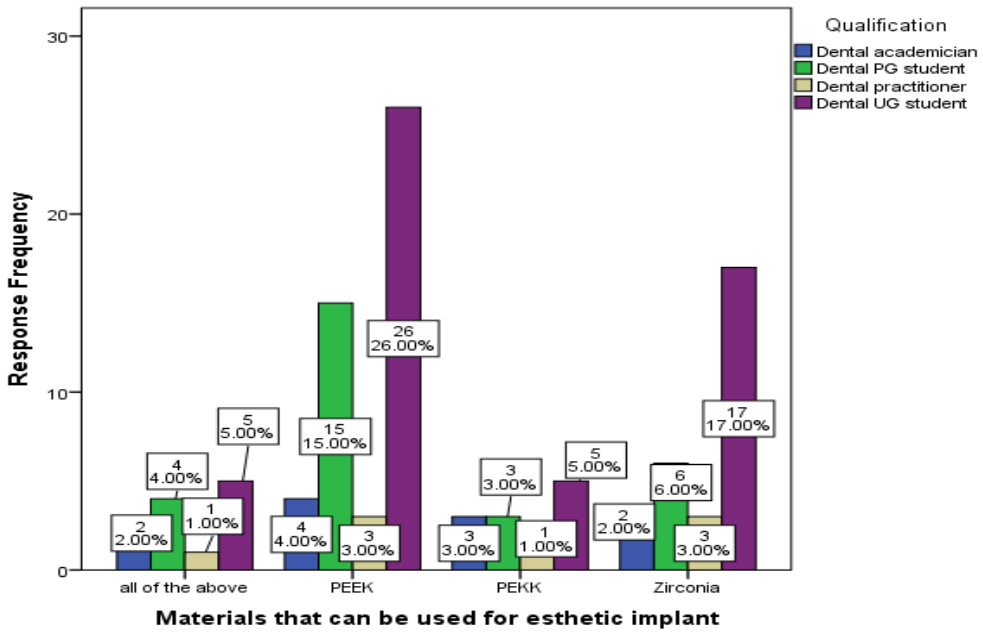

Figure 1 *shows the responses to the material that can be used for esthetic implants .This association was found to be statistically non-significant by Pearson's Chi-Square test. (Pearson's Chi-Square value=4.815, df=9, p=0.228 (p<0.05))*

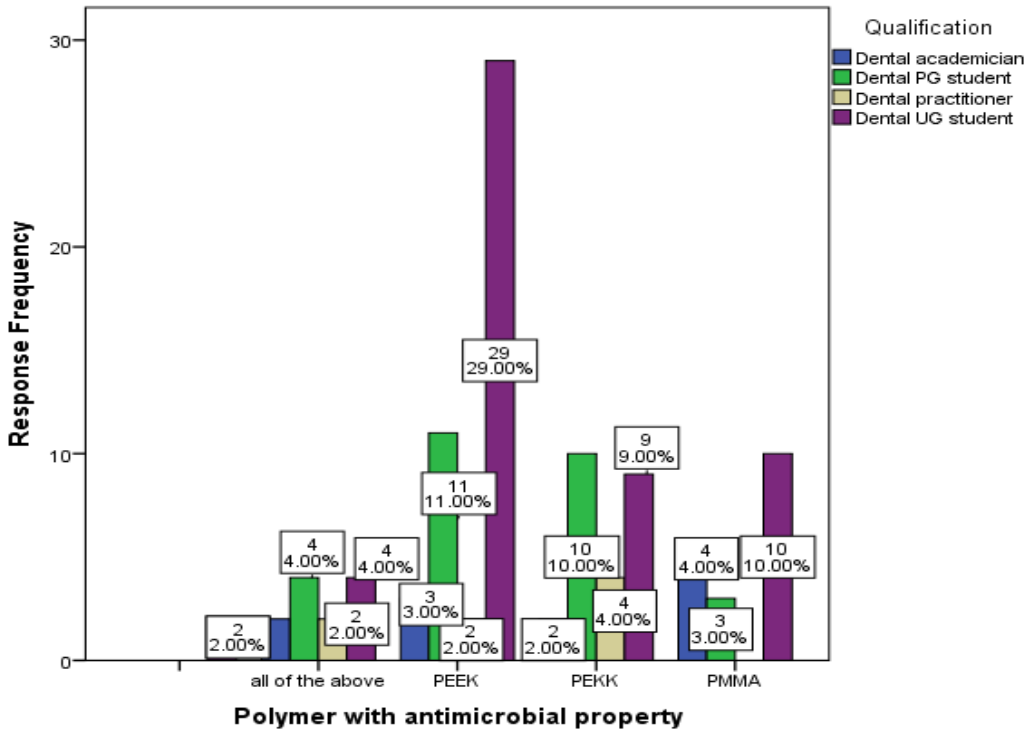

Figure 2 *shows the responses to which polymer has antimicrobial property..This association was found to be statistically non-significant by Pearson's Chi-Square test. (Pearson's Chi-Square value=16.390, df=12, p=0.174 (p<0.05))*

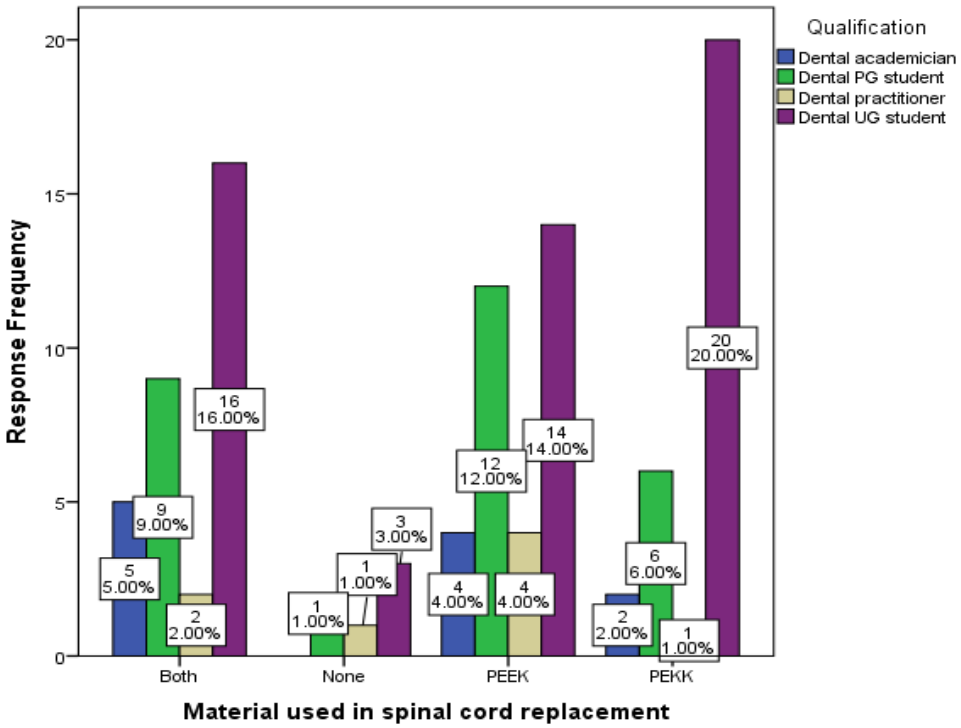

Figure 3 *shows the responses to the material used in spinal cord replacement.This association was found to be statistically non-significant by Pearson's Chi-Square test. (Pearson's Chi-Square value=8.104, df=9, p=0.524 (p<0.05))*

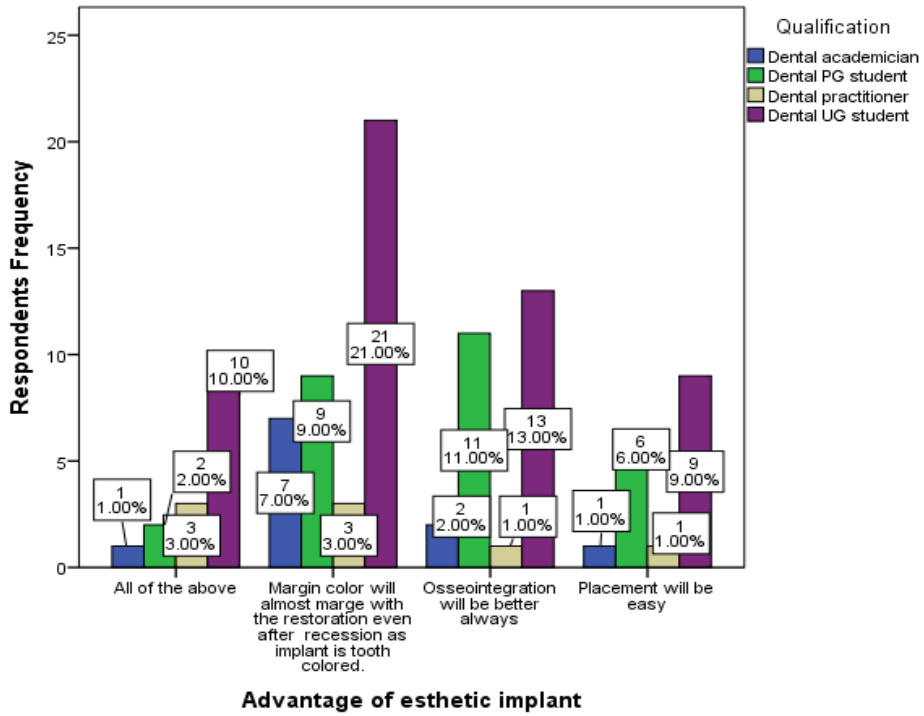

Figure 4 *shows the responses to the advantage of esthetic implant.This association was found to be statistically non-significant by Pearson's Chi-Square test. (Pearson's Chi-Square value=9.354, df=9, p=0.405 (p<0.05))*

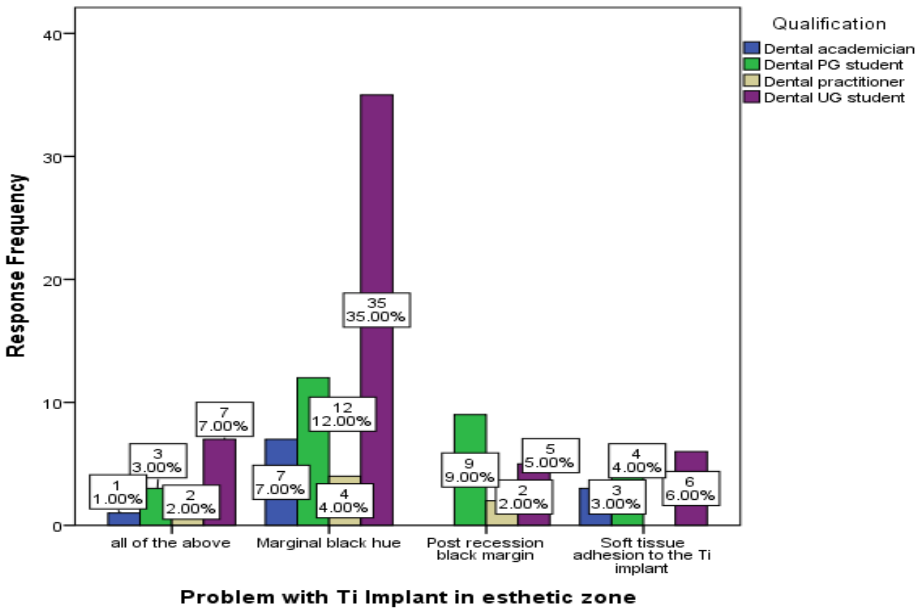

Figure 5 *shows the responses to the problem with implant in esthetic zone.This association was found to be statistically non-significant by Pearson's Chi-Square test. (Pearson's Chi-Square value=15.496, df=9, p=0.274 (p<0.05))*

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