

Microlearning Environment of Orthodontic Postgraduate Training Programmes in Pakistan: A Multicentre Cross-Sectional Study

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ABSTRACT

Objective: To explore the perception of residents regarding the microlearning environment of orthodontic postgraduate training programmes across Pakistan.

Study Design: Descriptive, cross-sectional, multicentre study.

Place and Duration of the Study: Department of Orthodontics, Dental College, HITEC Institute of Medical Sciences, Taxila, from February to July 2022.

Methodology: This questionnaire-based study was conducted using a pre-validated HEMLEM tool for data collection. QuestionPro survey tool was utilised for data collection and SPSS version 23 was used for data analysis. Independent t-test and one-way ANOVA were performed for comparison of different subgroups.

Results: A total of 204 residents participated in this study and collectively showed a mean score of 45.2. Male residents showed significantly higher level of satisfaction than females. Residents below the age of 25 years and those in the first year of training showed maximum level of satisfaction with their learning environments. In general, participants perceived the teaching quality and supervision as more satisfactory than the staff attitude and behaviour.

Conclusion: Overall, a higher HEMLEM score was recorded, which suggested that Pakistani orthodontic residents felt satisfied with their microlearning environment. Clinical supervisors, curriculum designers, and programme directors could use the findings of this study to further improve the learning environment of their training programmes.

Key Words: Learning environment, Microlearning environment, Residents, Clinical training, Supervision, Staff support.

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INTRODUCTION

Dental teaching hospitals provide hands-on learning opportunities to postgraduate residents by offering a nurturing, realistic, and constructive learning environment.^{1,2} The learning environment refers to the dynamic social structure in which residents learn by interacting with patients, supervisors, peers, and other staff members.^{3,4} Learning environment is a complex entity that is influenced by the resident-supervisor relationship, quality of teaching and supervision, peer support, available resources, organisational culture, residents' background and social interactions.⁵⁻⁷

Learning environment is a broad context comprising of many small microlearning environments and it is not a static phenomenon but rather dynamic.^{8,9} A microlearning environment is a smaller-scale entity that collectively makes up and influences the overall learning environment. These include, but are not limited to, the people, physical space, resources, opportunities as well as the emotional and social elements of the learning environment.⁹

Among the various microlearning environments, two of the utmost significance are the staff attitude and behaviour towards the residents and the quality of teaching and supervision that is provided to the residents during their clinical placements.¹⁰ The development of residents' competence and psychological well-being is determined by the level of support offered to the residents by their peers, seniors, and staff. Similarly, the supervision quality not only contributes towards the development of confidence, leadership and clinical skills of the residents but it has a profound role in avoiding residents' burnout and attrition.¹¹

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Since residents are directly influenced by the context in which they learn, it is vital to evaluate the clinical learning environment through the lens of residents so that more favourable learning opportunities can be created for their personal and professional growth. Most studies carried out to assess the clinical learning environment focus on either medical postgraduate training specialities or contexts other than Pakistan, which is why reports on the evaluation of the microlearning environment offered in the local postgraduate training programmes are scarce. The Healthcare Education Microlearning Environment Measure (HEMLEM) tool focuses on two specific microlearning environments of a training programme: staff attitude and behaviour and quality of teaching and supervision.¹⁰ The lessons learnt from this multicentre study might help the programme developers, supervisors, and administrative bodies to reflect upon and improve the respective micro-learning environment offered to their residents. The aim of this multicentre study was to evaluate the perceptions of postgraduate orthodontic residents working in different institutes in Pakistan on their microlearning environment.

METHODOLOGY

This questionnaire-based, descriptive, cross-sectional study was conducted from February 2022 to July 2022 at the Department of Orthodontics, Dental College, HITEC-Institute of Medical Sciences, Taxila. This study was approved by the Ethical Review Board of Dental College HITEC-IMS (IRB # Dental/HITEC/IRB/17). All participants of this study were informed about the objectives and methodology of this research project in detail. Written consent was obtained from all participants at the start of the electronic survey.

An online survey based on the HEMLEM tool was designed using QuestionPro® and the survey link was disseminated electronically. Orthodontic residents working in public as well as private dental teaching hospitals across the country were included in the study. Postgraduate residents of other dental specialities and undergraduate students were excluded from the study. An electronic consent was incorporated in the survey link in which

the participants were informed about the purpose of the study. The participants were asked to rate 12 items of the HEMLEM tool using a 5-point Likert scale (strongly agree=5, agree=4, not sure=3, disagree=2, strongly disagree=1). The overall HEMLEM score thus ranged between 12 and 60. An overall score greater than 36 was regarded as a positive satisfaction of the participants.

All the statistical analyses were performed using SPSS version 23. The categorical variables were measured in frequencies and percentages whereas the continuous variables were measured in means and standard deviations. Independent t-test was performed to find out the relationship of gender and setting (public or private) with the HEMLEM score. The relationship of HEMLEM score with age and training year was explored using one-way ANOVA. A p-value of <0.05 was considered as statistically significant.

RESULTS

A total of 204 residents from 21 training centres across Pakistan participated in the study. Of these participants, 60 (29.4%) were males and 144 (70.6%) were females. With respect to age, nine (4.4%) participants were younger than 25 years, 148 (72.5%) were between 25 and 30, and 47 (23%) were above 30 years. An equal number of participants (102, 50%) was received from public and private sector hospitals. In terms of year of residency, 46 (22.5%) participants were in the first year, 41 (20.1%) were in the second year, 33 (16.2%) were in the third year, and 84 (41.2%) were in the fourth year of training. Table I provides the distribution of variables in frequencies, percentages, and HEMLEM scores in means and standard deviations.

The overall mean score was 45.2, which depicted an overall high satisfaction level of the residents with the learning environment. Male participants scored significantly higher (47.5 ± 8.2) than females (44.2 ± 7.2 , $p = 0.018$). Moreover, this difference was statistically significant for both subscales ($p = 0.025$ for subscale 1 and $p = 0.032$ for subscale 2). Residents below 25 years of age showed the highest level of satisfaction (47.9 ± 7.9) among the three age groups.

Table I: Demographic variables and HEMLEM scores.

Variables		Participants		HEMLEM Mean \pm SD	p-value*
		Frequency (n)	Percentage (%)		
Gender	Male	60	29.4	47.5 \pm 8.2	0.018
	Female	144	70.6	44.2 \pm 7.2	
Age	Below 25	9	4.4	47.9 \pm 7.9	0.632
	25 – 30	148	72.5	45.3 \pm 8.3	
	Above 30	47	23	44.5 \pm 8.8	
Setting	Private sector	102	50	45.6 \pm 8.5	0.801
	Public sector	102	50	45.1 \pm 8.3	
Training year	First	46	22.5	47.9 \pm 6.8	0.952
	Second	41	20.1	43.9 \pm 8.1	
	Third	33	16.2	45.1 \pm 9.2	
	Fourth	84	41.2	45.6 \pm 8.0	

*Independent t-test was used for gender and setting-wise comparison. One-way ANOVA was used for age and training year-wise comparison.

Table II: Overall and gender-wise HEMLEM scores.

Item	Overall Mean \pm SD	Male Mean \pm SD	Female Mean \pm SD	p-value*
This placement had a welcoming, friendly and open atmosphere.	3.57 \pm 1.9	3.8 \pm 1.2	3.5 \pm 0.9	0.139
There was a culture where I felt free to ask questions or make comments on this placement.	3.55 \pm 1.0	3.9 \pm 0.8	3.4 \pm 0.6	0.008
Staff on this placement were enthusiastic about teaching.	3.63 \pm 1.03	3.8 \pm 1.0	3.5 \pm 1.0	0.189
My supervisor showed an interest in me.	3.82 \pm 1.07	4 \pm 1.0	3.7 \pm 1.1	0.084
My input was valued on this placement.	3.72 \pm 0.92	3.9 \pm 0.9	3.6 \pm 0.9	0.068
I was provided with regular, useful and supportive feedback during this placement.	3.48 \pm 1.0	3.7 \pm 1.0	3.4 \pm 1.0	0.141
I had the opportunity to apply my previous knowledge in this placement.	3.91 \pm 0.84	4.1 \pm 0.8	3.8 \pm 0.8	0.038
My knowledge and skills were developed on this placement.	4.12 \pm 0.71	4.3 \pm 0.7	4.1 \pm 0.6	0.066
This placement helped me put theory in practice.	3.94 \pm 0.8	4 \pm 0.8	3.9 \pm 0.8	0.456
I was able to meet my learning objectives on this placement.	3.74 \pm 0.92	4 \pm 0.9	3.6 \pm 0.9	0.007
I had the opportunity to deal with the patient as a whole on this placement.	4.01 \pm 0.84	4.1 \pm 0.9	4 \pm 0.8	0.164
I was given tasks suitable for my stage of training on this placement.	3.73 \pm 0.96	3.9 \pm 1.0	3.7 \pm 0.9	0.218
Subscale 1: Staff attitude and behaviour	21.7 \pm 4.5	23.1 \pm 6.1	21.1 \pm 6	0.025
Subscale 2: Teaching quality and supervision	23.4 \pm 3.90	24.4 \pm 5.1	23.1 \pm 4.8	0.032
Overall HEMLEM score	45.2 \pm 8.10	47.5 \pm 8.2	44.2 \pm 7.2	0.018

*Independent t-test was used for gender-wise comparison.

Table III: Training year-wise HEMLEM scores.

Item	First year Mean \pm SD	Second year Mean \pm SD	Third year Mean \pm SD	Fourth year Mean \pm SD	p-value*
This placement had a welcoming, friendly, and open atmosphere.	3.7 \pm 0.9	3.5 \pm 1.2	3.5 \pm 1	3.7 \pm 1.1	0.551
There was a culture where I felt free to ask questions or make comments on this placement.	3.6 \pm 0.8	3.7 \pm 1	3.4 \pm 1.1	3.5 \pm 1.1	0.589
Staff on this placement were enthusiastic about teaching.	3.8 \pm 0.9	3.7 \pm 1	3.6 \pm 1	3.4 \pm 1.1	0.149
My supervisor showed an interest in me.	3.8 \pm 1.1	4 \pm 0.9	3.8 \pm 1.1	3.7 \pm 1.2	0.462
My input was valued on this placement.	3.8 \pm 0.8	3.7 \pm 0.9	3.8 \pm 0.9	3.6 \pm 1	0.795
I was provided with regular, useful and supportive feedback during this placement.	3.7 \pm 0.8	3.4 \pm 1	3.7 \pm 1	3.3 \pm 1.1	0.127
I had the opportunity to apply my previous knowledge in this placement.	3.8 \pm 0.7	3.8 \pm 0.9	3.9 \pm 1	4 \pm 0.7	0.597
My knowledge and skills were developed on this placement.	4.1 \pm 0.5	4.2 \pm 0.7	4.1 \pm 0.9	4.1 \pm 0.6	0.978
This placement helped me put theory in practice.	3.8 \pm 0.7	3.8 \pm 1	4 \pm 0.8	4 \pm 0.8	0.404
I was able to meet my learning objectives on this placement.	4 \pm 0.3	3.7 \pm 1	3.5 \pm 1.1	3.7 \pm 0.9	0.093
I had the opportunity to deal with the patient as a whole on this placement.	4 \pm 0.6	3.8 \pm 0.9	3.9 \pm 1	4.2 \pm 0.8	0.157
I was given tasks suitable for my stage of training on this placement.	3.8 \pm 0.7	3.6 \pm 1	3.8 \pm 1.1	3.8 \pm 0.9	0.504
Subscale 1: Staff attitude and behaviour	22.4 \pm 5.3	22 \pm 6	21.8 \pm 6.1	21.2 \pm 6.6	0.722
Subscale 2: Teaching quality and supervision	23.5 \pm 3.5	22.9 \pm 5.5	23.2 \pm 5.9	23.8 \pm 4.7	0.831
Overall HEMLEM score	47.9 \pm 6.84	43.9 \pm 8.1	45.1 \pm 9.2	45.6 \pm 8.04	0.952

*One-way ANOVA was used for academic year-wise comparison.

Residents of private sector hospitals scored slightly higher (45.6 \pm 8.5) than the residents of public sector hospitals (45.1 \pm 8.3); however, the difference was statistically insignificant ($p = 0.801$). Overall, a higher score was recorded for the subscale quality of teaching and supervision (23.4 \pm 3.9) than for the subscale staff attitude and behaviour (21.7 \pm 4.5). Table II shows overall and gender-wise scores and their comparisons for each item, subscale, and full scale. Although the differences were statistically insignificant ($p = 0.952$), the first year residents scored the highest (47.9 \pm 6.84), followed by the fourth year (45.6 \pm 8.04), third year (45.1 \pm 9.2) and second year residents (43.9 \pm 8.1). Table III shows training year-wise HEMLEM scores and their comparisons.

DISCUSSION

The current study evaluated the perception of orthodontic residents regarding the microlearning environment offered to them in their clinical placements in different teaching hospitals in Pakistan. Overall, a high level of satisfaction was observed among the participants. Although an overall positive score was observed in both subscales, residents perceived the teaching quality and supervision as more satisfactory than the staff attitudes and behaviour. This finding was in accordance with the previous studies^{12,13} where a higher score was observed in teaching quality and supervision than staff attitudes and behaviour. A qualitative analysis of the received feedback showed that clinical teachers' high accessibility for the residents, mentoring skills and hands-on teaching were the pronounced reasons.

This finding gave an encouraging impression about the teaching quality offered to the orthodontic residents of the country. The staff support, unlike this study, had always received variable scores in the previous studies.^{14,15} These contrasting results might be due to differences in the nature of work done in other specialities, organisational culture, workload, and burnout. Qualitative exploration focusing on one speciality might be helpful in advancing the understanding of this topic.

Male residents scored higher than females. Since the reasons for residents' higher or lower satisfaction levels were not explored in this study, it would be difficult to draw a conclusive rationale for this finding. However, comparatively lower satisfaction level among female residents could be attributed to the fact that females often experience more challenges in their professional careers than their male counterparts. In some studies, female residents attributed their lower satisfaction to workplace discrimination, mistreatment, and societal prejudice.¹⁶⁻¹⁸

With respect to residents' age as well as year of training, no significant difference was found among different groups. This was in agreement with the findings reported by Al Shomrani¹⁹ while Iqbal *et al.*¹² found a significantly higher score in senior residents. In this study, senior residents might have shown higher satisfaction because of their autonomy, self-sufficiency and confidence that increases with experience. Similarly, junior residents might have shown an equally higher satisfaction because of their low expectations from a learning environment and/or social desirability pressure.⁵ Although a slight change can be anticipated, these findings suggested that age or year of training might not play a significant role in evaluating the quality of microlearning environments. More robust and large-scale studies are needed to draw a clear comparison as the role of age and seniority levels in evaluating microlearning environments remains unclear. The more generalisable results from these studies would play a constructive role in the improvement of the microlearning environments. Additionally, qualitative exploration of how senior and junior residents are influenced by the microlearning environment will add depth and breadth to the understanding.

The residents from private as well as public sector hospitals showed an overall positive satisfaction towards staff attitude and behaviour and quality of teaching and supervision. These results are in contrast to Sethi *et al.* and Ali *et al.* who found an overall higher satisfaction level among the residents of private institutes than the public sector institutes.^{20,21} Scholars of these studies hypothesised that although public sector hospitals provided more learning opportunities to their residents, the higher patient turnover in the public than private sector hospitals might be overwhelming to the residents, leading to less satisfaction with the offered learning environment. This study's finding was

encouraging as it showed that the private sector hospitals are providing an equally healthy microlearning environment as the public sector hospitals.

In authors' knowledge, this is the first multicentric study carried out in Pakistan that explored the experiences of orthodontic residents regarding the microlearning environment offered by postgraduate training programmes. Evaluating residents' perceptions is crucial to identify the reasons behind the gap between what residents should ideally be taught, what they are actually taught and what they ultimately learn.¹⁰ This study might provide an insight into the real-time experiences of the residents, creating opportunities for the educational improvement of postgraduate training programmes.²² Moreover, seeking feedback from the residents about their learning environment might serve as a source of encouragement for the residents by recognising that their opinions and inputs are valued.²³ Finally, participation in this research study might urge residents to play an active and constructive role in improving the quality of their learning environment.

This multicentre study was not without limitations. First, it was impossible to determine the accurate number of orthodontic residents working across Pakistan, which made it difficult to determine the exact sample size and response rate. Second, although responses from multiple teaching hospitals were collected, the findings of this study may not be sufficient for generalisation as collective scores are presented. It is possible that residents of some programmes might have scored their learning environment much lower than others. Third, the reasons underpinning residents' level of satisfaction were not explored; this is indeed a gap that needs to be filled in the future through qualitative studies. Lastly, an unequal distribution of residents in terms of gender as well as year of training may have resulted in an inaccurate representation of scores for these variables. Recruitment of an equal number of residents from each teaching hospital was impossible to ensure because of the voluntary nature of the survey.

CONCLUSION

In this multicentric study, there was an overall high level of satisfaction among the Pakistani orthodontic residents with their microlearning environment. Male residents, those below 25 years of age and junior residents showed higher satisfaction than their counterparts. Overall, a greater satisfaction was observed for the quality of teaching and supervision than for staff attitude and behaviour. Future researchers are advised to qualitatively explore how microlearning environments could be further improved for the residents to elevate the quality of training and healthcare services.

ETHICAL APPROVAL:

This study was approved by the Ethical Review Board of Dental College HITEC-IMS (IRB # Dental/HITEC/IRB/17).

PARTICIPANTS' CONSENT:

All participants of this study were informed about the objectives and methodology of this research project in detail. Written consent was obtained from all participants at the start of the electronic survey.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

MH: Conceptualisation, data collection and analysis, study design, project administration, search for resources, writing the original draft.

MZI: Conceptualisation, design of the methodology, administration of the project, supervision, data interpretation, and writing, review and editing.

SH, AHK, NI: Conceptualisation, data collection and analysis, search for resources, data interpretation, and validation, writing, review, and editing.

All authors approved the final version of the manuscript to be published.

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