

## Knowledge, attitude and practices of non guided and guided implant placement among dental professionals

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### ABSTRACT:

**Background:** When a person loses a tooth for any cause, dental implants are placed to replace the missing teeth. Achieving successful osseointegration necessitates a technique that minimizes surgical difficulties, which is one of the main attributes that establish implants as a dependable alternative. There are two primary methods for implant placement: manual implantation and implantation using a surgical guide. According to some researchers, implant placement with a surgical guide is more precise than with other techniques. Some have countered that although dental implants have a high accuracy rate when employing a surgical guide, the precision of free-hand implant surgery has shown adequate and acceptable in the majority of clinical settings. Therefore, weighing the benefits and drawbacks of each strategy can assist clinicians. The purpose of this study was to assess knowledge, attitude and practices of non guided and guided implant placement among dental professionals in India. **Material and methods:** The present cross sectional web based questionnaire study was conducted among 300 practicing dental professionals in India between dec 2022 and November 2023. The pre tested questionnaire included items on demographic details, placement of implants on regular basis, the system used, knowledge of CBCT imaging, surgical guides and complications of guided and non guided implant placement. The data collected was analysed by applying descriptive statistics. **Result:** The present study reported reduced postoperative morbidity in terms of swelling, pain, and bleeding with guided implant placement compared to the freehand approach. One limitation that could be noted from the included studies was the differences in the operators' clinical experience and skill set. Another limitation was a low number of quality studies comparing guided to freehand implants. Therefore, proper case selection and surgical execution could contribute to these differences. **Conclusion:** Once an implant is placed, the outcome of its placement is dependent on distinct clinical and radiographic parameters that determine the implant's success or survival. A good implant survival rate was achieved using both guided and free-hand implant placement procedures based on different variables that included demographic data, working environment, single versus multiple implant placement and the practitioners experience.

**Keywords:** dental implant, prosthetic-driven, implant placement

### INTRODUCTION:

As a prosthetic-driven operation, implant placement necessitates careful planning of surgical and restorative procedures. The final result is determined by a number of factors, including the surgical technique, practitioner expertise, medical condition, and anatomy of the patient.<sup>1</sup> Several surgical procedures are used when implant placement is being done. An implant can be inserted by a surgeon using a fully guided system, a pilot drill guide, or freehand.<sup>2,3</sup> For successful implant placement, the treatment planning requires extensive grasp of the underlying bone morphology, anatomy, and locations of important structures which is possible with the use of CBCT.<sup>3,4</sup> Using a cone-beam computed tomography (CBCT) and associated implant design

software, an ideal planning can be executed. An "effective" implant is characterized as an implant that is free of all technological and biological issues throughout the whole observation time frame. Smith and Zarb<sup>5</sup> state that implant success criteria consist of pain, peri-implant radiolucency, lack of mobility, as well as illness. Moreover, yearly bone loss must be less than 0.2 mm following the first year of placement in addition to the favorable the way implant prostheses look. They suggested a minimal success rate of 80% after ten years and 85% after five years.<sup>6,7</sup> For long-term success, precise implant placement is essential to attaining an aesthetically pleasing outcome and proper alignment to withstand occlusal stresses. There is ongoing debate over the surgical guide model's impact

on implant placement accuracy, with that of manual placement<sup>8</sup> even though the latter surgical process is widely used in clinics; therefore, the purpose of this study was to examine whether the surgical technique will affect clinicians or the implantologists for accuracy in implant placement when compared to preoperative implant planning.

### **MATERIAL AND METHODS:**

**Study population and study design:** The present cross-sectional questionnaire-based study was conducted among the practising dental professionals of India.

**Data collection tool:** A structured web-based questionnaire in the English language was used as a data collection tool. The questionnaire had two sections. In the first section, demographic details of the study subjects such as place of practice, highest qualification, specialization, and years of experience, were included. In the second section, there were nine close-ended and semi-open questions related to knowledge, attitude and practices of non-guided and guided implant placement. This section included questions on the placement of implants on a regular basis, the number of implants placed in a year, the type of implant system used, CBCT imaging, surgical guides, manual implant placement and surgical complications.

**Pilot study:** The English version of the questionnaires was first pre-tested among twenty dental professionals. The objective of the pilot study was to calculate the sample size and assess the validity of questions. In pilot testing after the completion of the questionnaire, participants were interviewed regarding the overall acceptability, length, language, clarity and feasibility of the tool. Over 90% of dental professionals found the questionnaire easy to understand and fill. Based on

their suggestions necessary changes were made to prepare a revised and final version of the questionnaire. The dentists among whom pilot testing was performed were excluded from the final data collection.

**Sample size and sampling technique:** Based on the response rate in pilot study (75.00%), confidence interval of 95% and 5% absolute precision, sample size calculated was 289 dental professionals. Hence, it was decided to include 300 dental professionals in the study via simple random sampling technique.

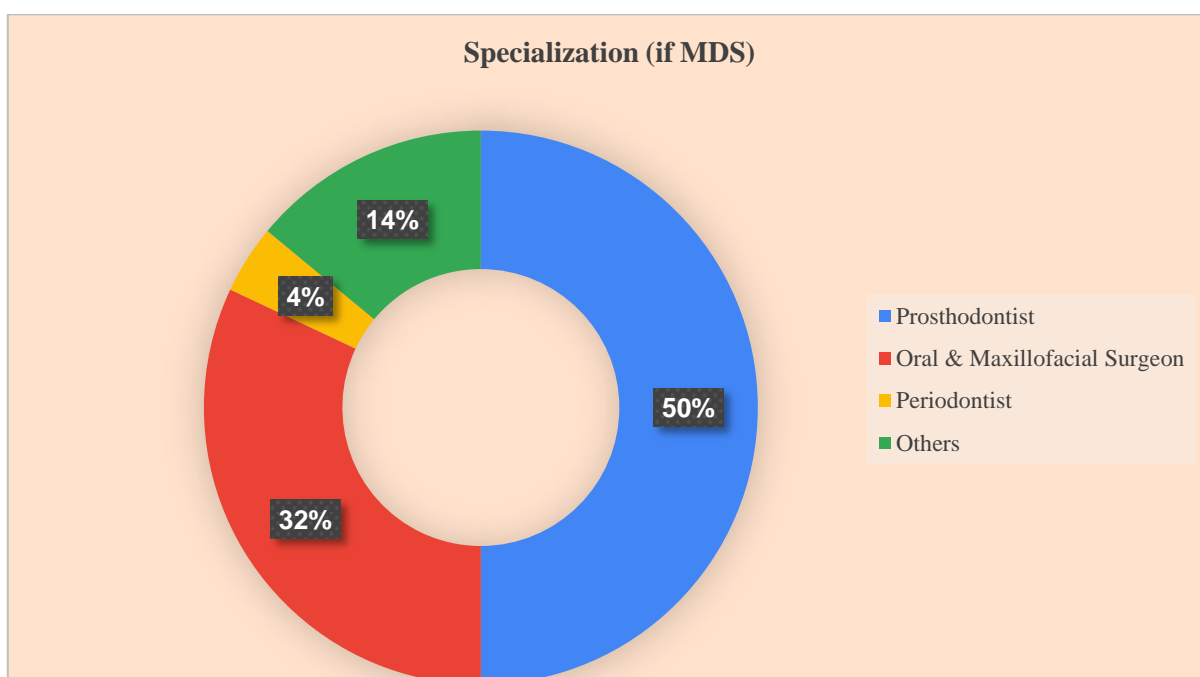
**Data collection and study duration:** The Google form was used to collect informed consent and responses. The study was conducted between December 1, 2022, and November 30, 2023.

**Statistical analysis:** Data collected was entered in Microsoft excel 365 for Windows. The frequency and percentages of responses were calculated using version 21.0 of the Statistical Package for Social Sciences (IBM Corporation, Armonk, New York, USA).

### **RESULT:**

#### **Demographic Characteristics of Respondents:**

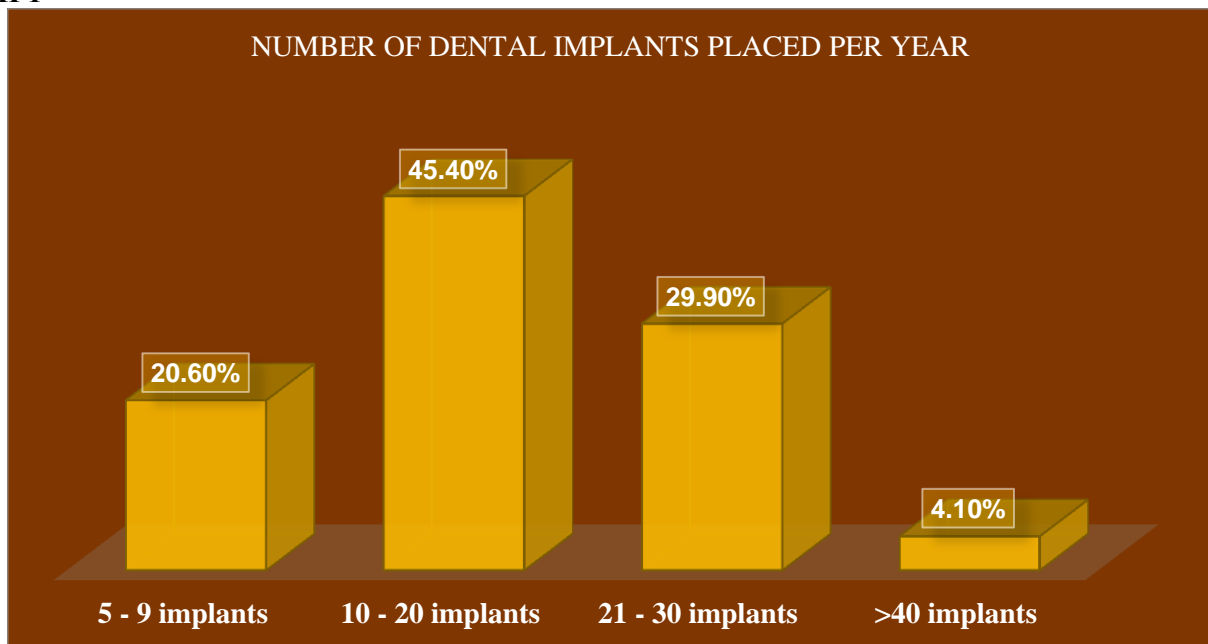
The study surveyed dental practitioners from both within and outside Madhya Pradesh, revealing that the majority (76.30%) practiced inside the state. Regarding qualifications, a significant proportion of respondents held Master of Dental Surgery (MDS) degrees (68.80%) compared to those with Bachelor of Dental Surgery (BDS) degrees (32.20%). Among MDS holders, the most prevalent specializations were Prosthodontics (50.00%) and Oral & Maxillofacial Surgery (32.00%). Respondents reported varied ranges of working experience, with the majority falling within the 5-9 years category (45.20%), followed by 10-12 years (30.80%)( pie chart 1).



### Implant Placement Practices:

Regarding implant placement practices, the majority of respondents (57.60%) reported placing implants on a regular basis. Bar graph 1 illustrates the distribution of respondents based on the number of dental implants placed per year.

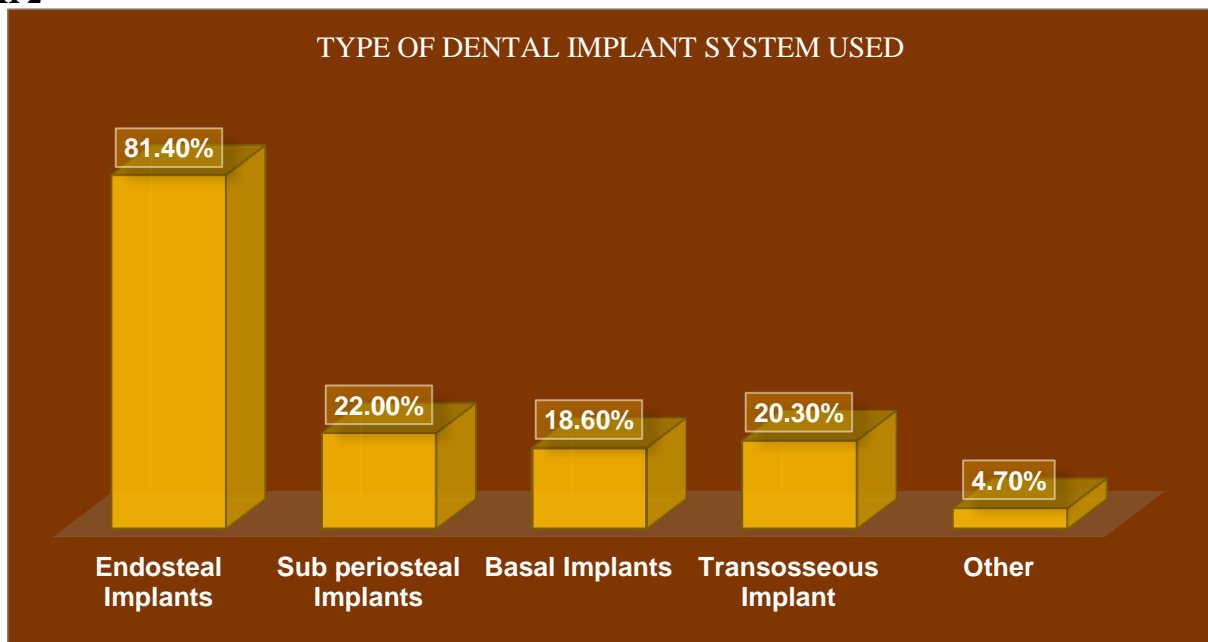
GRAPH 1



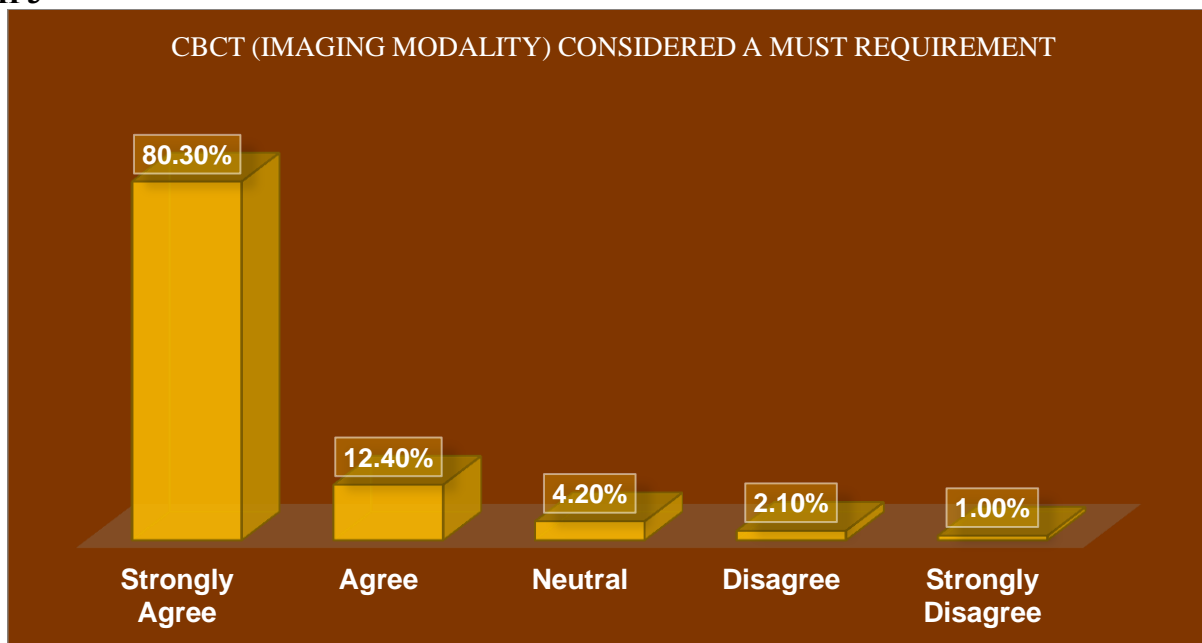
### Implant System and CBCT Imaging:

The preferred type of dental implant system and awareness about Cone Beam Computed Tomography (CBCT) as an imaging modality for virtual planning are presented in Bar graph 2.

GRAPH 2

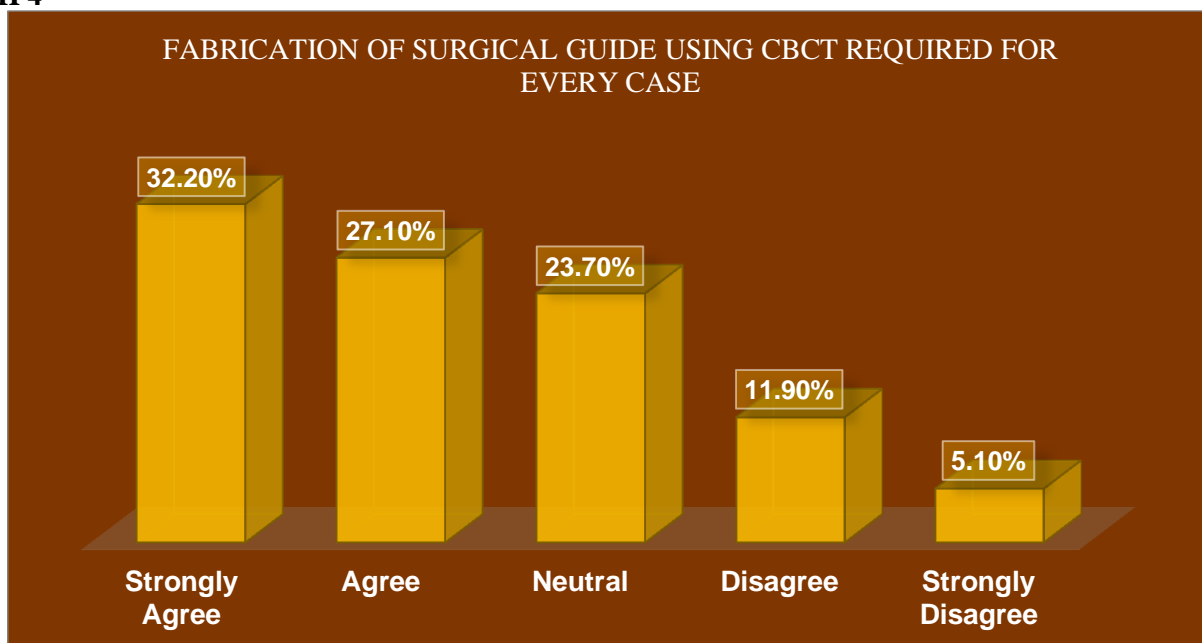


GRAPH 3



Graph 4 illustrates- the requirement of surgical stents by the practitioners as per each case.

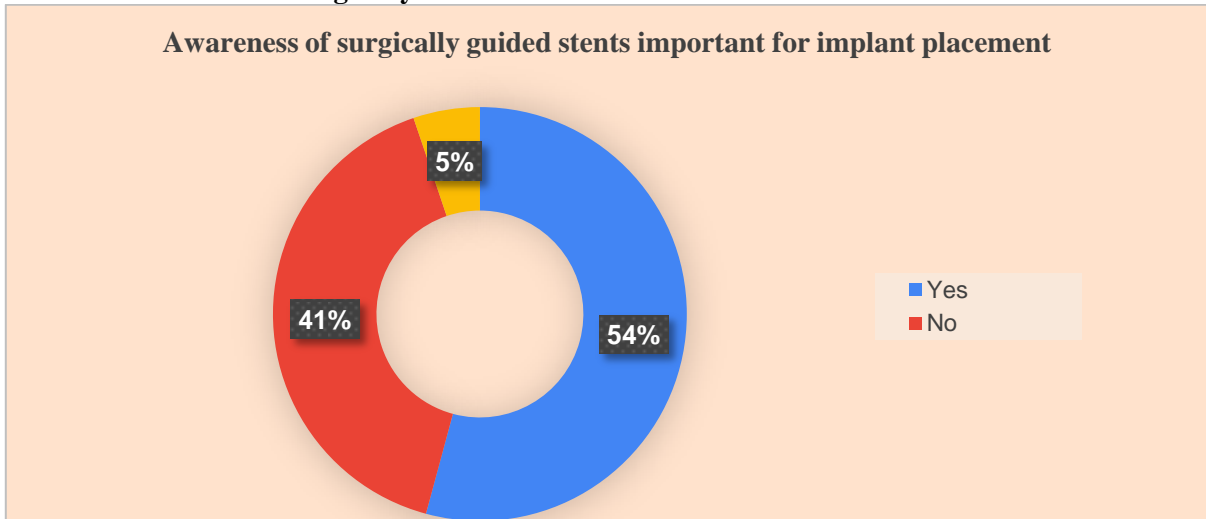
GRAPH 4



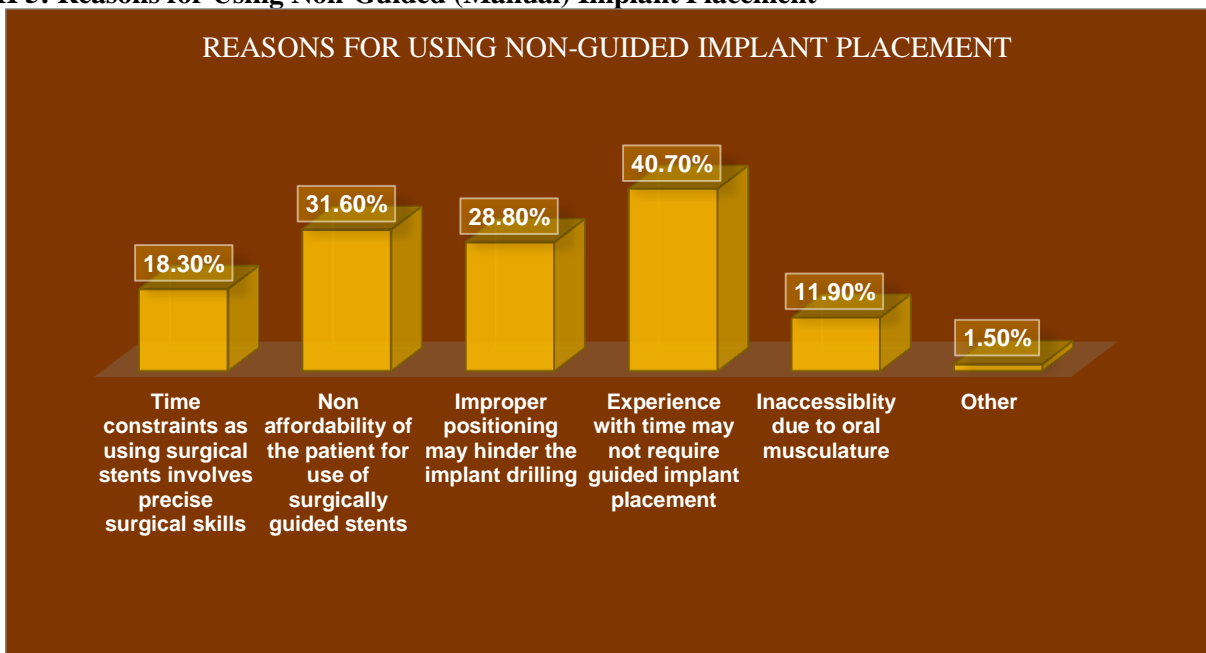
**Awareness of Surgically Guided Stents and Non-Guided Implant Placement:**

The importance of awareness regarding surgically guided stents for implant placement was assessed. While a majority of respondents affirmed its importance (54.20%), a significant portion also expressed uncertainty (40.60%). Reasons for opting for non-guided (manual) implant placement and common errors encountered during manual placement are presented in PIE CHART 1 and GRAPH 5, respectively. Time constraints, affordability issues, and concerns regarding proper positioning were cited as primary reasons for not using guided stents.

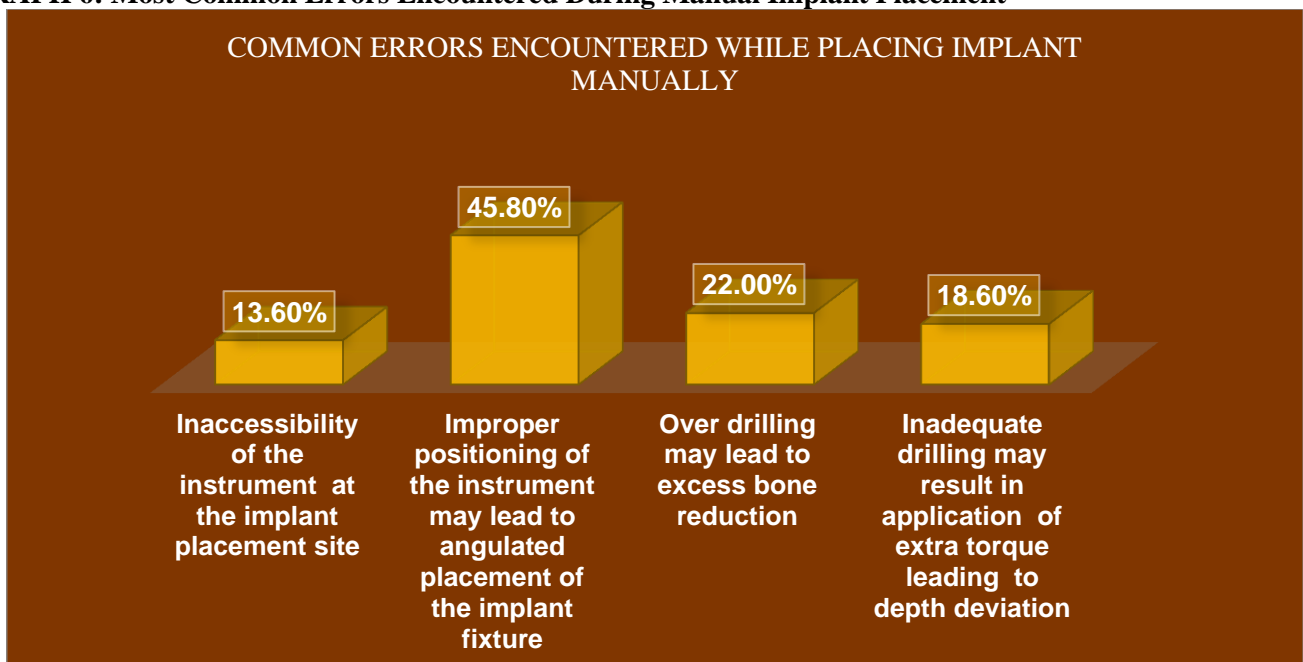
**PIE CHART 2: Awareness of Surgically Guided Stents**



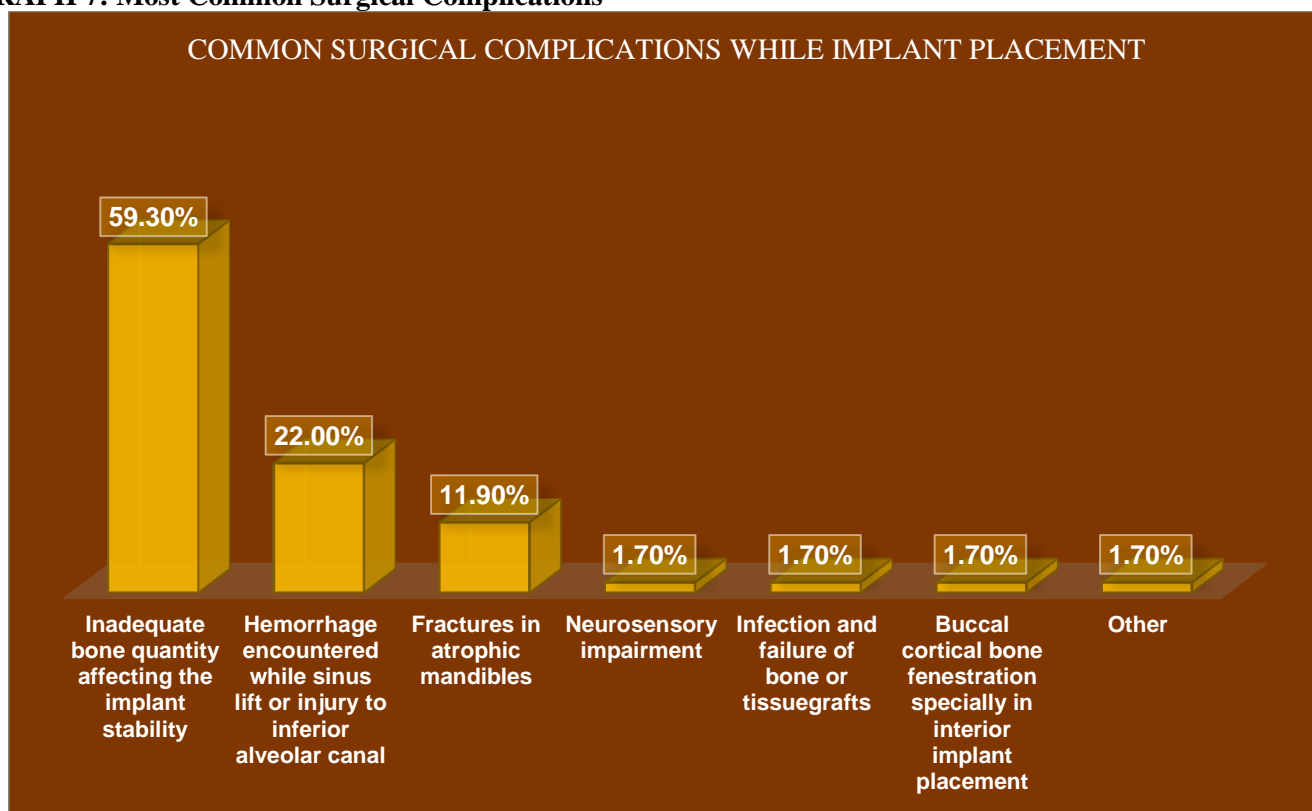
**GRAPH 5: Reasons for Using Non-Guided (Manual) Implant Placement**



**GRAPH 6: Most Common Errors Encountered During Manual Implant Placement**



**GRAPH 7: Most Common Surgical Complications**



**DISCUSSION:**

A high success rate is the goal that surgical implant aims to achieve. On the other hand, a satisfactory (but not perfect) result can occasionally occur from an implant that survives while not meeting all success criteria. Furthermore, there is a greater chance of implant placement failure at past unsuccessful implant sites. The osseointegration of the implant surface<sup>8</sup> with the surrounding bone is essential to the longevity and success of the implant. The present elucidated the demographic data which showed that the practitioners who with specialisation hold greater experience regarding placing of implant in regard with the virtual planning using cbct.<sup>9</sup> Among them the Prosthodontics had a majority as seen in chart 1. This has been demonstrated by numerous studies that show that, when all variables are taken into account, precise implant placement leads to a prosthetics that meets expectations. An incorrect implant placement and angulation is associated with a higher likelihood of issues,<sup>10</sup> such as inferior alveolar canal or lingual plate perforation. A deteriorated prosthesis could potentially communicate negative occlusal pressures to the implants or lead to poor prosthetic aesthetics.<sup>11</sup> Practitioners experience, tooth-borne status, timing relative to extraction, and the number of adjacent implants are identified as the four major factors influencing the number of implants that are placed as demonstrated through the graph 2. Also, tooth-borne status, number of adjacent implants, and the width of the edentulous space for the subset of tooth-borne, single-implant cases, have been introduced as three main influential factors on implant

planning for performing either by manual or guided placement.<sup>12</sup>

Its observed in various studies that despite being predictable outcomes using non guided, computer-guided implant placement has greater performance compared to free-hand implant placement in terms of failure rates.<sup>13</sup> This may be because lack of information about number, position, and angulation of the implants that affects prosthetic design as observed in graph 3 . When opposed to the freehand technique, the fully guided technique offers the advantage of accuracy in implant placement. The process involves merging the patient's jaw CBCT and teeth scan data into the guide design program.<sup>14</sup> In view of this, before to any approach, the jaw nerves, sinuses, adjacent tooth roots, and bone density are all assessed, and the implant is essentially positioned in the ideal spot. Surgical guidelines can guarantee implant safety and lower the risk of problems, which simplifies implant surgery therefore the results showcased in graph 4 support the present literature.

The studies show that fabrication of surgical guides is important from point of view when multiple implant placement needs to be performed.<sup>15</sup> When multiple implants that are placed too close to the root of an adjacent tooth or at improper angulation can result from poor surgical technique, poor treatment planning which may damage the periodontal ligament and surrounding structures. When opposed to the freehand technique, the fully guided technique offers the advantage of accuracy in implant placement. Thus, the graph 5 supports the study that fabrication of guides

can lead more accurate implant placement as compared to free hand technique.

Yogui et al.<sup>16</sup> compared survival rates between computer-guided and freehand placement. They concluded that both techniques yielded a similar result. Also, Pozzi et al.,<sup>17</sup> in their review, suggested that survival rates of guided surgery were similar to conventional freehand protocols. According to a systematic review by Schneider et al.,<sup>18</sup> computer-guided implant placement had higher implant survival rates ranging from 91 to 100% after 12–60 months of follow-up. As illustrated in pie chart 2 that the awareness of surgically guided stents plays an important role in implant placement. When interpreting the results obtained in graph 6 the reasons of free-hand implant placement include eliminating the time required to prepare the guide and reducing the cost of making the guide. Free-hand surgery has many benefits for the dentist because it can visualize and relate diagnostic data to the actual clinical condition by reflecting soft issues and examining bone anatomy.<sup>19</sup> Additional treatments such as bone grafts, PRF, and GBR can be easily performed if needed. As mentioned in literature. Despite its benefits the common errors the practitioners can encounter in non guided surgeries illuminate that firstly, clinical judgments about implant placement will be based on visualization of the clinical condition through information provided by cast and virtual planning. The second limitation is the longer time of this method than the surgical guide method because free-hand implant placement requires thinking and planning. Another limitation of the free-hand method is that aligning multiple implants using the freehand technique is difficult leading to angulation deviation and the results are less predictable than surgical guides. Therefore, human error in this method will be much greater. Increased recovery time, swelling, pain, and bleeding are other disadvantages of the free-hand technique.<sup>20</sup>

But if one compares guided implant surgery with a standard free-hand procedure, the former is not necessarily less demanding than the latter. A fully guided approach has the drawback of being more expensive, and it can be difficult to follow a fully guided drill sequence when mouth opening is restricted. Furthermore, a few studies examined the morbidity and intraoperative and postoperative problems that arise after implant insertion.<sup>21</sup> Among other things, the guide cannot be changed once it is made, so no changes can be made during the procedure. Therefore, it will affect how well the prosthesis fits and, ultimately, how well it functions. During surgery, there is a possibility of the guide being dislocated if it is not stabilized, since drilling is intended to penetrate hard bone, which produces torsional forces on the sleeves. Additionally, this approach involves expenses for software, specialized equipment, and drills, as well as the time required for the treating physician to overcome the learning

curve.<sup>22</sup> Therefore the overall reasons are concluded through graph 7

While several excellent reviews have compared the success and survival rates between free-hand versus fully guided implant placement, very few have evaluated the failures.<sup>23</sup> Despite the popularity of the surgical guide model in the clinic, there is still disagreement about its effect on the accuracy of implant placement. Some researchers believe that implant placement using a surgical guide is more accurate than other methods.<sup>24</sup> Others have argued that despite the high accuracy of dental implants when using the surgical guide, free-hand implant surgery accuracy has been sufficient and acceptable for most clinical conditions.

Appropriate case selection and surgical technique may be responsible for these variations. Another constraint identified in the included studies was to the variations in the clinical experience and skill set of the operators. An absence of high-quality trials contrasting guided versus freehand implants was another drawback. In order to establish the evidence, assess the effect magnitude, and standardize the potential effect modification when employing guided and freehand implant insertion procedures, these data highlight the necessity for more standardized RCTs.

## **CONCLUSION:**

Choosing the right method, such as other clinical considerations, will depend on the individual circumstances of each patient and the preference of the treating physician. Free-hand surgery is a cost-effective method in which the flap is reflected, and, according to the doctor's diagnostic information, an implant is placed, which in many cases is a useful method. Guided surgery has the highest level of accuracy and control, in which osteotomy is designed and printed through a digital surgery guide, and depending on the complexity of the case and the patient's anatomy, it has a higher level of value than free surgery. The surgical guide helps the surgeon make the implant surgery more accurate, safer, simpler, at a lower cost, and in less time. In fact, there are patterns that convey information about the position of the tooth to the dentist before the implant is placed. The study elucidates key findings from a questionnaire-based study on dental practitioners' practices, qualifications, awareness of advanced imaging technologies, and experiences with implant placement. Through a comprehensive analysis of quantitative data, supplemented by qualitative insights, it provides valuable insights into contemporary trends, challenges, and opportunities in implant dentistry. The findings contribute to a deeper understanding of the factors influencing decision-making processes, practice patterns, and clinical outcomes in implant dentistry, thereby informing future research directions, educational initiatives, and clinical guidelines in the field.



## **ANNEXURE 1:**

### **SECTION A: Practitioners demographic data**

#### **1.Place of practice( Please specify)**

- Within Madhya Pradesh
- Outside Madhya Pradesh

#### **2.Highest Qualification**

- Under graduate (BDS)
- Post graduate(MDS)

#### **3. Specialization(if MDS)**

- Prosthodontists
- sOral maxillofacial surgeon
- Periodontologists

**\*Specify any other**

#### **4.Years of working experience**

- <5
- 5-9
- 10-19
- >19

#### **5.Do you place dental implants on regular basis**

- Yes
- No

#### **6.How many dental implants are placed per year?**

- 5-10
- 10-20
- 20-30
- >40

#### **7.The type Dental implant system used for the placement (Mark if more than one)**

##### **Endosteal Implants**

- Sub periosteal Implants
- Basal Implants
- Transosseous Implant
- \*specify any other

**SECTION B:**The following set of questions will help to understand the thoughts on use of virtual planning with CBCT and evaluating accuracy of dental implants.

#### **8. Awareness about CBCT as Imaging modality as CBCT for virtual planning is a must requirement**

**Strongly disagree:**

- 1
- 2
- 3
- 4
- 5

**Strongly agree**

#### **9. Reason for not using CBCT imaging for virtual planning**

- Feasibility of the imaging center
- Affordability of the patient
- Patient not accustomed to the imaging machine
- \*Specify any other

#### **11. Is awareness of the use and functions of surgically guided stents important for implants for implant placement**

- Yes
- No
- Don't know

#### **12. Please select your reason(s) for using non guided ( manual )implant placement**

- Time constraints as using surgical stents involves precise surgical skills.
- Non affordability of the patient for use of surgically guided stents.
- Improper positioning may hinder the implant drilling
- Experience with time may not require guided implant placement
- Inaccessibility due to oral musculature
- \*specify any other

#### **13.According to you what is the most common error that is encountered while placing the implant manually?**

- Inaccessibility of the instrument at the implant placement site
- Improper positioning of the instrument may lead to angulated placement of the implant fixture
- Over drilling may lead to excess bone reduction
- Inadequate drilling may result in application of extra torque leading to depth deviation
- 14.Most common surgical complication that you might have encountered while the implants are placed?
- Inadequate bone quantity affecting the implant stability
- Hemorrhage encountered while sinus lift or injury to inferior alveolar canal
- Fractures in atrophic mandibles
- Neurosensory impairment
- \*Specify if any other

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