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Evaluation of the Suitability of The Established Standard Height of Occlusal Rim Blocks Among the Dental Clinicians in Makerere University Dental Hospital In Uganda

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Abstract

There's a growing demand for better dental prosthetics that combine function, aesthetics, and comfort. The therapy for edentulous patients can be realized through the use of conventional Removable Complete Dentures (RCDs), implant-supported prostheses, and Computer-Aided Design and Computer-Aided Manufacturing (CADCAM). This study was aimed at evaluating the suitability of the established standard height of ORBs among the dental clinicians in Makerere University Dental Hospital in Uganda. This was a cross-sectional study employing a qualitative approach using purposive sampling. Fifteen (15) participants were selected across social demographics. Thematic data analysis revealed insights into the suitability of the established standard height of ORBs. Interviews were recorded and transcribed and themes were generated to draw deeper meaning for suitability. A qualitative package, Open code version 4.2.1 was used to generate themes from the interviews followed by an interpretation of the data generated, and the result was presented as text and table. The findings revealed a prevalent trend in Uganda where occlusal rim block heights often fall below international standards, emphasizing the need for a patient-centered and individualized approach. There's a positive shift towards new measurements, improving chair-side efficiency, and reducing appointment duration. The findings highlighted economic efficiency, minimizing material wastage, and positively impacting patient-reported outcomes. This study highlighted the need for tailored ORB guidelines for Ugandan edentulous patients for better treatment outcomes. This will save time during the registration stage and help to improve accuracy.

Keywords: *Complete Dentures, Makerere University, Occlusal Rim blocks, Suitability, Standard Height.*

Introduction

According to the World Health Organisation (WHO) [1], the prevalence of edentulism in people aged 20 years and above is 1.8% in Uganda. The demand for esthetic restoration, comfort, and oral function has grown, emphasizing the importance of precise clinical practices. In sub-Saharan Africa, oral health problems greatly contribute to morbidity and in the case of edentulous patients, they lead to the desire to obtain Removable Complete Dentures (RCDs) to reinstate function and esthetics in the most comfortable way [2, 3, 4]. Moreover, apart from the predominant use of conventional RCDs, the therapy for edentulous patients can be realized through the use of implant-supported prostheses, and Computer-Aided

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Design and Computer-Aided Manufacturing (CADCAM) [5, 6].

The fabrication of an RCD entails several steps which include diagnosis, treatment planning, impression taking and border molding, dental model casts, occlusal rim blocks fabrication, bite registration, selection and set up of artificial teeth, wax denture try-in, denture processing and insertion, and patient's follow-up [7]. Occlusal Rim Block (ORB), which is employed in the third stage of denture fabrication consists of a rigid, accurate, and stable denture base and a rim made of a base plate wax. It is used to establish the occlusal plane level, the arch form, and the jaw relationship both horizontally and vertically, i.e. bite registration [8]. In addition, ORBs record the occlusal plane, Lip support, center line, high smile line, vertical dimension, centric relation, canine lines, and neutral zone which are used during the fabrication of the trial dentures and eventually conventional RCD [9, 10]. When ORBs are fabricated without considering the actual anatomical or scientific methodology, can lead to an increase in the clinical time and high chances of inaccuracy [11]. Furthermore, when these rims are made to the right 'average' dimensions and anatomical angles, the registration process is much easier, quicker, and more accurately carried out, but when the height and width of ORB are ignored during fabrication, may lead to restricting the tongue space and encroaching into the cheeks and lips, distorting the denture-bearing area resulting in inaccurate registration of the occlusion and sometimes selecting of slightly wider teeth during setting [9].

Considering the practical aspects, modifications such as the "Modified occlusal table/plane" have been explored to enhance the function of dental prosthetics [12]. Several other studies in different countries to determine the height of ORBs/teeth have been published. McGrane [13] used the unknown number of casts poured from muco-static impressions and found that the distance from the mandibular incisal edge of unworn teeth to the labial mucosal fold next to the lower labial fraenum was 18 mm and for the maxillary counterpart 22 mm, giving a total of 40 mm when mounted together. In Turkey, Yanikoglu [14] found that out of the 45 edentulous patients, the mean distance from the depth of the maxillary mucobuccal/vestibule to the tip of the buccal tubercle of the maxillary and mandibular posterior teeth was 17.2 mm and 16.4 mm, respectively, and Stananought and Newton [15] suggested 20 mm for the anterior upper jaw and 18 mm for the anterior lower jaw. In Uganda, Nono et al [16] on 240 pairs of ORBs, found the mean height for anterior maxillary and mandibular to be 19.4 and 16.4 mm, respectively, while for posterior maxillary and mandibular, 17.4 and 16.0 mm, respectively. Different height measurements of ORBs are reported from studies in different countries including Uganda. However, there is no readily available published literature about their suitability. Therefore, the purpose of the present study was to evaluate the suitability of the established standard height of ORBs previously recorded in Ugandan patients [16] among dental clinicians in Makerere University Dental Hospital in Uganda.

Materials and Methods

Study Design

The study employed a qualitative method of data collection using in-depth key informant interviews.

Study Site

The study was conducted at Makerere University Dental Hospital in Kampala. Kampala is the capital city of Uganda. The hospital is a teaching and health service delivery facility of Makerere University. It is the largest and adequately equipped dental facility employing the highest number of dental specialists in Uganda. It has a well-established prosthetic dental laboratory and offers specialized dental services including

rehabilitation of edentulous patients with RCD including staff and students of the University, and other communities outside the University at a minimal fee. The hospital attends approximately 660 outpatients per month of which about 20 are rehabilitated using RCD (Registry of Dental Records, 2022), the reason for choosing the study site, which could easily raise the required sample size.

Selection of Study Participants

The sample size was determined based on data saturation. The initially targeted number of interviews to be conducted was seven (7) participants, and the final number of interviewed respondents up to data saturation was fifteen (15) participants. A strategy of purposive sampling of key informants was used to collect data in consideration of areas of their expertise. The key informants included both male and female clinicians to ensure gender balance in participants' selection and diminish the possibilities of selection bias in thoughts, ideas, and perceptions. The selection also included variation in duration of practice, level of training, roles in denture fabrication procedures, and fitting to ensure a fair representation of the study population.

Inclusion Criteria

Dental clinicians participating in the provision of removable complete dentures in Makerere University Hospital.

Exclusion Criteria

Dental clinicians who were sick and unable to participate in the study.

Data Collection Procedure

Before participating in the study, written informed consent was provided by the participants. Additionally, participants were provided with confidentiality such that no identifiers like names were used in any reports prepared from the data collected. Dental clinicians attending to edentulous patients carried out an oral examination took the primary and secondary impressions of the patient's arches and sent them to the prosthetic dental laboratory for the technologist to fabricate the ORBs. The dental technologists fabricated two pairs of ORBs: one, the gold standard based on the internationally accepted heights (22 and 18 mm for anterior and posterior maxillary arch, respectively; 18 and 18 mm for anterior and posterior mandibular arch, respectively) [17], while the second one was made based on the newly estimated height (19.4 and 17.4 mm for anterior and posterior maxillary arch, respectively; 16.4 and 16.0 mm for anterior and posterior mandibular arch, respectively [16]. The clinicians carried out bite registration on the patients using both pairs of ORBs to achieve a freeway space of 2-4 mm. They also took part in the in-depth interview (IDI) using an interview guide to establish the suitability of using the newly estimated height of the ORBs in comparison to the internationally accepted standard height, i.e. the gold standard. With the suitability of ORBs, the investigator explored clinicians' views regarding how easy/hard it is to use the ORBs with new estimated height values, the duration involved to achieve bite registration to determine the free-way space of 2 to 4 mm, fitting ability, and how much height of wax was trimmed/added to attain the required harmonious bite registration. The in-depth interviews involved taking notes and audio recordings. The interview took between 30 to 45 minutes by a trained research assistant who is a social scientist with experience in qualitative research. After data collection, every tool that was filled out was verified again every day with utmost care toward consistency.

Quality Control

The data collection tools were pretested by the principal investigator and amendments were made to improve their validity and reliability. The research assistants were trained in data collection. The IDIs were audio-recorded to capture any discussion that may have been

missed in taking notes. Additional notes capturing body language and gestures during the interviews were taken by the trained research assistant.

Data Management and Analysis

Transcription of the audio recordings was handled by a person experienced in qualitative research. The English grammar mistakes were also corrected before the end of the interview. This was to ensure that good quality information is collected and is also kept in context. All soft copies of the transcripts were backed up on an external device and in Google Drive with password protection. The hard copies were kept under lock and key and only accessible to the investigating team. Open code software, version 4.2.1 was used to generate themes from the interviews, coded and transcribed. The results were presented as text and in a table.

Ethical Consideration

Ethical approval of the protocol was obtained from the Makerere University School of Health Sciences Research Ethics Committee (Reference Number: MAKSHSREC-2023-486) as well as the Uganda National Council for Science and Technology (Reference Number: HS3092ES). Permission to carry out the study was obtained from the administration of Makerere University Dental Hospital. Written informed consent was obtained from all the participants who took part in the study. The purpose of the study was explained to the participants and their participation was voluntary. Their agreement to participate in the study did not waive their rights in any way and this was in accordance with the Helsinki Declaration [18]. All the data collected was kept securely in a cabinet under lock and key and only accessible to the investigator.

Results

The study involved fifteen (15) participants with varying demographic characteristics (Table 1). All the participants had a Bachelor of Dental Surgery degree: 9 were registered dental surgeons and 6 interns. Eleven participants had 0 to-5 years of professional experience category while 4 were dental surgeons with 6- 10 years' experience. Participants' ages ranged from 24 to 39 years old. All the fifteen (15) individuals participated in the Key Informant Interviews (KIIs) (Table 1).

Table 1. Socio-Demographic Characteristics of the Study Participants (n=15)

Participant	Age	Sex	Professional Status	Years of Experience
1	27	Male	Dental Surgeon	0-5
2	27	Male	Dental Surgeon	0-5
3	33	Male	Dental Surgeon	0-5
4	24	Female	Dental Intern	0-5
5	39	Male	Dental Surgeon	6 -10
6	33	Male	Dental Surgeon	6 -10
7	33	Male	Dental Intern	0-5

8	38	Male	Dental Surgeon	6 -10
9	28	Male	Dental Intern	0-5
10	30	Male	Dental Intern	0-5
11	38	Male	Dental Surgeon	6 -10
12	26	Male	Dental Intern	0-5
13	33	Male	Dental Surgeon	0-5
14	27	Female	Dental Surgeon	0-5
15	26	Female	Dental Intern	0-5

Themes from the Study

The findings were summarized into two (2) main thematic areas, each with sub-themes:

Theme 1: Dentists' Experience With Using the Internationally Accepted Height of Orbs During Bite Registrations

Experience with Determining Freeway Space of 2-4 mm for Edentulous Patients Using the Internationally Accepted Standard Height of ORBs

The study participants highlighted that they employed speech and pronunciation exercises as central methods for evaluating the 2-4 mm freeway space. This patient-centered perspective goes beyond traditional clinical measurements, emphasizing patients' comfort. One respondent articulated this approach, stating that: *"Normally, I have been using words or speech by asking the patients to pronounce out some words or letters" (Participant 1).*

Regarding occlusion functionality and comfort, a participant noted:*" Freeway space is got by the difference between the occlusion vertical dimensions at rest and after swallowing" (Participant 3).*

A similar observation was also made that: *"…by determination of freeway space of 2-4 mm as per the calculations, it's got by subtracting the measured distance in millimeters between the occlusion vertical dimensions at rest and in occlusion." (Participant 4).*

It was noted that clinicians integrate both clinical and mathematical approaches to determine the 2-4 mm freeway space. One participant revealed: *"…What I used to do, was using a difference between vertical dimension at occlusion (VDO) and vertical dimension at rest (VDR). So, you get the difference between the two by getting VDR minus VDO. So, that's how you get the free-way space" (Participant 5).*

Influence of the Internationally Accepted Standard Occlusal Rim Block Height in the Treatment of Edentulous Patients

Clinicians acknowledged the influence of international guidelines (ORBs made with 22 and 18 mm for anterior and posterior maxillary arch, respectively; 18 and 18 mm for anterior and posterior mandibular arch, respectively) but emphasized the importance of tailoring the ORB's height to individual cases. The findings revealed that ORBs play a crucial role in treatment success, impacting various aspects including jaw relations, tooth size, height determination, the establishment of the neutral zone, and freeway space. As one participant

observed, the impact of ORB height is evident in its significant influence on the success of edentulous patient treatment: *"The height of the occlusal rim block significantly influences the success of edentulous patient treatment. It plays a pivotal role in achieving the multifaceted goals of prosthetics, including occlusion, functionality, and patient comfort. The height becomes integral to creating dentures that fulfill their intended purposes" (participant 1).*

The study highlighted that the standard international ORB heights do not offer a one-size-fits-all and that different patients require different occlusal rim heights. This emphasizes the importance of considering each case independently, as explained below: *"Different patients require different heights of occlusal rim blocks, emphasizing the importance of considering each case independently. The international standard heights may not practically work for all cases, and in my setting, most heights are below those standards, typically in the range of 17 for upper anterior and 15 to 16 for lower mandibular anterior" (participant 3).*

The findings revealed a trend in their setting, where heights often fall below international standards, implying the significance of individualized approaches in determining optimal heights of ORBs. One participant narrated: *"the heights of occlusal rim blocks wield too much influence. not every case would require the same height as the international standard heights are so, it depends on which case to me, but in most cases, they are always in about 17 mm for the upper anterior height, and to me, it is 15 mm to 16 mm on the lower mandibular anterior height from the vestibular/sulcus to the occlusal surface" (Participant 4).*

Experience in Using the International Guidelines in Making Occlusal Rim Blocks for Treating Edentulous Patients

Dental clinicians reported that they faced difficulties in implementing international guidelines, leading to time-consuming adjustments and compromises in patient comfort, and therefore recommended more localized standards, which reflects the need for guidelines tailored to the Ugandan population and which take into account the variations in dental anatomy and patient preferences. This is highlighted in the example below: *"Definitely in Ugandan setting, the clients we have, most of them are not of that value. So, we use extended time to adjust the rims and then have something better" (Participant 3).*

Impact of Using the International Guidelines on Time and Resources During Clinical Practice

Dental clinicians expressed the need for updated guidelines as the existing ones posed challenges in meeting the expectations of Ugandan patients. The negative impact on chair-side time, material wastage, and patient satisfaction called for a reconsideration of the standard height. As narrated by the participant in the examples below: *"I think the old guidelines, most of our clients, would not fit into those guidelines and measurements. we probably need to change to have new guidelines or new measurements so that we don't have to go through a lot of adjustments doing let's say the bite registration" (Participant 1).*

"The impact is there because I am going to waste material, I am going to waste time reducing on the occlusal rims. the impact is negative, and I am happy that we are doing this research because we are going to reduce the impact" (Participant 3).

The challenges related to chair-side time and frustration are noted with the occlusal rim blocks made using the international guidelines, as one participant noted: *"It makes my chair-side time a lot, then you're losing more resources because that's wasted work that you're going to discard. as a doctor you are frustrated, at times you end up having more visits for the patient and also yourself" (Participant 7).*

Challenges and Complaints With the Previous Measurements of Orbs Height (Internationally Accepted Standard Height of Orbs)

The study revealed a range of perspectives on the implementation of ORB guidelines. Dental clinicians reported that they faced challenges in delivering removable complete dentures fabricated using the internationally accepted standard height of ORBs hence necessitating post-delivery adjustments to enhance patient satisfaction. Patient feedback, though limited, suggested potential benefits and improvements with the newly established standard height of ORBS, as shown in the examples below: *"It was tricky because it was not definite, there was a lot of guesswork and testing here and there. sometimes the clients will need the whole process to be repeated so sometimes there is a lot of discomfort and dissatisfaction of the client." (Participant 2).*

Theme 2: Dentists' Experience With Using the New Estimated Height of Orbs During Bite Registration

Awareness and Adoption of the Newly Estimated Height of Occlusal Rim Blocks That Has Been Measured Among Local Patients

The study highlighted a positive shift in dental clinicians' acceptance of new estimated ORB heights, resulting in enhanced chair-side efficiency and reduced adjustment needs during bite registration. *"I think this is more efficient. because I am doing it all the time and I think it also depends on the patients, but it looks better" (Partpatients, 2).*

Clinicians particularly expressed contentment with the adoption of new occlusal rim block heights, incorporating individualized instructions for technicians. They also reported minimal adjustments, particularly in the posterior region, leading to significant time savings. The preference for localized measurements was also emphasized, highlighting the difficulties faced with previous guidelines requiring constant adjustments. An example is given below: *"The clients/patients are appreciating that they are no longer taking a lot of time on the chair than they used to take. they appreciate that we are becoming more advanced and more learned because we are doing what they want. they are referring more clients to us" (Participant 3).*

"With experiences that I have gone through, I have adopted that because it is showing accurate kind of occlusion bites to a patient because of minimal reduction compared to the ones which are already documented" (Participant 7).

The study participants acknowledged a significant change in the characteristics of the ORBs, emphasizing increased efficiency. They said that clients/patients appreciated the reduced chair-side time and viewed the adoption of new guidelines as a sign of advancement. The study also highlighted the importance of localized measurements catering to the specific needs of the Ugandan population. *"I think it's a great change, the measurements that they are currently following in the laboratory, of course, they are different. So, there is a great change in the rims that we are now receiving from the lab" (Participant 1).*

However, as pointed out by one participant, the move towards an established standard height introduces challenges in reconciling standardized measurements with individual patient needs. For instance, one participant highlighted the challenge of quickly learning and implementing the new guidelines: *"I have not fully adapted to it because it's a new system, but the few edentulous patients I got, it works well" (Participant 5).*

Treatment Outcomes and Patient Satisfaction With the Use of the Newly Established Height of Occlusal Rim Blocks

The qualitative analysis revealed positive sentiments towards the adjustment to the new estimated height of ORBs. Dental clinicians

reported improved treatment outcomes, reduced adjustment time, and enhanced patient comfort. *"I believe the new measurements are now of great advantage because even after delivery or post-delivery of our dentures, we have not received a lot of complaints from the patient" (Participant 1).*

The shift to the new measurements was associated with increased patient satisfaction, reduced chair-side time, and efficient treatment processes. Clinicians appreciated the accuracy of the newly established standard height of ORBs and its potential impact on business growth. Time efficiency emerged as a prominent theme in the narratives, with clinicians highlighting the reduced time spent on adjustments and post-insertion visits. The findings further highlighted that the adoption of new measurements had proven highly advantageous, with dental clinicians noting a significant lack of post-delivery compliments or complaints from patients. One participant emphasized the enhanced accuracy and absence of guesswork, predicting a prosperous future for the practice due to increased precision and overall patient comfort.

"It's more accurate and there is no guesswork here, you just look at exactly what is in the patient's mouth. there will be a lot of business in the future. Automatically, there is more comfort here than before" (Participant 2).

Another participant highlighted the anticipation of better treatment outcomes and simplified chair-side work, ultimately making procedures significantly easier. Patients, on the other hand, expressed satisfaction with the streamlined chair-side experience, leading to a positive impact on referral patterns. Dental clinicians observed a rise in referrals, attributing it to improved treatment outcomes and more straightforward chair-side procedures. The positive feedback from clients reinforced the effectiveness of the new ORB measurements as explained below: *"The clients are appreciating that they are no longer taking a lot of time on the chair than they used to take. they are referring more clients to us" (Participant 3).*

"Time, you take little time and chair-side time from the time once you have done a good job in the lab clinically you don't have a lot of time, so you take limited time, it saves a lot of time" (Participant 6).

Clinical Time and Resources with the Use of the Newly Established Standard Height of Occlusal Rim Blocks

The qualitative analysis highlighted the positive impact of the newly estimated standard height of ORBs on clinical time and resources. Clinicians reported a significant reduction in chair-side time, attributing it to fewer adjustments and streamlined processes. The efficient use of time was complemented by the positive feedback from patients who experienced enhanced comfort with the new prosthesis. The findings emphasized the potential for improved resource utilization, with reduced material usage leading to cost savings. Participants further highlighted the positive effect of new measurements on clinical time and resources. One participant observed that: *"Clinical time has reduced now that, of course, we don't make a lot of adjustments, so the appointments are shorter" (Participant 1).*

This sentiment was echoed by another participant, who emphasized the noticeable reduction in appointment duration and improved measurements, noting patients' increased comfort and satisfaction with the prosthesis as explained below: *"They are very comfortable, they are talking well, they are having their masticatory muscles not overstrained, and the complaints they used to have of ulcers, wounds, they are reducing drastically" (Participant 4).*

Furthermore, participants acknowledged the economic benefits associated with the new measurements. This economic advantage was further emphasized by the observation that lower dimensions led to reduced material usage, contributing to cost savings in dental

procedures. One clinician noted that: *"The cost is lowered because if I am having a higher dimension I am using more materials, if I am reducing the dimension, it means reducing the amount of materials I am using, meaning that the cost of production is also lowering" (Participant 6).*

How have the New Measurements Impacted Managing Edentulous Patients

The qualitative analysis revealed that participants were positive toward the adjustment to the newly estimated height of ORBs. Dental clinicians reported improved treatment outcomes, reduced adjustments, and enhanced patient comfort. The shift to the new measurements was associated with increased patient satisfaction, reduced chair-side time, and efficient treatment processes. Clinicians appreciated the accuracy of the new system and its potential impact on business growth. Time efficiency emerged as a prominent theme, with clinicians highlighting the reduced time spent on adjustments and post-insertion visits. *"I believe the new measurements are now of great advantage because even after delivery or post-delivery of our dentures, we have not received a lot of complaints from the patient" (Participant 1).*

"The clients are appreciating that they are no longer spending a lot of time on the chair than they used to take. they are referring more clients to us" (Participant 3).

Any Barriers, Limitations, and Recommendations Associated with Adopting Locally Measured Height of Occlusal Rim Blocks

The qualitative analysis revealed a positive reception of the new measurements among dental clinicians. Recommendations by the participants focused on encouraging dentists to adopt the new measurements, emphasizing the potential for improved efficiency and better patient outcomes. Suggestions included the need for comprehensive research that considered both the height and width of ORBs. Clinicians particularly expressed the desire for practical implementation, such as incorporating video documentation during the bite registration process. *".there are two things, the new findings would be great to us if they are going hand in hand with the width of the rims because we shall look at the height well, we shall get the occlusal vertical dimension, but we also need to find the size of the teeth that we use on these rims" (Participant 5).*

"Not so much just may be pushing for documentation of these and trying to share this information as wide as it can because I believe the majority of the practitioners don't know about it yet or they could know about it, but they are just waiting for that documented evidence to support it or to back up their practice" (Participant 6).

Discussion

This was a cross-sectional study employing a qualitative approach using purposive sampling to evaluate the suitability of the established standard height of ORBs among the dental clinicians in Makerere University Dental Hospital in Uganda. The goal was to generate findings that could be used to formulate strategic planning in the treatment of edentulous patients and the training of dental students. To our knowledge, there is no published information regarding the suitability of the determined height of ORBs for Ugandan edentulous patients. The present study established the baseline data of the suitability of the estimated standard height of ORBs among the dental clinicians who were purposively selected. The present findings will inform policymakers in reviewing existing guidelines in fabricating ORBs that are suitable for Ugandan edentulous patients [17].

The Study highlights the consideration of practices related to the 2-4 mm freeway space for edentulous patients in the established standard height of ORBs. This patient-centered approach incorporates speech dynamics and

directly influences denture wearers' satisfaction and adaptation. This aligns with previous research by Mishra et al., [19] that urged that changes in Occlusal Vertical Dimension (OVD) certainly affect functional activities such as chewing and speech due to their intrinsic relationship with the freeway space and the speaking space indicating the variability in adapting to new dentures and the influence of speech on patient experience. The present study further aligns with the broader literature that recognizes occlusion as a key determinant of prosthodontic success, impacting aesthetics, speech, and overall patient satisfaction [20]. Participants were observed to integrate both clinical (patients' pronunciation of words like Church, Mississippi, Musisi, Nalumansi, and then count from 50 to 70 with the close watch when they say 66 and 55) and mathematical approaches which involve getting the difference between Rest Vertical Dimension (RVD) and Occlusal Vertical Dimension (OVD), (RVD-OVD) when determining the 2-4 mm freeway space. This is in line with the recommendation made by Driscoll & Golden [21], that height can be confirmed by having the patient pronounce words that have fricative sounds (55 or any words with F and V sounds). Have the patient count from 50 to 60 and watch closely when they say 55. This comprehensive method indicates a multifaceted approach, considering both qualitative clinical assessments and quantitative measurements. Such integration leads to accurate evaluation and enhances the precision of determining freeway space for optimal denture function [22].

The participants in the present study acknowledged the impact of international guidelines while emphasizing the need to tailor the ORB height to individual cases. Indeed, such a perspective is in support of previous studies [23] on the OVD for complete dentures, which stress the importance of individualized approaches in achieving treatment success.

The present study highlighted a trend where the height of ORB in the Ugandan setting often falls below international standards. This is in line with other studies [24, 25, 26, 8,16] where most heights range from as low as 17 mm for the upper anterior to 15-16 mm for the mandibular anterior. Similarly, Gupta [27] emphasizes the significance of considering each case independently, aligning with the principle of patient-centered care. In addition, a study by Esan et al., [28] emphasized the importance of adapting to the ORB heights guidelines to cater to diverse populations. Furthermore, the difficulties highlighted in our study resonate with Bishop's [11] study on designing ORBs to save clinical time and improve accuracy where designing ORBs is based on facial measurements and analysis of existing dentures, acknowledging the need for personalized approaches. The call for more localized standards in our study aligns with findings from other regions, emphasizing the customization of the lower ORB height to patients' esthetic requirements [29]. The study's argument for tailored guidelines is further supported by the challenges clinicians face, as highlighted in the examination of mandibular edentulous bone height, where patient satisfaction is a critical aspect impacted by anatomical considerations [30].

The negative impact on chair-side time and material wastage is aligned with the findings of the Uganda Dental Association Journal, which discusses the clinical effectiveness of new surgical approaches [31]. The study has revealed that there are mixed reactions and limited experience with the new measurements to necessitate a comparison and some participants also noted that not being aware of the new measurements will impact positively on the treatment of edentulous patients since there were few patients seen yet to make a concrete conclusion. The study highlighted a positive shift in dental clinicians' acceptance of the newly estimated ORB heights, emphasizing improved chair-side efficiency and reduced

adjustment needs during bite registration. However, this transition towards an established standard height brings forth challenges in aligning standardized measurements with individual patient needs, as noted in the study considering African morphology and the time-saving benefits of adopting locally derived measurements. The adoption of new measurements is a game-changer, addressing concerns raised by dental clinicians reshaping patient experiences, and aligning with patient-reported outcome measures [32]. The positive impact on referral patterns reinforces the findings, as patient satisfaction often influences their likelihood to recommend services to others.

The positive effect of new measurements on clinical time is evident in the reported reduction in appointment duration, echoing the significance of time management in dental settings reported in [33]. This further correlates with a study emphasizing the importance of efficient procedures in enhancing overall dental practice outcomes [34]. Our study emphasizes the cost-saving benefits associated with lower dimensions and reduced material usage aligning with Smith et al., emphasizing the economic efficiency of dental procedures and the importance of minimizing material wastage in dental practice [35]. Most participants emphasized that the ORBs should be fabricated while considering the individual and anatomical features of the edentulous patients, not forgetting the right dimensions, angles, and measurements. This is in line with the recommendation made by Wood and John. They emphasized that when the rims are made to the right 'average' dimensions and anatomical angles, the registration process is much easier, quicker, and more accurately carried out, but when the height and width of ORB are ignored during fabrication, this may lead to the ORBs restricting the tongue space and encroaching into the cheeks and lips, distorting the denture-bearing area hence movements of the rims during registration, resulting in inaccurate registration of the occlusion and sometimes selecting of slightly wider than the teeth they will eventually carry [9].

Implications for Clinical Practice

The present study showed that the newly localized ORB height for patients in Uganda has the potential to improve patient management as well as the development of more tailored and effective clinical protocols for edentulous patients. Furthermore, the findings of the present study among the Ugandan population will set the center stage for improved rehabilitation of edentulous patients. This will save time and resources during the registration stage and help to improve the accuracy of the removable complete dentures.

Implications for Future Research

Building on the study's observation of ORB heights often falling below international standards in the Ugandan setting, future research should explore the effectiveness of individualized treatment approaches that correlate between individualized ORB heights and patient satisfaction to provide valuable insights into optimizing treatment outcomes in diverse populations.

Limitations of the Study

This study relied on the self-response of participants, and it was facility-based, participants who were interviewed might have given responses favoring the healthcare provider resulting in social desirability bias. In addition, the study centered in Makerere University Dental Hospital, Kampala, Uganda, may face limitations in generalizability to the Ugandan edentulous population, and other cultural and demographic contexts.

Recommendations

The study findings advocate for a comprehensive understanding that goes beyond standard height considerations but also looks at incorporating tooth size alongside the occlusal

vertical dimension. Furthermore, participants advocated for increased documentation and knowledge-sharing within the dental community.

Conclusion

Being able to assess/evaluate the clinical suitability of a patient's established ORB height will allow ORBs to be constructed that have the correct dimensions and anatomical features for a particular patient. This will save time during the registration stage and help to improve accuracy. The study supports the adaptation to tailored ORB guidelines, emphasizing improved treatment outcomes, patient satisfaction, and efficient utilization of clinical time and resources in dental practice. There is still insufficient understanding concerning the new standard height of ORBs within the dental community. This kind of tailored set of guidelines can only be adhered to successfully after the gap in awareness has been bridged.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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Author's Contributions

DN, IO, BNS, and CMR participated in the conception, study design, data analysis, and manuscript preparation. DN and GB participated in data collection. All authors read and approved the final manuscript.

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