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KNOWLEDGE ATTITUDE AND PRACTICE ON TILT CONCEPT IN IMPLANTOLOGY AMONG GENERAL PRACTITIONERS

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ABSTRACT

Dental implants are widely utilized in modern dental practice with inevitable long-term results. Implant placement is often not possible in case of anatomically compromised completely edentulous arches, such as bone resorption, poor bone quality, jaw shape, and location of the mental foramen or loop of the alveolar nerve, mandibular canal, and the presence of maxillary sinuses. Different procedures have been proposed to overcome these anatomic limitations. Among these tilted implants has been proposed as a conservative solution for the treatment of the atrophic edentulous maxilla and restoration of maxillary posterior segments without bone grafting. The aim of the study is to know about the knowledge, attitude, and practice of the TILT concept in implant among the general dental practitioners. A cross-sectional questionnaire study was conducted among the general dental practitioners of Chennai. The sample size of 200 students was selected. A close-ended

questionnaire was used to assess the practitioner's perspective on tilted implants. Survey software was used to reduce sampling bias. Repeated answers or questioning were avoided. Chi-square tests are applied to find the association between the parameters and the level of significance. Out of 200 practitioners, only 41. 5% of the practitioners had knowledge about the TILT concept in implant and the other 58.5% were not aware. And only 28.5 % of the practitioners were aware of the indications for tilted implants whereas 65% of them responded that they don't know under what conditions tilted implants are used. Within the limitation of the study, we can conclude that general practitioners in the Chennai population were not much aware of the tilted implants and their uses and advantages over other techniques.

INTRODUCTION

Dental Implants were first introduced by "Per-Ingvar Branemark".Titanium alloys are the most commonly used materials for dental implants with high rates of success and survival. Branemark observed that the human body will be osseointegrated by titanium into bone tissues (Branemark, 1985). Osseointegration of dental implants is determined by various factors. For instance, surface modification in implants (macro rough features) has shown substantial success in the survival rate of the implant by affecting the early wound healing effects, therefore enhancing the osseointegration.

Dental implants are nowadays commonly used in modern dental practice with inevitable long-term results. Edentulous affects the patient's chewing efficiency, intake of food, and also gives the premature aging appearance. Therefore, the edentulous condition has a detrimental effect on the oral health-related quality of life. Patients are often unsatisfied with the prosthesis because of its instability during functional movements. Therefore edentulous patients can be given prostheses supported by implants that can improve masticatory function in terms of chewing efficiency and bite force (Attard and Zarb, 2004).

However, implant placement is often not possible in case of anatomically compromised completely edentulous arches, such as bone resorption, inadequate bone width, presence of maxillary sinuses and close proximity to vital structures (Razavi*et al.*, 1995; Ulm *et al.*, 1995; Truhlar*et al.*, 1997). Implants in atrophic completely edentulous arches were placed in upright positions as proposed by the original concept of Brånemark System implants. With such an implant position there is an increased risk of implant failure due to its long cantilever (Rangert, Jemt, and Jörneus, 1989; Shackleton *et al.*, 1994; Sertgöz and Güvener, 1996). Different procedures have been proposed to overcome these anatomic limitations. All-on-4 and All-on 6 and tilted implants are those alternative methods used to overcome anatomic limitations.

For rehabilitating the completely edentulous arches, All on 4 concept uses four implants. Two implants are placed axially in the anterior region and the other two implants are placed distally in the posterior region (Malo, Rangert and Nobre, 2005; Malo, de Araujo Nobre, and Lopes, 2007; Patzelt*et al.*, 2014). all-on-four implant's survival rate is less due to short arch span.(Heydecke*et al.*, 2012)

The All-on-6 concept uses 6 straight axial implants. Two additional implants are placed in the second molar region. The addition of these two implants provides additional support to the anterior four implants that will avoid the distal cantilever. The "All-on-6" concept involves less stress when compared to the All-on-4 implant concept. But bone in the posterior maxilla is trabecular, so factors like sinus pneumatization and residual ridge resorption lead to implant failure due to poor osseointegration.(Gargari*et al.*, 2013)

Among which tilted implants are known as a conservative solution for the treatment of the atrophic edentulous jaws without bone grafting(Krekmanov*et al.*, 2000; Aparicio, Perales and Rangert, 2001; APARICIO and C, 2002; Fortin, Sullivan and Rangert, 2002; Maló, Rangert and Nobre, 2003; Calandriello and Tomatis, 2005). Tilting of distal implants allows to reduce cantilever length and to augment the anteroposterior distance between the most anterior implant emergence (Krekmanov*et al.*, 2000; Bellini *et al.*, 2009; Francetti, Romeo and Corbella, 2012).In this technique, 16–25 mm tall and tilted implants (with angulations of 30°–45°) are used. Tall implants provide more surface area for osseointegration and are also engaged in the cortical bone. The implants are placed in a pinhole manner. Therefore it is also called Tall Tilted Pin Hole Immediate Loading- All Tilt (TTPHIL ALL TILT)(Nag, Sarika and Pavankumar, 2017). The inclination of distal/posterior implants reduces the cantilever effect on force magnitude from short arch to long arch which is the advantage of the TTPHIL-ALL TILT concept over All-on-4 and All-on-6 concepts(P. V. Nag *et al.*, 2018; P. V. R. Nag *et al.*, 2018).

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test: An in vitro Study', 2017; Ganapathy, Kannan, and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Arigа*et al.*, 2018; Gupta, Ariga and Deogade, 2018; Anbu*et al.*, 2019; Ashok and Ganapathy, 2019; Duraisamy*et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the TILT concept of dental implant awareness among general practitioners.

MATERIALS AND METHODS

Study design

Awareness based survey

Data collection

A survey was conducted in January 2020 among general dental practitioners. It was an online questionnaire-based study, conducted to assess the Knowledge, attitude, and practice on the TILT concept in implants among the general dental practitioners. 200 general dental practitioners participated in this study. The data collection was done via google forms.

Survey instrument

A pretested, self-administered, closed-ended questionnaire comprising the following sections formed the survey instrument. A structured questionnaire containing 10 questions was framed. The goal of developing this questionnaire

was to know about the Knowledge, attitude, and practice of the TILT concept in implants among the general dental practitioners. The questions had to be answered with a Yes or No response.

Data ***analysis***
The data collected was entered into an Excel sheet and subjected to statistical analysis using SPSS version 20. A Chi-square test was done. The level of significance was set at $p<0.05$.

A questionnaire given is as follows:
Clinicians Experience: Less than 5 years, 5-10 years, More than 10 years
Are you aware of the TILT concept in implant dentistry?
Are you aware of what all circumstances/ conditions Tilted implanted are placed?
Do you know that the TILT concept is an alternative method for the replacement of teeth in the maxillary posterior segment without bone grafting?
Are you aware of tilted implants' advantages over conventional methods?
Are you aware of the steps and clinical procedures involved in placing tilted implants?
Do you know any other concepts of placing implants in compromised completely edentulous arches?
Do you think tilted implants can be used in partially edentulous patients also?
Do you think tilted implants will provide enough support to the prosthesis?
Do you think force acting on the tilted implants will lead to bone loss over the period of time?

RESULTS AND DISCUSSION
200 general dental practitioners were selected as the study population for this survey. Out of 200 practitioners, 32% of them had less than 5 years of experience,45% of them had 5-10 years of clinical experience and 23 % of the practitioners had more than 10 years of clinical experience (Figure 1). Among them, only 41. 5% of the practitioners had knowledge about the TILT concept in implant and the other 58.5% were not aware (Figure 2). And only 28.5 % of the practitioners were aware of the indications for tilted implants whereas 65% of them responded that they don't know under what conditions tilted implants are used (Figure 3). However, 25% of them responded that they are aware of tilted implants are used in the maxillary posterior segment without bone grafting for the replacement of teeth. However, the practitioners did not have much knowledge about the advantages of tilted implants over conventional or other methods. Only 28.5% of them were aware of the benefits of tilted implants (Figure 4). A maximum number of practitioners responded that they were not aware (77%) about the steps and clinical procedures involved in placing tilted implants (Figure 5).

Tilted implants are placed anterior to the maxillary sinus on the mesial aspect, so that the implant threads are engaged in the cortical bone, without invasion or rupture of the Schneiderian membrane(Jensen *et al.*, 2010). Apart from the TILT concept, there are other methods and concepts such as "All on 4" and "All on 6" that are used in anatomically compromised completelyedentulous patients. However, 68% of the practitioners were not aware of any of these

concepts or methods. Studies have shown that the All-on-Four surgical, distal tilted implants and the prosthetic procedure were proposed to be used in edentulous arches without any bone augmentation procedures. (Malo, Rangert and Nobre, 2005; Malóet *al.*, 2012). Studies have also shown that tilted implants can also be placed in partially edentulous patients also (Fortin, Isidori, and Bouchet, 2009). But from our study, 76% of the practitioners did not know about tilted implants that can be used in partially edentulous patients. Furthermore, it is also shown that 54.5% of the practitioners responded that tilted implants can cause bone loss due to forces acting on them by implants (Figure 6) And 68.5% of them also perceive that tilted implants can't support prosthesis (Figure 7).

Figure 8 shows the associations between clinicians' experience and their awareness of the TILT concept. Maximum awareness about the TILT concept was seen in practitioners whose experience was more than 10 years (13.5%).p-value- 0.015 (<0.05), hence statistically significant.

Figure 9 shows the association between clinicians' experience and their awareness of steps and clinical procedures involved in placing tilted implants. Most of the practitioners whose experience is more than 10 years had knowledge about clinical procedures in placing tilted implants (13%) and none of the practitioners with 5-10 years experience had knowledge of placing tilted implants. p-value- 0.000 (<0.05), hence statistically significant.

Resorption and reduction in bone density are the outcomes of long term edentulous arches. This is more common in completely edentulous jaws. These features may require bone grafting before implants are placed. Bone augmentation techniques such as sinus augmentations and nerve transposition are traditional approaches for compromised bone density. But these procedures are highly expensive and procedures involve longer duration. However long distal cantilevers, short implants, or implants placed into the zygoma or pterygoid plate are the alternative techniques that are advantageous than conventional bone augmentation procedures offer advantages but require significant expertise for inevitable success (Ho, Dent and Jovanovic, 2014).

No significant literature opposing the consensus was found. The Survey conducted within Chennai does not represent all ethnic groups and populations. Hence the study can not begeneralized. Also, subjective error bias may creep in. Hence a study including all general dental practitioners across the country in a similar study setup can provide better accurate results.

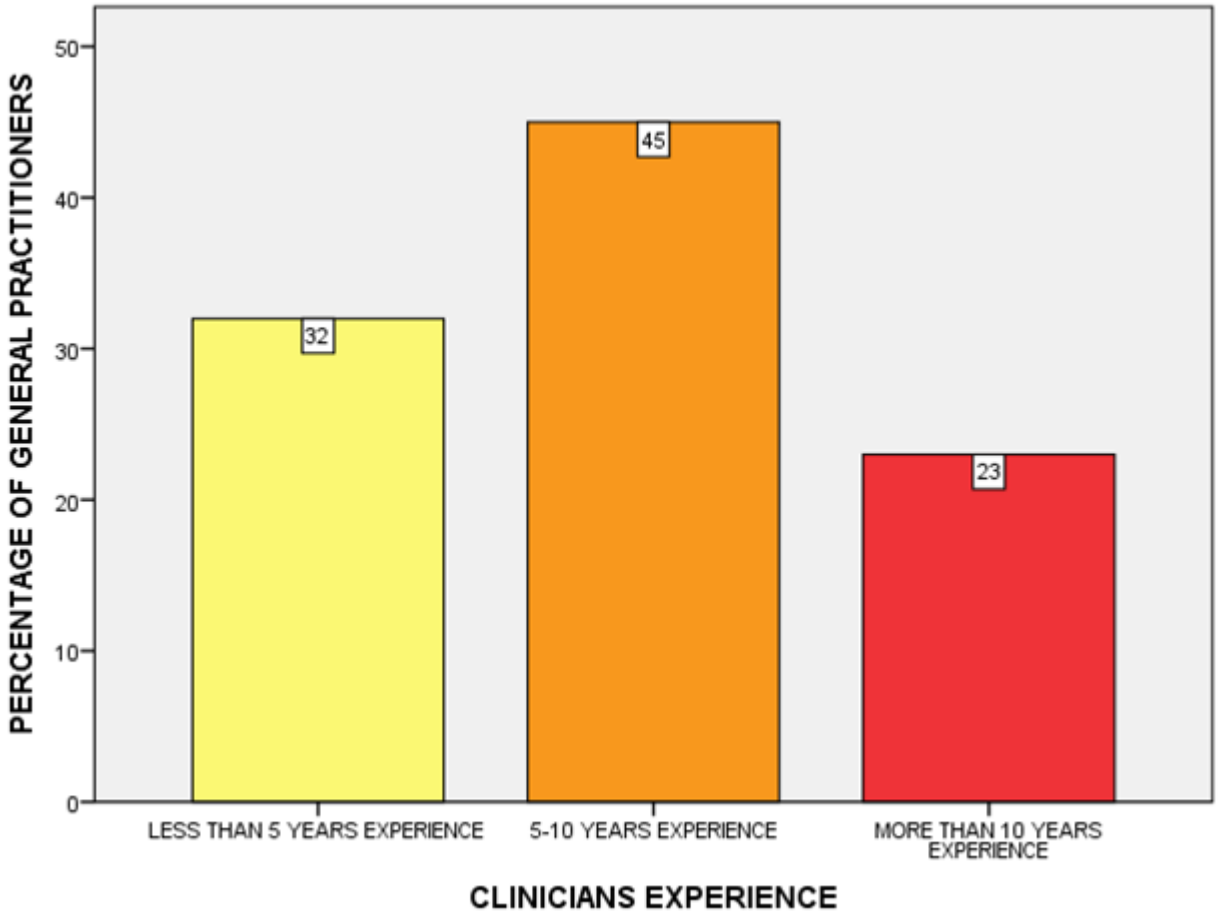

Figure 1 Bar graph shows the distribution of general practitioners based on their clinical experience. The X-axis depicts the clinical experience among general practitioners. Y-axis represents the percentage of general practitioners. The clinical experience was color-coded as yellow (less than 5 years), orange (5-10 years experience), and red (more than 10 years experience). The graph shows that the majority of the practitioners who participated in this study were with 5-10 years of experience.

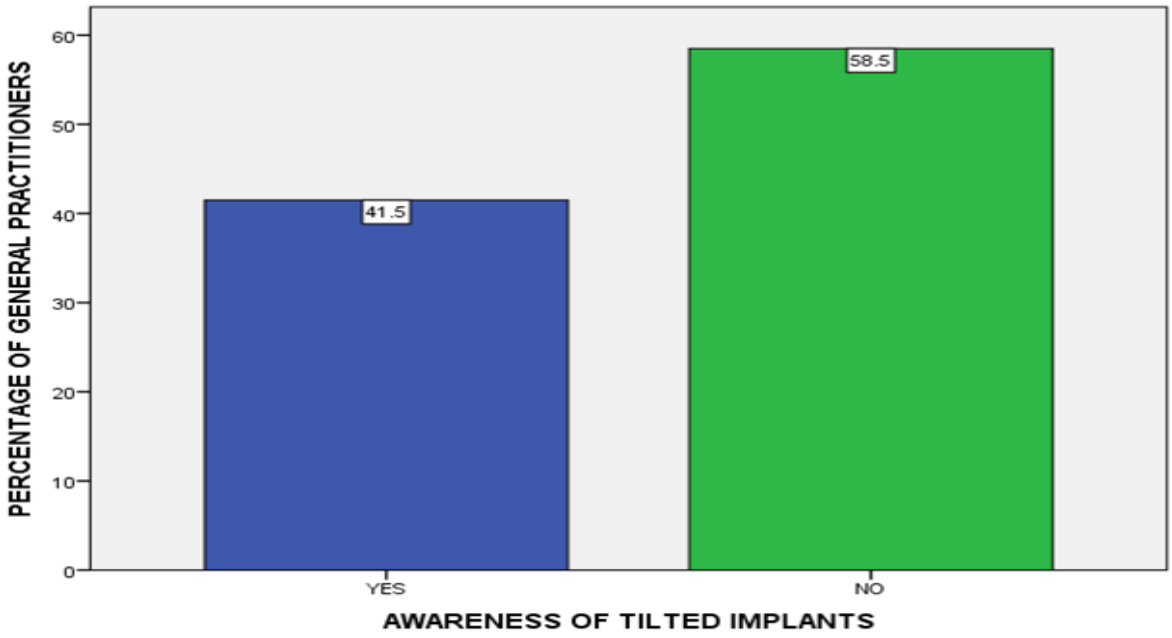

Figure 2 Bar graph representing the responses for the question, whether the general practitioners are aware of tilted implants. The X-axis represents the response options (No - Green) (Yes-Blue), Y-axis represents the percentage of responses. The graph shows that the majority of them were not aware of Tilted implants.

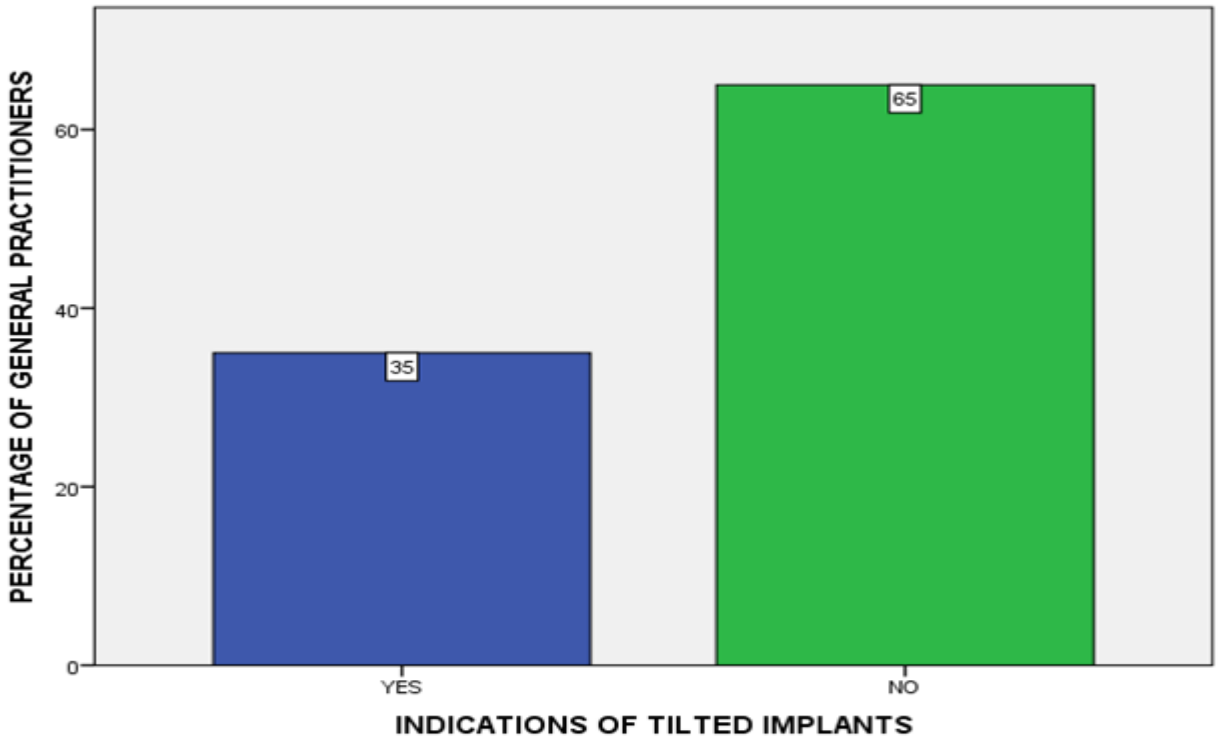

Figure 3 Bar graph representing the responses for the question, whether the general practitioners are aware of indications for tilted implants. The X-axis represents the response options (No -Green) (Yes-Blue), Y-axis represents the percentage of responses. The graph shows that the majority of them were not aware of indications for tilted implants.

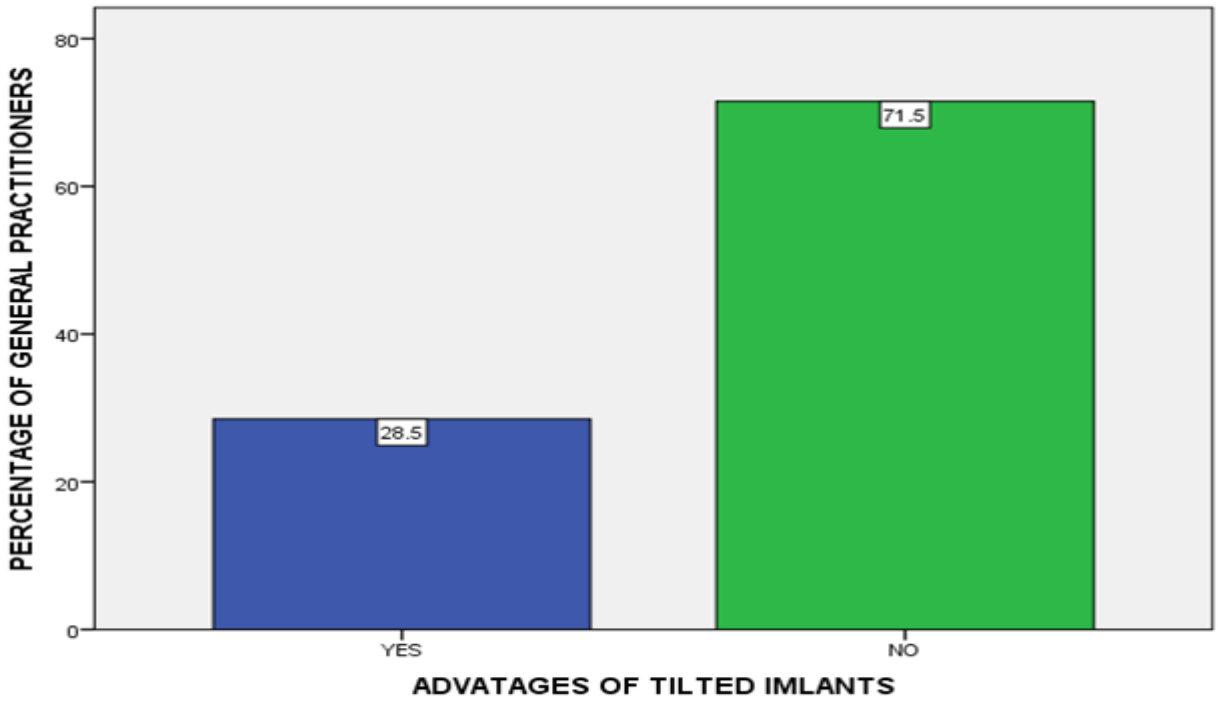

Figure 4 Bar graph representing the responses for the question, whether the general practitioners are aware of the advantages of tilted implants. The X-axis represents the response options (No -Green) (Yes-Blue), Y-axis represents the percentage of responses. The graph shows that the majority of them were not aware of the advantages of tilted implants.

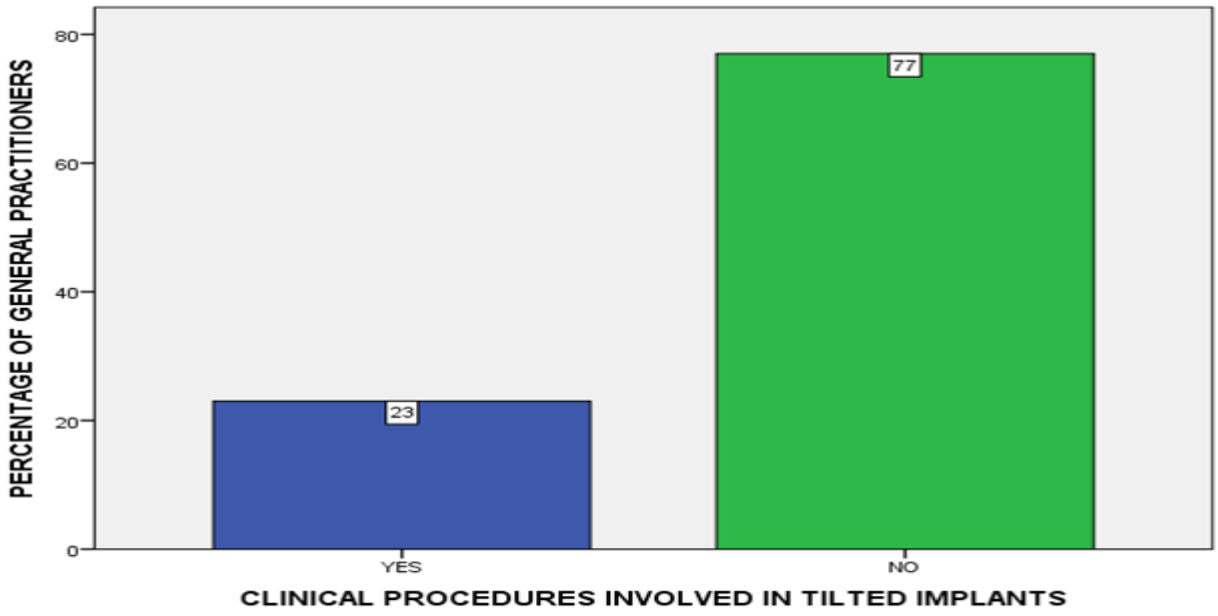

Figure 5 Bar graph representing the responses for the question, whether the general practitioners are aware of clinical procedures involved in tilted implants. The X-axis represents the response options (No -Green) (Yes-Blue), Y-axis represents the percentage of responses. The graph shows that the majority of them were not aware of clinical procedures involved in tilted implants.

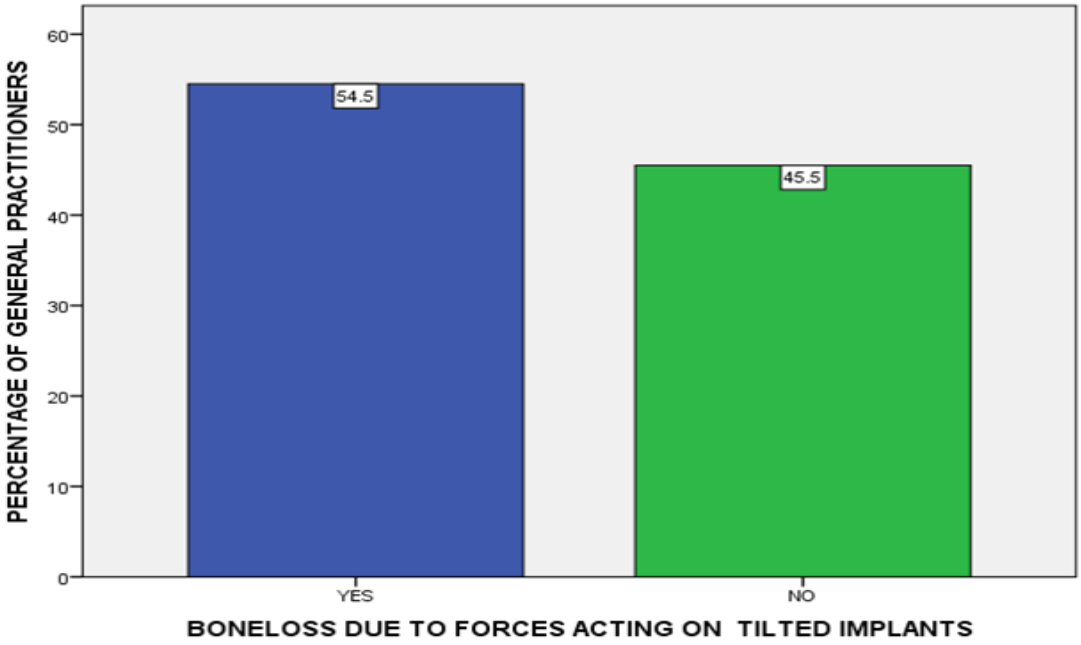

Figure 6 Bar graph representing the responses for the question, whether the general practitioners think tilted implants can cause bone loss due to forces acting on them. The X-axis represents the response options (No -Green) (Yes-Blue), Y-axis represents the percentage of responses. The graph shows that the majority of them think that tilted implants will cause bone loss over a period of time.

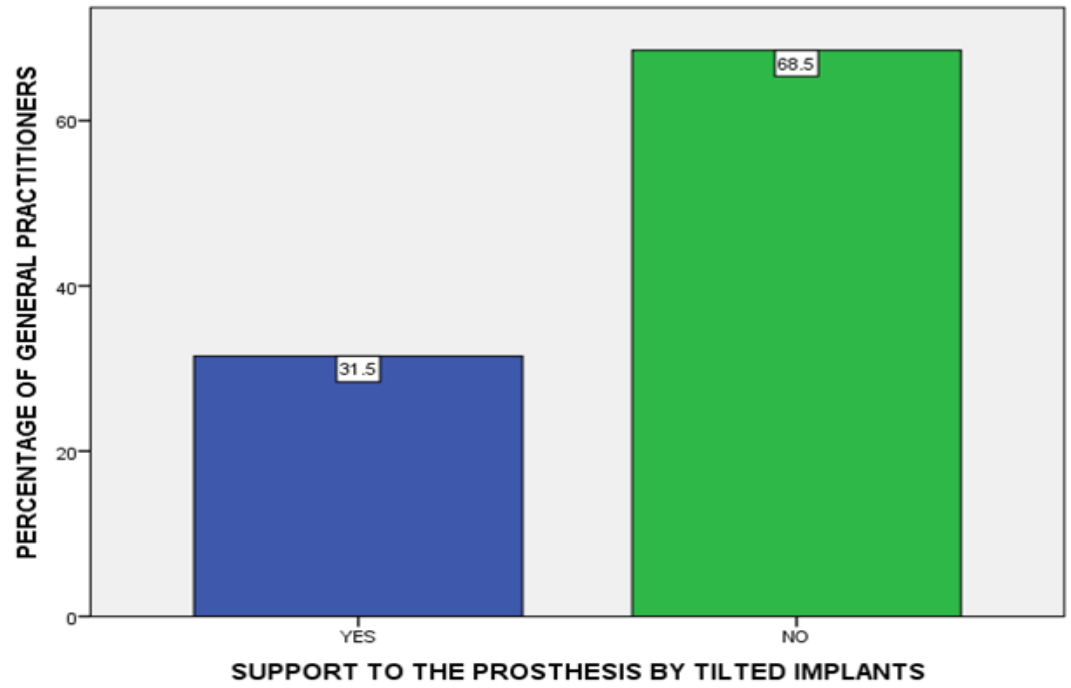

Figure 7 Bar graph representing the responses for the question, whether the general practitioners think tilted implants can provide adequate support to the prosthesis. The X-axis represents the response options (No -Green) (Yes-Blue), Y-axis represents the percentage of responses. The graph shows that the majority of them think that tilted implants can not support the prosthesis.

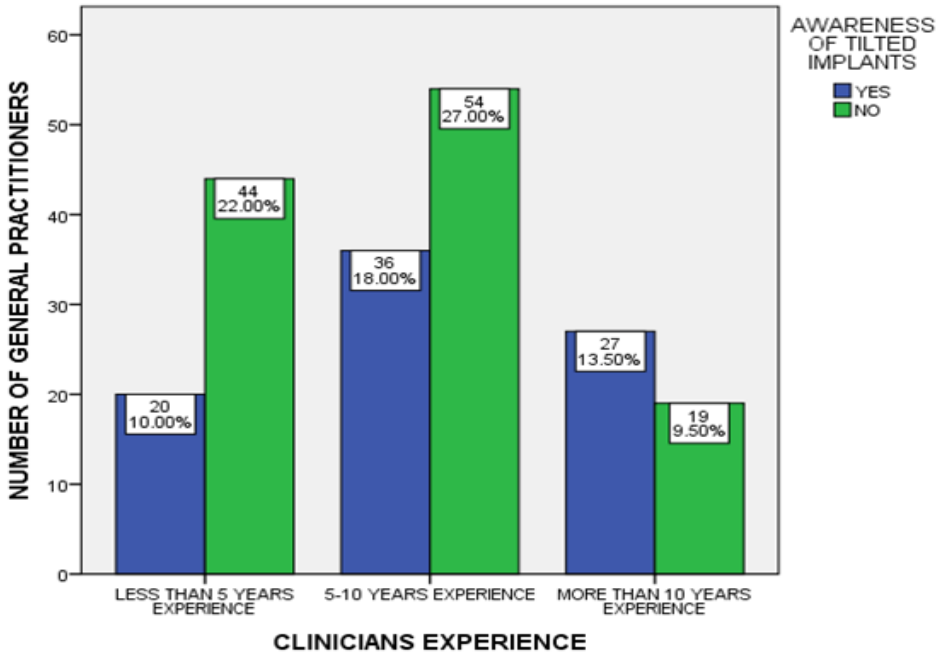

Figure 8 Bar graph shows the association between the general practitioners and their awareness about tilted implants. The X-axis depicts the clinical experience. Y-axis represents the number of general practitioners. The graph shows that most of the practitioners with more than 10 years of experience had awareness about tilted implants (Green-No),(Blue-Yes). Chi-square test was done.p-value- 0.015 (<0.05), hence statistically significant.

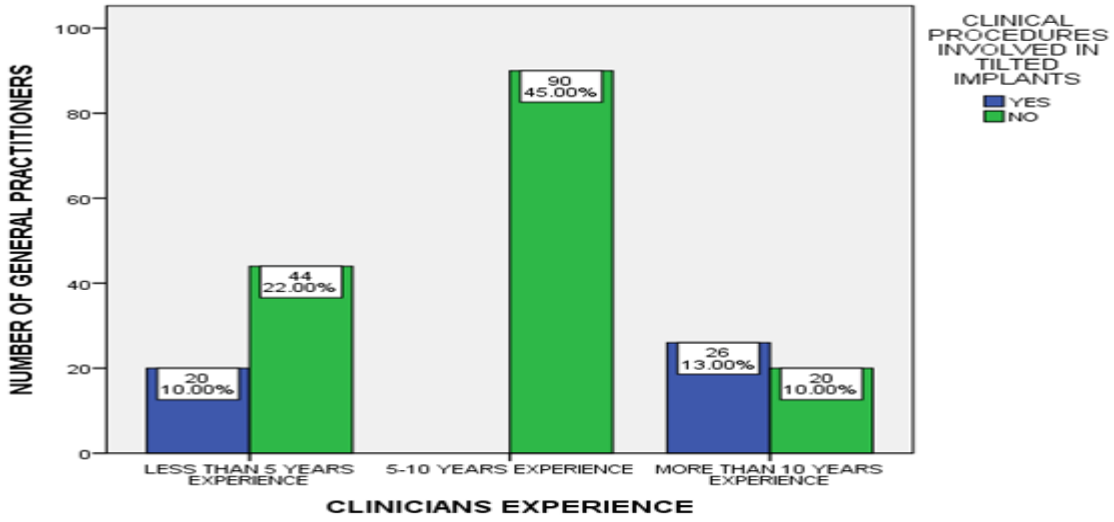

Figure 9 Bar graph shows the association between the general practitioners and their awareness about clinical procedures in placing tilted implants. The X-axis depicts the clinical experience. Y-axis represents the number of general practitioners. The graph shows that most of the practitioners with more than 10 years experience had awareness about clinical procedures in placing tilted implants and none one the practitioners with 5-10 years experience knew how to place tilted implants (Green-No),(Blue-Yes). A Chi-square test was done. p-value- 0.000 (<0.05), hence statistically significant.

CONCLUSION

Within the limitations of the study, we can conclude that general practitioners in the Chennai population were not much aware of the tilted implants and their uses and advantages over other techniques. More continuing dental education and workshop programs can be conducted to educate general practitioners.

AUTHOR CONTRIBUTIONS

First author, VaishnaviSivakali Subramanian performed the data collection by reviewing patient details, filtering required data, analyzing and interpreting statistics, and contributed to manuscript writing. The second author, Dr. V Ashok contributed to the conception of study title, study design, analyzed the collected data, statistics, and interpretation and also critically revised the manuscript.

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CONFLICT OF INTEREST

There were no potential conflicts of interest as declared by authors.

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