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RESEARCH ARTICLE

DETERMINATION OF ERGONOMICS, FITNESS AND ITS IMPACT IN DENTAL PRACTICE : A KAP STUDY

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Abstract

Aim: To understand the dental practitioners' Knowledge, Attitude and Practice towards Ergonomics & Fitness and implementation of the same in their practice and way of life.

Subjects and Methods: A total of 400 private dental practitioners across Mumbai and Navi Mumbai were included in the study, 184 males and 216 females, with a mean age of 33.79 years. Dentists were evaluated with 19 point close-ended self-administered questionnaire.

Results: The data showed 87% subjects observing a sitting position while working on patients. Majority (75.8%) subjects did not use dental loupes in their practice. Most (69%) subjects practiced four hand dentistry. 44% practitioners experienced pain while working on patients with moderate pain in the neck (60.55%) predominating most of the cases followed by mild pain in the lower back (52.57%). Use of wrong posture was the probable reason for pain mentioned by 42.70% subjects. 19.33% dentists did not indulge into physical fitness during the day because of lack of interest (53.96%), busy practice (25.39%).

Conclusion: Dental practitioners should incorporate use of proper ergonomic practices in their daily routine through use of assistive devices and follow a fitness regimen regularly for a healthier way of life.

Introduction:-

Dentistry is a profession with limited work setting and a social interaction amongst a helper and recipient. The most important aspect in any profession involves a state of good health and wellbeing of the professional himself, which is applicable highly in the field of dentistry and dental professionals. Though 88% of dentists report good or excellent health (Ivona K et al 2014; Kupcinskas L et al 2003), some studies show that one out of ten dentists reports having poor general health and three out of ten dentists report having poor physical state (Ivona K et al 2014; Gorter RC et al 2000). Dentists are vulnerable to difficulties and illness that hamper their day to day practice.

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Ergonomics is the science of fitting the task to human capabilities and limitation in order to improve work place safety and productivity (Shah AF et al 2014). Dental profession is susceptible to Musculoskeletal Disorders. The dental profession entails multiple risk factors including poor flexibility, improper patient positioning, stress, untimed breaks, prolonged postural deformity, repetitive movements. Due to ignorance and lack of knowledge of following proper ergonomic design, most dental professionals are prone to MSDs developing gradually and subsequently worsening over the years.

The aim of the article is to understand the KAP of dental practitioners towards ergonomics and highlight ergonomic practices that a dentist must observe to reduce discomfort and increase productivity for a prolonged period of time.

Materials and Methods:-

A total of 400 private dental practitioners completed the 19-point closed-ended, pre-tested, self-administered questionnaire. This study was approved by the Scientific Research Ethical Committee, Faculty of Dentistry.

Manual and internet-based questionnaire was revolved which was divided into 3 parts. The first part included demographic questions regarding age, sex, work duration, and acquired specialization. The second dealt with working conditions (working posture, working with or without an assistant) and organization of the dentist's work (number of breaks and their purpose), whereas the third part concerned about the history of pain and type of pain experienced by subjects and what they did to get relief from the pain experienced. It also included questions regarding indulgence in physical activities (type, effectiveness). Data collection was performed using a self-questionnaire with items related to socio-demographic characteristics, time in profession, activities performed, work conditions, and work organization. A part of the questionnaire interrogated about the areas of pain experienced and severity of pain represented in a chart. The completed questionnaire was collected on the third day. The anonymity of the participating subjects was maintained. A pilot study for testing the same was conducted to test the reliability and validity of the questionnaire.

Inclusion criteria:

1. Private dental practitioners
2. Subjects willing to participate in the study
3. Only fully completed forms would be included
4. Subjects completing the forms in the speculated time period.

Results:-

Four hundred private dental practitioners were included in the study in Mumbai and Navi Mumbai with an average age of 33.7 years, including 46% males and 54% females with years of practice ranging from 49% subjects were into practice for less than 5 years, 22.8% practitioners- 5-10 years and 28.2%- more than 10 years (Table 1)

Table 2 shows 87% and 13% subjects practiced sitting standing dentistry respectively
Table 3 presents majority of the participants experienced pain due to wrong posture
Table 4 shows 90.09% subjects had an angulation of the knee to the floor at more than 90˚
Table 5 shows only 5.34% used saddle shaped dental stool while 65.9% used stools with partial back support.

Graph 1 shows that 75.8% subjects did not use of dental loupes while 24.3% did so in their practice.
Graph 2 shows that 69% subjects practiced four-hand-dentistry.
Graph 3 shows that pain affected 82.16% subjects in delivering quality dental care.
Graph 4 shows that 80.66% subjects indulged in physical exercises during the day

Among the subjects, 65.8% attended to less than 10 patients per day. Fortunately, 63.2% practitioners took breaks other than lunch during their working hours. Forty-three percent of practitioners taking breaks took break after 2 to 3 hours and 30% of them even took a break directly after 3 hours. The purpose of breaks for 45.65% practitioners was because they were tired or other reasons. While on a break 32.53% dentists used refreshments, 22.75% stretched themselves on the dental stool. The incidence of musculoskeletal disorders including backache, cervical spondylitis etc. was 38.8%, of which 26.88% thought dental practice was the cause and 26.52% dentists were not sure about the cause of the pain. Many dental practitioners (44.3%) experienced pain while working on the patient. Among the sites of injury, moderate pain in the neck predominated at 60.55% followed by mild pain in the upper back and mild

pain in the lower back at 52.32% and 52.57% respectively. Forty-two percent practitioners attributed pain to use of wrong posture. A severity of pain was highest during the evenings and night at 34.05% and 34.59% respectively. Pain relief was sought by 46.48% dentists by stretched or exercised and by others (27.02%) through rest. Most dentists (92.3%) kept a semi – reclined position of the dental chair. Out of the dentists who indulged in physical exercise, 67% exercised in the mornings. Majority of them (38.32%) went for a walk or run, 23.91% practiced yoga and 22.76% of them went to the gym.

Discussion:-

Dentistry demands dental personnel to be healthy so as to ensure quality dental care rendered to patients. The profession involves sustained movement of head, neck, arms and back besides awkward working postures. Studies in the past have highlighted prevalence of MSDs amongst dentists. Few studies in India are questionnaire based, discussing about the knowledge and application of preventive strategies in dental practice and physical fitness of the dental professional.

A study conducted by Jolanta S. stated that 22.8% worked in a sitting position, Fraçzak et al, who studied dentists, reported 74.4% changed position (sitting/standing) during work, the rest 15.4% worked exclusively in the standing position and 10.2% sitting down (Szymańska J 2002; Fraçzak B et al 1991).

Over two-third of the subjects did not incorporate the use of dental loupes, similar to the conclusion in a study conducted by Riziq A. et al. This was despite most practitioners being aware about use and benefits of such devices. It was also noted in their study that 63% practitioners were aware about the advantages of use of assistive tools but only 40% used assistive devices in their practice (Gaowgzeh RA et al 2015). Due to lack of use of magnifying devices, in the current study only 30% practiced a straight-back sitting posture.

Most practitioners practiced four-hand dentistry (Graph 2). The advantage for musculoskeletal and nervous systems, and for the individual dentist and dental team, is practicing four- or six-handed dentistry as it allows the dentists to conserve definite work time and provide adequate rest to the back, muscles and lower extremities (Szymańska J 2002).

On an average 65.8% practitioners attended to less than 10 patients per day. Literature states that 57.8% dentist were treating 1-3 patients per day (Gaowgzeh RA et al, 2015). In the current study, 63.2% subjects took breaks other than lunch, out of which 25.68% subjects took a break after every hour, 43.73% took breaks after 2-3 hours and 30.58% took breaks after more than 3 hours. Its noted 46.3% dentists had a single break through the course of a day, 16.4% had 2 breaks, 7.0% - 3 breaks, and 0.4% - 4 breaks and 29.9% of those questioned had no break at all in literature. The biggest group comprised those dentists who had a single break per day after 4 hours' work - 13.8% (Szymańska J 2002).

The purpose of taking breaks for 45.65% practitioners was because of tiredness, 3.26% experienced pain and 51.08% took breaks for other reasons (monotony, to smoke, to use the washroom/ freshen up etc.). During the break, only 6.34% subjects performed bending exercises, 14.28% took a short stroll inside the clinic, 22.75% stretched themselves on the dental stool. Similar results were observed where 17% subjects exercised during the break even though 57% took breaks during their working period (Gaowgzeh RA et al 2015).

An ergonomist or physical therapist is best suited to educate dental professionals regarding appropriate stretching and relaxation exercises to avoid or control musculoskeletal disorders.

The Applied Occupational and Environmental Hygiene guidelines recommend at least 6 minutes of rest every hour for professionals who perform repetitive movements (Yemineni BC et al 2018; Valachi B et al 2003). The three types of breaks which are recommended for dentists would be the following:

1. Frequent stops and shaking exercises (15 seconds).
2. Breaks between successive patients (2-3 minutes).
3. Breaks to allow recovery (10-15 minutes every 2-3 hours)

The current study also revealed that 38.8% subjects have a history of musculoskeletal disorder. Among subjects with history of musculoskeletal disorder, 46% had the problems for reasons apart from dental practice. Out of subjects, 44% experienced pain while working on patients. It was further noted that 60.55% had moderate pain in the neck,

52% experienced mild pain in the upper back and lower back respectively, 35% noted pain in their arm. According to a study 70% of dentists suffered from back pain (Gaowgzeh RA et al 2015), similar results were noted by Chandra S et al stating 72.80% incidence of neck and lower back pain (Chandra S et al 2015). Shaikh et al also reported incidence of 80% of MSDs in their study in 30 dentists (Chandra S et al 2015; Shaik AR et al 2011) as also the results of Jolanta S in Poland which observed incidence of neck pain (56.3%) and back ache was observed by 60.1% practitioners (Szymańska J 2002). Forty-two percent of the subjects agreed that the reason of their pain was using an incorrect working posture during their practice. Dentists are able to recognize and identify their own postures and equipment usage patterns that lead to high risks for musculoskeletal pain, especially lower back pain. Recognition is the first step to neutralize non-ergonomic behaviour and reduce risks to dental practitioners (Shaik AR et al 2011). Yemineni B. et al mentioned that some investigations have shown that the prevalence and location of pain and other symptoms may be influenced by posture and work habits (Yemineni BC et al 2018). The severity of pain was at its peak at nights and evenings among 34% of the subjects. The quality of dental care delivered was affected due to pain among 82.16% of the subjects. Similar results were noted in a study conducted by Dhanya M et al, reported that MSD has affected the practitioners and is evident from the percentage taking sick leaves, consultations with doctor and hospitalization. More than one third of the practitioners' required sick leaves (Muralidharan D et al 2013). To get relief from pain 46% of the subjects stretched or exercised. Literature states that certain factors help the participants to relieve their pain which includes correct posture (46.9%), pause for few minutes (32.7%), muscle relaxing exercise (24.5%), analgesic drugs (10.2%), and complete rest for a day (4.1%). Similarly, a study in Glasgow also observed improving posture can definitely help to relieve the pain (Yemineni BC et al 2018; Students of University of Glasgow Dental School, A study on back pain, 2005). Some literature, however, states improvement in ergonomics of the dental equipment does not reduce the incidence of MSDs. Aetiology of MSD is multifactorial, involving biomechanical, individual and psychosocial factors related to work (Yemineni BC et al 2018).

While practicing, 92% of practitioners kept the position of the dental chair in a semi reclined position. S Raja Rajeswari et al mentioned the dental chair is one of the vital equipment in delivering optimal dental treatment (Haddad O et al 2012, Rajeswari SR et al 2016). Haddad et al. recommended introduction of ergonomically designed chairs early in student training before the development of wrong postures (12). It was observed that 76.88% of the dental practitioners had an angulation of 90° of their knee to the floor (Table 4). S Raja Rajeswari et al states 32.35% of the subjects admitted that they were unaware of desired positioning of operator's knees to hips during stool adjustment (Rajeswari SR et al 2016).

The study observed merely 5.34% used the saddle shaped dental stool in their dental practice. Dental Products Report states an increased awareness of use of saddle shaped dental stools in dental practice. A saddle-style stool promotes a neutral pelvic position, which supports the spine's three natural curves in a balanced posture. The thighs slope steeply (45°) downward, so the seated position is halfway between sitting and standing (supported standing). The resultant benefits to the musculoskeletal system and from an ergonomic standpoint when compared with conventional style seating are numerous (Dental Products Report: The ergonomic benefits of saddle-style stools 2017).

The study results stressed that 81% of the dental practitioners performed some kind of physical exercises, preferably in the mornings. Walking, running, yoga, gym were the most prominent forms of exercises. Similarly, a study in Patna stated that 57.85% dentists practiced yoga or opted for some physical fitness exercises (10). Surprisingly, the subjects who did not indulge into any physical exercises showed lack of interest. Deolia S et al suggest in their study that not performing any exercise or indulging in any sport on daily basis increased the risk of having musculoskeletal problems (Deolia S et al 2018). Regular physical activity is recommended for all, including dental health professionals as it is one of the keys to counteract the current epidemic of obesity and musculoskeletal work-related disorders. In previous studies found that Pain was significantly prevalent among the group who worked in direct vision, without an assistant, in a standing position, or who did not follow a fitness regimen (Gaowgzeh RA et al 2015; Hayes MJ et al 2013; Nemes D et al 2013).

The current study concludes that despite awareness amongst dental professionals regarding use of assistive devices and proper ergonomic practices, they fail to apply it in their daily practice. However, we acknowledge that study had a limitation of less interaction with practitioners due to busy practice across Mumbai and Navi Mumbai.

Tables:-

Table 1:- Demographic characteristics of the study participants (N=400).

Variables	Sub-groups	%
Gender	Male	46.0
	Female	54.0
Years of Practice	0 – 5 years	49.0
	5 – 10 years	22.8
	>10 years	28.2

Table 2:- Working posture.

		Percent
Valid	Sitting	87.0
	Standing	13.0
	Total	100.0

Table 3:- Distribution of reason for pain

		Percent
Valid	Lack of physical exercises	12.97
	Long working hours	30.81
	Stress	13.51
	Wrong posture	42.70
	Total	100.0

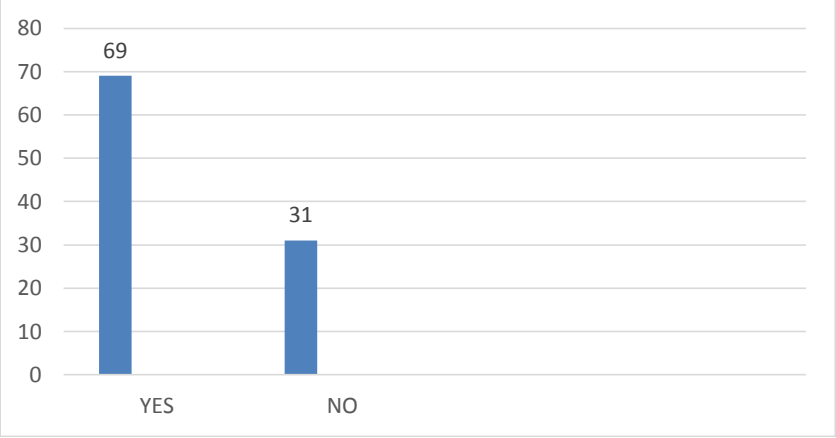
Table 4: Distribution of angulation of knee to the floor while doing dental treatments.

		Percent
Valid	<90 degrees	14.02
	> 90 degrees	9.09
	90 degrees	76.88
	Total	100.0

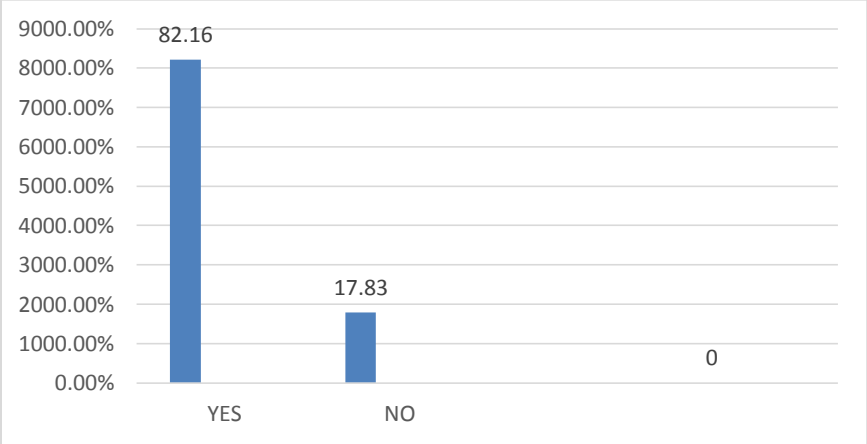
Table 5: Distribution of kind of dental stool used

		Percent
Valid	Option 1	28.75
	Option 2	65.90
	Option 3	5.34
	Total	100.0

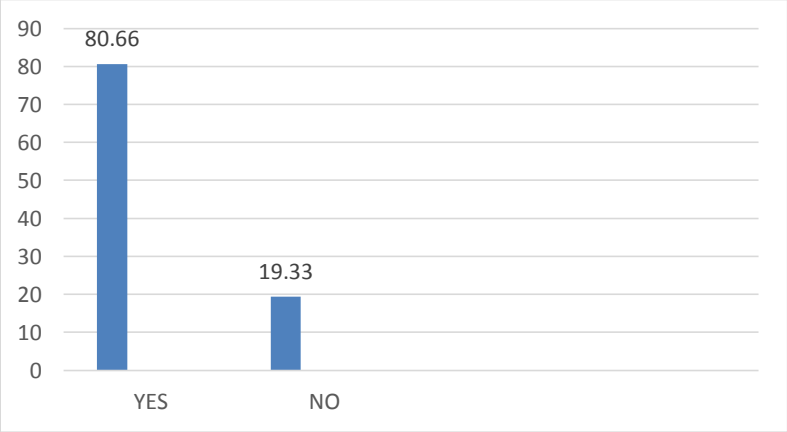
Graphs:-



Graph 1: Subjects practicing four handed dentistry.



Graph 3:- Pain affecting in delivering quality dental care to patients.



Graph 4:- Subjects indulging in any kind of physical exercise.

Conclusion:-

Ergonomics principles can be adopted in dental practice by correct patient chair position, tool/ instrument design, workstation needs, operators chair position, posture and position of the dental practitioner. The importance of use of magnification devices like dental loupes, microscopes etc. should be reinforced at student training level as it influences the posture of the dentist which eventually becomes a habit. Another important aspect is the practice of four – and six – hand dentistry to minimize the stress on the practitioner. Dental professionals should be educated at student level through training programs, workshops etc. regarding the benefits and application of proper ergonomic practices to facilitate smooth dental practice and prevent occupational hazards.

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