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Evaluating Lingual frenum- lower incisal edge distance as a pre-extraction landmark in Jordan population

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Abstract

Background: Prosthodontic treatment planning in edentulous patients requires precise determination of occlusal dimensions, particularly in the mandibular arch where distinct landmarks are lacking. This study aimed to investigate the average distance between the lingual frenum and mandibular incisal edges in Jordanian patients to aid in pre-extraction records.

Methods: A total of 126 patients aged between 40 and 60 years with lower partially edentulous ridges and poorly diagnosed lower anterior teeth attended the prosthodontic clinic at Princess Haya Bint Al-Hussein Military Hospital "in Ajloun First, a lower alginate impression was taken in the clinic and then it was poured into a dental cast. Subsequently, the distance between the lingual frenum and the mandibular incisal margins was measured on the dental cast using a standardized vernier caliper. Descriptive statistics and the Shapiro-Wilk test were employed for data analysis.

Results: The results showed a standard deviation of 1.58 millimeters; the mean distance was 9.39 millimeters between the mandibular incisal edges and the lingual frenum. Despite the non-normal distribution of the data ($p < 0.001$), the central tendency measurements provide reliable estimates. The range of distances varied from 6 to 14 millimeters.

Conclusion: This study offers valuable insights into the distance between the lingual frenum and mandibular incisal edges in Jordanian patients, aiding in prosthodontic treatment planning. Despite data non-normality, the findings provide a reference point for determining occlusal rim height and incisor setting. Further research is warranted to explore additional factors influencing mandibular prosthetic rehabilitation outcomes.

Keywords: Prosthodontics; Mandibular Arch; Vertical Dimension Relations; Lingual Frenum; Complete Denture Construction; Jordanian Population

1. Introduction

Navigating the complexities of vertical relationships in edentulous patients presents a tough challenge for prosthodontists, as the absence of natural teeth complicates the determination of ideal occlusal dimensions. While the maxilla benefits from the presence of stable anatomical landmarks, such as the incisive papilla, facilitating precise measurement and reproduction of occlusal dimensions, the mandible lacks such distinct references. This absence of definitive landmarks in the mandibular arch poses a significant clinical problem, forcing clinicians to resort to alternative methods and subjective judgment to achieve satisfactory outcomes in prosthetic rehabilitation[1]. The incisive papilla serves as a dependable landmark in the maxilla due to its stability and consistent anatomical location[2]. Its presence allows for accurate determination of occlusal dimensions, facilitating the creation of prostheses that

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seamlessly integrate with the patient's oral anatomy and functional requirements[2]. On the other hand, the absence of a corresponding landmark in the mandible poses challenges for establishing vertical relationships, increasing the need for subjective evaluations that yield less predictable results[3].

In mandibular edentulism, prosthodontists often struggle to precisely calculate the optimal centric relation (CR) and vertical dimension of occlusion (VDO) [1,4]. Inaccuracies during the prosthesis fabrication process are more likely to occur when there is not a clear point of reference. These inaccuracies could result in occlusal inconsistencies, compromised aesthetics, and reduced patient satisfaction. Achieving ideal occlusal relationships in the mandible is further complicated by differences in soft tissue architecture and residual ridge shape[5]. Despite these challenges, prosthodontists employ various techniques and strategies to surmount the limitations posed by the absence of distinct landmarks in the mandible[6]. These may include leveraging functional assessments such as phonetics and facial measurements to guide occlusal rim fabrication[7], alongside the utilization of adjustable articulators to simulate mandibular movements and optimize prosthetic fit and function[3,8]. By delving into the intricacies of establishing vertical relationships in mandibular edentulism and scrutinizing current methodologies and challenges[9], this manuscript attempts to provide insights into enhancing clinical decision-making and improving the predictability and precision of prosthetic interventions[10]. Through a comprehensive understanding of the factors influencing occlusal relationships in the mandible[11], clinicians can refine treatment planning and execution, ultimately culminating in enhanced patient outcomes and satisfaction in prosthetic rehabilitation[12,13].

2. Methods

This study was conducted in Princess Haya Bint Al-Hussein Military Hospital in Ajloun as a cross-sectional observational study over 5 months, from 8 August 2025 to November 2025. The study recruited 127 patients who met specific inclusion criteria, targeting individuals with lower partially edentulous ridges and poorly diagnosed lower anterior teeth. This study represented a diverse demographic, ranging from 40 to 60 years of age, referring to the prosthodontic clinic in the dental department of Princess Haya Bint Al-Hussein Hospital. The study's gender distribution was properly balanced, with 78 males (61.4%) and 49 females (38.6%), ensuring a full representation of both sexes. The selection procedure was designed to include a wide range of patients commonly seen in clinical settings, increasing the findings' applicability to the larger Jordanian population.

Patient selection adhered to rigorous inclusion criteria, emphasizing the presence of lower partially edentulous ridges and poorly diagnosed lower anterior teeth. These criteria were meticulously applied to ensure homogeneity within the sample while encompassing a range of clinical presentations commonly encountered in prosthodontic practice.

First, informed consent was obtained to ensure patient privacy. Next, an alginate lower impression was taken, with patients instructed to elevate the tip of the tongue to touch the incisive papilla of the hard palate, ensuring standardized positioning and minimizing variability. Subsequently, the impression was poured to construct a lower dental cast. Finally, measurements were meticulously taken on the dental cast from the lingual frenum to the mandibular incisal edges by trained dental professionals using standardized calipers. To minimize variability and ensure consistency and accuracy in data acquisition, all measurements were recorded in millimeters, adhering to established standards in dental metrology using a Vernier caliper (Figure 1).

Descriptive statistical analyses were conducted to clarify key findings from the collected data. The mean distance between the lingual frenum and mandibular incisal edges was calculated to be 9.39 millimeters, providing a central tendency measure indicative of the average distance within the sample. Furthermore, information about the dispersion or variability of the data around the mean was provided by the standard deviation, which was found to be 1.58 millimeters. Calculating the 95% confidence interval from the mean and standard deviation allowed us to determine a range within which we can be 95% confident that the genuine populations mean lies. The sample population's observed range of distances was further contextualized, with a minimum of 6 millimeters and a maximum of 14 millimeters.

The comprehensive statistical analyses conducted offer valuable insights into the average distance and variability observed in the sample (Figure 2). These findings serve as a foundation for establishing guidelines for mandibular occlusal rim height and incisor setting in complete denture construction, thereby enhancing clinical decision-making and improving treatment outcomes for edentulous patients within the Jordanian population.

3. Results

The data distribution of the distance between the lingual frenum and the mandibular incisal margins in this study deviated significantly ($p < 0.001$) from a normal distribution, according to the results of the Shapiro-Wilk test. This suggests that the measured distances did not follow the expected typical bell-shaped curve of a normally distributed dataset. The presence of outliers, measurement mistakes, or population variability all have the potential to cause non-normality in the data distribution. The non-normal distribution in this study implies that there was an uneven distribution of the distances between the mandibular incisal margins and the lingual frenum around a central tendency.

Despite this deviation from normality, the study continued with descriptive statistical analyses to clarify important findings concerning the separation between the mandibular incisal edges and the lingual frenum in the sample of 127 patients who had lower partially edentulous ridges and poorly diagnosed lower anterior teeth. The mean distance between the lingual frenum and mandibular incisal edges was calculated to be 9.39 millimeters, with a standard deviation of 1.58 millimeters (Table 1). Despite the non-normal distribution, the mean serves as a central measure indicative of the average distance within the sample population. Although the 95% confidence interval for the mean distance was not explicitly reported in the study, it can be calculated using appropriate statistical methods. Additionally, the range of distances observed within the sample population varied from a minimum of 6 millimeters to a maximum of 14 millimeters. The median distance, calculated to be 8.9 millimeters, provided a measure of central tendency that closely aligned with the mean, suggesting a relatively symmetrical distribution of measurements despite non-normality (Table 2). These results, despite the departure from normality, offer valuable clinical guidance for prosthodontic treatment planning and execution in the Jordanian population. The comprehensive analysis of measurements provides a robust foundation for establishing guidelines aimed at optimizing treatment outcomes and enhancing patient satisfaction in edentulous patients. Further research may be warranted to explore potential factors contributing to the non-normal distribution observed in the sample population.

Emphasizing the new and important aspects of the study, our investigation focused on elucidating the distance between the lingual frenum and mandibular incisal edges in a cohort of Jordanian patients with lower partially edentulous ridges and poorly diagnosed lower anterior teeth. Notably, this study provides novel insights into a crucial aspect of prosthodontic treatment planning specific to the Jordanian population, addressing a significant gap in existing literature.

A minor gender difference exists in the average distance between the mandibular incisal margins and the lingual frenum: males have a slightly higher mean distance of 9.56 millimeters compared to females, whose mean distance is 9.12 millimeters (Table 3). This suggests a tendency for slightly greater separation in males based on a marginal anatomical variance. Despite this variation, the standard deviation of measurements is comparable between genders, indicating similar variability around the mean. These subtle differences between genders highlight how crucial it is to take individual anatomical variances into account when designing prosthodontic treatments, especially regarding incisor placement and mandibular occlusal rim height when constructing complete dentures for Jordanians.

Overall, the findings underscore the mean distance of 9.39 millimeters between the lingual frenum and mandibular incisal edges, offering a valuable reference point for clinicians in determining mandibular occlusal rim height and incisor setting for complete denture construction. Despite the non-normal distribution of the data, the central tendency measures provided reliable estimates for guiding clinical decision-making, contributing to enhanced treatment precision and patient satisfaction. These results have implications that extend beyond the scope of this investigation and lay the groundwork for further studies and prosthodontic clinical practice. The observed variation in distances emphasizes the significance of customized treatment planning that considers soft tissue architecture and residual ridge morphology. Furthermore, additional research into the causes of the non-normal distribution seen in our sample population may provide insightful information that may help improve treatment plans and outcomes for edentulous patients. While this study offers valuable contributions to the field, several limitations must be acknowledged. The non-normal distribution of the data warrants caution when generalizing the findings to broader populations. Additionally, the sample size may limit the generalizability of the results, necessitating validation in larger cohorts. Future research endeavors could explore correlations between lingual frenum morphology, mandibular arch dimensions, and clinical outcomes, further enhancing our understanding of mandibular prosthetic rehabilitation.

Figure 1 Measurement of the Vertical Distance Between the Lingual Frenum and Mandibular Incisal Edges. The image illustrates the standardized technique using a VC to measure the distance on a lower dental cast. The measurement is taken from the anatomical lowermost point of the LF (replicated in the alginate impression) to the MIE. This measurement serves as a biological landmark for determining the height of the mandibular occlusal rim

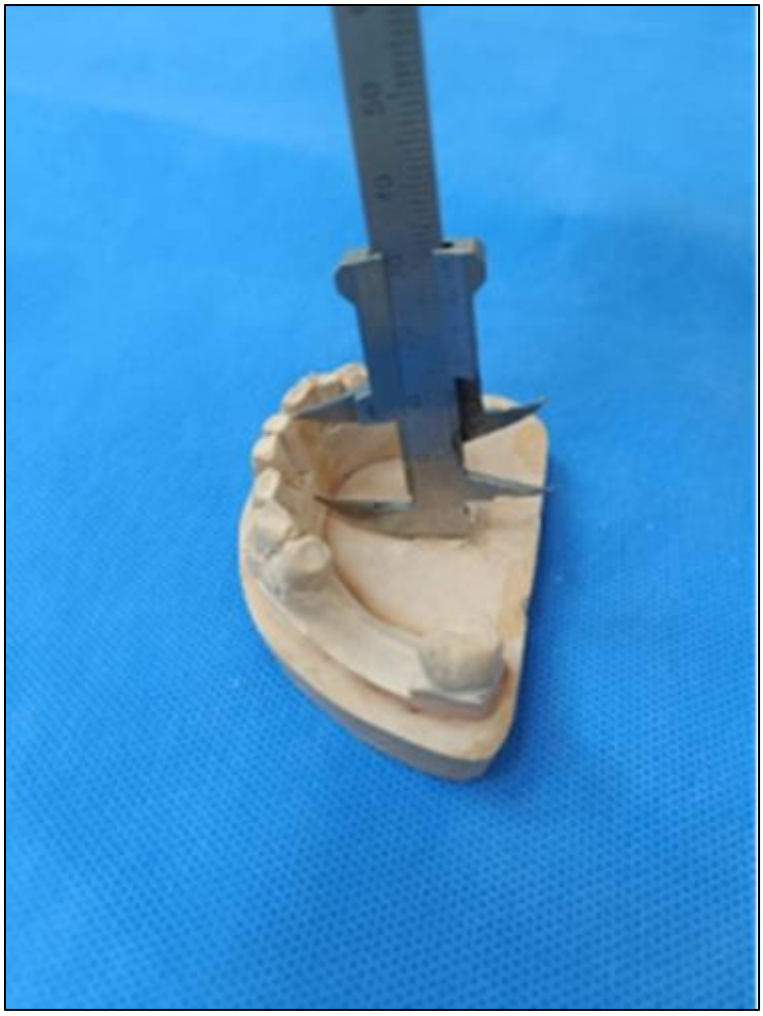

Figure 2 Statistical Distribution of the Measured Vertical Distance ($n = 127$). The data represents the findings from the PHBHMH patient cohort. The Mean distance was recorded at 9.39 mm ($\pm$ 1.58 mm SD), with a total range of 6 mm to 14 mm. The 95% CI indicates the high level of confidence in the population mean, providing a foundational metric for CD construction and incisor setting in the Jordanian population.

Table 1 Descriptive Statistics for Lingual Frenum-Incisal Edge Distance (LF-IE Distance) in the Total Sample (N=127)

Statistic	**Abbreviation**	**Value**	**Unit**
Sample Size	N	127	--
Mean	M	9.39	mm
95% Confidence Interval for Mean	95% CI	9.11 - 9.66	mm
Median	Mdn	9.00	mm
Standard Deviation	SD	1.58	mm
Minimum	Min	6.00	mm
Maximum	Max	14.0	mm
Range	--	8.00	mm

Legend: LF-IE Distance = Distance between the lingual frenum and mandibular incisal margin. Data distribution was non-normal (Shapiro-Wilk test, $p < 0.001$).

Table 2 Gender Distribution of the Study Sample

Gender	Abbreviation	Count	% of Total	Cumulative %
Female	F	49	38.6%	38.6%
Male	M	78	61.4%	100.0%

Legend: Table shows the gender composition of the cohort of Jordanian patients with lower partially edentulous ridges and poorly diagnosed lower anterior teeth.

Table 3 Descriptive Statistics for LF-IE Distance by Gender

Statistic	Gender	Value (mm)
Mean (SD)	Female (F)	9.12 (1.55)
	Male (M)	9.56 (1.58)
Median	Female (F)	9.0
	Male (M)	10.0

Legend: LF-IE = Lingual Frenum to Mandibular Incisal Edge. Males showed a slightly greater mean distance compared to females. Standard Deviations (SD) were comparable between groups.

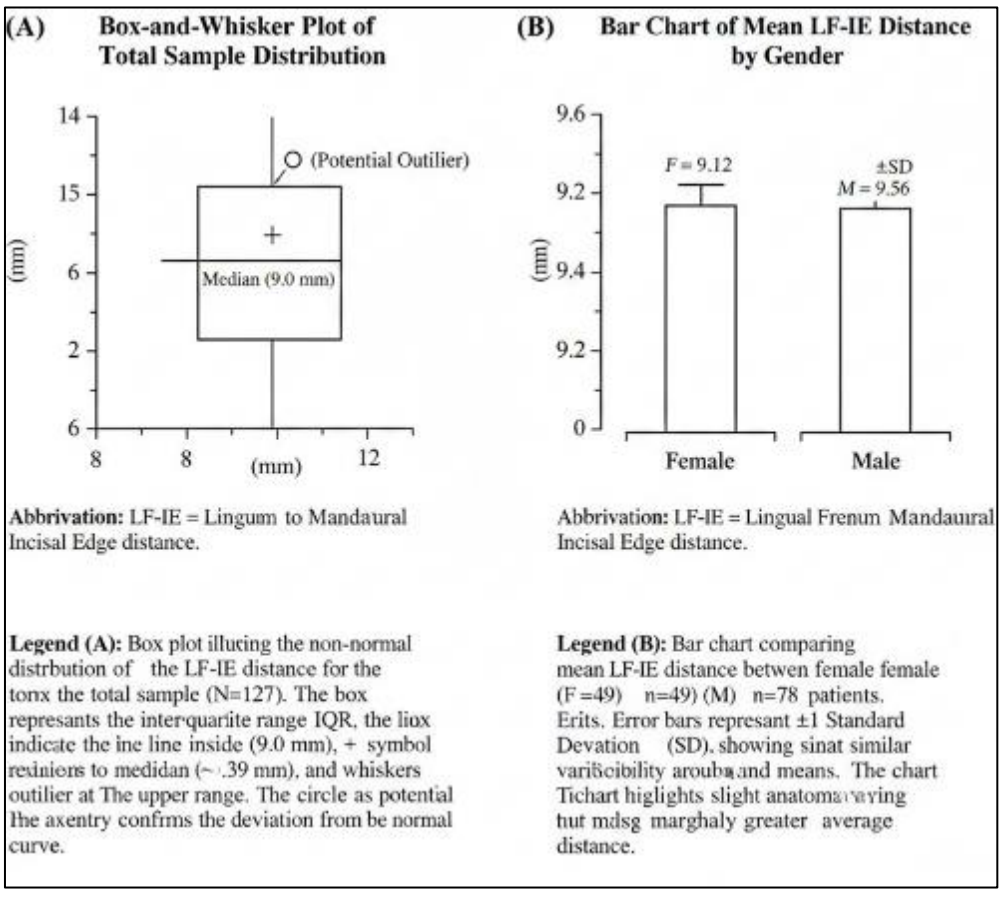

Figure 3 Graphical Representation a LF-IE Distance Data

4. Discussion

This study embarked on a detailed examination of the distance between the lingual frenum and mandibular incisal edge in a subset of the Jordanian population characterized by lower partially edentulous ridges and suboptimal diagnoses of

lower anterior teeth[13]. The insights gleaned from this research refine the pre-extraction records, thereby facilitating more accurate vertical dimension relationships[14]. A mean distance of 9.39 millimeters was discerned through our analyses[15], providing dental professionals with a benchmark for setting mandibular occlusal rim height and positioning incisors in the context of complete denture construction[16]. This particular measurement emerges as a pivotal element in treatment strategy[17], promoting the creation of dental prostheses that are in harmony with the anatomical and functional idiosyncrasies of the patients[12,18].

Despite the departure of the data from a normal distribution pattern, the central tendency metrics proffered by this study are robust, serving as reliable beacons for clinical decision-making. Such precision in measurement can substantially amplify the accuracy of prosthodontic interventions, culminating in heightened patient contentment with treatment outcomes[19]. The study underscores the imperative of a tailored approach in prosthodontic planning, especially when addressing the inherent needs of mandibular prosthetic rehabilitation[18,20]. Acknowledging the diverse presentations within the patient population paves the way for personalized treatment modalities that address the unique anatomical considerations of each individual[14,20].

Deliberations on factors like the contour of the residual ridge and the specifics of soft tissue architecture are vital for optimizing the efficacy of the treatment and securing the sustained oral well-being of the patients[21]. The assortment of distances between the mandibular incisal edges and the lingual frenum elucidates the complexity involved in establishing vertical dimensions in mandibular edentulism[22]. To illuminate the various influences on the outcomes of mandibular prosthesis rehabilitation, further scholarly inquiry is warranted. Such exploratory studies are crucial in honing the clinical acumen necessary for refining treatment protocols, thereby elevating the standard of mandibular prosthetic rehabilitation across different patient demographics[17,23].

It is imperative to acknowledge the constraints of this study, such as the limited sample size and the non-normal data distribution. While the findings presented here offer significant insights pertinent to prosthodontic treatment planning in the Jordanian context, extrapolation to broader populations should be approached with circumspection[18,24]. Future research, with expanded participant cohorts and a focus on delineating the interplay between mandibular arch dimensions, lingual frenum characteristics, and treatment outcomes, stands to build upon the groundwork laid by this study[25].

In addition to the insights garnered from our examination of lingual frenum to mandibular incisal edge distance, it's crucial to consider the broader implications for oral health care in Jordan and beyond[16,20]. By improving our comprehension of the complexities of mandibular prosthesis rehabilitation, we pave the way for developments in dental treatment procedures that will help Jordanians and people throughout the world who are dealing with comparable issues. Moreover, by elucidating the complexities of vertical dimension relationships and treatment outcomes, we contribute to the ongoing evolution of prosthodontic practices, ultimately enhancing patient care and satisfaction across diverse demographics. As we continue to expand our knowledge through further research and collaboration, we move closer to achieving comprehensive oral well-being for all[23].

5. Conclusion

The research provides significant insights into the distance between the lingual frenum and mandibular incisal edges in patients with lower partially edentulous ridges, enhancing the understanding of mandibular prosthetic rehabilitation. The findings offer a critical reference for determining mandibular occlusal rim height and incisors placement in complete dentures, despite challenges such as non-normal data distribution. Emphasizing the need for individualized treatment planning in prosthodontics, the study suggests that understanding patient diversity in the Jordanian context can improve treatment efficacy and long-term oral health. Acknowledging limitations like sample size, the authors call for further research into factors influencing prosthetic rehabilitation outcomes, marking a notable advancement in the field and aiming to enhance oral health for edentulous patients globally.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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