



Awareness on Applications of Photodynamic Therapy in Dentistry Among Undergraduate Dental Students- a Questionnaire Survey

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ABSTRACT

Photodynamic therapy is a light-based therapy that uses photosensitizers as an activating substance which has an inducing and therapeutic effect. It can be used to treat many periodontal and orthodontic problems in dentistry. It is used widely in treating many problems related to periodontics, oral lesions and to treat cariogenic bacteria. The aim of the study was to analyse the awareness on applications of photodynamic therapy in dentistry among undergraduate dental students. A questionnaire was prepared and administered to 100 participants through Google forms - an online survey platform. The study population included undergraduate dental students. Results were collected and generated in SPSS software. The results showed that the majority of participants were aware about the photodynamic therapy and its various uses in dentistry to treat patients. Photodynamic therapy is a light-based therapy which is used to treat various periodontal problems and it is used in gingival curettage and melanin pigmentation removal in dentistry. Within the limitations of the study, we conclude that the undergraduate dental students were well informed about the various uses of photodynamic therapy in dentistry.



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INTRODUCTION

Photodynamic therapy is the treatment involving light wavelength principle to activate substances called photosensitizers. These photosensitizers

produce free O₂ radicals (Sibata, 2000). Oxygen radicals help in enabling the activating substances to destroy bacteria and their products. These are used to treat some skin and eye conditions, as well as certain types of cancer (Hu *et al.*, 2014). This is used to treat abnormal cells (Shree, 2019) in parts of the body that a light source can reach, such as the skin, eyes, mouth, food pipe and lungs. The scientific importance is the formation of single oxygen which produces peroxidative reactions. This causes cell death and damage. Particularly, in dentistry, it is used in treating oral cancer and many bacterial and fungal infection therapies, oral lesions (Palati *et al.*, 2020), leukoplakia, oral lichen planus and importantly in head and neck cancer (Konopka and Goslin-ski, 2007).

It is very important that the applied doses of light

and the activated substances are too small to achieve the therapeutic effects when given separately. The combined effects of light and the activated substances in special order may ensure therapeutic effects. Photosensitizers are chemical compounds which under the influence of light energy shift to an excited state (Hannah, 2018). On ensuing photochemical reactions, singlet oxygen and highly reactive radicals are generated in cells (Palumbo, 2007).

In dentistry, photodynamic therapy is used to treat periodontitis (Gunasekaran and Abilasha, 2016) and an alternative to antimicrobial agents to suppress subgingival (Manohar and Abilasha, 2019) species. Bacteria with dense biofilms (Dental plaque) have been found to be resistant to antimicrobial therapy (Ahad and Gheena, 2016). Photodynamic therapy is used in removing biofilm and treating antibacterial infections and antibiotics have been the traditional methods of periodontal therapy (Palati et al., 2019). Photodynamic therapy could be useful to add-on mechanic as well as antibiotics in eliminating periopathogenic bacteria (Fontana, 2009; Sheriff and Santhanam, 2018). The aim of the study was to analyse the awareness on applications of photodynamic therapy in dentistry among undergraduate dental students.

MATERIALS AND METHODS

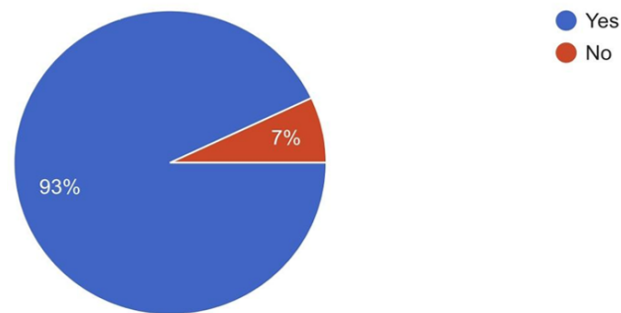


Figure 1: The pie chart depicts the knowledge about photodynamic therapy among undergraduate dental students

A self-structured questionnaire survey (Uma, 2020) based on a prospective observational study. The study comprised about 100 people (sample size) belonging to all age groups of undergraduate dental students (Prasanna and Gheena, 2016). The questionnaire was circulated on an online survey platform. The sampling method involved non - probability convenient sampling. The questionnaire was checked for validity. The results were collected and the statistics/data were analysed using SPSS software.

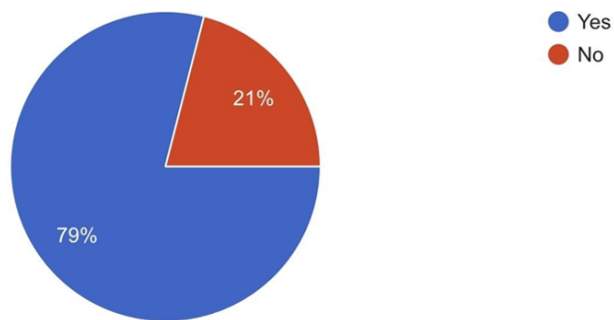


Figure 2: The pie chart depicts the awareness of the photodynamic therapy used to kill microbial cells

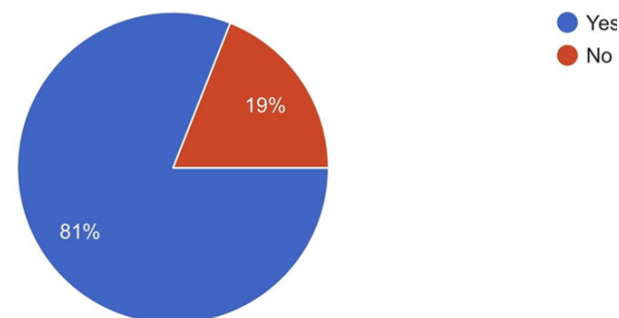


Figure 3: The picture depicts the awareness that photodynamic therapy is a light-based therapy used in dentistry

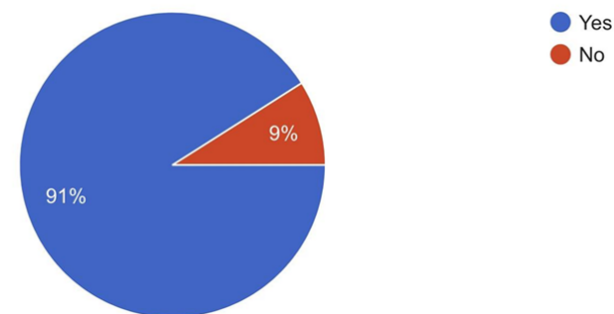


Figure 4: The picture depicts the awareness of the use of phototherapy in the treatment of cancer

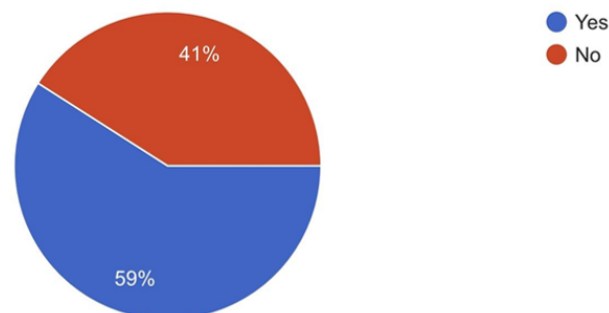


Figure 5: The picture depicts the knowledge on application of phototherapy in periodontal problems

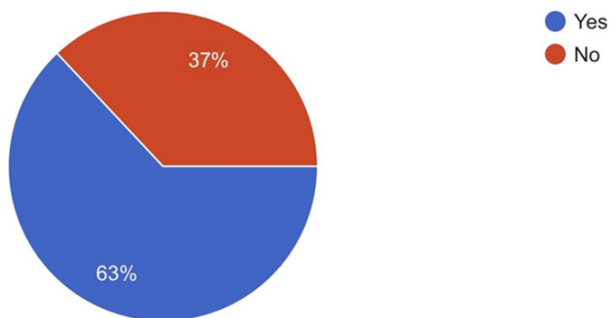


Figure 6: The picture depicts the knowledge that photodynamic therapy involves thermal action

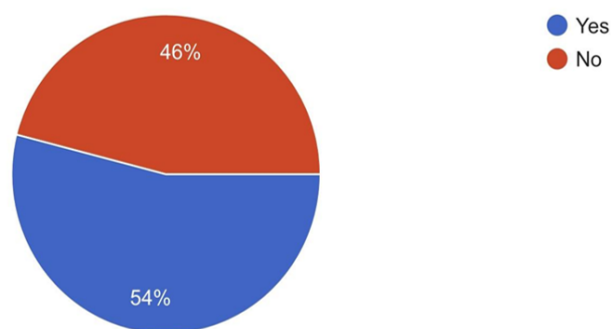


Figure 10: The picture depicts awareness that photodynamic therapy is used now in orthodontics

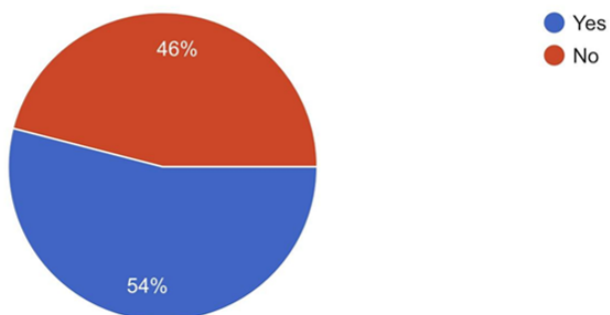


Figure 7: The picture reveals the awareness that the therapy is used in treating inflammatory aspects of periodontal issues

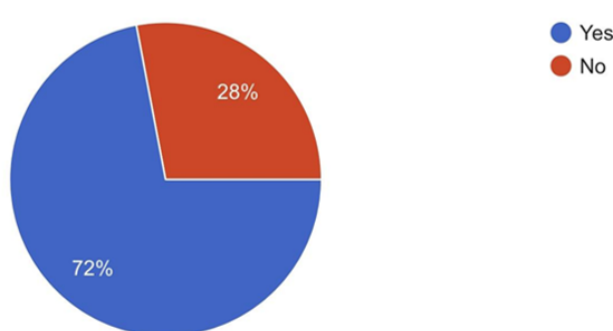


Figure 11: The picture depicts the awareness that photodynamic therapy is used in surgical procedures

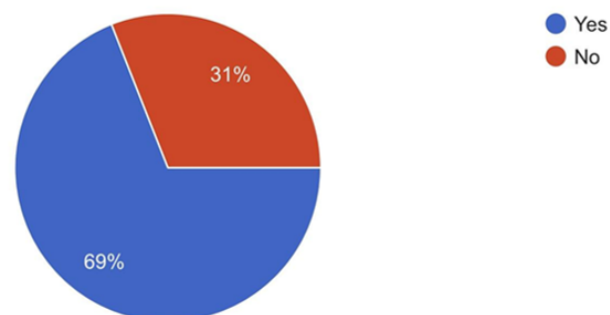


Figure 8: The picture depicts the awareness that photodynamic therapy can be used in promoting osseointegration

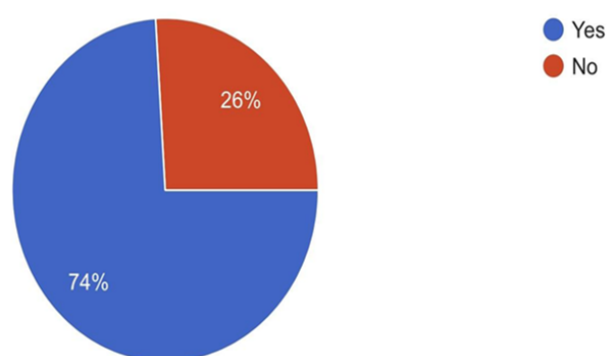


Figure 12: The picture depicts the awareness of photodynamic therapy which involves photosensitisers

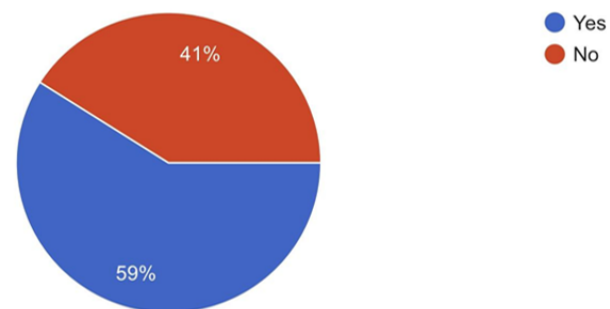


Figure 9: The picture depicts awareness that photodynamic therapy prevents peri-implantitis

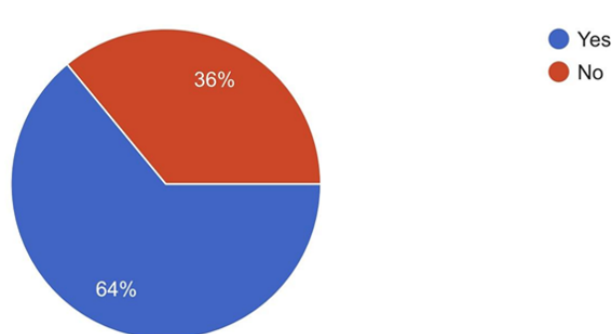


Figure 13: The picture depicts awareness if the photosensitisers are injected intravenously

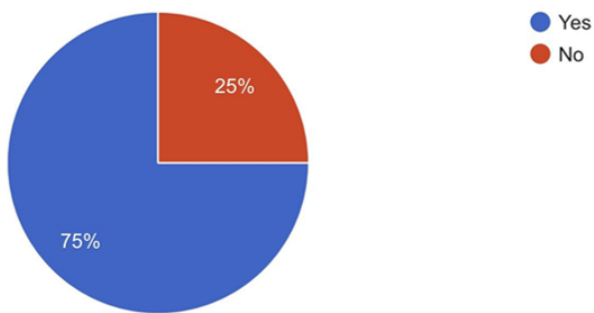


Figure 14: The picture depicts the awareness that photodynamic therapy involves electron transfer

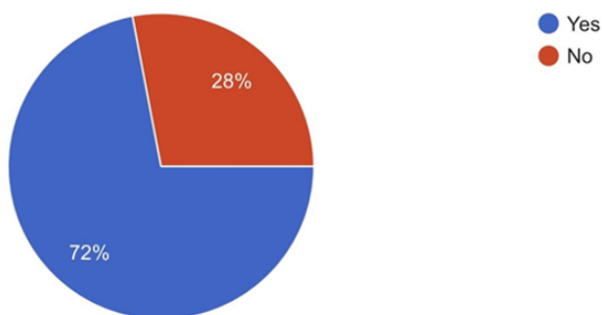


Figure 15: The picture depicts the awareness of photodynamic therapy used in gingival curettage and a melanin pigmentation removal

RESULTS AND DISCUSSION

The results from the survey were collected and the data were analysed using SPSS software. Majority of the respondents showed a positive perception about the photodynamic therapy [Figure 1].93% of the respondents were aware of the photodynamic therapy and 7% of the respondents were not aware of the therapy.

When asked about the microbial action [Figure 2], (Sarbeen and Gheena, 2016), of photodynamic therapy, the response was positive -79% respondents answered that they were aware of the microbial action and 21% respondents were not aware. According to (Tierney, 2008), the survey concluded that patients’ recovery time shortened significantly and was found to improve the cosmetic outcome in photodynamic therapy compared to surgical excision.

When asked if it was light-based therapy [Figure 3], 81% of respondents answered positively, 19% of respondents were not aware. According to (Osiecka et al., 2012), Osiecka BJ et al., this light-based therapy cured 6 patients totally, 4 lesions decreased in size and 18 lesions disappeared. Also, when asked if this therapy helps in treating cancer (tumour) [Fig-

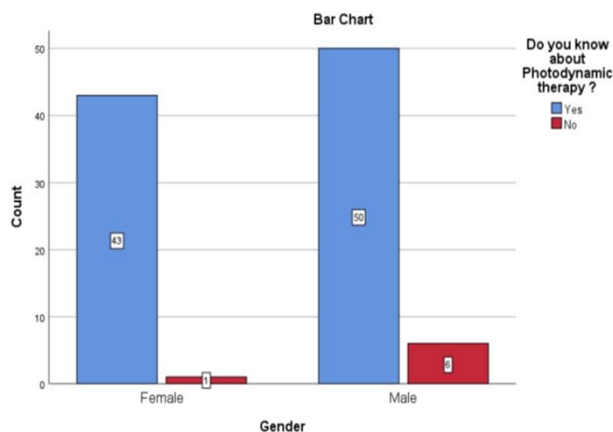


Figure 16: Association between gender and awareness of photodynamic therapy in dentistry

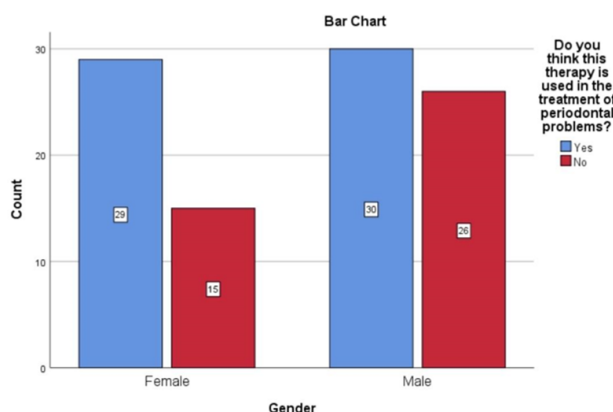


Figure 17: Association between gender and knowledge on the role of photodynamic therapy in the treatment of periodontal problems

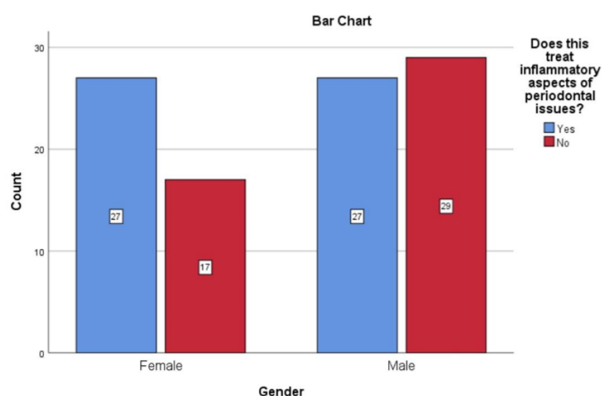


Figure 18: Association between gender and knowledge on the role of photodynamic therapy in treating inflammatory aspects of periodontal issues

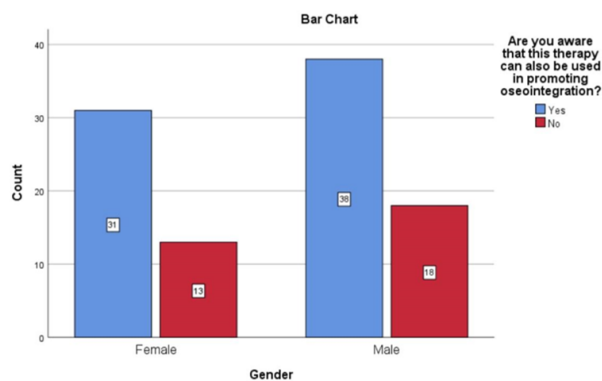


Figure 19: Association between gender and knowledge on the role of photodynamic therapy in promoting osseointegration

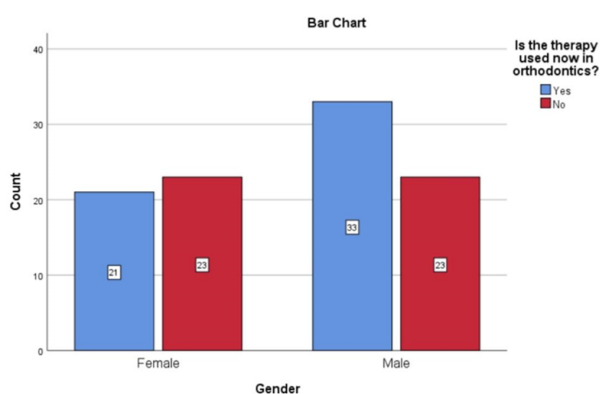


Figure 20: Association between gender and knowledge on the role of photodynamic therapy in orthodontics

ure 4], 91% believed that it helps in treating cancer and 9% answered negatively.

When asked the study population about treating periodontal problems [Figure 5], 59% of respondents answered that the therapy could treat the problem and 41% of respondents didn't think so. Also, when asked if photodynamic therapy involves thermal action, 63% of respondents were aware and 37% we're unaware [Figure 6].

Also, when asked about the inflammatory aspects of periodontal issues to be treated [Figure 7], 54% of respondents answered positively and 46% of respondents didn't think so. According to (Fontana, 2009), photodynamic therapy killed bacteria present in suspension, which was helpful in treating inflammatory aspects.

When asked, if the therapy is used in promoting osseointegration [Figure 8], (Sukumaran and Padavala, 2018), 69% of respondents were aware and 31% of respondents were unaware. According to (Faria, 2015), they concluded that the use of photosensitisers by the therapy demonstrated a ten-

dency to stimulate bone formation, similar to bone grafting.

According to (Javed, 2017), the participants of this study who smoked daily when the treatment was given patients showed a noticeable reduction in peri-implantitis [Figure 9].

When asked, if the therapy was used in orthodontics [Figure 10], (Harrita and Santhanam, 2019), 54% of respondents were aware and 46% of respondents were unaware. According to (Panhóca et al., 2016), this survey concluded that Photodynamic therapy could be used as an adjunctant and a convenient agent to promote oral decontamination in clinical practice.

When asked if this photodynamic therapy specially helps in surgical procedures - 72% of respondents answered 'yes' and 28% answered 'no'[Figure 11], (Krishnan, 2018). The awareness of photodynamic therapy which involves photosensitisers. Photodynamic therapy involves photosensitisers, 74% of students knew about it and 26% of students did not know about it [Figure 12].

When asked if the photodynamic therapy involved photosensitisers which are injected intravenously [Figure 13], 64% of respondents answered that they were aware and 36% of respondents were not aware. According to (Kramer, 1996), this photodynamic therapy was tested using lipoprotein - derived benzoporphyrin derived mono-acid effectively, which closed experimental choroidal neovascularization with light doses.

Also, when asked if the photodynamic therapy involves electron transfer which occurs in the presence of oxygen [Figure 14], 75% of respondents were aware of it and 25% respondents were unaware. According to (Sperandio, 2013), this photodynamic therapy works by radical - enhanced photoinduced electron transfer mechanisms.

When asked if the treatment is used in gingival curettage and melanin pigmentation removal [Figure 15] - 72% respondents answered that they were aware that it could be used in the treatment and 28% were not aware.

Association between gender and awareness of photodynamic therapy in dentistry; knowledge on the role of photodynamic therapy in the treatment of periodontal problems; in treating inflammatory aspects of periodontal issues; in promoting osseointegration and the role in orthodontics; X-axis represents 'Gender of the respondents' and Y-axis represents 'Total students who were aware (Blue) or not aware (Red)'. (Chi-square analysis, P-value = 0.101;0.213; 0.190; 0.780 and 0.265 respectively)

Statistically, not significant. Both the male and female population were equally aware.

Figures 16, 17, 18, 19 and 20. The study assessed the views of a small population and hence is not representative of the whole population.

Figure 16 shows that, The X-axis represents 'Gender of the respondents' and Y-axis represents 'Total students who were aware (Blue) or not aware (Red)' (Chi-square analysis, P value=0.101) Statistically not significant. Both the male and female population were equally aware.

Figure 17 shows that, The X-axis represents 'Gender of the respondents' and Y-axis represents 'The students who were aware (Blue) or not aware (Red)' (Chi-square analysis, P value=0.213, P > 0.05, Statistically not significant. Level of awareness among the male and female population was found to be similar.

Figure 18 shows that, The X-axis represents 'Gender of the respondents' and Y-axis represents 'The students who were aware (Blue) or not aware (Red)' (Chi-square analysis, P value=0.190, P > 0.05, Statistically not significant) Level of awareness among the male and female population was found to be similar.

Figure 19 shows that, The X-axis represents 'Gender of the respondents' and Y-axis represents 'The students who were aware (Blue) or not aware (Red)' (Chi-square analysis, P value=0.780, P > 0.05, Statistically not significant). Level of awareness among the male and female population was found to be similar.

Figure 20 shows that, The X-axis represents 'Gender of the respondents' and Y-axis represents 'The students who were aware (Blue) or not aware (Red)' (Chi-square analysis, P value=0.265, P > 0.05, Statistically not significant). Level of awareness among the male and female population was found to be similar.

CONCLUSION

Photodynamic therapy is a light-based therapy which is used to treat various periodontal problems and it is used in gingival curettage and melanin pigmentation removal in dentistry. The survey led us to know that the majority of the students who were assessed had good knowledge about the various applications of photodynamic therapy in dentistry.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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