

Cognizance of the Vitality of Proper Ergonomics among Orthodontists

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Abstract

Context: The fundamental recognition and practicality regarding ergonomics is requisite to anticipate work related disorders. We often abandon our health to provide best possible treatment, which results in loss of well being. Awareness about proper armamentarium, appropriate workstation and correct postures is mandatory to lower the stress and enhance the safety of an orthodontist.

Aim:The purpose of this study was to assess the

cognizance of orthodontists towards the vitality of proper ergonomics.

Material and Methods: An online cross-sectional survey was conducted among 220 practicing orthodontists and postgraduates from various parts of the country. A questionnaire was developed using Google forms that were circulated to the willing participants via different social media platforms. Questions consisted of two sections, one dealt with demographic specifics following which were 25 questions designed to gauge their awareness

on ergonomics

Statistical Analysis: Kolmogorov- Smirnov test and Shapiro-Wilks test were employed to evaluate the normality of data. Chi square test was performed to assess whether there was any statistical difference in the participant's knowledge.

Result: Majority (84.6%) was aware about the concept of ergonomics and considered it while designing their clinic. However, maximum participants assumed awkward positions and experienced repetitive strain injuries (61.5%) occurring in the neck and back region. Only 13.2 % participants reported the use of magnification using loupes in orthodontic practice.

Conclusion: There is an increased risk of certain afflictions and musculoskeletal disorders among orthodontists, reason being long extended work appointments. Increase in the awareness programs, periodic breaks and use of magnification in orthodontic practice must be stressed enough to combat faulty postural habits.

Keywords: Ergonomics, Musculoskeletal disorders, Magnification Orthodontists

Introduction

Ergonomics is derived from a Greek term 'ergon' that means work and "omics" means law.^[1] It is the applied science of situating and designing job settings propitious to the worker. The goal is to enhance human efficiency and focusing on worker safety as well as productivity.^[2]

The fundamental principle is to match equipment and tools, plan workstation allowing the worker to fine-tune his performance. Thus, recognizing the sequence of events that lead to distress and inconvenience along with implementing tactics to eliminate the stressful conditions is of utmost importance.

The purview of ergonomics in dentistry is immense. It ranges from interaction between dental team to noise, odor

conditions and lighting, to operating software and equipments. The working environment with dental unit, patient chair, operating light, peripheral and cabinetry equipment, hand and active instrumentation must be pliable.^[3] There is a need for proper working postures, adequate lighting and easy ingress to needful materials and armamentarium for different patient practices and clinical procedures.

The increased work duration due to long extended appointments elevates the strain and exertion to the muscles and bones resulting in musculoskeletal disorders. The postgraduates and practicing orthodontists suffer from musculoskeletal disorders due to subpar ergonomics accountable for inapt sitting posture and actions resulting in overload, work related uneasiness and fatigue. The necessity of clear field of vision and precision in work causes revolving positions and repetitive bending of the body, which in turn results in malfunction leading to pain.^[4] Around 54-93 % of dental professionals develop work related musculoskeletal disorders with the most recurrent injuries occurring in the spine (back and neck) shoulders, elbows and hands.^[5]

The paradox of faulty ergonomics reflects need for comprehensive understanding and cognizance among orthodontists to assure amplified contentment and high productivity.^[6] To the best of author's knowledge, there is paucity of studies about the perception of ergonomics among orthodontists.^[7] Therefore, the rationale for this study is to assess the cognizance of orthodontists towards the vitality of proper ergonomics.

The null hypothesis states that there is no difference between knowledge regarding ergonomics among practicing orthodontists and postgraduates

Methodology

A pilot survey was conducted on a sample population of 220 practicing orthodontists and orthodontic postgraduates,

drawn from various zones in the country. The mode of the survey was a questionnaire developed using Google forms, which was filled by the participants. The questionnaire was divided in two sections. The first section dealt with participant specifics, primarily their socio-demographic status with solicited data points covering age, gender and present designation. The trailing section was a cluster of 25 questions, constructed to gauge the awareness of the participants on ergonomics, with a specific focus on lighting, proper ventilation, positioning of operator stools and dental chairs, advanced instrumentation, use of magnification loupes and the criticality of different exercises and micro breaks. The questions were configured to be close ended, and the answer choices were designed for easy elucidation and response. Participating orthodontists were provided with a secure link, and careful emphasis was laid on maintaining the anonymity of the responders.

Statistical Analysis

The responses were entered into a spreadsheet and the data collected was entered in Microsoft Excel. Data processing and statistical analysis were carried out using Statistical Package for Social Sciences (SPSS, IBM version 20.0). The level of significance was fixed at 5% and $p \leq 0.05$ was considered statistically significant. Kolmogorov- Smirnov test and Shapiro-Wilks test were employed to test the normality of data. Chi square test was performed for quantitative variables.

Results

In the present study the mean age of the participants was found to be 31.09 ± 7.42 years and females (52.7%) outnumbered male participants (47.3%) (Table 1). Majority of the participants (84.6%) were aware about the concept of ergonomics and considered it while designing their clinic (78%). Maximum participants experienced repetitive strain injuries (61.5%) of which majority occurred in the neck and back region. Obtaining a better

field of view in the mouth was reported as the main reason for assuming awkward posture. 98.9 % participants were aware that improving posture could help them in preventing MSDs. 41.8% of the participants maintained erect posture while treating patients and an equivalent number were unsure about their posture and answered maybe as their response. Participants preferred taking enough periodic breaks; however the use of magnification using loupes in orthodontic practice was reported by only 13.2 % participants (Table 2). Gender wise evaluation of knowledge regarding ergonomics showed significant difference between males and females in performing light exercises, having assistant and provision of movable work surface in mobile cabinet. Majority of males performed entire arm and twisting of body whereas females reported significantly greater finger and wrist exercise (Table 3).

A comparison between designation of the study participants and knowledge regarding ergonomics showed significant differences in use of magnification, performing light exercises or twisting movements and presence of assistance and dental stools at clinic with proper back support. Majority of postgraduates did not use magnification, never performed light exercises and assumed awkward postures while treating the patients. Postgraduate students did not have assistance and reported having dental stools at clinic without proper back support (Table 4).

Discussion

The dental health professionals often experience strain and are prone to work associated injuries. The present cross sectional study was carried out to assess the awareness regarding ergonomics among 220 orthodontic practitioners, academicians and post- graduate students.

In the present study the major portion of the participants were females (52.7%) relating to the increase feminism in orthodontic profession.^[7-9] Majority of the participants

were aware about the concept of ergonomics (84.6%) and considered it while designing their clinic (78%). Batra H et al.⁶ and Gopinadh A et al.^[10] in their studies reported 89% and 59.3% awareness respectively regarding ergonomics whereas only 50% were aware in the study by Kanteshwari et al.^[11] and Gupta et al.^[12]

61.5% of participants experienced repetitive strain injuries of which majority occurred in the neck and back region. In accordance to the findings of our study, Shetty A et al.^[13] in their study to assess the prevalence of musculoskeletal disorders among dental surgeons in different specialties also showed that 37% suffered from neck pain, 52 % shoulder pain, 29 % and 38% had pain in the upper back and lower back respectively. Gopinadh A et al.^[10] also reported that neck and back were the common sites for MSDs as dentists do large portion of their work with their head bent forward and rotated among different specialties of dentistry. Studies conducted in New South Wales and Australia by Marshall ED et al.^[14] and Leggat PA et al.^[15] also found that most prevalent MSDs were reported at the neck (57.5%), lower back (53.7%) and shoulder (53.3%).

In our study, the reason for assuming awkward physical positions while treating the patients was to obtain better view of the oral cavity (78%) which corresponds to the review by Bhanat et al who stated inaccessible vision as the root cause to presume awkward position resulting in back strain.^[16] 80.2% of the responders believed in taking enough periodic breaks in their clinic, however contrasting results were reported by Rajeswari SR et al in which 58.82% of post graduates never took microbreaks knowingly during the clinical hours.^[7]

Our study shows significant differences in gender wise evaluation of knowledge regarding ergonomics in performing light exercises, having an assistant and provision of movable work surface in mobile cabinet.

Majority of males performed entire arm and twisting of body whereas females reported significantly greater finger and wrist exercise. Studies conducted by Gopinadh A et al.^[10] and Shetty A et al.^[13] showed male suffered more from MSDs as compared to females, the reason could be attributed to females paying more attention to their health and well being. This is the first study to have taken into consideration a comparison between designation of the orthodontists, which showed that the majority of participants did not use magnification, never performed light exercises and assumed awkward postures while treating the patients. Study conducted by Shetty A et al.^[13] also reported low use of magnification by dentists in their study whereas it has been reported that magnification use has led to reduced back and neck pain.

It seems appropriate to highlight some of the limitations of the study. As the present study was cross-sectional, differentiating cause and effect from simple association could not be done. Due to the current pandemic situation only a subjective assessment via Google documents was carried out and what people report may differ from their actual situation, an objective assessment in addition to assessment using Google document would have been more apt. It must also be stressed that, despite the limitations mentioned, this is one of the first study to have taken into consideration the assessment of ergonomics awareness among different orthodontists from postgraduates to academicians. The present study highlights the need of increasing the awareness programs, increasing periodic breaks and use of magnification in orthodontic practice.

Tables

Table 1: Assessment of demographic details of the study participants

Variables	Categories	Percentage (%)
Gender	Female	52.7
	Male	47.3
Designation	Post Graduate	29.7
	Practitioner	15.4
	Academician	54.9

Table 2: Awareness regarding Ergonomics among study participants

Questions	Categories	Frequency
Are you aware of the concept of “Ergonomics” and its impact on orthodontic practice?	Yes	84.6
	No	7.7
	Maybe	7.7
Did you consider the ergonomic aspect while designing your clinic?	Yes	78
	No	22
Do you think exercise plays an important part in ergonomics?	Yes	92.3
	No	7.7
Do you think proper equipment and instrument design can help solve this problem?	Yes	81.3
	No	-
	Somewhat	18.7
Do you experience repetitive strain injuries?	Yes	61.5
	No	38.5
If yes, where do maximum strain occur?	Spine – neck and back	85.7
	Shoulders and elbows	13.2
	Pelvis and knees	1.1
Most of the time during treatment what is the reason for which you have to assume awkward physical positions?	To get a better view of the intraoral cavity	78.0
	To provide a more comfortable position for the patient	6.6
	To reach for instruments and supplies	15.4
Are you aware that by improving posture you can prevent MSDs	Yes	98.9
	No	1.1

Is gender a factor in musculoskeletal disorders?	Yes	31.9
	No	68.1
Do you maintain an erect posture while treating your patient?	Yes	41.8
	No	16.5
	Maybe	41.8
Do you believe in taking enough periodic breaks while at the clinic?	Yes	80.2
	No	19.8
Do you use magnification in your orthodontic practice to improve your posture?	Yes	13.2
	No	86.8
If yes, do you think using magnification (loop 2.5X) will help in improving operator's posture in dental practice?	Yes	33.8
	No	13.2
	Maybe	52.9
Is frequently shifting and changing of positions advisable while treating patients?	Agree	44.0
	Disagree	14.3
	May be	39.6
	No idea	2.2
Do you remember to adjust your chair so as to be comfortable during treating?	Yes	93.4
	No	6.6
How often do you have to perform twisting movements for treatment?	Many times	35.2
	Sometimes	62.6
	Never	2.2
Do you perform light exercises or movements at your clinic?	Often	12.1
	Sometimes	71.4
	Never	16.5
If you perform light exercises at clinic what are they generally?	Fingers and Wrists	24.2
	Fingers, Wrists and Elbows	26.4
	The Entire Arm and Twisting of the Body	31.9
	More than one of the above	17.6
Do you experience back pain while performing treatment?	Quite often	25.3
	Sometimes	63.7
	Never	11.0
Do you have an assistant to help you with the equipment and stuff?	Yes	48.4

	No	51.6
According to you, what is the most important criteria while selecting equipment?	The design of the product should make intuitive sense given the goal of the design.	12.1
	The product should feel comfortable to use.	20.9
	The product should put the user into a more neutral posture.	13.2
	The manufacturer/designer should clearly articulate what the ergonomic objectives are for specific design elements	53.8
Does your mobile cabinet provide a movable work surface that can be positioned over the assistant's lap or knees.	Yes	30.8
	No	69.2
Does the dental stools at your clinic have stable tools with proper back support?	Yes	74.7
	No	25.3
Is there a good ambient light source at your clinic?	Yes	93.4
	No	6.6
Do you use equipment like ultrasonic cleaner to improve the ergonomic efficiency of sterilization process?	Yes	59.3
	No	27.5
	Maybe	13.2

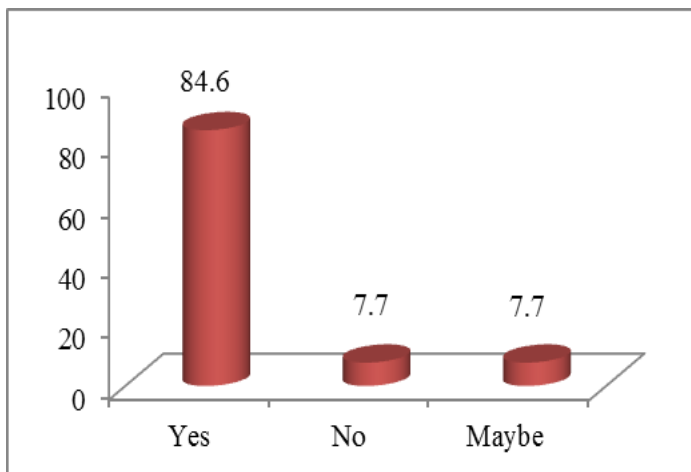
Table 3: Gender wise evaluation of Ergonomics Awareness

Questions	Chi square Value	p value
Are you aware of the concept of “Ergonomics” and its impact on orthodontic practice?	.337	.845
Did you consider the ergonomic aspect while designing your clinic?	.617	.432
Do you think exercise plays an important part in ergonomics?	.298	.585
Do you think proper equipment and instrument design can help solve this problem?	2.55	.110
Do you experience repetitive strain injuries?	.441	.507
If yes, where do maximum strain occur?	1.525	.467
Most of the time during treatment what is the reason for which you have to assume awkward physical positions?	2.015	.365
Are you aware that by improving posture you can prevent MSDs	.906	.341
Is gender a factor in musculoskeletal disorders?	.589	.443
Do you maintain an erect posture while treating your patient?	4.542	.103
Do you believe in taking enough periodic breaks while at the clinic?	1.729	.189
Do you use magnification in your orthodontic practice to improve your posture?	1.074	.300
If yes, do you think using magnification (loop 2.5X) will help in improving operator's posture in dental practice?	.033	.984
Is frequently shifting and changing of positions advisable while treating patients?	2.822	.420
Do you remember to adjust your chair so as to be comfortable during treating?	3.357	.067
How often do you have to perform twisting movements for treatment?	.244	.855
Do you perform light exercises or movements at your clinic?	.268	.874
If you perform light exercises at clinic what are they generally?	7.998	.046* (s)
Do you experience back pain while performing treatment?	3.042	.218
Do you have an assistant to help you with the equipment and stuff?	5.921	.015* (s)
According to you, what is the most important criteria while selecting equipment?	1.539	.673
Does your mobile cabinet provide a movable work surface that can be positioned over the assistant’s lap or knees.	3.705	.05* (s)
Does the dental stools at your clinic have stable tools with proper back support?	.299	.584
Is there a good ambient light source at your clinic?	.971	.324
Do you use equipment like ultrasonic cleaner to improve the ergonomic efficiency of sterilization process?	.433	.805

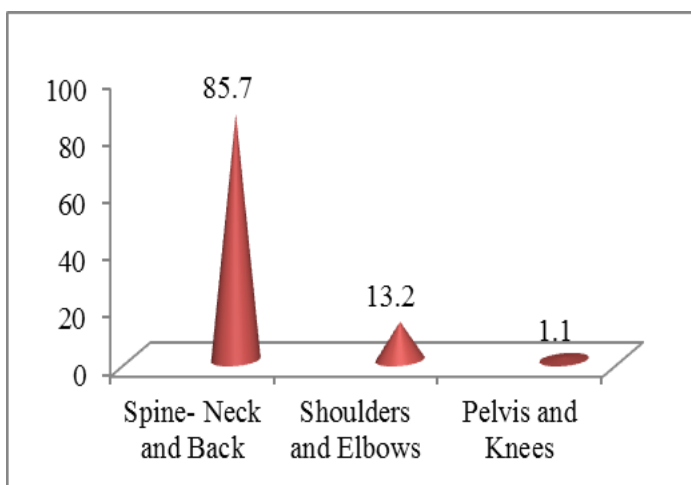
Table 4: Awareness among study participants with varying degree of designation

Questions	Chi square Value	p value
Are you aware of the concept of “Ergonomics” and its impact on orthodontic practice?	6.638	.156
Did you consider the ergonomic aspect while designing your clinic?	1.062	.588
Do you think exercise plays an important part in ergonomics?	.016	.992
Do you think proper equipment and instrument design can help solve this problem?	.416	.812
Do you experience repetitive strain injuries?	4.164	.125
If yes, where do maximum strain occur?	8.749	.068
Most of the time during treatment what is the reason for which you have to assume awkward physical positions?	2.676	.613
Are you aware that by improving posture you can prevent MSDs	.829	.661
Is gender a factor in musculoskeletal disorders?	.834	.659
Do you maintain an erect posture while treating your patient?	1.767	.778
Do you believe in taking enough periodic breaks while at the clinic?	4.250	.119
Do you use magnification in your orthodontic practice to improve your posture?	7.483	.024*(s)
If yes, do you think using magnification (loop 2.5X) will help in improving operator's posture in dental practice?	4.094	.393
Is frequently shifting and changing of positions advisable while treating patients?	3.800`	.704
Do you remember to adjust your chair so as to be comfortable during treating?	2.296	.317
How often do you have to perform twisting movements for treatment?	16.599	.002* (s)
Do you perform light exercises or movements at your clinic?	9.484	.05*(s)
If you perform light exercises at clinic what are they generally?	9.763	.135
Do you experience back pain while performing treatment?	7.344	.119
Do you have an assistant to help you with the equipment and stuff?	35.88	.001*(s)
According to you, what is the most important criteria while selecting equipment?	5.471	.485
Does your mobile cabinet provide a movable work surface that can be positioned over the assistant’s lap or knees.	1.193	.551
Does the dental stools at your clinic have stable tools with proper back support?	6.808	.033*(s)
Is there a good ambient light source at your clinic?	2.296	.317
Do you use equipment like ultrasonic cleaner to improve the ergonomic efficiency of sterilization process?	2.684	.612

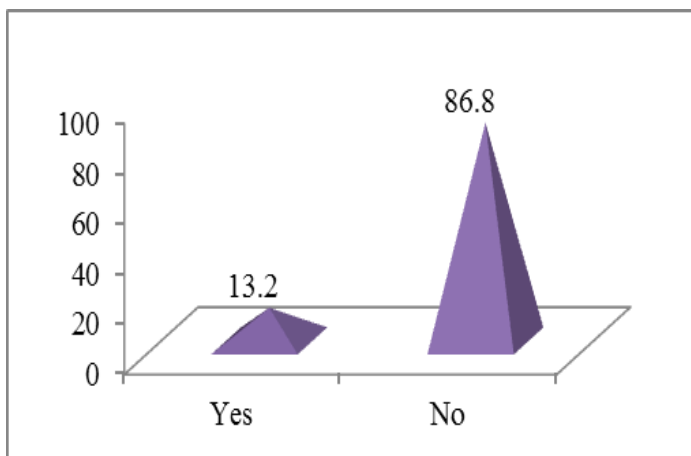
Graphs



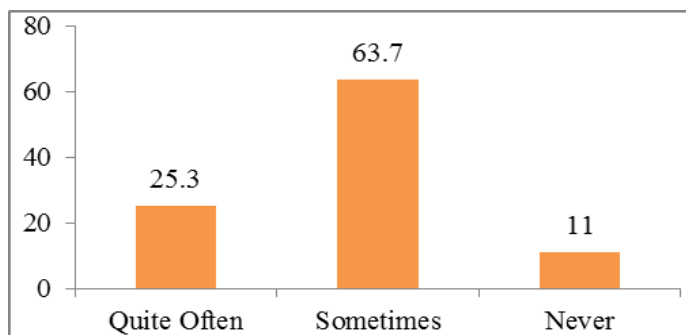
Graph 1: Are you aware of the concept of “Ergonomics” and its impact on orthodontic practice?



Graph 2: Where does maximum strain occur?



Graph 3: Do you use magnification in your orthodontic practice to improve your posture?



Graph 4: Do you experience back pain while performing treatment?

Conclusion and Guidelines

Orthodontists are vulnerable to increased risk of muscular injury, which requires unique intervention of ergonomic practices aimed to improvise their workability for a prolific career. It’s crucial to address the significance of proper ergonomics and measures to execute them. One must pay heed to his nutrition, posture, focus on strengthening exercises and periodic breaks to prevent strain injuries which become worse over the years and lead to life-long disabilities.

We recommend:

Educating orthodontic postgraduates and clinicians on the importance of maintaining good ergonomics by organizing various CDE programs periodically to uplift their performance and efficiency while treating the patients.

Inculcating the use of magnification in the PG curriculum so that the postgraduates are well acclimatized by its use.

Obesity has a detrimental effect on the muscles of lower back and shoulder subjecting the workers to extreme risk of musculoskeletal injuries.^[17] Therefore, one must emphasize on selective strategies to control weight by adapting healthy eating habits and exercising regularly (that includes mandatory neck, shoulder and back exercises

Cyclic screening of symptoms associated with musculoskeletal disorders must be conducted for early diagnosis and focus on reducing its prevalence.

Producing guidelines for manufacturing ergonomic friendly equipments to facilitate appropriate working environment

Need of comprehensive evidence based studies and RCTs to enlighten the scope of ergonomics among orthodontic society.

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