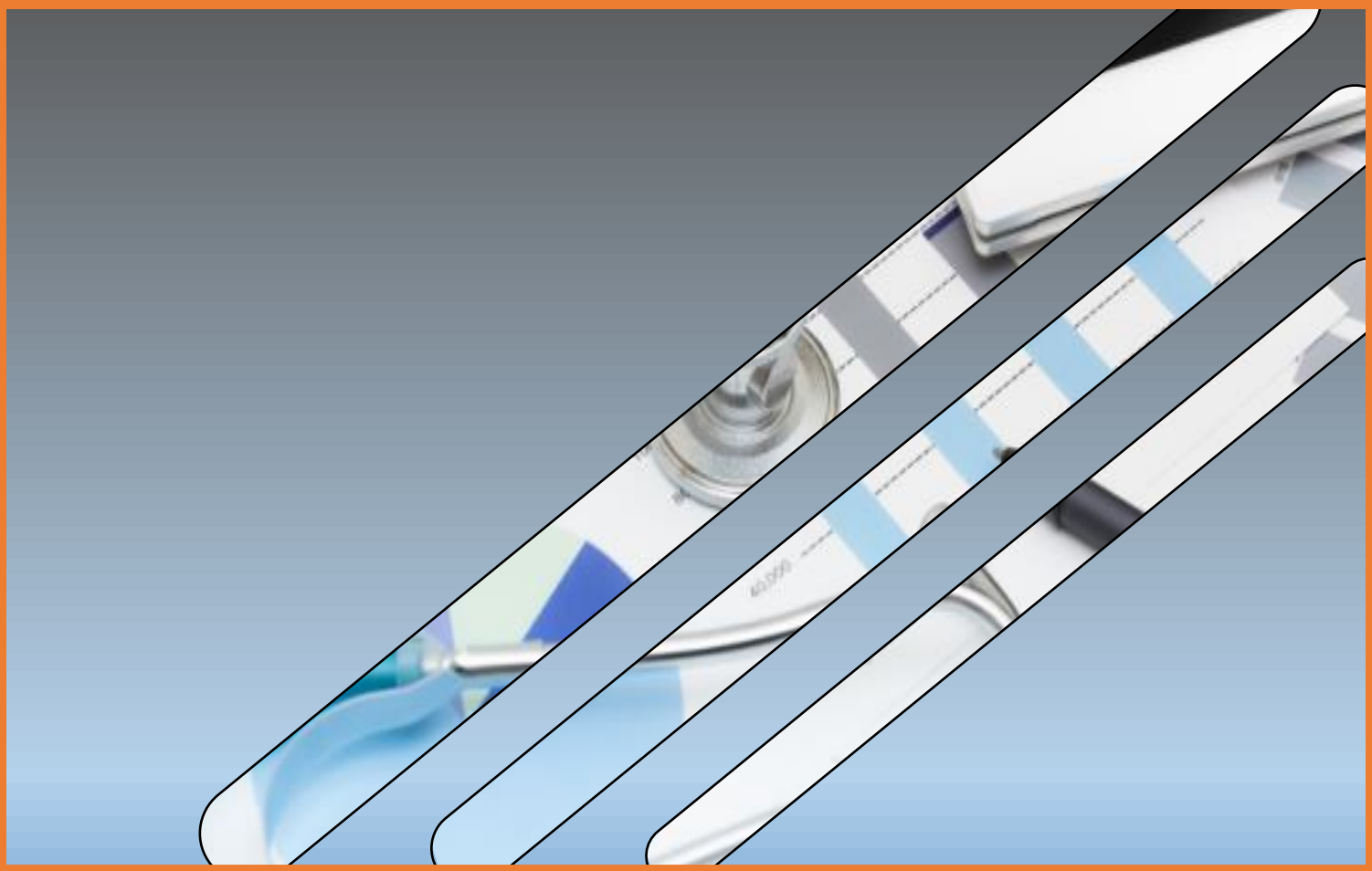

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Mechanism of Anti-Cancer Therapy Alopecia: An Achievement

Dr. Vatsul Sharma

Anticancer drugs, primarily taxanes are known to induce a very harrowing and sometimes long-running hair loss also known as taxane-induced alopecia. It is a transitory and usually reversible after effect of anticancer therapy that can have a devastating effect on psychological wellbeing of the patient.[1] The severe emotional trauma due to hair loss may lead to refusal or delay in cancer treatment.[2-3] The resolving time may last for several months to years. Long lasting nature of this condition may result in the amplification of the psychological impact of the disease and related treatment. It is also really not known that why some patients show greater hair loss as compared to others even with the same drug and the same dosage.

Currently, scalp cooling is the only preventive treatment available for tackling chemotherapy associated alopecia, but clinical efficacy of the same is yet unsatisfactory and hard to speculate, especially in cases of taxane related hair loss.[4] Marks DH et al., in a systematic review, concluded that scalp cooling systems and scalp hypothermia with cold caps are reported to show satisfactory effectiveness in the treatment of hair loss caused as an adverse reaction due to taxane chemotherapy.[5] A treatment approach would only show good results if the mechanism of hair loss following chemotherapy is brought to light. Purba et al, in their sensational research, explored how taxanes (docetaxel and paclitaxel) damage human scalp hair follicles in a clinically appropriate ex-vivo organ culture model. As per their results, taxane use results in alopecia through several mechanisms including induction of the massive stockpiling of phospho-histone H3+ cells in the anagen matrix of human scalp hair follicles and agglomeration of cleaved caspase-3+ and pH3+ cells within the stem/progenitor-rich outer root sheath.

They also stimulate micronucleation, transcriptional arrest and cell death in keratinocytes of hair matrix. Additionally, taxanes induce cell death and mitotic defects within human hair follicle K15+ epithelial stem and progenitor cell niches.[6]

In their research, Purba et al. revealed how taxanes damage stem, progenitor and transit amplifying cell niches in the human hair follicles in a cell cycle-dependent fashion and uncovered an interestingly new management tactic for chemotherapy associated alopecia, that is hair follicle protection through targeted cell cycle arrest. They also reported that palbociclib, the G1 arresting CDK4/6 inhibitor antagonises the mitosis-targeting cell toxicity of taxane chemotherapy in stem cell and transit amplifying cell compartments in the human hair follicle, without promoting premature catagen or causing adverse events related to hair follicles.[6]

Their recently developed and clinically relevant human model of taxane associated hair follicle damage provides an invaluable preclinical research tool for developing novel strategies to manage taxane-induced hair loss and protect against human epithelial stem cell toxicity. Moreover, they have provided a proof-of-principle of a novel therapeutic approach, i.e. pharmacological G1 arrest, that could mitigate taxane-induced hair follicle damage and prevent subsequent chemotherapy-induced alopecia through the topical delivery of G1 arresting agents.[6] This breakthrough discovery will further help in unlocking more mechanisms that result in taxane induced hair loss leading to development of more safe and efficacious treatment modalities.

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Incidences of Root Microcracks Caused by Hand and Rotary File System at Different Lengths

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ABSTRACT

OBJECTIVES: The present research was conducted to assess incidences of root microcracks caused by hand and rotary file system at different lengths.

MATERIAL AND METHODS: This in-vitro study was undertaken to assess incidence of root microcracks caused by hand and rotary file system at different lengths In total, 100 the mandibular premolar with straight roots determined with intact, fully formed apices were taken. Samples were randomly distributed into 5 groups based on the file system used: a) Group A: Control, b) Group B: Reciproc, c) Group C: WaveOne, d) Group D: One Shape and e) Group E: ProTaper. Pearson Chi-square test was used to determine the differences between groups. The dentinal defects were expressed as percentage of samples with microcracks in each group. Level of statistical significance was set at p-value less than 0.05.

RESULTS: The chi square test was used to compare the Distribution of the number of teeth in which cracks were observed on the horizontal sections. It was found to be significant with group ProTaper showing maximum cracks at 3,6,9 mm level as compared to other file system

CONCLUSION: Nickel-titanium instruments causes cracks on the apical root surface or in the root canal wall. ProTaper causes maximum dentinal cracks as compared to other file systems.

KEYWORDS: Reciproc, WaveOne, One Shape, ProTaper, Microcracks

INTRODUCTION

Endodontic treatment is fundamentally aimed for prevention and cure of apical periodontitis. The primary requisite is to achieve shaping and cleaning the root canal system effectively as well as maintaining the original anatomical configuration. The Clinical evidence from the existing literature reports that root canal systems is to be cleaned, shaped and obturated to achieve hundred percent success. The Knowledge, skill and desire of clinician also play major role in determine the predictability of successful treatment.[1-4]

Careful manipulation of hand instruments within the root canal space and adhering strictly to the biologic and surgical principles, following essential disinfection procedures were incorporated so as to prevent any iatrogenic incidences such as instrument fracture, external transportation, ledge, or perforation. In recent times, mechanized and automated systems for preparation and sealing of root canal system have been developed.[5-9]

The Nickel-Titanium (NiTi) instruments result in complications such as perforations, canal enlargement, root canal transportation and vertical root fracture. Even the shaping procedures can damage the root dentin, resulting in dentinal cracks which under dynamic oral environment progressing to vertical root fractures. During these procedures, a loss of tissue takes place that along with excessive occlusal forces, making the teeth highly prone to dentinal crack formation in the roots even. The susceptibility of the fracture in the root majorly depends on the apical preparation of canal and followed by its enlargement as they are stress concentration sites. Henceforth, different bio mechanical techniques employed in preparing root canal and varied instrument design, lead to different levels and severity of dentinal damage to the root canal wall.[10-13]

Recently, one shape files that are used in continuous rotation have emerged as a better alternative for curved canals. These are enhanced with different cross sections along the length of the file which provides better cutting action around the canal walls and further results in minimizing the instrument fatigue risk indirectly eliminating the chances of instrument breakage.[12-14]

Reciproc and WaveOne are two different reciprocating systems employing balanced force technique. These instruments are designed on use of clockwise and anti-clockwise motion for root canal preparation and

achievement of complete shaping of the root canal can be done with a single file.[8-10,11,13]

WaveOne NiTi file is an another new single-file system for shaping the root canal completely till finish with a pre-programmed motor set for the angles of reciprocation and speed. Before it can lock into the canal, the clockwise movement of this file system disengages the instrument from the dentine.[15]

The Self-Adjusting File is a hollow file system, designed as a compressible cylinder. It has got a thin NiTi lattice with an abrasive surface. The vibrating file acts as a sandpaper helpful in scraping dentin and enlarging the canal with a back and forth grinding motion. Its easy adaptability to shape to the canal anatomy, helps in applying a mild but constant delicate pressure on the walls of the root canal.[16]

Unlike One Shape, Reciproc, and Self-Adjusting File that usually require a single file for shaping the root canal, the ProTaper system engages a sequence of files with different sizes.4 There is a multiple increasing percentage tapers over the length of cutting blades in each instrument which considerably increases the efficiency of cutting, flexibility and safety profile of the files.[17-19]

The concept of Single file system requires a gliding path and only a single file for finishing the instrumentation of root canals. This system saves both cost and time as it has an added advantage of reduced instrument fatigue which leads to decreased working time and lowers the cross contamination between subjects. The diagnostic methods of root microcracks used currently are based on optical assessment, with or without the surgical loupe aid, microscopes, dyes or transillumination. Enhanced magnification improves their detection. Hence in the present study stereomicroscope under a magnification of 20 was employed[20-23] to assess the occurrence of microcracks in root caused by hand and rotary file system at different lengths.

MATERIAL AND METHODS

Sample Size: Based on the calculated variance of 1.5 (based on previous study), 5% level of precision, 95% confidence level and 80% power of the study. The sample size for the mandibular premolar with straight roots determined was 93, Rounding off to nearest whole number, the final sample size for the study was 100, with 20 in each group.

Preparation of Samples: Random allocation of human caries free single-rooted mandibular premolar with intact, fully formed apices was done. The teeth were disinfected in a 0.1% thymol solution for 24 hours. Throughout the experiment, the teeth were stored in purified filtered water. Periapical radiographs (Bucco-lingual and mesio-distal) of the teeth were obtained to confirm the presence of a single root canal. The same operator experienced with these instrumentation techniques performed the laboratory procedures.

To remove coronal portions of the teeth, a double-sided diamond disc was used. All the teeth were examined and compatible with a #10 K-file made from stainless steel. A file was inserted to determine the length of the canal until the tip became visible on the apical foramen. The distance between the tip of the file and the reference plane was defined as the canal length. To calculate the working length, 1 mm was subtracted from the obtained length.

Root canal preparation: Acrylic resin blocks were prepared for the samples. Initially, 2 mL of a 2.5% sodium hypochlorite solution was used to irrigate the root canals. A #10 K-file was used to make the glide path of all the samples. The tooth were worked upon in a wet environment. The coronal part of each canal was flared with #2 Gates-Glidden drills and one operator performed all root canal instrumentation. The experimental groups were prepared with the instruments, Reciproc, Wave one, one shape and ProTaper as per the manufacturer's instructions.24 The motor that was used had 350 rpm and 5 N/cm2 of torque. The preparation was performed with in-and-out pecking movements of the instrument with 3 mm of amplitude until the working length was reached with a brush motion on the buccolingual extension.

Group A: CONTROL GROUP

No preparation was made in the control group. Gates-Glidden drills #2 was used to flare the coronal part of each canal with no further instrumentation.

GROUP B: RECIPROC

Canals were prepared with NiTi flex K-files to #15 first and a single REC file (25/0.08) was used with reciprocating movements.

GROUP C: WAVEONE

Canals were prepared with NiTi flex K-files to #15 first and WOG primary single file (25/0.07) in a reciprocating movement.

GROUP D: ONE SHAPE
In the One Shape group, the canals were prepared with NiTi flex K-files to #15 first. One Shape rotary file #25/.06 at a low-torque motor with a constant speed of 300 rpm was used for root canal preparation to the apical foramina.

GROUP E: PROTAPER NEXT (PTN)
The ProTaper Next system was used in the X1 (17/0.04) and X2 (25/0.06) instrumentation sequence until the working length was achieved in a continuous rotary movement.

Irrigation of canal was done with 2 mL of 2.5% NaOCl with the use of each instrument and a final irrigation was performed at the end of the process using 17% EDTA and 2.5% NaOCl (2 mL each).

Sectioning and microscopic examination: All roots were horizontally sectioned first at 3mm from the apex with rotating diamond disc positioned perpendicularly to the root canal axis with water cooling.[25] To reduce the fine scratches produced by rotating diamond disc and to obtain a clear, highly magnified image, sectioned was polished with waterproof of 1000-,1200-,1500- grit abrasive paper (silicon carbide) and a fine polishing was performed with a diamond paste. Under running tap water debris was removed after fine grinding and polishing. Each sample was viewed through stereo microscope. Pictures was taken with camera attached to stereo microscope examine the sections for dentinal cracks. Similar procedure was performed by reducing the roots further at 6mm (middle) and 9mm (incisal). PowerPoint presentation for each root sections was prepared with three images on each slide for blind study by examiner. Any crack that originates from root canal was considered as having been produced by the instrument and was noted. The collected data was subjected to statistical analysis.

Statistical methods: Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables and Graphs. The data was analyzed by SPSS (21.0 version). Shapiro Wilk test was used to check which all variables were following normal distribution (p value more than 0.05). Parametric test i.e. Pearson Chi-square test was used to determine the differences between groups. The results regarding the presence of dentinal defects was expressed as the number and percentage of samples with microcracks in each group. Level of statistical significance was set at p-value less than 0.05.

RESULTS
Table 1 describes the distribution of the number of teeth in which cracks were observed on the horizontal sections at 3, 6 and 9 mm.

The distribution of the number of teeth in which cracks were observed on the horizontal sections. It was found to be significant ($p < 0.001$*) with group E showing maximum cracks at 3 mm, 6mm and 9 mm level as compared to other file systems.

DISCUSSION
In endodontics, while doing biomechanical preparation, a torque force is exerted on the root canal walls. This process initiates the formation of microcrack in the root dentin.[26]

While shaping canals, both continuous rotating and doing a reciprocating movement has its own merit and. The commercially available files used in are manufactured from NiTi material. They are mechanically driven in continuous rotation. They require less inward pressure and improves hauling capacity auguring debris out of a canal.

Whereas clinically utilized stainless steel files, work on reciprocation principle i.e. repetitive back-and-forth motion.[27] The reciprocating motors and hand piece rotatory files operate in large equal angles of 90º clockwise and anti-clockwise rotation. With time, almost all available reciprocating systems began to make effective use of small but equal angles of rotation.[28,29] The mechanical reciprocating motion is profitable as it imitates manual movement to some extent and decreases the risks related to continuous rotation of a file through the curvatures of canal.[30,31]

For a motor driven drive, that reciprocates shaping files, multi-file sequences are required to prepare a canal in an adequate manner. Their small angles have decreased cutting intensity, require more inward pressure and have a restricted ability to dig debris out of a canal.

Working with NiTi engine-driven instruments for biomechanical preparation of the root canal has become the fundamental of today's endodontic treatments. These instruments have many benefits including less operating time, less procedure related accidents and increased cleanliness of root canal walls. They are being increasingly used as they cause less fatigue to the dentist and make the procedure less time intensive.[5,9,10]

n=20	Group A n (%)	Group B n (%)	Group C (%)	Group D N (%)	Group E N (%)	P value
3 mm						
Yes	0 (0)	7 (35)	11 (55)	4 (20)	12 (60)	0.001*
No	20 (100)	13 (65)	9 (45)	16 (80)	8 (40)	
6 mm						
Yes	0 (0)	6 (30)	12 (60)	7 (35)	13 (65)	0.001*
No	20 (100)	14 (70)	8 (40)	13 (65)	7 (35)	
9 mm						
Yes	0 (0)	2 (10)	12 (60)	5 (25)	14 (70)	0.001*
No	20 (100)	18 (90)	8 (40)	15 (75)	6 (30)	

Table 1. Distribution of the number of teeth in which cracks were observed on the horizontal sections at 3, 6, 9 mm

Conventional ProTaper pioneers the realm of engine-driven instruments and they have got a convex triangular cross-section, engaging 360° rotation and multiple tapers inside the shaft.[32,33]

The files are used at a particular speed and torque in a specific order that is catalogued by the manufacturing companies. Single-file systems such as, WaveOne, Reciproc, Neolix and One Shape are recently introduced to the market. It is claimed that Reciproc systems are highly capable of cleaning the root canals with varied anatomical variations and the alloy used in manufacturing of these systems enables high flexibility and also results in superior adaptation of files to the root canal walls.[9,10,34]

WaveOne instruments have a special decreasing percentage tapered design which advances the adaptability and preserves the remaining dentin in the coronal 2-3rd section of the finished canal preparation. They have noncutting redesigned guiding tips permitting these files to safely move forward through any secured canal practically and also enhancing safety and efficiency in root canals that have a confirmed, levelled and reproducible glide path.[32]

The Reciproc is the latest single file system enabled with reciprocating motion and has S-shaped cross-section with a non-cutting tip which shapes the canal by 150 degrees counter-clockwise followed by 30 degrees clockwise motion at speed of 300 rotations per minute.[35,36]

When compared to multiple file systems, the single file systems show superior or no less than equal cleaning efficacy, act economical, cause low damage to root and save time. They are highly preferred as. Root canal preparation with NiTi rotary systems and every following additional procedure in endodontics as obturation and retreatment with rotary systems can create fractures or craze lines.[9]

Research data suggests that in the formation of dentinal fractures, shape and taper of the files as influencing factors could play an important role. Crack formation in the walls of root canal is of utmost concern during the use of rotary systems and it can further lead to Vertical Root Fracture and adversely affect the prognosis of the tooth in the long run and this kind of fracture is one of the annoying complications of root canal treatment leading to extraction of tooth in most of the cases.[37]

Literature reports that resistance to tooth fracture is of prime importance in endodontic treatment because such fractures decrease the survival rate in the long run. Research work has shown that removal of dentin in excess during root canal preparation or obturation procedures with spreader can result in tooth fractures.[38]

Bier et al. have also reported that fractures do not occur immediately after preparation of canal. Although, craze lines (4% to 16%), might develop into fractures during retreatment or after long term functional stresses like chewing and misbalanced occlusal forces.[9]

In the present research, the control group showed no incidence of dentinal cracks. Similar findings were reported by Khoshbin et al. (2018)[34] where they reported that no crack was found in the control groups, emphasizing the fact that the microcracks seen were as a result of the preparation procedures with nickel titanium rotary and reciprocating files.

In the present study, at 3,6,9 mm horizontal sections, of teeth the distribution of incidence of cracks were compared across five groups. It was found to be significant ($p < 0.001$) with ProTaper system showing maximum cracks at all levels These findings are in accordance to that reported by Liu et al (2013).[8]

No significant differences were noted for microcracks between other groups ($P>0.05$). These findings of the present research are in agreement with the results of Capar et al. (2014)[39] and Kansal et al. (2014).[40] Similarly Bier et al. (2009)[9] observed cracks in the horizontal sections instrumented with the ProTaper system (16%)

The probable reason could be that more manipulations in the canal could cause the accumulation of damage. It may be attributed to the fact that the tip of ProTaper finishing files has greater taper than other file system utilized. Also in the present study, rotary and Reciproc files were the same in terms of taper and the final file. Thus, differences in the frequency of cracks among different groups cannot be attributed to the taper of files. This difference in the percentage of cracks between experimental groups may be attributed to the design of the file tip, variable or constant taper of rotary file, geometrical shape of the cross-section of the file and flute shape, which are all related to crack formation in root canal walls. Also, the other files, are made of M-Wire NiTi. This alloy has higher cyclic fatigue resistance and greater flexibility than traditional NiTi, which may explain fewer crack formation in M-Wire NiTi compared to conventional NiTi files.

In the present research, maximum dentinal cracks were seen at apical section. In 2013, Liu et al. reported cracks at the apical root surface in 25% of the roots instrumented with the ProTaper.[8] Cracks were observed in half of the roots instrumented with the ProTaper at apical surface when the apical root surface and horizontal sections of the roots were examined. One Shape and ProTaper files work in a continuous rotatory motion and result in cracks. The Reciproc files work in a reciprocating movement similar to the balanced force technique. This kind of motion minimizes torsion and flexural stresses and decreases canal transportation and causes less dentinal damage when compared to continuous rotation motion. This is also supported by Kim et al. (2013)[10] confirmed that the new rotary systems with a modified design and alloy composition apply less stress to root dentin compared to older systems such as ProTaper and thus, it is expected to create fewer cracks in dentinal walls.

The present study was in vitro study design. It is difficult to create the highly dynamic conditions seen inside the oral cavity. This could have been one of the limitations of the present study. The present research employed the use of single rooted teeth, as they provide few anatomical variations when compared with multi-rooted teeth could have added to the disadvantage. This anatomic homogeneity does not reproduce true clinical presentations. Thirdly, the evaluation of different torque could have been employed to further add to the study. Contrast enhanced micros could have been used for further investigations to throw better light in this direction. Another possible bias from the clinical situation is the minimal coronal flaring used.

CONCLUSION

Instruments made up of nickel titanium can cause cracks on the apical portion of root surface or in the wall of root canal. The pioneer ProTaper results in maximum dentinal cracks as compared to other file systems commonly used in endodontic practice.

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Soft Tissue Cephalometric Norms for Bihar Ethnic Population

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ABSTRACT

INTRODUCTION: A person's ability to recognize a beautiful face is innate, but translating this into defined treatment goals is problematic and various authors tried to relate the importance of soft-tissue esthetics with orthodontic diagnosis and treatment planning.
AIM AND OBJECTIVES: To derive the Soft Tissue Cephalometric norms for the normal, well-balanced and esthetically pleasing faces of the Bihar ethnic population and to compare them with pre-established norms.
MATERIALS AND METHOD: A sample of 60 subjects from an ethnic Bihar population residing in Patna, on the basis of facial symmetry, balance and pleasing appearance were observed from five sets of extra-oral photographs. Standardized lateral cephalometric radiographs were taken with metallic markers placed on various soft-tissue structures on the face using derma tapes. All lateral cephalometric films were traced and Soft Tissue Cephalometric Analysis was done.
RESULTS: Total facial length was significantly less in males as compared to the Caucasians with 117.50±1.74 as mean value. Males had significantly less protrusive upper and lower lips in projection to TVL with a mean value of 0.77±0.77 and -3.13±0.73 respectively. Lower lip length in females was significantly decreased with a decreased lower third facial height with a mean value of 62.27±1.46. Total facial length was significantly less in females with a mean value of 115.40±1.99. Females had significantly more protrusive upper and lower lips in projection to TVL with a mean value of 1.90±0.84 and 1.93±0.74 respectively.
CONCLUSION: The established norms in present study could be used as future reference for Orthodontic treatment in Bihar ethnic population.

KEYWORDS: Soft Tissue analysis, Soft-Tissue Cephalometric Analysis (STCA), cephalometric analysis, Arnett & Bergmann, True Vertical Line (TVL)

INTRODUCTION

A person's ability to recognize a beautiful face is innate, but translating this into defined treatment goals is problematic. Various authors have tried to relate the importance of soft-tissue esthetics with orthodontic diagnosis and treatment planning.[1]

Arnett and Bergman[1,2] presented the Facial Keys to Orthodontic Diagnosis and Treatment Planning as a three-dimensional clinical blueprint for soft tissue analysis and treatment planning. Later, they developed the Soft-Tissue Cephalometric Analysis (STCA)[3] for orthodontic diagnosis and treatment planning. Analysis of dental and skeletal patterns alone might be inadequate or misleading, because of marked variations in the soft tissues covering the dentoskeletal framework.[4]

Richardson[5] (1980) defined the term “ethnic group” as a “nation or population with a common bond such as geographical boundary, a culture or language, or being racially or historically related”.

However, there has been no conclusive investigation in this matter undertaken on the people of Bihar, a part of the India, which has a distinct facial and physical characteristics with distinct lifestyle and culture of their own.

The purpose of the present study is to derive the Soft Tissue Cephalometric norms for the normal, well-balanced and esthetically pleasing faces of the Bihar ethnic population, which will be useful in providing clinically specific values for diagnosis and treatment planning.

MATERIAL AND METHODS

Subject Selection: The sample of Eighty young adults (40 males and 40 females) was selected from an ethnic Bihar population residing in the area of Patna, Bihar.

A composite of male and female subjects [Figure 1 (a) & (b)] were prepared and they were then rated for facial symmetry, balance and pleasing appearance by a panel of five judges including an orthodontist, an oral surgeon, an endodontist, a prosthodontist and a social worker. The judges, after screening the subjects, selected sixty subjects (30 males and 30 females), on which the study was then carried out.

The inclusion criteria were the ethnicity i.e. at least 3

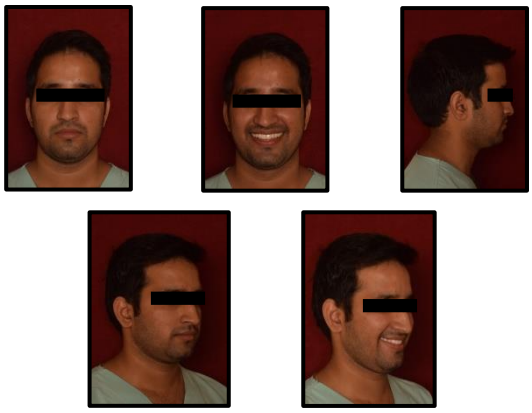

Figure 1 (a). Composite Extra Oral Photographs of a Male Subject

Figure 1 (b). Composite Extra Oral Photographs of a Female Subject

generations should have been residing in Patna, young adults with Class I occlusion, well-balanced facial profile, full complement of permanent teeth, normal overjet (2-3mm) and normal overbite (2-3mm) and mild crowding or spacing (≤3mm), mild rotations are considered as acceptable. The exclusion criteria were marked facial asymmetry, history of previous orthodontic treatment, craniofacial deformities, history of facial or systemic pathologies, history of trauma.

Data Collection: Five sets of extra oral photographs were taken with a DSLR camera for each subject in 5 different views i.e. frontal rest, frontal smiling, profile, oblique rest, oblique smiling [Figure 1 (a & b)]. Subjects were selected and standardized lateral cephalometric radiographs were taken in natural head position6. Metallic markers measuring 1mm in diameter were placed on various soft-tissue structures on the faces with the help of derma tapes.

Landmarks identified by Metal Markers (Figure 2)
1. Orbital rim: placed directly over the osseous orbital rim and directly under the pupil with the eye in straight-ahead gaze.
2. Cheekbone: the right most malar prominence of the contour in three quarter view.
3. Alar base: placed in the deepest depression at the alar base of the nose.
4. Subpupil: directly below the straight ahead gaze of the pupil i.e one half the vertical distance between the orbital rim and alar base markers.
5. Neck-throat point: the intersection between the throat and neck.

All lateral cephalometric films were traced by two operators in a standardized manner to eliminate bias in the study. The landmarks and measurements were taken according to the Soft Tissue Cephalometric Analysis (STCA)[3], which was studied and related to the True Vertical Line (TVL) as described by Arnett et al.[1,2]

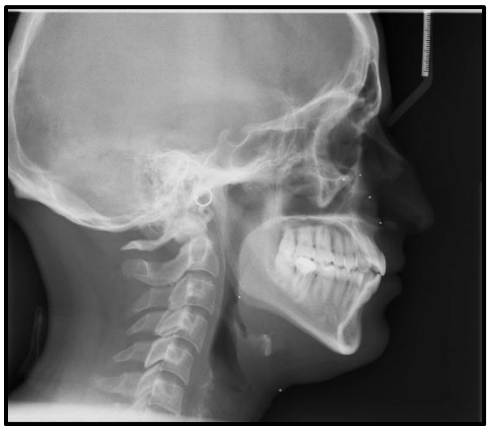

Figure 2. Lateral Cephalogram with Metallic Markers

Statistical Analysis: Normality of the data was checked by Shapiro Wilk test. Data failed to achieve normality. Thus, inferential statistics were performed using non-parametric tests of significance. Inferential statistics were performed using Mann Whitney U test. The level of statistical significance was set at 0.05.

RESULTS

Descriptive statistics and the results of Soft tissue Cephalometric analysis comparison between Subject males and Caucasian males (Table 1)

The total facial length from soft tissue nasion to menton is significantly less than the Caucasians with a mean value of 117.50±1.74. The upper and lower lip length is

Measurements	Males (Subjects)		Males (Caucasians)	
	Mean	SD	Mean	SD
DENTOSKELETAL FACTORS				
Mx1 to Occlusal Plane	56.83	2.17	57.8	3.00
Md1 to Occlusal Plane	62.57	1.45	64.0	4.00
Overjet	3.23	1.10	3.2	0.6
Overbite	2.80	0.89	3.2	0.7
SOFT TISSUE STRUCTURES				
Upper Lip Thickness	9.17	1.53	14.8	1.4
Lower Lip Thickness	12.33	1.84	15.1	1.2
Pogonion – Pogonion'	14.07	2.92	13.5	2.3
Menton – Menton'	11.10	1.47	8.8	1.3
Nasolabial Angle	103.63	2.46	106.4	7.7
Upper Lip Angle	9.63	2.27	8.3	5.4
FACIAL LENGTH				
Nasion' – Menton'	117.50	1.74	137.7	6.55
Upper Lip Length	20.57	1.89	24.4	2.5
Interlabial Gap	0.73	0.83	2.4	1.1
Lower Lip Length	44.67	1.79	54.3	2.4
Lower 1/3 of the face	65.53	2.89	81.1	4.7
Overbite	2.80	0.89	3.2	0.7
Mx1 exposure	0.73	0.83	3.9	1.2
Maxillary Height	24.77	2.50	28.4	3.2
Mandibular Height	46.00	1.49	56.0	3.0
PROJECTION TO TVL				
Glabella	-8.30	3.98	-8.0	2.5
Nasal Projection	14.37	1.16	17.4	1.7
Subnasale	0.00	0.00	0	0
A Point'	-2.87	0.86	-0.3	1.0
Upper Lip Anterior	0.77	0.77	3.3	1.7
Mx1	-13.50	1.14	-12.1	1.8
Md1	-15.83	1.23	-15.4	1.9
Lower Lip Anterior	-3.13	0.73	1.0	2.2
B Point'	-10.77	1.52	-7.1	1.6
Pogonion'	-5.0	1.2	-3.5	1.8
ADDITIONAL POINTS				
Orbitale	-23.70	1.39	-22.4	2.7
Cheekbone	-30.70	3.70	-25.2	4.0

Ala of the nose	-15.87	1.55	-15.0	1.7
Subpupil	-20.133	0.819	-18.4	1.9
Angle of Mandible	-90.223	2.873		
Chin – Throat Angle	-58.433	2.487		

Table 1. Descriptive statistics and the results of Soft tissue Cephalometric analysis comparison between Subject males and Caucasian males

also significantly decreased with a significant less lower third facial height, mean value of 65.53±2.89. Upper and lower lip thickness of the male population is significantly less than the Caucasians with a mean value of 9.17±1.53 and 12.33±1.84 respectively. The subject males have significantly less protrusive upper and lower lips in projection to TVL with a mean value of 0.77±0.77 and -3.13±0.73 respectively. The Maxillary dentition is significantly retrusive with soft tissue A point and B point also being retrusive in projection to TVL with a mean value of -2.87±0.86 and -10.77±1.52. The orbitale, cheekbone, ala of the nose and subpupil are significantly retropositioned in projection to TVL with the mean values of -23.70±1.39, -30.7±3.7, -15.87±1.55 and -20.13±0.819 respectively.

Descriptive statistics and the results of Soft tissue Cephalometric analysis comparison between Subject females and Caucasian females (Table 2)

The total facial length from soft tissue nasion to menton is significantly less than the Caucasians with a mean value of 115.40±1.99. The lower lip length is also significantly decreased with a significantly less lower third facial height with a mean value of 62.27±1.46. third facial height of females is significantly less than males with a mean value of 62.27±1.46. Lower lip thickness in the females population is significantly less than the males with a mean value of 10.03±0.81 and 12.33±1.84 respectively. The females have significantly more protrusive upper and lower lips in projection to TVL with a mean value of 1.90±0.84 and 1.93±0.74 respectively. The orbitale, ala of the nose, subpupil and angle of the mandible are significantly retropositioned in the male population when compared to females whereas the cheekbone and the point at the chin throat angle are retropositioned in the female population when compared to the male population.

DISCUSSION

The STCA uses True Vertical Line (TVL)[4] which is a completely different reference in comparison to the other soft tissue analysis. The TVL eliminates the problems associated with cranial base cephalometry as it does not use the cranial base landmarks and has the maximum reliability and accuracy as it does not change with the minor errors of the cephalograms. Also, the TVL does not rely on any of the cephalometric landmark which could easily get altered by the head positions of different individuals.

Upper and lower lip thickness of the female subjects is significantly less than the Caucasians with a mean value of 8.83±0.87 and 10.03±0.81 respectively. The females have significantly less protrusive upper lip in projection to TVL with a mean value of 1.90±0.84 and also the upper lip angle of 7.97±1.67. The maxillary and mandibular dentition is significantly retrusive with soft tissue A and B point also being retrusive in projection to TVL with a mean value of -2.87±0.86 and -11.53±1.76. The orbitale, ala of the nose and subpupil are significantly anteriorly positioned in projection to TVL with the means of -17±0.74, -11.8±1.3 and -14.3±1.18 respectively and the cheekbone is significantly retropositioned with a mean value of -34.17±1.39.

Descriptive statistics and the results of Soft Tissue Cephalometric analysis comparison between Subject males and females (Table 3)

The total facial length from soft tissue nasion to menton is significantly less in females than the males with a mean value of 115.40±1.99. The lower lip length is significantly less in females than in males with the means of 41±0.91 and 44.67±1.79 respectively. The lower

In the male and female population, the upper and lower lip thickness is reduced when compared to the Caucasians. Both the sexes also have an increase in the thickness of soft tissue chin in the vertical plane. These results are in accordance with the study conducted by Tancansan Uysal et al.[7] in Turkish adults which concluded that the lower lip thickness of the Turkish population was lower and menton thickness was greater than Arnett's norms. Also, in a study by Faruk Ayhan Basciftci et al.[8] on Anatolian Turkish adults, it was reported that the Turkish men have greater upper lip thickness than the Turkish females.

Measurements	Females (Subjects)		Females (Caucasians)	
	Mean	SD	Mean	SD
DENTOSKELETAL FACTORS				
Mx1 to Occlusal Plane	61.57	2.47	56.8	2.5
Md1 to Occlusal Plane	63.83	4.28	64.3	3.2
Overjet	2.93	0.83	3.2	0.4
Overbite	3.47	1.14	3.2	0.7
SOFT TISSUE STRUCTURES				
Upper Lip Thickness	8.83	0.87	12.6	1.8
Lower Lip Thickness	10.03	0.81	13.6	1.4
Pogonion – Pogonion'	12.00	1.46	11.8	1.5
Menton – Menton'	8.33	1.12	7.4	1.6
Nasolabial Angle	101.30	3.56	103.5	6.8
Upper Lip Angle	7.97	1.67	12.1	5.1
FACIAL LENGTH				
Nasion' – Menton'	115.40	1.99	124.6	4.7
Upper Lip Length	20.77	1.50	21.0	1.9
Interlabial Gap	0.73	0.78	3.3	1.3
Lower Lip Length	41.00	0.91	46.9	2.3
Lower 1/3 of the face	62.27	1.46	71.1	3.5
Overbite	3.47	1.14	3.2	0.7
Mx1 exposure	0.73	0.78	4.7	1.6
Maxillary Height	24.13	1.59	25.7	2.1
Mandibular Height	40.50	1.72	48.6	2.4
PROJECTION TO TVL				
Glabella	-7.43	1.79	-8.5	2.5
Nasal Projection	14.37	1.13	16.0	1.4
Subnasale	0.00	0.00	0	0.00
A Point'	-2.87	0.86	-0.1	1.0
Upper Lip Anterior	1.90	0.84	3.7	1. 2

Mx1	-12.57	1.87	-9.2	2.2
Md1	-14.87	1.68	-12.4	2.2
Lower Lip Anterior	-1.93	0.74	1.9	1.4
B Point'	-11.53	1.76	-5.3	1.5
Pogonion'	-5.4	1.1	-2.6	1.9
ADDITIONAL POINTS				
Orbitale	-17.00	0.74	-18.7	2.0
Cheekbone	-34.17	1.39	-20.6	2.4
Ala of the nose	-11.80	1.30	-12.9	1.1
Subpupil	-14.367	1.188	-14.8	2.1
Angle of Mandible	-82.900	1.583		
Chin – Throat Angle	-62.800	2.139		

Table 2. Descriptive statistics and the results of Soft tissue Cephalometric analysis comparison between Subject females and Caucasian females

Males had an increased facial height, lower 3rd facial length and an increased lower lip length when compared to the female subjects. Contradicting these results, in a study conducted on Central India population of Madhya Pradesh by Rohit Yadav and Jyoti Singh9, it was concluded that the central India group exhibited a significantly increased lower third of face with greater convex profile, increased maxillary prognathism and increased facial convexity. Whereas, in another study on Turkish adults by Tancansan Uysal.[7], it was concluded that soft tissue thicknesses were greater and facial lengths were longer in Turkish males than females, but the males had decreased upper incisor exposure when compared to Turkish females.

Similar observation was seen in a study by Kalha AS et al.[4] on South Indian ethnic population which stated that facial height, upper lip length, lower lip length, lower third of the face and mandibular height were greater in men than in women. Similar to the soft tissue norms, hard tissue norms were also developed for orthognathic population in Karnataka population by G M Shashikumar[10] which concluded that the subjects have greater upper posterior facial height and decreased lower anterior face height when compared to the Caucasians.

According to a study performed in Andhra Population by Lalitha C et al.,[11] it was concluded that the males had a more acute nasolabial angle than the females with thicker, shorter and protrusive lips in both males and female subjects when compared to the Caucasians. Conversely, a study performed on South Indian population by Anmol S Kalha[4], it was stated that the females have a greater interlabial gap and maxillary incisor exposure as compared to males. Also, in a study on Adolescent Kuwaitis by Rashed Al-Azemi[12], it was observed that the Kuwaitis had increased incisors protrusion when compared to the Caucasians. Similarly, according to a study conducted by Scheideman[13] the mandibular height was greater in men than in women.

A study done by Faruk Ayhan Basciftci[8] on Anatolian Turkish adults, it was seen that the males had relatively prominent nose and soft tissue chin compared to the females. Conversely, a study done by Lalitha C et al.[11] in Andhra population, concluded that mildly proclined incisors, mild facial convexity and retruded lower faces were considered as normal in the Indian population groups. According to Scheideman[13], the nasal prominence was greater in men than in women. In a study conducted on Karnataka population by G M Shashikumar[10] to establish hard tissue norms, it was observed that they have greater maxillary skeletal prognathism with increased lower incisor proclination

Measurements	Males		Females	
	Mean	SD	Mean	SD
DENTOSKELETAL FACTORS				
Mx1 to Occlusal Plane	56.83	2.17	61.57	2.47
Md1 to Occlusal Plane	62.57	1.45	63.83	4.28
Overjet	3.23	1.10	2.93	0.83
Overbite	2.80	0.89	3.47	1.14
SOFT TISSUE STRUCTURES				
Upper Lip Thickness	9.17	1.53	8.83	0.87
Lower Lip Thickness	12.33	1.84	10.03	0.81
Pogonion – Pogonion'	14.07	2.92	12.00	1.46
Menton – Menton'	11.10	1.47	8.33	1.12
Nasolabial Angle	103.63	2.46	101.30	3.56
Upper Lip Angle	9.63	2.27	7.97	1.67
FACIAL LENGTH				
Nasion' – Menton'	117.50	1.74	115.40	1.99
Upper Lip Length	20.57	1.89	20.77	1.50
Interlabial Gap	0.73	0.83	0.73	0.78
Lower Lip Length	44.67	1.79	41.00	0.91
Lower 1/3 of the face	65.53	2.89	62.27	1.46
Overbite	2.80	0.89	3.47	1.14
Mx1 exposure	0.73	0.83	0.73	0.78
Maxillary Height	24.77	2.50	24.13	1.59
Mandibular Height	46.00	1.49	40.50	1.72
PROJECTION TO TVL				
Glabella	-8.30	3.98	-7.43	1.79
Nasal Projection	14.37	1.16	14.37	1.13
Subnasale	0.00	0.00	0.00	0.00
A Point'	-2.87	0.86	-2.87	0.86
Upper Lip Anterior	0.77	0.77	1.90	0.84
Mx1	-13.50	1.14	-12.57	1.87

Md1	-15.83	1.23	-14.87	1.68
Lower Lip Anterior	-3.13	0.73	-1.93	0.74
B Point'	-10.77	1.52	-11.53	1.76
Pogonion'	-5.0	1.2	-5.4	1.1
ADDITIONAL POINTS				
Orbitale	-23.70	1.39	-17.00	0.74
Cheekbone	-30.70	3.70	-34.17	1.39
Ala of the nose	-15.87	1.55	-11.80	1.30
Subpupil	-20.133	0.819	-14.367	1.188
Angle of Mandible	-90.223	2.873	-82.900	1.583
Chin – Throat Angle	-58.433	2.487	-62.800	2.139

Table 3. Descriptive statistics and the results of Soft Tissue Cephalometric analysis comparison between Subject males and females

as compared to the Caucasians.

The females had a more recessive chin when compared to the male subjects. These results are in accordance with
a study conducted by Shweta Raghav14 on the central India (Malwa) female population in which it was concluded that a mild convexity of the face, recessive chin and the resulting tendency toward Class II in females is acceptable aesthetically. A study on Adolescent Kuwaitis by Rashed Al-Azemi[12] concluded that the Kuwaitis have increased lip protrusion relative to the norms for white Caucasians.

A study conducted by Tancansan Uysal et al.[7] in a sample of 133 Turkish adults which concluded that Turkish subjects have depressed orbital rims, cheek bones and subpupils. Conversely, in the female population, they reported a prominent orbital bone, prominent alar base and subpupil but recessive cheek bone in comparison to the Caucasians.

SUMMARY AND CONCLUSION

The present study highlights the differences between the cephalometric norms for Bihar ethnic population as against the Caucasian norms which are considered as standard.

The salient conclusions drawn from the present study are:
1) Frontal: The males and females have a short and broad face as compared to the Caucasians. Also, males have an increased facial length when compared to the females.
2) Profile: Both the subjects, male and female, have a recessive profile with recessive chin as compared to the Caucasians. The males have a more recessive profile as compared to the female subjects.
3) Lips: The males and females have thinner lips with retrusive upper and lower lips when compared to the Caucasian population. When compared to each other, males have a thicker lip with protrusive upper lip and retrusive lower lip.
4) Incisor Display: The males and females have a decreased maxillary incisor display with decreased interlabial gap when compared to the Caucasians. On comparing the male and female subjects, the incisor display was greater in males with increased interlabial gap.
5) Mid-face: The mid-face of the males and females were retrusive when compared to the Caucasians. While on comparing within the subjects, the females have a mid-face deficiency in comparison to the male subjects.

The established norms in the present study is the reference for the future treatment for the Bihar ethnic population as they are the most applicable norms for this particular population.

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Effect of Summer Temperature on the Work Efficiency of Dentists

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ABSTRACT

INTRODUCTION AND AIM: Environment is closely related to human health. While the effects of temperature on comfort are broadly recognized, the effects on worker productivity have received much less attention. Thus, this research was planned to investigate the effects of heat stress on job satisfaction, job performance, occupational stress among dentists.
MATERIALS AND METHOD: This research was designed to be cross-sectional in nature where a convenience sampling of 70 interns, 88 post-graduate students and 49 faculty members of IDS Bareilly were selected. Questionnaires were self-administered and contained twelve points for job satisfaction (Minnesota Satisfaction Questionnaire), thirteen points for occupational stress and twelve for job performance.
RESULTS: The subjects were moderately satisfied with their jobs, were less stressed and had a moderate job performance. After descriptive tests, the Chi-squared test, Pearson and Spearman Correlation Coefficient was applied to test statistical significance and p value was set to be significant at $p<0.5$.
DISCUSSION: The present study showed that most of the dentists (60.9%) had a high sense of heat and such results may be because of the current hospital framework which includes lack of air conditioners, continuous patient workload in hospital, high sense of heat among the dentists working in top floors etc.
CONCLUSION: If effective prevention measures are taken in the hospitals, dentists may perform more efficiently and also the increase the job satisfaction.

KEYWORDS: Work Efficiency, Job satisfaction, Job Performance, Occupation Stress, Summer Temperature

INTRODUCTION

Climate change is one of the most fiercely debated scientific issues of the past 20 years. Environment is closely related to human health. Besides naturally occurring hot climate, the use of burners, motors, boilers, scaler, dental chair focusing light, compressor, autoclave amplify the climatic stresses as a consequence of the cumulative effect on the work efficiency of dentists. Excessive heat strain in the hospitals can lead to heat related illness like headache, nausea, vomiting and thus decreases the work efficiency of dentists. In many hospitals, thermal conditions are not well-controlled due to insufficient cooling or heating capacity, high internal or external loads, large thermal zones, improper control system design or operation, and other factors.

Job satisfaction is among the most important factors that not only influence the productivity of workers but also the quality of work within an organization.[1] Job satisfaction is, according to the definitions of contemporary psychology, a state of positive or negative feelings that refers to a workers professional duties which results in his/her attitude towards work. Job satisfaction is a comparison between input and output.[2]

Occupational stress, also known as job stress, has been defined as the experience of negative emotional states such as frustration, worry, anxiety and depression attributed to work related factors.[3] Performance is defined as the management or measurement refers to the on-going means by which an organization monitors, documents, corrects or rewards individual and collective employee performance in an organization, using various tools.[4] A hot environment is a kind of unhealthy environment and in the recent years its psychological effects on workers have increased.[5] Such unhealthy environment can be responsible for the occupational stress, weak performance and job dissatisfaction.

While the effects of temperature on comfort are broadly recognized, the effects on worker productivity have received much less attention. Thus this research was planned to investigate the effects of heat stress on job satisfaction, job performance, occupational stress among dentists. The results of this research can present some suggestions related to improvement of environment heat condition in order to decrease occupational stress, improve job performance, and increase job satisfaction.[5]

MATERIALS AND METHODS

This research was designed to be cross-sectional in nature with a convenience sampling of 70 interns, 88 post-graduate students and 49 faculty members of IDS Bareilly. Questionnaires were self-administered to assess job satisfaction, job performance, occupational stress and heat strain score index. The Questionnaire was pre-validated and pre-tested prior to application and its Cronbach's Alpha (α) was found to be .07. Prior to commence of the study, a due ethical clearance was obtained from the Institutional Ethical Committee and a written consent from the study subjects were obtained.

Instruments:

1. Twelve points for job satisfaction (Minnesota Satisfaction Questionnaire), thirteen points for occupational stress and twelve for job performance[4] were selected. The respondents were asked to rate each of the items on the 5-point Likert scale: Strongly agree, Agree, Neutral, Disagree, Strongly disagree. Responses were scored as follows: Strongly agree = 1, agree=2, neutral=3, disagree=4, strongly disagree=5.

2. Heat strain score index (HSSI) was determined by HSSI questionnaire. The scores were determined by three levels, where level one is Green Zone or mild level, level two is Yellow Zone or moderate level, level three is Red Zone or severe level.

Both questionnaires and method of filling them was explained to the subjects and were completed simultaneously. In the next stage, the distributed and completed questionnaires were collected and the obtained data was entered in MS Excel sheet and further transferred to SPSS version 20.0 for statistical analysis. After descriptive tests, the Chi-squared test, Pearson and Spearman Correlation Coefficient was applied to test statistical significance and p value was set to be significant at p<0.5.

RESULTS

The subjects (n=207) were moderately satisfied with their jobs, were less stressed and had a moderate job performance. The result of table 1 reveal that most people (60.9%) had a high sense of heat, 29.0% people had moderate and 10.1% had low sense of heat.

The standard deviation and means of job satisfaction (28.83+7.55), performance (25.43+5.90) and occupational stress (34.14+5.70) is described in table 2.

HSSI	Frequency (%)
Low	21 (10.1%)
Moderate	60 (29.0%)
High	126 (60.9%)

Table 1. Frequency Distribution of Heat Stress Situation

Variables	N	Mean±SD
Job satisfaction	207	28.83±7.55
Job performance	207	25.43±5.90
Occupational stress	207	34.14±5.70

Table 2. Standard Deviation and Mean of Job Satisfaction, Performance and Occupational Stress

There was a negative co-relation between heat strain score index and job satisfaction as well as between HSSI and job performance (Table 3). There was a mild positive co-relation between HSSI and occupational stress. Therefore, job performance decreased as temperature increased.

Variables	HSSI	
	p value	R
Job satisfaction	0.283	-0.075
Occupational stress	0.969	0.003
Job performance	0.046	-0.025

Table 3. Pearson and Spearman Correlation Coefficient between Heat Strain Score Index with Job Satisfaction, Occupational stress, Job performance (p<0.05 – statistically significant, Spearman's rank correlation)

There is no difference between males and females when job satisfaction, job performance and occupational stress were considered (Table 4).

Variables	p value
Job satisfaction	0.643
Job performance	0.189
Occupational stress	0.511

Table 4. Gender based comparison (p<0.05: statistically significant, Mann-Whitney test)

The comparison between all dental departments on the

basis of job satisfaction, job performance and occupational stress is given in Table 5.

Variables	p value
Job satisfaction	0.010*
Job performance	0.189
Occupational stress	0.511

Table 5. Department based comparison (p<0.05 – statistically significant)

When the mean value for satisfaction was calculated for all departments, the results showed that department of oral medicine and radiology (24.3+5.99) was highly satisfied and the department of oral pathology (35.75+6.25) was least satisfied. Post hoc analysis showed significant differences between the department of oral medicine and radiology (24.3+5.99) and oral pathology (mean 35.75+6.25), (p value - 0.001); orthodontics (26.80+8.03) and oral pathology (35.75+6.25), (p value - 0.019).

The comparison of job satisfaction, job performance, occupational stress between faculty, post graduate students and interns is given in Table 6. Job performance results were found significant (p value 0.008) between the faculty and interns where faculty (24.43+ 5.85) had better job performance as compared to interns (mean 26.50+ 5.85).

Variables	p value
Job satisfaction	0.094
Job performance	0.008*
Occupational stress	0.259

Table 6. Post based comparison [p<0.05 - statistically significant, Post hoc analysis showed significant difference between faculty and interns (0.006)]

DISCUSSION

There are many dimensions in dentistry that can lead to satisfaction or dissatisfaction and can even affect the performance and lead to increase in stress among dental practitioners.[2] Increased temperature can be one such factor. The present study was done to assess the effect of temperature on job performance, satisfaction and occupational stress. When talking about job satisfaction, various factors were taken into consideration like chance of doing different things, freedom of judgement, working conditions, co-worker relationship etc. In our study, the dentists were moderately satisfied with their jobs (Mean 28.83±7.55). For occupational stress factors, 13 questions were asked to the dentists like workload in the job, opportunity to utilize the ability and experience independently, reward for their hardwork, co-operation among the colleagues in solving various problems etc. Most of the dentists were less stressed with their jobs (mean 34.14±5.70).

Regarding job performance, 12 questions were asked to the dentists concerning dedication, seriousness and ability to take the responsibility, enjoy professional skills and technical knowledge, feel satisfied with the work in department, ability to express thoughts fluently and freely, feeling bored of repeating the same procedure in doing work etc. Most of the dentists were of the opinion that they were performing their job as per their ability (mean 25.43).

The present study showed that most of the dentists (60.9%) had a high sense of heat and such results may be because of the current hospital framework which includes lack of air conditioners, continuous patient workload in hospital, high sense of heat among the dentists working in top floors etc.

The obtained results suggested that heat has an impact on job performance but has no significant impact on job satisfaction and occupational stress.[5] The insignificant results for job satisfaction and occupational stress by the dentists may be because they were scared of losing their jobs. This is in accordance with a study conducted by Kobza J et al. and Pandita V et al. where the dentists where reasonably satisfied with their jobs.[2,6]

No significant differences were observed between males and females in the current study with regards to job performance, satisfaction and occupational stress. This finding is in accordance with a study in Yemen where no statistical differences were reported in stress among male and female dentists. However, it is in contrast with a study conducted by Rogers et al. where female Irish dentists were more stressed than males.[7] (MA) There is lack of further data exploring the association between the high temperature and work efficiency of dentists.

Limitation of the Study: As this was a questionnaire study, the responses were not always honest.

CONCLUSION

If effective prevention measures are taken in the hospitals, dentists may perform more efficiently and also the increase the job satisfaction. The potential

impacts of high temperature at workplace are underestimated to some extent, may be due do the lack of literature.

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A Study to Assess the Effect of Stress on Mental Balance/ Judgement, Psychological Health and Adjustment Level

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ABSTRACT

BACKGROUND AND AIM: Stress acts as a warning signal generated in the brain by detecting danger in the environment and indicating that action is required immediately. Only when this regulatory mechanism fails to function properly and promptly, stress inflicts abnormal pathological conditions (e.g. anxiety disorders or depression) interfering with healthy well-being. Present study was designed to study the effect of stress on judgment, adjustment and various aspects of psychological health.
MATERIALS AND METHOD: The study was done on 90 subjects (medical students) chosen randomly with no gender bias. Baseline parameters of mental balance/ judgment, adjustment level and various parameters of psychological health were recorded during mid-semester when there was no exam pressure. The parameters were again studied one to two week before exams. Parameters were compared from their baseline values. The student's t-test was used to compare baseline values from during stress values. p value was significant when $p \leq 0.05$.
RESULTS: Students reported significant decrease in judgment level and their adjustment level showed tendency to decrease during stress. Also, there was significant increase to fall into disorders of anxiety and depression. Other aspects of psychological health showed variable response to stress.
CONCLUSION: Stress has impact on judgment, adjustment and psychological health.

KEYWORDS: Adjustment Level, Stress, Self-Esteem, Inferiority Complex, Psychological Health

INTRODUCTION

Stress is a psychological pain that may be harmful or beneficial depending upon the degree of stress. Stress in small amount enhances performance, act as motivating factor for adaptation and reaction to environment.[1] In excessive amount, stress leads to bodily harm such as increased risk of stroke, heart attack, ulcers and mental illness (depression).[2] Stress is related to both internal and external factors. External factors are usually related to environment.[3] Internal factors cause an individual to experience anxiety, negative emotions surrounding a situation such as pressure, discomfort, etc.[1] Stress is mostly due to inability in coping with obstacles (stimuli, people, situations, etc.). When people think that the demands being placed on them exceed their ability to cope, then they perceive stress.[4]

Stress can be good [eustress] or bad [distress]. It may be in excessive amount [hyperstress] or in fewer amounts [hypostress]. For a productive lifestyle, good stress and a perfect balance between excess and less amount of stress is required.[5-6] The response to stress varies at individual level. Much of it depends on individual's personality, childhood experiences with major stresses and trauma and also depends on the genetic makeup of an individual.[7-9]

Mental balance is the healthy psychological state of someone with good judgment. It is the equal integration of all mental processes.[10] WHO defines mental/ psychological health as not just the absence of mental disorder but a state of well-being in which an individual realizes his/her own abilities, can cope up with normal stresses of life, can work productively and fruitfully and is able to make a contribution to his/her community.[11] Mental health problems might arise due to stress, loneliness, depression, anxiety, death of loved ones, suicidal thoughts, grief, addiction, self-harm, mood disorders or other mental illness.[12] Mental wellness is generally viewed as a positive attribute. It highlights emotional well-being, the capacity to live a full creative life and the flexibility to deal with life's inevitable challenges.[13] Emotional well-being refers to high levels of positive emotions. The social and psychological well-being refers to the presence of social and psychological skills and abilities that contribute to optimal functioning in daily life.[14]

Stress and stressful encounters are inevitable and non-escapable part of life. Does exam stress effects our adjustment level in social, emotional, home, health and college fronts? Does exam stress lead to increase in incidence of psychological disorders? To answer these

intriguing questions, the present study was designed to study the effect of stress on mental balance/judgment, psychological health and adjustment level has been studied.

MATERIALS AND METHOD

The study was conducted on 90 subjects (medical students) chosen randomly with no gender bias on volunteer basis (age 20 – 29 years; mean ± SD, 23.42 ± 1.6). Subjects with past or present significant history, psychiatric illness, CNS disorder, drug or alcohol abuse and any other known medical conditions were excluded. Subjects were arbitrarily assigned numbers for the sake of convenience and quick reference in the results and discussion. Complete anonymity was maintained to ensure that subjects comfortably gave honest responses. Each subject was its own control.

Inclusion criteria for the subjects

- Age 20-29 years.
- No significant medical history based on a short clinical interview.

Exclusion criteria for the subjects

- Past or present significant history.
- Psychiatric illness.
- CNS disorder including traumatic brain injury.
- Drug or alcohol abuse, asthma, immune disorders, hypertension, seizures, corticosteroid treatment, or any other known medical condition.

Median value was taken as cut off on basis of which subjects were divided into high and low judgment groups (median split method). For various psychological parameters, scores obtained during test were used to divide the subjects into good psychological health, normal status and poor psychological health groups. The scale used were: For mental balance/judgment: PGI Memory Scale[15]; for psychological health: ANDI scale[16] and for adjustment level: Adjustment inventory.[17] The subjects were called and briefed about the study and informed written consent for participation was taken. The basal parameters were studied during mid-semester to ensure that there was no examination stress. The parameters were again recorded one to two weeks prior to exams to study the effect of stress on the same parameters. Comparison was made between two values.

STATISTICAL ANALYSIS

The results were computed using stats tester version 3.1.2. The test of significance used to compare the results in both groups was student t test with p value < 0.05 being considered as significant (*), p < 0.01 as more significant (**) and p < 0.001 as highly significant (***).

RESULTS

The effect of stress on judgment lead to division of subjects into high and low judgment group. Both high and low judgment groups exhibited significant response to exam stress. Also, adjustment level showed tendency to decrease during stress though it was non-significant (Table 1 & Figure 1).

The effect of stress on various components of psychological health lead to division of subjects into three groups. These were poor psychological health (Group 1), normal status (Group 2) and good psychological health (Group 3). The different components of psychological health studied exhibited variable results to stress [Table 2 (a)-(g)].

S. No	GROUPS	BASAL VALUE	DURING STRESS	p VALUE
1	JUDGEMENT GROUPS			
(i)	HIGH JUDGMENT [n = 47]	8.48 ± 0.49	6.85 ± 1.42	0.000***
A	Decrease [n = 33]	8.69 ± 0.45	6.18 ± 1.14	0.000***
B	Increase [n = 14]	8.00 ± 0.00	8.42 ± 0.49	0.004**
(ii)	LOW JUDGMENT [n = 43]	6.23 ± 0.77	4.44 ± 2.11	0.000***
A	Decrease [n = 35]	6.14 ± 0.79	3.62 ± 1.35	0.000***
B	Increase [n = 8]	6.62 ± 0.48	8.00 ± 0.70	0.000***
2	ADJUSTMENT LEVEL			
		246.06 ± 47.28	243.12 ± 47.39	0.67

Table 1. Basal and during stress values of judgment and adjustment level

DISCUSSION

Stress is an inevitable part of life. Both the stressful life events and daily life stresses have deleterious and cumulative effects on human body and brain functions. The present study reported significant decrease in judgement level in both groups. There was non-significant decrease in adjustment level under stress.

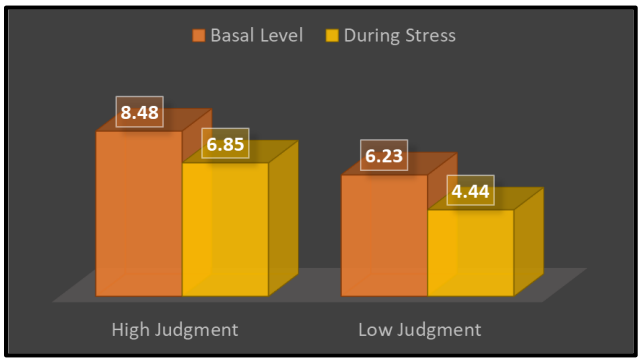

Figure 1. High and Low Judgement Groups

GROUPS	BASAL VALUE	DURING STRESS	p VALUE
Group 1: Poor psychological health [n = 15]	8.33 ± 1.01	8.66 ± 1.19	0.43
Group 2: Normal status [n = 32]	5.5 ± 0.5	5. 56 ± 0.55	0.64
Group 3: Good psychological health [n = 43]	2.46 ± 0.99	3.25 ± 0.74	0.000***

Table 2 (a). Self Esteem/ Inferiority Level of the Subjects

S.NO	GROUPS	BASAL VALUE	DURING STRESS	p VALUE
1	Group 1: Poor psychological health [n = 19]	8.15 ± 1.08	8.42 ± 1.18	0.49
2	Group 2: Normal status [n = 54]	5.42 ± 0.49	6.85 ± 1.33	0.000***
A	Deteriorated to group 1 [n = 30]	5.43 ± 0.49	7.83 ± 0.93	0.000***
B	Remained in group 2 [n = 24]	5.41 ± 0.49	5.62 ± 0.48	0.15
3	Group 3: Good psychological health [n = 17]	2.41 ± 1.03	4.82 ± 1.72	0.000***
A	Deteriorated to group 1 [n = 3]	2.66 ± 1.24	7.66 ± 0.94	0.01**
B	Deteriorated to group 2 [n = 6]	1.83 ± 0.68	5.33 ± 0.47	0.000***
C	Remained in group 3 [n = 8]	2.75 ± 0.96	3.37 ± 0.69	0.18

Table 2 (b). Happiness/ Depression Level of the Subjects

Various parameters of psychological health reported significant and non-significant changes.

In the present study, both increase and decrease in performance was noted in both high and low judgment groups. In high judgment group [n = 47], 33 subjects showed decrease and 14 subjects showed increase of performance. While in low judgment group [n= 43], 35 subjects showed decrease and 8 subjects showed increase of performance under stress. Both improved and degraded performance has been associated with increased stress. For some individuals, heightened stress elevates their performance and others are vulnerable to the negative impacts of stress, which results in diminished performance.[18] In another study, the effect of stress (computerized forest fire-fighting game) on performance and judgment was analysed. Half of the subjects were placed under conditions of stress and others were left to focus on their task. The researchers found that subjects under stress performed equally to those not stressed, but their problem solving patterns were different. Stressed subjects focused on the general outline of the problem, while non-stressed individuals relied on in-depth analysis. Consequently, stressed subjects made fewer errors in setting priorities while non-stressed subjects controlled their fire-fighting game operations better.[19]

The present study reported decrease in adjustment level during stress though it was not significant. Another study on adjustment level and academic stress reported inverse and no significant relation between them though level of adjustment influenced the number of stressful events and stress experienced.[20] Adjustment depends on fulfilment of significant needs (physical, emotional, social, intellectual, moral and vocational).[21] Negligence of parents, high expectations in academic and other performances, abused childhood, growing up tensions etc. are few listed causes of stress. Parents who are not emotionally available for their children or lack of positive coping

mechanism themselves often spur stress in their offspring. Stressed children show signs of emotional disabilities, aggressive behaviour, shyness, social phobias and lack interest in otherwise enjoyable activities.[22]

S.NO	GROUPS	BASAL VALUE	DURING STRESS	p VALUE
1	Group 1: Poor psychological health [n = 11]	7.72 ± 0.96	8.72 ± 0.96	0.03*
2	Group 2: Normal status [n = 14]	5.42 ± 0.49	6.35 ± 1.28	0.02*
A	Deteriorated to group 1 [n = 4]	5.5 ± 0.5	8.0 ± 1.22	0.01**
B	Remained in group 2 [n = 10]	5.4 ± 0.48	5.7 ± 0.45	0.19
3	Group 3: Good psychological health [n = 65]	2.46 ± 0.97	5.30 ± 1.94	0.000***
A	Deteriorated to group 1 [n = 18]	2.77 ± 0.91	7.66 ± 0.88	0.000***
B	Deteriorated to group 2 [n = 27]	2.25 ± 0.96	5.44 ± 0.49	0.000***
C	Remained in group 3 [n = 20]	2.45 ± 0.97	3.0 ± 0.94	0.08

Table 2 (c). Calmness/ Anxiety Level of the Subjects

The present study reported significant increase in inferiority complex during stress among good psychological health students while rest two groups showed non-significant changes with tendency to increase. Earlier studies reported positive correlation between inferiority complex, frustration level and academic performance.[23]

The present study reported both significant and non-significant changes in various groups between baseline and during stress value in happiness depression and anxiety/calmness level. Earlier studies reported that stress, anxiety and depression exist among all medical students.[24] These baseline traits of anxiety, depression and stress increased among students as the exams approached nearer.[25] Students adopted exam related trait emotions i.e anxiety, depression, hopelessness, anger as a method of coping style for examination stress.[26]

GROUPS	BASAL VALUE	DURING STRESS	p VALUE
Group 1: Poor psychological health [n = 20]	8.05 ± 1.02	8.85 ± 1.01	0.02**
Group 2: Normal status [n = 37]	5.37 ± 0.48	5.54 ± 0.64	0.22
Group 3: Good psychological health [n = 33]	2.54 ± 1.01	3.33 ± 0.94	0.000***

Table 2 (d). Naturality/ Obsessiveness Level of the Subjects

GROUPS	BASAL VALUE	DURING STRESS	p VALUE
Group 1: Poor psychological health [n = 21]	8.14 ± 1.03	8.90 ± 1.06	0.02*
Group 2: Normal status [n = 39]	5.41 ± 0.49	5. 66 ± 0.56	0.03*
Group 3: Good psychological health [n = 30]	2.3 ± 1.00	3.43 ± 0.76	0.000***

Table 2 (e). Independence/ Dependence Level of the Subjects

GROUPS	BASAL VALUE	DURING STRESS	p VALUE
Group 1: Poor psychological health [n = 27]	8.51 ± 1.13	8.77 ± 1.22	0.43
Group 2: Normal status [n = 42]	5.40 ± 0.49	5.57 ± 0.49	0.12
Group 3: Good psychological health [n = 21]	2.28 ± 0.93	3.0 ± 1.02	0.02*

Table 2 (f). Healthy/ Hypochondriasis Level of the Subjects

Present study reported significant increase in obsessiveness level under stress. Studies show that stress has role in aetiology and maintenance of symptoms of OCD and that stress can predispose towards or exacerbate symptoms of OCD. People with OCD often identify stress as factor that exacerbates their symptoms and many trace the onset of symptoms to the stressful period of life.[27]

GROUPS	BASAL VALUE	DURING STRESS	p VALUE
Group 1: Poor psychological health [n = 15]	8.33 ± 1.13	8.80 ± 1.27	0.31
Group 2: Normal status [n = 35]	5.42 ± 0.49	5.57 ± 0.49	0.23
Group 3: Good psychological health [n = 40]	2.62 ± 0.99	2.92 ± 0.98	0.96

Table 2 (g). Innocence/Guilt Feeling Level of the Subjects

The present study reported significant increase in interpersonal dependence level under stress. Persons differ in their vulnerability to different types of stressful life events that determines whether their self-worth is primarily dependent on interpersonal relations (sociotropy/ dependency) or achievement (self-criticism/ autonomy).[28]

Also, there was significant increase in state of hypochondriasis under stress in good psychological health group and rest two groups reported non-significant changes with tendency to increase. Studies have reported that hypochondriasis is more related to anxiety disorder than somatization or depressive disorder.[29] The pre-examination phase is an inescapable period of each student's life and there is an increase in anxiety symptoms during this phase.[30]

Present study reported no significant increase in guilt level under stress though there was tendency to increase. Studies report that guilt experienced in response to traumatic/ stressful event may lead to development of stress disorder.[31]

Limitations of the study

The present study was performed with small sample size for assessing the effect of stress on judgment, psychological health and adjustment level. The results of the study maybe specific to the type of subject chosen and individual variation in genetic make up to handle stressful situations. However, the study gave us important insight into the fact that stress does have impact on above mentioned parameters. Further studies need to look at the effect of stress in larger number of subjects.

CONCLUSION

Stress inflicts error in judgment and to some extent enhancement in performance. On the whole, stress leads to poor emotional, social and psychological well-being and adjustment level.

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Assessment of Oral Health Care Delivery System in Greater Noida Using Five A's Model

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ABSTRACT

BACKGROUND: Access to dental health services refers not only to utilization but also to the extent by which the utilization is judged as per the professional norms using five independent dimensions of accessibility, availability, accommodation, affordability and acceptability.
AIM: The aim of the study is to assess the dental services utilization among population of Greater Noida using Five A's model.
MATERIALS AND METHOD: The study was conducted in Dental College in Greater Noida. This cross-sectional study was carried out on the 200 subjects using convenient sampling on the patients visiting dental OPD.A self-administered structured questionnaire in English and Hindi language was used. Data was entered in the Microsoft excel sheet and analysed using SPSS (version 20.0).
RESULTS: Mean level of access to dental services in the study population was 60.3.Corresponding figures for affordability, availability, accessibility, accommodation and acceptability were 55.2 ± 12.1,57.1± 12.8,60.75 ± 14.7,61.75 ± 8.7,58.65± 11.4 respectively.
CONCLUSION: According to the results of our study , the level of access to dental care services is not very good with family income, location and level of education being the determinants of this access.

KEYWORDS: Oral Health Care Delivery, Accessibility, Affordability, Availability, Acceptability

INTRODUCTION

Good health is the condition where both our body as well as our mind are functioning properly. Over the years, evidence-based information has suggested that the health of our mouth, mirrors the conditions of our body as a whole. Dental disorders have affected mankind from time immemorial, and man has always tried to fight with the disease process by various methods available to them. Oral health is the reflection of our general well-being, therefore, oral health is also an essential part of the public health but which is often neglected in health care policies. The poor ability to access the health services is strongly associated with factors such as poverty, mismanagement of services, and unavailability of facilities.[1] Access to dental services not only refers to utilization but also to the extent by which the utilization is judged as per the professional norms using five independent dimensions of availability, accessibility, accommodation, affordability and acceptability.[2]

Affordability is determined by how the charges of the provider relate to the ability of client and his/her and willingness to pay for the concerned services. Availability reflects the extent to which the provider has the requisite resources to meet the needs of the patient. Accessibility is the geographical accessibility, which is determined by how easily the client can physically reach the location of the provider. Accommodation refers the extent to which the provider's operation is organized in ways that meets the preferences and constraints of the client.[3] And finally, acceptability describes the extent to which the client is comfortable with the more immutable characteristics of the provider, and vice versa. These characteristics include the age, gender, social class, and ethnicity of the client and provider, as well as the type of coverage and diagnosis of the client.[3]

The World Health Organization has identified the inverse care law as one of the common shortcomings of health care delivery which suggests that the availability of good health care tends to vary inversely with the need for the same in the population that is being catered1. India, being one of the biggest democracies in the world, with a population of more than a billion is rapidly developing and making great progress in information technology, finance and living standards. In spite of these, it is very discouraging that very few people believe in regular dental care.[4] Greater Noida is one of the emerging township in western Uttar Pradesh which is still under development. It has mixed culture of population and the utilization of dental services is

very low. Aim of the present study was to assess the dental services utilization among population of Greater Noida using Five A's model.

Objectives:
1. To assess the oral health care delivery system using 5 A's model.
2. To assess the dental services utilization among population using 5 A's model.

MATERIALS AND METHOD

The study was conducted in Dental College in Greater Noida. Ethical clearance was taken from the Institutional Review Board before starting the study. Verbal consent was taken from the individuals who were willing to participate in the study. A Pilot study was conducted on 20 subjects to check the feasibility of the study and validity of questionnaire was also checked. This cross-sectional study was carried out on the 200 subjects using convenient sampling on the patients visiting dental OPD who met the following inclusion and exclusion criteria:

Inclusion Criteria:
- Patients attending dental college and hospital were included in the study.
- Subjects willing to participate.

Exclusion Criteria
- Subjects who were uncooperative.
- Subjects hiding the facts regarding their income, education and occupation were excluded from study.
- Those who did not give verbal consent were excluded from the study.

Scheduling: The average time for the each study subject was approximately 20-25 minutes. The entire study was carried out over the period of two months.

Data Collection: A self-administered structured questionnaire in English and Hindi language was used. The data for the study was recorded on pretested questionnaire (Moosazadeh M)[2] by personal face to face interview of the study subjects by a single interviewer. Questionnaire included general information regarding socio-demographic characteristic of the study subjects including name, age, gender, income, occupation, education, number of family members. It also included view about general and dental health, attitude regarding family dental health, monthly budget for dental health, dental attendance pattern, main reason for visit, treatment received, experience with previous dental visit and attitude towards dental treatment and preferred place for dental service utilization, cost of dental treatment.

Statistical Analysis: Data was entered in the Microsoft excel sheet and analysed using SPSS (version 20.0). Descriptive methods and analytical tests (chi square test and multivariate linear regression models) were used. Chi square test was applied to analyse the factors for availability, accessibility, accommodation, affordability and acceptability of dental services. Multivariate Analysis of demographic factors with affordability and overall level of access was done. p value of 0.05 was considered to be statistically significant.

RESULTS

Out of total 200 study subjects, 140 were males (70%) and 60 were females (30%). 83% of the study population lived in peri urban area of Greater Noida. It was found in the study that 31.5% of the subjects were illiterate whereas 17% were having high school certificate and only 11.5% were graduate or postgraduate (Table 1).

It was found that 64.3% of males had insurance or health scheme where as 43% females had insurance or health scheme which was found to be highly significant (Table 2).

It was seen in the study that 48.6% males and 30.0% females had got no treatment due to high cost which was found to be highly statistically significant. It was also found that the 17.1% of the males refused for dental prosthesis due to high cost where as 16.1% females refused dental prosthesis due to high cost(Table 3).

It was found that affordability to dental services was significantly higher among males living in urban areas and who had done graduation or higher degree with monthly income level between INR 31,591-47,262. While availability was significantly associated with location of residence, education status. It was seen that Accessibility was significantly associated with location of residence, education status and monthly income of the study population. Accommodation was seen significantly associated with location and education and whereas acceptability was also significantly associated with location of residence, education status and monthly income of the study population(Table 4).

Variable		n	%age
Gender	Male	140	70.0
	Female	60	30.0
Location	Urban	34	17.0
	Periurban	166	83.0
Education	Profession or Honours	22	11.0
	Graduate or post graduate	23	11.5
	Intermediate or post high school dip	24	12.0
	High school certificate	34	17.0
	Middle school certificate	20	10.0
	Primary school certificate	14	7.0
	Illiterate	63	31.5
Income (in INR)	>126,360	2	1
	63,182-126,356	61	30.5
	47,266-63178	10	5
	31,591-47262	38	19
	18,953-31589	45	22.5
	6327-18949	38	19
	≤6323	6	3

Table 1. Demographic Characteristics of Study Subjects

	Yes	No	p value
MALE	90	50	0.001 (Significant)
	64.3%	35.7%	
FEMALE	26	34	
	43.3%	56.7%	

Table 2. Percentage of subjects with Insurance or Health Scheme

According to multivariate linear regression model significant association was there between total level of access with education status and location of residence. Moreover affordability was significantly associated with location of residence (Table 5).

Mean level of access to dental services in the study population was found to be 60.3. Corresponding figures for affordability, availability, accessibility, accommodation and acceptability were 55.2 ± 12.1,57.1± 12.8,60.75 ± 14.7,61.75 ± 8.7,58.65± 11.4 respectively

DISCUSSION

Present study indicated that the access to dental services was not at a promising status. The same was true for each of five components of access as described by 5 A's model. The analysis also indicated that the acceptability of dental services was related to education level of participants which was in accordance with study done by Moosazaadeh M et.al[2], Davidson and Anderson[5], Bhushan P[1] who indicated that education was significantly associated with use of dental services among populations. Availability dimension received the (57.1).This indicates that the people believed there were not enough resources, to meet their needs which is not in accordance with study done by Moosazaadeh M et.al[2],Ravindranth NS et al.[6] Accessibility dimension received (60.75) indicates geographic accessibility which refers to easiness of patient's physical access to the providers location which was in accordance with the study done by Moosazaadeh M et al.[2] Affordability dimension of access received (55.2) indicates that for a significant number of studied people inability to pay for dental services was an obstacle in front of using dental services which was in line with the study done by Moosazaadeh M et al.[2], Casey et al.[7] and Wallace BB et al.[8] who also found that inability to pay the cost of dental care contribute to lower use of dental services. The accommodation of dental services is appropriate. It means that the dentists working hours and way of organizing service providers is acceptable for service recipients which was in accordance with the study done by MoosazaadehMet.al2and not in accordance with Ravindranath NS[6] who found negative attitude towards dentist's waiting time.

CONCLUSION

According to the results of our study, the level of access to dental care services is not very good with family income, location and level of education being the determinants of this access. The major limitation of our study was that population of Greater Noida is mainly the rural population where the people are either illiterate or have only basic education, therefore more extensive studies needs to be conducted to have proper

	FILLING	DENTAL PROSTHEIS	TOOTH EXTRACTION	SURGICAL SERVICES	GUM INFECTION	NO TREATEMENT	MORE THAN ONE	P VALUE
MALES	0	24	6	2	0	68	40	0.001 (SIGNIFICANT)
	.0%	17.1%	4.3%	1.4%	.0%	48.6%	28.6%	
FEMALES	4	10	6	4	6	18	12	
	6.7%	16.7%	10.0%	6.7%	10.0%	30.0%	20.0%	

Table 3. Dental Services Refused due to High Cost of Treatment

		AFFORDABILITY		AVAILABILITY		ACCESSIBILITY		ACCOMMO-DATION		ACCEPTABILITY		TOTAL LEVEL OF ACCESS	
		%	P value	%	p value	%	p value	%	p value	%	p value	%	p value
GENDER	Male	59.2	0.02	57.9	0.871	61.4	0.764	63.2	0.045	59.7	0.431	60.3	0.078
	Female	51.2		56.3		60.1		60.3		57.6		57.1	
LOCATION	Urban	60.7	0.001	68.3	0.001	74.2	0.001	59.4	0.001	67.5	0.001	66	0.001
	Periurban	52.1		56.2		63.5		51.1		62.1		57	
EDUCATION	Graduate and Higher	67.3	0.001	66.7	0.001	65.1	0.001	64.1	0.001	63.3	0.001	65.3	0.001
	Inter-mediate	64.2		65.2		62.3		63.7		62.5		63.5	
	High School	59.2		59.4		58.7		59.8		60.4		59.5	
	Primary	53.6		54.7		54.2		56.3		58.3		55.4	
	Illiterate	49.5		48.7		50.3		52.4		55.2		51.2	
INCOME (In INR)	>126,360	52.5	0.0001	53.4	0.5	54.3	0.001	60.5	0.6	70.4	0.001	58.7	0.001
	63,182-126,356	56.3		52.2		57.8		60.5		70.4		59.9	
	47,266-63178	59.8		55.4		64.1		59		69.3		62.2	
	31,591-47262	66.3		51.2		62.3		60.1		71.4		63	
	18,953-31589	65.2		50.2		60.2		57.6		72		64.7	
	6327-18949	63.5		49.5		59.8		55.7		70.1		66	
	≤6323	61.2		48.3		57.6		54.6		68.1		66.9	

Table 4. Status of Access Varieties Aspects to Dental services by Variables Studied

	AFFORDABILITY			LEVEL OF ACEESS		
	B	p value	CI	B	p value	CI
GENDER	2.6	0.01	1.3-4.9	0.008	0.87	1.4-1.4
LOCATION	2.3	0.001	4.02-1.1	1.03	0.03	1.8-0.09
EDUCATION	2.1	0.01	1.2-4.03	0.4	0.04	0.6-1.7

Table 5. Multivariate Analysis of Demographic Factors with Affordability and Overall Level of Access

understanding of the utilization of dental services by the population.

RECOMMENDATIONS

1. The dental community should be sensitive to patients' occupations as a marker for limited dental care access and unmet dental care needs.
2. State funding should be earmarked for the development of oral health care services targeting worker groups (and their families)reporting the highest levels of unmet dental care needs and significant barriers to receiving dental care.

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