



Knowledge, attitude, and practice about adjustable articulators among dental clinicians in the Salem district

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ABSTRACT

The use of an average value or a hinge articulator for both fixed/removable partial (FPD/CPD) and complete dentures (CD) is not uncommon. A hinge articulator can establish occlusion in the intercuspal position. Lateral movements of the prosthesis against each other cause prosthetic instability. Aim: This study aimed to assess the knowledge, attitude, and practice of adjustable articulators among dental clinicians in the Salem district. Sixty (n = 60) dentists were included in this study. Dentists who are not willing to participate in the study, non-practitioners, and prosthodontists were excluded from the study. Informed consent was obtained from the clinicians. Data was collected using a questionnaire for dentists regarding knowledge, attitude, and practice about adjustable articulators. The study had been carried out for 3 months. The mean (standard deviation - SD) attitude score was 14.84 (1.65) out of the total attitude score of 25 indicating a positive attitude. The mean (SD) knowledge score was 2.66 (1.19) out of the total knowledge score of 8 indicating less knowledge. The mean (SD) practice score was 6.15 (1.24) out of the total practice score of 10 indicating willingness to practice with the aid of adjustable articulators. Within the constraints of the study, there is a low level of knowledge about the adjustable articulators among the clinicians. However, they exhibit a positive attitude and low interest in practicing with adjustable articulators for various prosthodontic clinical situations.

Keywords: adjustable articulators, dental clinicians, prosthesis

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INTRODUCTION

The ultimate goal of prosthetic restorative dentistry is to design the occlusal morphology of the prosthesis harmonious with the mandibular movements [1]. Clinicians have access to a multitude of designs of articulators [2]. Articulators are used in dentistry by assisting in fixed and removable prostheses constructions [3]. An articulator must replicate the static and dynamic occlusion permitting the dental technicians to design a restoration that is congruent with the patient's stomatognathic system. If discordant prostheses are fabricated, it could deteriorate the patient's comfort and jeopardize the restorations/teeth irreversibly by wearing off or fracturing [2].

The use of an average value or a hinge articulator for both fixed/removable partial (FPD/CPD) and complete dentures (CD) is not uncommon. A hinge articulator can establish occlusion in the intercuspal position. Lateral movements of the prosthesis against each other cause prosthetic instability [2]. In day-to-day practice, most of the single-unit crowns and simple FPDs are constructed with the aid of hinge articulators that have restricted capability to replicate jaw movements. The resultant occlusal errors by employing this instrument are adjusted clinically at the expense of time [4]. Adjusted or trimmed ceramic/porcelain prostheses that are not re-glazed may also lead to the inflammation of soft tissues if

contacts. Reduction of antagonistic natural teeth for occlusal corrections leads to hypersensitivity, irreversible damage of dental pulp, the risk of caries in the stripped enamel areas, and periodontal diseases. Many of these occlusal problems remain unnoticed and uncorrected, unfortunately. The prosthesis with such inaccuracies is allowed to remain in the oral cavity which frequently elicits symptoms of occlusal diseases and eventually leads to temporomandibular joint disorders.

The parameters responsible for such occlusal errors are the average anatomic location of the hinge axis, arbitrary location of the anterior point of orientation, straight condylar path, absence of Fischer angle, and working condylar motion [5-7]. The construction of an average value articulator is based on Bonwill's equilateral triangle theory. These articulators comply with the single static-centric interocclusal record. They permit opening and closing movements around the opening axes of the articulators. Eccentric movements exhibited are based on mean values [8]. The mean condylar and incisal guide parameters of such an articulator cannot be adjusted. These parameters are the vital factors determining the occlusal morphology while fabricating the fixed prostheses and responsible for balanced occlusion in CD prostheses.

A hinge articulator, on the other hand, is a simple holding instrument capable of accepting a single static registration that neither accepts facebow transfer nor allows adjustment to replicate mandibular movements. It only simulates the opening and closing movements of the mandible. No eccentric movements are possible [8]. However, an individual patient presents with distinct condylar and incisal guidance even in decimals. This mandates programming and setting or customizing these parametric values in the adjustable articulator to alleviate occlusal errors. Prosthodontists are the prime specialists of occlusion who are responsible for the physiologic harmony of the temporomandibular joint, masticatory musculature, and teeth [4]. When articulators are available with minimum errors, practitioners and specialists should make use of them and get the maximum benefit of reproducing accurate results. As general practitioners and specialists are involved in a broader array of rehabilitation procedures, their perspective of suitable articulator selection and implementation must also evolve [2]. This study aimed to assess the knowledge, attitude, and practice of adjustable articulators among dental clinicians in the Salem district.

MATERIAL AND METHODS

The present study was carried out among the general dentists & specialists who are practicing in the Salem district. Ethical clearance was obtained from the Institutional Ethical Committee (VDCW/ICE/178/2019). Sixty ($n = 60$) dentists were included in this study. Dentists who are not willing to participate in the study, non-practitioners, and prosthodontists were excluded from the study. Informed consent was obtained from the clinicians. Data was collected using a questionnaire for dentists regarding knowledge, attitude, and practice about adjustable articulators [2,9-11]. The study had been carried out for 3 months.

Questionnaires were distributed personally to the practicing dentists in their dental offices by a single investigator and answered questionnaires were collected after two days. The questionnaire allowed respondents to select any one option for a question. Eligible participants were issued with a questionnaire (15 questions). It had 4 questions concerning knowledge, 8 questions regarding attitude, and 3 questions concerning the use of adjustable articulators. Knowledge items concentrated on the articulator's choice for each prosthetic technique. Attitude items covered domains like the importance of an articulator's requirements, utility, and occlusal equilibration. Practice items covered facebow transfer to articulator and making interocclusal records. The data were entered in a Microsoft Excel sheet. Descriptive statistics were used. Pearson's correlation test was done to find the relationship between knowledge, attitude, and practice scores. A $p < .05$ was considered statistically significant.

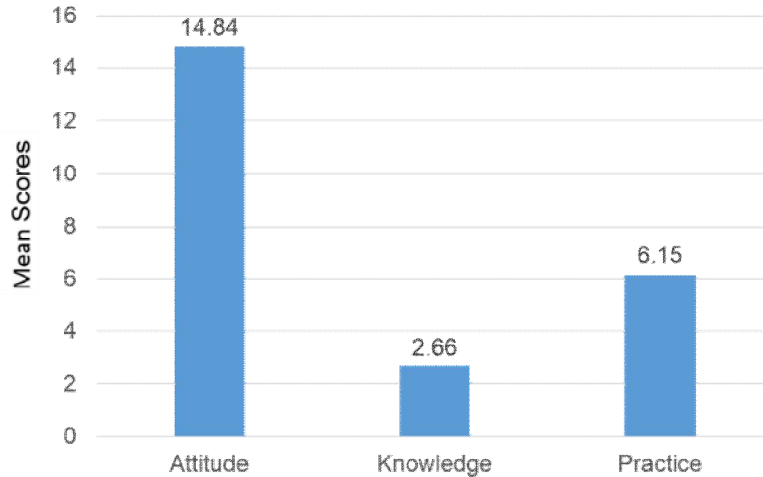
RESULTS

The mean (standard deviation - SD) attitude score was 14.84 (1.65) out of the total attitude score of 25 indicating a positive attitude. The mean (SD) knowledge score was 2.66 (1.19) out of the total knowledge score of 8 indicating less knowledge. The mean (SD) practice score was 6.15 (1.24) out of the total practice score of 10 indicating willingness to practice with the aid of adjustable articulators. Table 1 tabulates the mean and standard deviation of the scores concerning attitude, knowledge, and practice. Graph-1 pictorially represents the mean scores of attitude, knowledge, and practice.

Table 1: Mean attitude and knowledge among study subjects.

Variable	Mean	Standard deviation
Attitude	14.84	1.65
Knowledge	2.66	1.19
Practice	6.15	1.24

Graph 1: Mean attitude, knowledge, and practice scores



The mean attitude score was found to have a weak positive correlation with the mean knowledge score ($r = 0.216$). A weak negative correlation was found between attitude and practice scores ($r = -0.172$); knowledge and practice scores ($r = -0.243$). However, none of these correlations were found to be statistically significant ($p > .05$). Table 2 describes the correlation between the three domains.

Table 2: Correlation between attitude and knowledge scores among study subjects.

Variable	Attitude $r(p\text{-value})$	Knowledge $r(p\text{-value})$	Practice $r(p\text{-value})$
Attitude	1 (1.000)	0.216 (0.100)	-0.172 (0.192)
Knowledge	0.216 (0.100)	1 (1.000)	-0.243 (0.064)

DISCUSSION

The ability of the articulators to duplicate the biomechanical parameters concerning mandibular movement differs significantly. The instrument’s complexity is directly proportional to the number of adjustment provisions in replicating the condylar movements and therefore, reproducing the *in vivo* teeth articulation in eccentric mandibular excursions. There is substantial debate on an ideal articulator selection for a specific prosthodontic procedure [12]. Although, there are no studies that aid in developing a benchmark for articulator utility, professional associations, and books to teach occlusion in dental schools serve as a foundation for selecting an ideal articulator [2].

The majority of clinicians in the current study chose to employ a mean value articulator for the fabrication of CD. This articulator does not reproduce eccentric excursive mandibular movements. Hence, it is the least recommended articulator for CDs with or without balanced articulation. On the other hand, the use of adjustable articulators predominantly semi-adjustable type, avoided the commonly occurring occlusal errors, particularly anterior open bite which occur due to eschewing facebow orientation in the clinical practice. The majority of clinicians chose fully adjustable articulators for simple crowns, multiple unit FPDs, and full mouth rehabilitation using FPDs and implants. For three or more crowns, 2 – unit bridges, and three or more unit bridges, where the protrusive and canine guidance is to be recorded, the articulator of choice is the adjustable articulator [13-15]. In the present study, the fully adjustable articulator was the first choice followed by the mean value articulator. Handheld models were sufficient and recommended for simple crowns [13,16]. In the present study, adjustable articulators were opted over the hinge and mean value articulators. Even though sophisticated occlusal adjustments/equilibrations were beyond the undergraduate scope, more than half of the clinicians agreed thoughtfully to adopt adjustable articulators. This is owing to mandatory prostheses corrections/grinding at the time of luting when hinge or mean value articulators were employed. Nevertheless, numerous dental schools have initiated to include clinical dental implantology in the undergraduate program. In the present study, not all clinicians, yet 43.3% of them opted for the fully-adjustable articulator for implant therapy. The clinicians exhibited a positive attitude in knowing the articulator’s requirements, and utility. From the

results obtained, it can be inferred that the clinicians were aware of the existence of adjustable articulators, while some of the clinicians use them occasionally, and very few on regular basis. Concerning the knowledge, a minimal score was observed. It can be attributed to the fact that theoretical emphasis on the evolution, concepts, and programming of adjustable articulators is negligible in the undergraduate curriculum.

Eight questions in the questionnaire were about knowledge concerning the recommendation of the articulator type for each clinical situation. Intriguingly, the clinicians are willing to use the adjustable articulators. The results concerning practice chiefly revealed that, though the clinicians have the knowledge and better attitude towards adjustable articulators, they are reluctant to use them. This could be attributed to limiting factors concerning cost, availability of the equipment, skill of the operator in handling the articulators, transfer of clinical works to a laboratory, the lack of significance and methods of locating true hinge axis, and increased number of patients' count and time-consuming procedures. The fully adjustable articulator is the highly opted articulator for almost all procedures by the clinicians though they might not have used the articulator. The high degree of adjustability permits the articulator to duplicate the complex mandibular movements and may become the choice of articulator prospectively. Despite this, as previously stated, the other articulators also have a conspicuous role in certain dental treatment procedures.

Since the present study had a 100% response rate, the outcomes should be paradigmatic and prototypical of teaching practices in dental schools in and around the Salem district. This presupposes that not only the respondents were totally known about the teaching practices for each given clinical situation but also the questions were precisely interpreted. Questions were not included regarding the programming of an adjustable articulator. Questions concerning types of face bows were also eschewed. Knowledge about recent devices recording true hinge axis is yet to be known. The study should be extended at a state level and further to the national level to arrive at a definitive picture regarding the knowledge, attitude, and practice concerning the articulators' use.

CONCLUSION

Within the constraints of the study, there is a low level of knowledge about the adjustable articulators among the clinicians. However, they exhibit a positive attitude and low interest in practicing with adjustable articulators for various prosthodontic clinical situations.

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