ASSESMENT OF KNOWLEDGE OF LIGHT MICROSCOPIC ERGONOMICS AMONGPATHOLOGISTS

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Abstract:

Back Ground

Sound knowledge regarding ergonomics and their practical application are essential for prevention of musculoskeletal disorders (MSD). The role of microscopic ergonomics (ME) in preventing these work related ailments is significant.

Methods

Authors conducted a cross sectional survey among pathologist of Davangere city, Karnataka, India. The data was collected using 26 - item custom designed proforma, with questions evaluating pathologist's basic knowledge about microscopic ergonomics.

Results

Of 100 subjects surveyed, 70% pathologists (staff and post graduate) stated that they came across microscopic ergonomics only through this survey. Also 100% pathologists of believed that the emphasis about microscopic ergonomics is less in the present dental curriculum.

Conclusions

The findings suggest that the pathologist's comprehension regarding microscopic ergonomics is limited. This study advocates the revision of dental curricula regarding microscopic ergonomics to prevent musculoskeletal injuries.

Practical Implications

Increased importance should be given during formative years of dental education about this essential clinical entity either via textbook education or in continuing dental education (CDE) programs.

Key Words

Microscopic ergonomics; musculoskeletal disorders; micro breaks

Introduction

The science of ergonomics is the study and application of human anatomy, biomechanics and biology to the design of objects, systems, and environments. Also called **HUMAN ENGINEERING** or **HUMAN FACTORS**. The human body is a wonder of biomechanics, accommodating and adapting to a wide variety of postures and activities.

It is a well-established fact that pathologists are more prone for work associated injuries, illness, leading to a high rate of absence from work and related costs. This injuries are associated with increased possibility of long term disabilities, psychosocial problems, mental stress and overall reduced work proficiency.[1] Most prevalent among these are the musculoskeletal injuries (MSI) which ironically many at times are preventable.[2]

Dental surgeons are at a high risk category for developing MSI, because of the nature of work patterns which basically has repetitive movements in a static position for an extended period of time. The same is exaggerated if combined with wrong postures, forceful movements and poorly designed equipments.[3]A systematic review states that between 64 – 93% of dentists are affected by MSI.[4]Among the affected dentists, only 32% were found seek medical help, which reflects the inadequate importance given to this crucial injuries.

.Equipment design plays a major role in modulating these work related stresses and ergonomically designed instruments can prevent many such associated problems.[3]Even though there are various advances in the equipment designs, the dentist were known to select instruments based on familiarity rather than the design characteristics and other ergonomicadvancements.[5]

MICROSCOPIC ERGONOMICS (ME): Microscope work usually involves prolonged sitting, high visual demands and repetitive adjustment of microscope controls. Common symptoms from microscope use that are classified as work-related musculoskeletal disorders (MSDs or WMSDs) which may include eyestrain, sore hands from maneuvering the controls and sore neck and shoulders from awkward sitting postures

ME not only plays a central role in delivering an effective and pleasant treatment for the patient, but also an significant part in providing an competent and user friendly work environment for the pathologists.

Inadequate understanding and lack of knowledge regarding ME among the budding pathologist is the basic reason behind the occurrence of these health related concerns. If the importance of ME is not properly stressed upon and followed in the early formative years of dental education, it is highly improbable that it will be followed later during their clinical practice. This echoes the dire need for increased stress about ME in the dental curriculum. Similarly there is no other studies done previously assessed the knowledge of pathologists regarding ME, according to best of author's knowledge.

Hence the aim of this current cross sectional survey is to evaluate the pathologist's knowledge and attitude regarding ME and to record their suggestions for change in the dental curriculum about the same.

Methodology

The study design was a cross sectional, area-framed, self-administered questionnaire survey, conducted between May 2014 and July 2014. Total sample or the whole target population constituted the sample. The study population comprised of the pathologists of Davangere city, Karnataka, India. The pathologist who have participated in the survey have completed undergraduate and post graduate dental/Medical education and working as staff, and others were doing Postgraduation in pathology. The subjects not willing to participate were excluded from the study. Ethical clearance for conductance of the survey was obtained from Institutional Review Board, College of Dental Sciences, Davangere, India (reference number. BDC/ Exam/393/ 2013-2014). Informed consent from the subjects was taken prior to commencement of the survey. Authors used a 26- itemed, custom designed, nominal-polytomous closed-ended, check listed questionnaire developed based on various literature sources[6, 7] For convenience sake the questionnaire was divided into three parts, with part 1 having questions on basic knowledge regarding ME, part 2 on knowledge regarding exercises, micro-breaks and part 3 on suggestions of the participants regarding changes in the curriculum. In the outset of the questionnaire, a brief introduction was given and an option of 'In this questionnaire' was provided in relevant questions. This choice was provided keeping in mind the scenario, in which the participants were introduced a new to the concept of ME with this questionnaire only.

The validation of the questionnaire was conducted by means of face validation, content validation, reliability, consistency tests.[8, 9] 5 subject experts were selected and the content validation was carried out. Before the data collection, a pilot test was done with a sample size of 20 to pretest the questionnaire and Cohen's kappa coefficient was estimated as 0.925, reflecting almost perfect agreement in the questionnaire.[10] Data collection mode used was face to face

method with paper and pencil interviewing method. The data was coded, tabulated and analyzed using statistical package for social sciences (SPSS Statistics version 13.0) software. Chi square test was conducted to assess whether there was any statistical significance in the responder's knowledge with a significance level of 'p' value less than or equal to 0.05.

Results

The questionnaire was administrated to a total of 100 participants. Among the included subjects in the study, Staff comprised of 45.5% PG students of 55.5%. Of all the respondents, 60% were female and 40 % male pathologist

In the Part I, the responder's basic knowledge about ME was assessed in this section. For ease of understanding and answering the questions, it was sub-divided into following:

Introduction (Basic knowledge) pathologist posture, Eye adjustments/posture and advanced instruments Ergonomics.

Regarding the questions of when and where they came across the term ME, majority answered that they came to know about the concept of ME only in this questionnaire (p value <0.001*)

(GRAPH-I) .When asked about the relevance of ME in dentistry/medical, response was mixed, 50 % told it is relevant and 50 % told it may or may not relevant. Whether ME should be incorporated in every clinical practice, mixed response came i.e. 59.80% pathologist said yes and 41.18% pathologist responded as no (p value <0.001*) (GRAPH-I). In the question about whether the ergonomics principles apply only for pathologist position but not to equipment's, majority 84.31% pathologist disagreed (p value <0.001*) (GRAPH-I). When questioned about MSD relation to ME, 71.21% pathologist accepted that they are related.

A sum of 6 questions was present regarding pathologist postures. Majority of responders 81.96% interns) were assertive that position of thigh should be horizontal when viewing specimen in microscope (p value is 0.548). Likewise a large majority (93.14%) concurred that they don't have any idea about use of fore arm rest while viewing specimen (p value is 0.219) (GRAPH-2).

when queried about position of elbow, position of neck and back posture majority and 94.12% of pathologist have idea about these postures (p value is 0.465) (GRAPH-2)..

6 questions were enquired about eye adjustments/postures majority of pathologist have no idea about

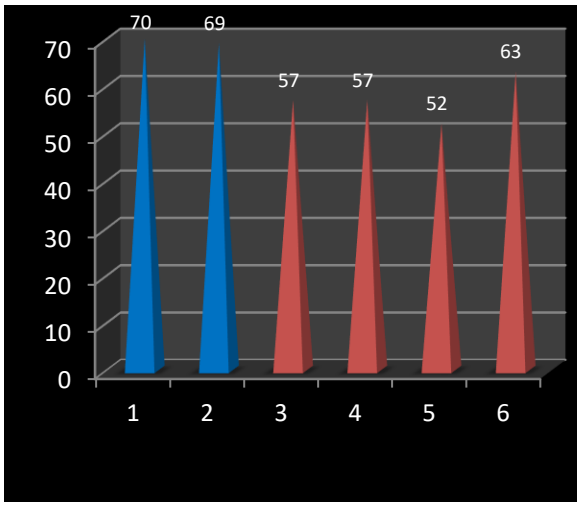
degree of eye piece to horizontal plane. Majority of pathologist have no idea about use of diopter, glass wear while viewing specimen. When queried about blinking eyes, closing of eyelids completely in between is necessary we got mixed response 60% have no idea and 40 % pathologist accepted that it is necessary (GRAPH-3) .

When queried about advanced instrument ergonomics, majority 89.02% responded that ergonomically designed microscopes are effective in reducing time & muscle fatigue (p value is 0.079). 88% pathologist accepted that employing video camera system which display specimen on monitor screen made the procedure easy and effective (p value is 0.002*)(GRAPH-3).

In second part, 2 questions were given to assess the knowledge regarding exercises & micro- breaks. 62.75% of pathologist answered yes when enquired about necessity of pathologist taking micro-breaks to reduce excessive muscle fatigue (p value <0.001*). However when enquired about whether the responders have used these exercises in their clinical practice, only a minority (34.31% pathologist) told that they have practiced it (p value <0.001*) (GRAPH- 4).

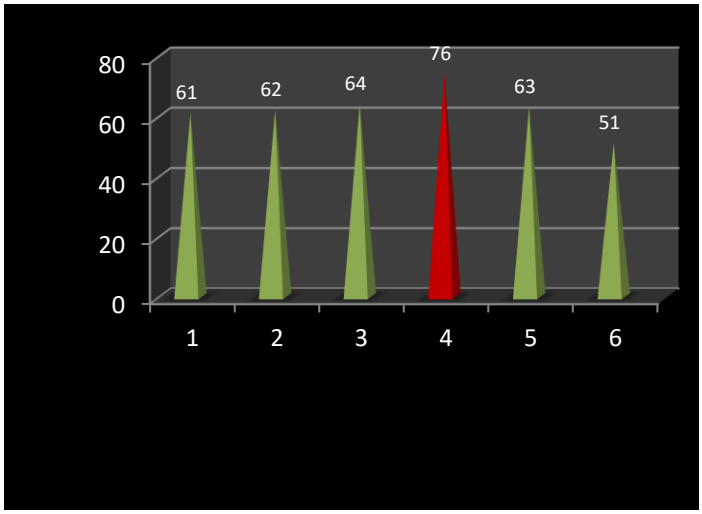
In third part 3 questions were asked to assess the responder's suggestions regarding the changes in the current curriculum regarding ME. A vast majority feels that the emphasis about ME is less in the present dental/medical curriculum (p value is 0.974) (GRAPH-4) .Alike 100 pathologist suggests that ME should be included as a separate entity in the syllabus before the students enter the clinic .Of the respondents 100 % proposed that improper ME and its related musculoskeletal problems should be properly emphasized in the curriculum (GRAPH-4) .

Results- Graphs



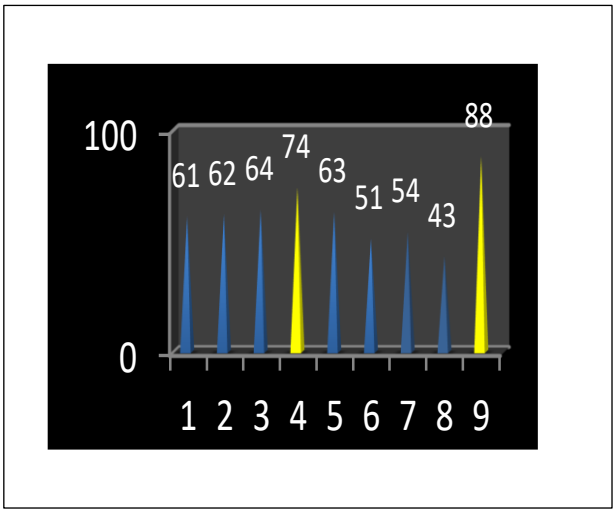
GRAPH -1 PART I-A

Of 100 subjects surveyed, 70% Pathologist (Staff and Post graduate students) stated that they came across microscopic ergonomics only through this survey (p value <0.001*)



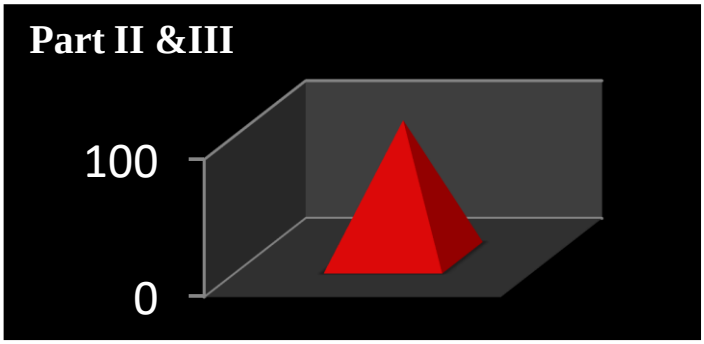
GRAPH-2 PART I-B

76% of pathologists had no idea about use of fore



GRAPH-3 PART I-C

74% of pathologist felt they need of micro breaks while viewing microscope and 88% of pathologist felt the need for camera to display tissue sections onto the moniter



GRAPH - 4 PART II AND III

Also 100 % of pathologist believed that the emphasis about microscopic ergonomics is less in the present curriculum

Discussion

Our musculoskeletal system was not intended to put through sustained, awkward finer hand movements hour after hour, day by day without showing the resultant ill effects. Such a work could be categorized as repetitive tasks and the dentist's work mode in general comes under this, since more than 50% of time is allocated for performing very controlled, fast, precise motions. These repetitive tasks are one of the main culprits for the development of MSI and there are various terminologies related to this clinical entity such as: repetitive strain injury, cumulative trauma disorders, repetitive stress injuries, repetitive motion injuries and musculoskeletal disorders.

In the dental profession these terms are commonly used now-a-days and the reported prevalence rate is very high and is due to the various work place related risk factors. Apart from the personal risk factors (age, sex etc.), the main etiologic factors could be broadly divided into work place- physical, psychosocial factors. Excessive force application, intense or repeated or sustained exertions, awkward or extreme postures and insufficient recovery time are the some of the work place related physical factors associated. [11]

To prevent the occurrence or to reduce the progression of MSI, self-recognition and identification by the pathologist regarding their own postures, practicing position, equipment usage pattern is the first critical step. Such recognition will help in avoiding or neutralizing these risk factors, decreasing the possibility of needless reduction of professional clinical carrier.[12]

ME is the study of how instruments, machines and equipment could be arranged in order that operator can work with them more efficiently and easily. The importance of good equipment selection in terms of its design, balance, weight, and latest technologies etc. is insurmountable in terms of prevention of MSI.

This study was conducted among pathologists of Davangere, Karnataka, India. This particular pathologist population was selected in this study because they represent the pathology community diagnosing the disease with good knowledge of their subject, as they have to pass postgraduate level university exams prior and are the future of India.

This study is first to assess when and where the respondents came across ME. As mentioned in results section, surprisingly a large majority stated that they came across it only via this study. Then only 30% of pathologists have stated that they got this knowledge from textbooks and evenminority (8%) selected CDE programs. This highlights the dire need to stress upon ME among these students.

When questioned about pathologist posture like neck posture, back position ,thigh position elbow position and us e of fore arm rest, among these majority of pathologist never use fore armrest.

Taking frequent, brief rest periods in-between the work to prevent or reduce MSI and to improve work productivity is known as microbreaks.[18] A study by Galinski et al, examined the effect of supplementary breaks among data-entry operators and concluded that it had positive effects on musculoskeletal discomfort.[19] A review by Gupta recommends that dentists taking microbreaks during dental procedures.[20] In this study, 34.41% pathologist expressed that they have never used these micro breaks during their clinical work.

The advancements in the equipment ergonomics in the last few decades are exponential. Numerous diverse designs and technologies being incorporated at a breakneck speed in all the aspects of the dentistry/medical gives us an added leverage in providing a better and safe treatment in terms of both the pathologist and the patient. But concurrent with the advancements, 'rushing to the market' of the products and the marketing of the vendors of their products leads to inadequate scrutiny paid on the ergonomic considerations overall. Thus a consensus on a structured approach in understanding the dynamics of ME should be arrived upon and made available for the Pathologist in a more systematic way. Caballero et al recommends initiating occupational health programs in the starting of their clinical practice since dentists are more prone for MSI.[21] Thus the importance of micro breaks and exercises in the clinical practice should be stressed upon and practiced in the formative years of student training only.

Conclusion

This cross sectional study shows that the pathologists are lacking complete understanding regarding ME and the newer advances in the traditional instruments. The pathologists are being exposed to the concepts of ME in much later stage of clinical experience and in our study we found that about 70% of the responders came across the concept of the ME in this survey only. India was of the opinion that it should be included in the dental curriculum as a separate entity. Hence within the limitations of this study, we suggest that the dental curriculum be modified appropriately to provide pathologist with clear understanding of ME on the whole. As this study was limited to the pathologists of Davangere, Karnataka, India, additional studies needs to be carried out nationwide to appraise the knowledge of the dental student community altogether.

ASSESMENT OF KNOWLEDGE OF ORAL PATHOLOGISTS REGARDING LIGHT MICROSCOPIC ERGONOMICS

Microscopic ergonomics: It is the study of how microscope could be arranged in order that operator can work with them more efficiently and easily

PART 1:

A) BASIC KNOWLEDGE REGARDING MICROSCOPIC EQUIPMENT ERGONOMICS

SL NO	QUESTIONS	OPTIONS
1	**Where did you come across the word microscopic ergonomics?**	◯ **In regular classes** ◯ **In CDE programs** ◯ **In textbooks** ◯ **In internet** ◯ **In this questionnaire**
2	**When did you come across it?**	◯ **I BDS/MBBS** ◯ **II BDS/MBBS** ◯ **III BDS/MBBS** ◯ **IV BDS/MBBS** ◯ **Internship** ◯ **Post graduate** ◯ **In this questionnaire**
3	**Do you think that microscopic ergonomics is not relevant to dentistry?**	**Yes** ◯ **No** ◯ **May be** ◯ **No idea** ◯

4	**Do you think it should be incorporated in every laboratory**	**Yes No May be No idea** ◯ ◯ ◯ ◯
5	**Microscopic ergonomic principles apply only to pathologist's position, but not to equipment's**	◯ **Agree** ◯ **Disagree** ◯ **May be** ◯ **No idea**
6	**Do you consider that the musculoskeletal problems are not related to wrong microscopic ergonomics**	**Yes No May be No idea** ◯ ◯ ◯ ◯

B) PATHOLOGIST POSTURES

SL NO	QUESTIONS	OPTIONS
1	While viewing specimen in microscope pathologist's neck posture should be?	◯ 30 degree inclination ◯ 45 degree inclination ◯ Vertical (90 degree) ◯ Any angulation
2	While viewing specimen in microscope pathologist's back posture should be	◯ 30 degree bent forward ◯ 45 degree bent forward ◯ Erect(90 degree) ◯ Any angulation
3	While viewing specimen in microscope pathologist's arm should rest on?	◯ Hard surface ◯ Soft surface ◯ No idea
4	Use of fore arm rest is necessary?	◯ Agree ◯ Disagree ◯ May be ◯ No idea
5	How should be the elbow position while viewing specimen?	◯ Far to the body and have them bent as close to a 90-degree angle ◯ Close to the body and have them bent as close to a 90-degree angle ◯ Close to the body and have them bent as close to a 180-degree angle ◯ None of the above

6	**What should be the position of pathologist's thighs in relation to floor when viewing in microscope?**	◯ **Vertical** ◯ **Horizontal** ◯ **Slanted slightly down**

C) EYE ADJUSTMENTS/POSTURES

SL NO	QUESTIONS	OPTIONS
1	Eye piece should be how many degrees above the horizontal plane?	◯ 20 degrees ◯ 30 degrees ◯ 40 degrees ◯ 45 degrees
2	Diopter adjustment is used to compensate?	◯ Major focus problems ◯ Minor focus problems ◯ None of the above
3	When should the pathologist wear glasses to view specimen?	◯ Mild astigmatism ◯ Moderate to severe astigmatism ◯ None of above ◯ Both of the above
4	While viewing specimen, blinking of eyes, closing the eyelids completely in between is necessary?	◯ Agree ◯ Disagree ◯ May be ◯ No idea
5	Focus on a distant object - at least 20 feet away–every 15 minutes or so will give rest to muscles in the eye?	◯ Agree ◯ Disagree ◯ May be ◯ No idea
6	Touching eyes and rubbing eyes in between viewing specimen will reduce eye strain?	◯ Agree Disagree ◯ May be ◯ No idea

D) OTHERS/RECENT ADVANCES

SL NO	QUESTIONS	OPTIONS
1	Microscope should not be used more than?	◯ 2 hours ◯ 3 hours ◯ 4 hours ◯ 5 hours
2	Alternate using the right and left hands when making adjustments on the microscope is necessary?	Yes ◯ No ◯ May be ◯ No idea ◯
3	Employing video camera systems that display the specimen on a computer monitor or television screen is necessary?	Yes ◯ No ◯ May be ◯ No idea ◯

PART 2: KNOWLEDGE REGARDING EXERCISES AND MICRO-BREAKS

SL NO	QUESTIONS	OPTIONS
1	**Should the pathologist take micro-breaks in order to reduce excessive muscle fatigue and eye strain?**	**Yes No May be No idea** ◯ ◯ ◯ ◯
2	**Have you ever used these micro-breaks in your work?**	**Yes No May be No idea** ◯ ◯ ◯ ◯

PART 3: SUGGESTIONS REGARDING CHANGES

SL NO	QUESTIONS	OPTIONS
1	**Emphasis about microscopic ergonomics is less in the present dental curriculum.**	◯ **Agree** ◯ **Disagree** ◯ **May be** ◯ **No idea**
2	**It should be included as a separate entity in the syllabus before students enter the clinic/laboratory.**	◯ **Agree** ◯ **Disagree** ◯ **May be** ◯ **No idea**
3	**Improper microscopic ergonomics and its related musculoskeletal, eye strain and other problems should be properly emphasized in the curriculum.**	◯ **Agree** ◯ **Disagree** ◯ **May be** ◯ **No idea**

(Signature)

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