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Comparison of Accuracy of WHARFE Assessment and Pederson Difficulty Index for Predicting Surgical Difficulty in Patients with Impacted Mandibular Third Molar Surgery

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ABSTRACT

The extraction of a mandibular impacted third molar was a highly prevalent oral surgical procedure. Assessing the surgical difficulty of impacted mandibular third molar extraction was crucial for planning and executing successful procedures. Various assessment tools, such as the WHARFE Assessment and Pederson's Difficulty Index, have been developed to aid clinicians in predicting the complexity of these surgeries. **Objective:** To determine the accuracy of the WHARFE assessment and Pederson's difficulty index for predicting surgical difficulty in patients with impacted mandibular third molar surgery. **Methods:** A descriptive cross-sectional study was conducted at the department of Oral and maxillofacial surgery, Dow university of health sciences, Karachi, Pakistan. Data were collected in time duration of six months by employing non-probability convenience sampling technique. SPSS version 26.0 was used for data analysis. Chi-square test was applied with a significant level of p value <0.05. **Results:** The WHARFE assessment demonstrated an accuracy of 60.0% in predicting surgical difficulty, with a corresponding p-value of (p=0.001). Similarly, Pederson's difficulty index assessment showed an accuracy of 54.5% in predicting surgical difficulty, with a p-value of (p=0.232). **Conclusion:** Both assessments showed some ability to predict surgical difficulty, WHARFE assessment demonstrated a strong predictive accuracy, and the differences observed did reach statistical significance(p-value 0.001).

INTRODUCTION

One of the teeth that gets impacted the most often is the lower third molar. Around the world, its prevalence varies from 30.3% to 68.6% [1, 2]. A tooth that has been impaction is a pathological condition in which the tooth does not erupt normally, that is, within the anticipated time frame. Due to postural instability and aberrant position brought on by the impaction, the impacted tooth becomes non-functional [3]. Numerous local and systemic factors influence the natural eruption of teeth. A nearby tooth, an excessive amount of soft tissue nearby, or solid bone above can all affect a normal eruption. Also influencing or changing the impaction rate are race and ethnicity [4]. One of the most frequent surgical procedures carried out in dental clinics on a daily basis is the extraction of the wisdom tooth [5-7]. No grading system or scale is thought to be adequate to anticipate the degree of difficulty of this

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surgery for impacted lower third molars; that is, each scale considers some characteristics while leaving out others, making it clinically not very reliable. Here are a few suggested scales or models that are currently being used in therapeutic settings: The models of WHARFE, Pederson, winter, Pell, and Gregory [8-10]. A popular classification/method for determining the degree of difficulty while organizing the extraction of a third mandibular molar tooth is WHARFE's grading system. WHARFE is an acronym for Winter's lines, mandibular height, angulation, root, follicular size, shape and morphology, and tooth exit path [11]. Prior to organizing any third-molar intervention, this approach aids in a more thorough examination of the tooth and its radiological condition. Pederson's difficulty assessment scale, however, is used to forecast the level of pre- and post-operative difficulty associated with extracting the third mandibular molar tooth [12]. Patients who have impacted third molars surgically extracted may have severe pain, swelling, and trismus as a consequence of the inevitable stress to soft and hard tissues. They frequently suffer from severe postoperative discomfort and a reduction in their Quality of Life (QoL) [13-15]. The impaction of the third molar, commonly known as wisdom tooth impaction, can lead to various dental issues. Some of the notable problems associated with third molar impaction include: pain, infection, cyst formation, misalignment of teeth, stiffness, damage to adjacent teeth, orthodontic issues etc [16]. Therefore, the purpose of this study was to evaluate these systems' believability. In addition, this research will investigate if these systems are reliable enough to be used in the (intelligent) planning of interventions for patients who present with lower third-molar impaction. It will undoubtedly aid in expanding one's knowledge base and offer some recommendations for better clinical practice when caring for these individuals. In the end, this will bring the clinical strategy and body of knowledge for treating oral and maxillofacial surgeries up to date.

METHODS

Descriptive cross sectional study was conducted at Department of Oral and Maxillofacial Surgery Dow university of health sciences Karachi by employing non probability consecutive sampling technique in time frame of six months (from 19 October 2022 to 18 April, 2023) with approval of research ethics committee (IRB-2502/DUHS/Approval/2022/848) on dated (30th April, 2022) after getting the written consent from the patients. Sample size was calculated from online calculator (from www.openepi.com) keeping confidence intervals of 95% and 44% accuracy of the Pederson Scale index, with a 7% margin of error it yields sample of 194, in case of a drop out failure to follow up and also enhance the study's strength, total sample size was 200 [12].

Inclusion criteria was based on patients having age of 18 to 35 years with either gender. Patients having impacted 3rd mandibular molar according to Winter's classification and patients with no evidence of dental caries or restoration in the past were included. Patients with history of orthodontic treatment or periodontal surgery, having craniofacial anomalies, congenital deformities or syndromes, with evidence of cyst or tumor in the molar area and pregnant women were excluded from the study. Demographic details like age, gender were noted. All information about patients was kept confidential.

After complete history and examination, the patients fulfilling inclusion criteria were picked for the study. Pre-operative analysis with OPG radiograph tracing, the difficulty was determined by Pederson's and WHARFE's indices, and the surgical procedure was planned in the light of the modified parent scale. Intra operatively, the application of preoperative assessment observations by the pre-planned surgical procedure and the actual difficulty was analyzed with the variable of time to justify the effectiveness of a particular scoring system. The primary outcomes include the accuracy of both systems compared to the pre-operative measure of Pederson's and WHARFE'S systems with the actual intra-operative difficulty faced, by filling a developed proforma. The secondary outcome variable was the time taken of the surgical procedure which was recorded by a stopwatch from the start of the procedure i.e. administration of local anesthetic to the end i.e. packing of the extraction site. SPSS version 26.0 was used as a tool for data analysis. The quantitative variables like age, time, and scoring of the WHARFE and Pederson's systems were represented in Mean ± SD or median. The qualitative variables like gender and the percentage of accuracy were represented in frequencies and percentages. Effective modifiers such as age, gender and the percentage of accuracy were controlled through stratification. Fischer exact test/Chi square test was applied, taking a p-value of <0.05 as significant.

RESULTS

Table 1 indicated demographic information of patients where Mean ± SD of age was 28.43 ± 5.13 with a median of 29. Among the gender distribution, there were 101 individuals, constituting 50.5% of male, whereas 99 individuals, making up 49.5% as female. The duration of procedure of the patients ranged from 4 to 30 minutes with a median of 8 and Mean ± SD of 13.97 ± 8.19 (Table 1).

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Table 1: Demographic Characteristics and Duration of Procedure of Patients

Variables	Mean ± SD	Median	
Age	28.43 ± 5.13	29.00	
Gender	**Male N (%)**	**Female N (%)**	
	101 (50.5%)	99 (49.5%)	
Duration of Procedure (Minutes)	**Mean ± SD**	**Minimum**	**Maximum**
	13.97 ± 8.19	4.00	30.00

Table 2 showed descriptive statistics of WHARFE score, Pederson's difficulty index score and surgical difficulty score where the WHARFE score of the patients ranged from 2 to 12 with a median of 5 and with a Mean ± SD of 5.45 ± 2.40 with difficult score of 3 and 197 was recorded as easy score. The Pederson's difficulty index score of the patients ranged from 3 to 9 with a median of 6 and a Mean ± SD of 6.27 ± 1.46 with difficult score of 96 and 104 was easy score. Surgical difficulty score of patients ranged from 1 to 4 with a median of 2.00 and with a Mean ± SD of 2.44 ± 1.07 with difficult score of 83 and 117 was recorded as easy score(Table 2).

Table 2: Assessment of WHARFE Score, Pederson's Difficulty Index Score and Surgical Difficulty Score

Variables	Categories	Statistics Mean ± SD
WHARFE Score	Mean ± SD	5.45 ± 2.40
	Median	5.0000
	Minimum	2.00
	Maximum	12.00
	Difficult	3
	Easy	197
Pederson's Difficulty Index Score	Mean ± SD	6.27 ± 1.46
	Median	6.0000
	Minimum	3.00
	Maximum	9.00
	Difficult	96
	Easy	104
Surgical Difficulty Score	Mean ± SD	2.44 ± 1.07
	Median	2.0000
	Standard Deviation	1.07366
	Minimum	1.00
	Maximum	4.00
	Easy	117
	Difficult	83

Table 3 demonstrated accuracy of WHARFE assessment and Pederson's difficulty index assessment for predicting surgical difficulty. WHARFE assessment demonstrated an accuracy rate of 60.0% in predicting surgical difficulty, along with a p-value of (p=0.001) and Pederson's difficulty index assessment achieved an accuracy rate of 54.5% in predicting surgical difficulty, did not reach statistical significance along with Chi square test with a p-value of (p=0.232)(Table 3).

Table 3: Accuracy of WHARFE Assessment and Pederson's Difficulty Index Assessment

WHARFE Assessment	Surgical Difficulty N (%)		p-Value
	Difficult	Easy	
Difficult	3 (100.0%)	0 (0.0%)	0.001
Easy	80 (40.6%)	117 (59.4%)	
Pederson's Difficulty Index Assessment			
Difficult	44 (45.8%)	52 (54.2%)	0.232
Easy	39 (37.5%)	65 (62.5%)	

DISCUSSION

Assessing the complexity of third molar surgery was crucial for developing an effective treatment plan that minimizes potential complications. To estimate the time needed for tooth removal accurately, it was essential to gather both clinical and radiological data. Over time, numerous attempts have been made to establish a reliable model for this assessment, with several proposed but none universally accepted [17, 18]. Several other notable models have been proposed over time, including those by Winter, Pell and Gregory, Pederson, and the WHARFE classification or scoring systems. These models encompass various criteria, such as Winter's classification, mandible height, second molar angulation, root shape and morphology, follicle development, and exit path. These adopted quantitative scores for each of the parameters and difficulty was estimated based on the total radiographic scoring of the impacted tooth [19, 20]. The findings of this study were comparable with multiple studies conducted worldwide. This study evaluated the predictive accuracy of the WHARFE assessment and Pederson's Difficulty index in a cohort of patients aged 18 to >30. A study by Sekhar, MR *et al.*, had a mean age of 27.04 years (19–49 years) [21]. Demographically, this study represented a diverse patient group, with a median age of 29 years, aligning with previous research on this surgical population. Before extraction, the Pederson index can be used to assess the level of difficulty. In terms of accuracy and usability, a modified parent scale with a postoperative index was thought to be a superior substitute for the Pederson scale [22]. According to results of this study the median surgical procedure duration of 8 minutes fell within the expected range. The mean duration of the procedure of the study was 13.97±8.1. The WHARFE assessment achieved an accuracy rate of 60.0% in predicting surgical difficulty, but a closer look revealed a p value of 0.001. While the accuracy may seem promising on the surface, the p-value suggests a statistical significance. These results have raised concerns about the predictive efficacy of the WHARFE assessment. Pederson's difficulty index, on the other hand, yielded an accuracy rate of 54.5% in predicting surgical difficulty, with a p-value of 0.232. According to study by Janjua OS *et al.*, 44% accuracy of Pederson scale index in assessing third molar surgery [11].

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Numerous indices have been introduced and were employed by clinicians to categorize the complexity of removing impacted third molars. Among these indices, the Pederson and WHARFE indices were commonly used for pre-extraction assessments. However, their effectiveness was constrained, as multiple studies have revealed [23]. In practice, experienced oral and maxillofacial surgeons often consider multiple factors and use their clinical judgment to assess the difficulty of a particular case. This holistic approach takes into account patient-specific characteristics, anatomical variations, and other clinical factors that may affect the surgical procedure's outcome. It's important for clinicians to be aware of the limitations of any assessment tool or index and to use them as a part of a broader clinical evaluation rather than as definitive predictors of surgical difficulty [20]. Nevertheless, the study demonstrates specific limitations that require further examination. An important drawback was the possible restriction imposed by the study's sample size, which could undermine the strength of the results. The relatively moderate accuracy ratings of 60.0% for WHARFE and 54.5% for Pederson's difficulty index indicate that these evaluation tools have only limited predictive powers. This suggests that there was potential for development in these instruments. Moreover, the lack of substantial disparities detected between the evaluations, as evidenced by the p-values, prompts inquiries regarding the therapeutic importance of the identified distinctions.

CONCLUSIONS

It was to be concluded that both assessments showed some ability to predict surgical difficulty, whereas WHARFE assessment demonstrated a predictive accuracy of 60% (p-value 0.001) and the differences observed did reach statistical significance. Study has discovered WHARFE assessment to be a more consistent and reliable measure for the evaluation of surgical difficulty over the Pederson difficulty index.

Authors Contribution

Conceptualization: GR
Methodology: GR, AA, R
Formal analysis: SK
Writing, review and editing: SNI, DS, R

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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