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Emerging Physical Therapy as an Autonomous and Specialized Health Care Profession
Syed Shakil-ur-Rehman 1, Hossein Karimi 2

According to the World Confederation of Physical Therapy (WCPT) “Physical therapy (PT) is an autonomous global health care profession and physical therapists (PTs) serve the community to develop, maintain and restore the optimal movement and functional ability”. They can target the people from childhood to old age, where movement and functional abilities are threatened by ageing, injury, diseases, disorders, conditions or environmental factors. PTs help their patients to enhance the quality of life, covering physical, psychological, social and emotional well being. They promote good health, play a preventive role, treat and manage patients suffering from diseases, rehabilitate the patients after injuries, and habilitate children born with disabilities, hence looking at the clients’ health in a holistic approach. 1

PTs are skilled for comprehensive history taking, examination, evaluation of the findings from the examination, make clinical judgments, formulate diagnosis, prognosis, and plan the treatment. They are competent enough to independently give consultation to the patients, make referrals to other health care professionals, plan treatment, estimate the outcomes and advise self-management. The broad role of the PTs in the health care system is to involve in public health strategies, health advocacy, supervision, delegation, leading the PT institutions, manage, teach, research, and develop and implement local, national and international health policies. 2

Currently PT professional has a structured university level education including entry level doctor of Physical Therapy (DPT), Master level programs in sub-specialties, and advanced research based Doctoral (PhD) and post-doctoral level programs. PT is a main stream health care profession and has established sub-specialties including; musculoskeletal and manual physical therapy, neurological physical therapy, cardiovascular and pulmonary physical therapy, sports physical therapy, gynecological physical therapy, geriatric physical therapy, community based physical therapy, and pediatric physical therapy. Currently some specialties have also developed their super-specialties like neurological physical therapy which is further subdivided into pediatric, adult and spinal cord injuries.

Being once used for polio epidemics and world war victims, it is now used for multiple purpose such as providing high quality evidence based patient care with strict adherence to the patients’ safety, research, technological developments, education standards and professional ethics. PT profession in Pakistan is trying to fulfill all the three parameters set by the Commission on Accreditation of Physical Therapy Education (CAPTE), USA. The first one is professional practice expectations by demonstration of accountability, altruism, integrity, communication, clinical reasoning, and education. Secondly it is used for the patient/client management expectations of screening, examination, evaluation, diagnosis, prognosis, planning of care, and outcome assessment. Thirdly it is used for practice management expectations of prevention, health promotion, management of care delivery, practice consultation, social responsibility, and advocacy. 3

Today PTs are aware of the continuous professional development in academics, clinical expertise and research skills. They are updating competence along with lifelong learning to insure high quality evidence based health care services. Clinical residency programs, clinical fellowship programs and clinical specialization programs are the integral part of PT education system globally, to achieve the objective of continuous professional development (CPD). Furthermore there is licensure system for PTs in developed countries and regulated through the government bodies with a view to establish the competence of the PTs. 4 On the other hand there are professional bodies like World Confederation of Physical Therapy representing 350,000 PTs worldwide through 112 member organization/
countries and they are striving to achieve high standard in PT education, research and practice. Many other societies, organizations and associations are working for the same purpose at the country level. As part of the global village this revolution of the PT profession also affected Pakistan in the last decade. Although PT education was introduced in fifties and there were only 4-5 PT institutions by 2007 but now there are approximately 80-90 institutions offering degree programs in PT. The first Doctor of physical Therapy program was started in 2007 along with Post-professional Doctor of Physical Therapy program for the existing practicing PTs with 4 years BS degree. The Higher Education Commission (HEC) of Pakistan developed a uniform curriculum for entry level doctor of physical therapy program in 2011 and it was revised in 2016 through the national curriculum revision committee which represented the key PT institutions of the country. Another key development was the establishment of Pakistan Physical Therapy association in 2008 and PTs started struggling for the Pakistan Physical Therapy Council, which is in progress. National and international conferences were organized by the universities offering PT education and are now regular part of their academic calendar to develop research among the faculty members. PT journals were started and three research journals are regularly published to cover the PT research. MS and PhD level programs were stated to educate the faculty through research based and clinical degree programs. The challenges we are currently facing in Pakistan are regulation of the PT practice and education, lack of policies for job creation in government hospitals as per the community need, lack of specialized rehab centers, proper clinical service structure, advanced technology for patient care and research.

REFERENCES
ABSTRACT

Objective: The aim of this was to compare the effects of constraint movement therapy and conventional therapy for improving motor function of upper limb in patients with sub-acute stroke.

Study Design: A randomized controlled trial.

Place and Duration of Study: The study was carried out from January 2016 to December 2016 in Rafsan Neuro Rehabilitation Centre, Peshawar.

Materials and Methods: A total of 60 patients with sub-acute stage of stroke were randomly allocated into constraint induced movement therapy and conventional therapy groups. Patients in conventional therapy group followed conventional physical therapy rehabilitation activities while patients in the constraint induced movement therapy group were guided to perform the same activities while constraining their less effected limb. Patients in both groups were assessed just before and six weeks after the start of these therapies. Mann Whitney U test was used to compare the results of both treatment.

Results: The patients in constraint induced movement therapy group showed better results on upper arm function, hand movement and advanced hand activities of motor assessment scale as compared to the patients in conventional therapy group. The mean rank for upper arm function of constraint induced movement therapy and conventional therapy group were 40 and 20, respectively (p=0.001), hand movement for CIMT and CT were 40 and 20 (p=0.001) and advanced hand activities for CIMT and CT group were 43 and 17 (p=0.001), respectively. The patients in induced movement therapy group showed 20% better result on upper arm function, 21% on hand movements and 26% on advanced hand activities of motor assessment scale.

Conclusion: It is concluded that constraint induced movement therapy provides improved upper arm function, hand movement and advanced hand activities as compared to the conventional therapy for the patients with sub-acute stroke.

Key Words: Constraint Induced Movement Therapy, Paretic Upper Limb, Upper Limb Motor Function, Sub-Acute Stroke.
Therefore, strategies to improve upper extremity function amongst stroke population are important to ameliorate motor recovery in upper limb.\textsuperscript{10} Traditionally, neurophysiological approaches developed by Bobath, Brunstrom, Rood & Kabat are used for enhancing recovery in stroke rehabilitation.\textsuperscript{11} However, new and convincing evidence techniques which have been reported to facilitate neuroplasticity included movement therapy protocols, task oriented approach, constraint induced movement therapy and mental imagery.\textsuperscript{12,13} Movement therapy protocols are based on motor learning principles and are capable of facilitating neural reorganization following stroke.\textsuperscript{14} While motor learning refers to permanent changes in behavior that occurs due to practices and experiences of individuals.\textsuperscript{15} Movement therapy protocols target deficits in neuromuscular system and use repetition or an experience for improving skilled motor activity.\textsuperscript{16} Repetitive practice for reaching to a glass of water improves the elbow extension, causes structural and functional changes in the motor cortex and cerebellum. These changes due to functional activities are resulted due to motor recovery and remain permanent.\textsuperscript{17} On the other hand, changes resulted from doing simple exercises like performing elbow flexion-extension without any task remain may not achieve the proposed goals of treatments in patients having stroke.\textsuperscript{18} Similar findings have resulted in the development of task oriented goals for improving function of upper extremity in patients with stroke.\textsuperscript{19,20} It has been reported that task-specific training with or without constraining the less affected limb had resulted in improving performance of the involved limb in both chronic and sub-acute stroke survivors.\textsuperscript{21} The physiology behind the latter fact involves an increase in signals from higher center to the affected limb resulting constraining the unaffected limb and enforcing it to significantly participate.\textsuperscript{22} The rationale behind constraint induced movement therapy is to overcome learned non-use movements and bring about functional reorganization of primary motor cortex. Studies on the this model of constraint induced movement therapy have shown achieving better functional outcomes in patients with stroke.\textsuperscript{23} However, the trials carried out on the effectiveness of constraint induced movement therapy are limited in proposing a minimum dose of constrained induced movement therapy for the treatment applied. Moreover, to the authors’ knowledge no published data was found on the topic in the whole country. Therefore, this clinical trial was designed to compare the effectiveness of the distributed model of constraint induced movement therapy and conventional physical therapy in improving function of upper limb in patients with stroke.

\textbf{Materials and Methods}

This was randomized controlled trial carried out at Rafsan Neuro Rehabilitation Centre, Peshawar from January 2016 to December 2016. The inclusion criteria for the patients in this trial was limited to sub-acute stroke patients who were able to score 19 or more on Mini Mental State questionnaire, 20° of wrist extension and 10° of finger extension in the affected upper limb, a minimum of 2 score in the ‘Upper Arm Function’ section on the Motor Assessment Scale. Subjects were excluded if they exhibited; excessive spasticity > 3 on the Modified Ashworth Scale, Excessive pain in the affected upper limb, as measured by a score of > 4 on a 10 point visual analog scale. A total of 60 patients having stroke were randomly allocated into constraint induced movement therapy and conventional therapy groups. Random numbers were generated through an excel sheet and 60 pre-labeled envelopes (30 labeled as constrained induced movement therapy and 30 labeled as conventional therapy) were placed in a container. Each willing patients was asked to pick an envelope for group allocations. The study was approved by the ethical committee of Khyber Medical University, Peshawar. Informed consents were obtained from all the participants. All patients received routine 2 hours physiotherapy sessions for 5 days a week. However, the patients in constraint movement induced therapy group wore the constraint during the routine physiotherapy sessions. Constraint is a cotton upper arm sling, with a strap around the neck for support. Participants were not asked to wear the constraint in unstable environments and during bilateral hand activities (e.g. opening bottles, lifting jars). Participants were encouraged to wear the constraint independently; subjects who could not wear it independently were assisted for it. The subjects were provided with a log book to enlist all activities performed during the
constraint wear period. This log book was reviewed and discussed with the patients or their caregivers on regular basis before starting a new therapy session. The functional task practice includes: picking up glass of water and drinking it, reaching for an item and putting into mouth, opening lid of bottles, arranging puzzles, peg boards and in real environment the activities encouraged were turning handles of doors, turning pages of newspapers and magazines. The complex tasks were broken down into simple components for the individuals who were not able to perform those steps. The levels of the tasks were adjusted according individuals’ needs and capacities. All participants were tested at baseline and after six weeks following the treatment. Participants were kept blinded to the group allocation. Moreover, the testing teams were also blinded to the patients’ allocation, making the study a double blinded randomized controlled trial. The assessment tool used for evaluation of the participants was Motor Assessment Scale (Upper Arm Functions, Hand Movements and Advanced Hand Activities). It is 6-point ordinal scale, measuring the activity level of upper limb. The test-retest reliability and inter-rater reliability of the scale have been reported $r = 0.98$ and 0.95, respectively. Motor assessment scale responses are similar to the responses of action reach arm test which is one of the commonest outcome measures used in clinical trials carried out on evaluation of constraint induced movement therapy for upper extremity functions in patient with stroke.  SPSS version 23 was used to analyze data. A non-parametric test Mann Whitney U test was used to assess the difference between the outcomes of both treatments.

Results

Both the groups consisted of equal number of participants (30 participants in each group). The mean age for the participants in constraint induced movement therapy group and conventional therapy group was age 54.4 ± 9.7 years and 56.4 ± 7.3 years, respectively. The average duration from the onset of stroke to the recruitment was between 3 and 9 months in the patients in both groups. Baseline physical and clinical characteristics indicated no significant differences amongst the mean scores of the participants in both groups (table I). Significant differences on Upper Arm Function, Hand Movement and advanced Hand Activities were observed amongst the patients in constraint induced movement therapy and conventional therapy groups. The patients in CIMT group showed 20% more improvement on Upper Arm Function of Motor Assessment Scale when compared with the outcomes of the patients in conventional therapy group (table II). Moreover, the patients in CIMT group showed better outcomes on Hand Movements and advanced hand activities compared to the patients in conventional therapy group (21% and 26% more improvement, respectively) (table II).

<table>
<thead>
<tr>
<th>Variables (Baseline)</th>
<th>Groups</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>Mann Whitney U</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Arm Function</td>
<td>CIMT</td>
<td>30 30</td>
<td>914 915</td>
<td>449</td>
<td>0.99</td>
</tr>
<tr>
<td>Hand Movement</td>
<td>CT</td>
<td>29 31</td>
<td>876 954</td>
<td>411</td>
<td>0.49</td>
</tr>
<tr>
<td>Advanced Hand Activities</td>
<td>CIMT</td>
<td>31 30</td>
<td>930 900</td>
<td>435</td>
<td>0.79</td>
</tr>
</tbody>
</table>

CIMT: Constraint Induced Movement Therapy
CT: Conventional Therapy

<table>
<thead>
<tr>
<th>Variables at 6th Week</th>
<th>Groups</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>Mann Whitney U</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Arm Function</td>
<td>CIMT</td>
<td>40 20</td>
<td>1206 624</td>
<td>159</td>
<td>0.001</td>
</tr>
<tr>
<td>Hand Movement</td>
<td>CT</td>
<td>40 20</td>
<td>1214 616</td>
<td>151</td>
<td>0.001</td>
</tr>
<tr>
<td>Advanced Hand Activities</td>
<td>CIMT</td>
<td>43 17</td>
<td>1316 513</td>
<td>48.5</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Discussion

The aim of this randomized controlled trial was to compare the effectiveness of constraint induced movement therapy and conventional therapy for improving function of upper limb in patients with stroke. In conventional therapy patients are engaged for around 60 hours of therapy during a six week rehabilitation program in a specialized rehabilitation center designed for patient in sub-acute phase of stroke. Patients in this program attended 2-hours
physiotherapy session for 5 days for the mentioned duration. Patients in the constraint therapy group followed the same pattern of rehabilitation along with restricting their less affected limb during performing the suggested activities. The use of constraint induce movement therapy has been suggested to the patients who are in their sub-acute or chronic phase of stroke rehabilitation. The latter technique involved constraining less affected limb of stroke patients for 5 hours each day for 10 weeks. However, the same technique is not well developed in majority of the Asian countries including Pakistan. Therefore, with slight modification the duration was decreased to 2 hours each for six weeks. One of the other reasons for allowing this modification was exiting protocols of the rehabilitation center where this clinical trial was deployed. The center is one the few centers in the country working specifically on rehabilitation of stroke. The present study results indicated that constraint induced movement therapy for 6-weeks duration promoted significant improvement in upper limb function in patients who were in sub-acute phase of stroke. These findings are consistence with the findings reported by Wolf et al. 2006 in a randomized controlled trial comparing the effectiveness of constraint induced movement therapy and conventional therapy. In the latter clinical trial, a total of 222 patients in a single center were randomly allocated to either of the groups and were assessed for functional abilities in upper arm. In the latter trails, patients in both experimental and control group were able to maintain activities of daily living with significant differences amongst the mean scores of the patients when assessed on functional outcomes.

In this clinical trial upper arm function, hand movement and advance hand activities of motor assessment scale were used for comparing the effectiveness of constraint induced movement therapy and conventional therapy for rehabilitation of stroke patients who were in sub-acute phase of stroke. This scale has been reported to be sensitive, valid and reliable measure for the assessment of upper limb function in patients who had stroke. The same scale has been used in clinical trials assessing the acute effects of additional task for improving mobility and function in upper limbs of patients with stroke. Moreover, the use of the same scale for assessing bilateral and unilateral functions of upper arm for patients with chronic has been reported. This suggests that the scale may be used for assessing function of upper limb in stroke patients during different phases of rehabilitation.

One of the limitations of this clinical trial was performing assessment of the patients with only a patient-reported outcome measure (Motor Assessment Scale). Use of functional tests for assessing the gains in upper limb of the patients in both the constraint induced movement therapy and conventional therapy were not included in the trial. Still, the used of a sensitive, reliable and valid scale during the assessment provide findings that can be generalized. Another limitation of this clinical trial was lack of an objective assessment tools that would have been used for assessing compliance of patients to the proposed treatment protocols in both the constraint induced movement therapy and conventional therapy groups.

**Conclusion**

The findings of this clinical trial suggest that despite some modification in the techniques of constraint induced movement therapy, still the patients in the group are superior and the modified techniques can be used for enhancing functional activities in the patients with stroke.

**REFERENCES**


ABSTRACT

Objective: The objective of the study was to determine the impact of hearing loss on the self concept of hearing impaired students and to ascertain the impact of hearing aids and cochlear implants on their self concept.

Study Design: It was a descriptive, cross-sectional study.

Place and Duration of Study: The study was conducted in Sir Syed School and College of Special Education, Rawalpindi with permission from the concerned authority. It took the researcher six weeks from 12

st Sep 2016 to 21

st Oct 2016 to collect data from hearing impaired students.

Materials and Methods: An aggregate of 233 students was the sample of this study of which 103 were students using hearing devices and 120 students were using normal hearing controls. Special arrangements were made to collect the data. The hearing impaired students could choose between two versions of the questionnaire. The first version was exclusively composed of things, while in the second; everything was displayed in written text with sign language video clip appearing at the top corner of the screen by using Master Writer 3.0 software, whereas, the IBM Statistical Package for the Social Sciences (SPSS) 21 was used for data analyses.

Results: Multiple regression analysis showed that all dimensions of self-concept were predicting linguistic competencies of hearing impaired children with cochlear implant produced R2= 0.23, F=73.57 and p<0.05 accounted for 23% of the variance.

Conclusion: The impaired children with cochlear implant showed the highest score of academic self concept and had highest level of linguistic competencies after controlling for the other factors in the model.

Key Words: Cochlear Implants, Hearing Aid, Hearing Impairment, Self Concept.
students include: severity or degree of disability, age of onset of disability, acceptance of the disability by parents, type of schooling (regular or special) and special support, labeling, and identification of group adherence.

Hearing-impaired (HI) people frequently confront numerous difficulties with respect to their self-concept, such as discourse and dialect delays, correspondence issues, and practically no or limited entrance to the sound-ruled world. These issues can scar HI individuals’ level of self-concept leading to such consequences as social embarrassment, tiresomeness and unstable companionship. Today, hard of hearing children who cannot make effective use of traditional listening devices get cochlear implants (CIs), which are able to produce beneficial results for them. Cochlear implants beneficiaries have been found to promote levels of self-concept that are more or less equivalent to those of Normal Hearing (NH) children. Ample studies are available related to the manner in which deaf children communicate in the family environment, which have been very useful in determining criteria for early intervention and language development with regard to deaf children. However, this is not the case for older children, especially for young students, as the studies provide data on linguistic development in the phonological and syntactic aspects of written and spoken language as well as on the treatment of certain texts (especially narratives). There is practically no material available on the evolution of self-concept in relation to the environment and the development of conversational skills, pertinent in developing guidelines for educational intervention. Furthermore, there are only a few studies of social–effective development at the school age that assess the HI children’s competence for forming relationships with their hearing peers. Accordingly, it is imperative to examine the effect of deafness both from the way society responds and how the teenagers with listening hindrances react. Self-concept is based on associations and these are based on communication. Children with hearing impairment are more prone to developing lower levels of self-concept. This is on account of their mis-correspondence and the natural social associations that happen outside of their listening bubble. It is likewise identified as to how individuals in their surroundings respond to their listening gadgets and/or the specialized visual techniques used by them. Additionally, the manner in which a deaf child positively integrates his or her deafness into his or her self-concept rests on: the quality of communication the child has with his or her surroundings; the social representation of the child’s deafness in his or her immediate environment; and the social structure to which he or she belongs. Similarly, Calderon and Greenberg found that The communication barrier between HI and NH children can function as an obstacle for successful interpersonal relationships and may hamper these children in developing solid social networks.

The main objective of the present study was to find out the impact of hearing loss on the self concept of hearing impaired students and to ascertain the impact of hearing aids and cochlear implants on their self concept.

**Materials and Methods**

The study was a descriptive and cross-sectional, having hearing aids and cochlear implants as independent variable, whereas, self concept was the dependent variable. It was conducted in Sir Syed School and College of Special Education, Rawalpindi and Preston University Islamabad Campus with permission from the concerned authority. The data was collected individually from each student which took six weeks i.e. from 12th September 2016 to 21st October 2016, to collect data from hearing impaired students. The subjects were incapable of giving informed consent so the physician sought that assent by using sign language, lip movements and through written expression in addition to the consent of their parents and legally authorized guardians. The research protocol was submitted for consideration, comment, guidance and approval to the University’s research ethics committee before the conduction of study. All procedures performed in the present study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments made in 64th World Medical Association, 2013. All students had a nonverbal IQ of no less than 80 as well as no other known learning issues. Students
were not included on the off chance that they encountered co morbidities, such as: visual hindrances or Autism Spectrum Disorders. The HI youngsters were incorporated on the off chance that they encountered hearing loss of no less than 40 decibels in the best ear, which was identified prelingually (3 years) or prelingually (3–5 years).

<table>
<thead>
<tr>
<th>S.No</th>
<th>Criteria</th>
<th>Inclusion</th>
<th>Exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age/Population</td>
<td>11-14 years with diagnosed hearing loss</td>
<td>Below 11 and more than 14 years with or without diagnosed hearing loss</td>
</tr>
<tr>
<td>2</td>
<td>Disease</td>
<td>Sensorineural hearing loss Conductive hearing loss, congenital hearing loss</td>
<td>sudden hearing loss, hearing loss due to recent noise or occupational exposure</td>
</tr>
<tr>
<td>3</td>
<td>Language</td>
<td>Instructions given through text both in Urdu and English, lip reading and sign language was also used where required.</td>
<td>Native language</td>
</tr>
<tr>
<td>4</td>
<td>Setting</td>
<td>Studies performed in settings generalizable to primary care and special educational settings</td>
<td>Illiterate deaf persons</td>
</tr>
<tr>
<td>5</td>
<td>Interventions</td>
<td>Screening tests used, available, or feasible in primary care settings, self concept questionnaire, and portable audiometer</td>
<td>Screening tests not used or available in primary care settings and special educational settings</td>
</tr>
<tr>
<td>6</td>
<td>Study Design</td>
<td>Randomized controlled trials and controlled observational studies</td>
<td>Uncontrolled observational studies</td>
</tr>
</tbody>
</table>

Table I: Inclusion/Exclusion Criteria

An aggregate of 233 students (Mean age = 11.8 years, SD = 1.7) took an interest in this investigation of which 103 were youngsters using hearing devices (70 using hearing aids and 30 using cochlear implants) and 120 youngsters were used NH controls (hearing impaired without any aiding device). Data was parametric in nature. A modified version of Self-Description Questionnaire III based upon the Shavelson Model of self-concept constructed by Marsh and Shavelson was used, after permission from the author. The modified version assessed three components namely academic self-concept, physical self-concept and social self-concept having 60 items. Fifty percent statements were negatively phrased. The original SDQIII based on 8-point self-rating scale consisted of 136 items, which assessed four areas of academic self-concept, eight areas of nonacademic self-concept, and the area of Generalself. All 13 SDQIII areas consisted of 10 or 12 items each, half of which were negatively worded. Modifications were made in SDQIII to use it in Pakistani institutions. It was translated into Urdu language. Responses were delimited to 4-point scale and the number of items were reduced to 60. As the study was restricted to three components of self-concept i.e. academic self-concept, physical self-concept and social self-concept, only 6 areas (i.e. Verbal, Academic, Physical Ability, Physical Appearance, Same Sex Peer Relations and Parent Relations) of SDQIII were included in the instrument. Each area consisted of 10 items. Verbal and academic areas were merged to assess academic self-concept, items of physical ability and physical appearance were fused to assess physical self-concept, and items of same sex peer relations and parent relations were combined to assess social self-concept.

The research instrument was validated by three specialists in the field. After pilot-testing, its reliability was determined by calculating the Cronbach’s alpha and further improvements were made in its items. Factor analysis was deemed appropriate for the study data, as the value of KMO was 0.724, which is considered as a good value.

Data collected, by using the procedure mentioned above, was sorted and tabulated. Testing of hypotheses entailed a thorough analysis of data by using such statistic as multiple regression and correlation matrix.
The statistics were applied after fulfilling their assumptions regarding their applicability on the data collected. The IBM Statistical Package for the Social Sciences (SPSS) 21 was used for data analyses.

**Procedure**

NH controls were used from primary and secondary schools over Pakistan. A sample representing a complete range of HI children, 10 special schools for the HI were enlisted. The survey was regulated on LCD. Questions were shown one by one on the screen. Guidelines for all tests were prearranged in the child’s preferential method of communication to guarantee that the student understood each item. The HI students could choose between two versions of the questionnaire. The first version was exclusively composed of things, while in the second; everything was displayed in written text with sign language video clip appearing at the top corner of the screen. The talked dialect was interpreted using gesture based communication performed by a qualified mediator. It was ensured that there was a perfect synchronization between all the elements.

Parents or caregivers were requested to complete a questionnaire assessing demographic variables such as net income and level of education. In the HI group, several audio logical variables were derived from the children’s medical and audio logical notes after an informed consent was obtained.

**Table II: Characteristics of Hearing Impaired children (N=223)**

<table>
<thead>
<tr>
<th>Total Hearing impaired</th>
<th>Hearing impaired (HI) without any aiding device</th>
<th>Hearing impaired with Hearing Aid (HA)</th>
<th>Hearing impaired with Cochlear Implant (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of children</strong></td>
<td>120</td>
<td>70</td>
<td>33</td>
</tr>
<tr>
<td><strong>Age mean in years (SD)</strong></td>
<td>11.2(1.3)</td>
<td>11.6(1.7)</td>
<td>11.5(1.9)</td>
</tr>
<tr>
<td><strong>Gender %</strong></td>
<td>Male 57 (48%) 63 (52%)</td>
<td>Male 36 (51%) 34 (49%)</td>
<td>Male 19 (58%) 14 (42%)</td>
</tr>
</tbody>
</table>
| **Degree of hearing loss (%)** | Moderate (40-60dB) 23 (19%) 29 (41%) 0 (0%)
  | Severe (61-90dB) 30 (25%) 24 (34%) 2 (6%)
  | Profound (>90dB) 67 (56%) 17 (24%) 31 (94%) |

Note: All the students were from Special schools meant for hearing impaired children.

a. degree of hearing loss was calculated by averaging unaided threshold at 500, 1,000, 2,000 Hz.
b. preferred mode of communication scores were calculated by using information from parents.
c. age of onset of hearing loss was calculated by using medical reports of children.
d. Socio-economic status scores were calculated by measuring parental education, and total family income.

1**p<.05

**Table III: Correlation Matrix of all Types of Hearing Impaired Students (N = 223)**

<table>
<thead>
<tr>
<th>Hearing impaired without any Hearing Device (HD) n = 120</th>
<th>ASC</th>
<th>PSC</th>
<th>SSC</th>
<th>GSC</th>
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<tbody>
<tr>
<td>Academic Self-Concept (ASC)</td>
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<td>Physical Self-Concept (PSC)</td>
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<td>.26**</td>
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<td>.33**</td>
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<table>
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<th>PSC</th>
<th>SSC</th>
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<td>Physical Self-Concept (PSC)</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Social Self-Concept (SSC)</td>
<td>.40**</td>
<td>.49**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Self-Concept (GSC)</td>
<td>.42**</td>
<td>.41**</td>
<td>.46**</td>
<td></td>
</tr>
</tbody>
</table>
Results

The value of Cronbach's alpha for Academic Self-Concept = 0.83, Physical Self-Concept = 0.79, Social Self-Concept = 0.76 and General Self-Concept = 0.81. According to Table III, a Pearson product-moment correlation coefficient was computed to assess the interrelationship among the dimensions of self-concept for the hearing impaired without any hearing device, hearing impaired with hearing aid and hearing impaired with cochlear implant. This determined the extent of interrelationship among the 4 dimensions of self-concept for each of three categories of students.

With regard to hearing impaired without any hearing device in Table III there was a positive correlation, but a weak uphill relationship between each paired dimension of self-concept. The p-values are less than .05, which show that each dimension of self-concept are correlated with each other: r (118) = .28, p < .05 (academic self-concept and physical self-concept); r (118) = .26, p < .05 (physical self-concept and social self-concept); r (118) = .20, p < .05 (social self-concept and general self-concept); r (118) = .25, p < .05 (social self-concept and academic self-concept); r (118) = .34, p < .05 (general self-concept and academic self-concept); and r (118) = .33, p < .05 (general self-concept and physical self-concept). The results show that there is a significant relationship between each paired dimension of self-concept.

With regard to hearing impaired with hearing aid in Table III, there was a positive correlation, but a moderate uphill correlation between each paired dimension of self-concept. The p-values are less than .05, which show that each dimension of self-concept are correlated with each other: r (68) = .42, p < .05 (general self-concept and academic self-concept); r (68) = .41, p < .05 (general self-concept and physical self-concept). The results show that there is a significant relationship between each paired dimension of self-concept.

With regard to hearing impaired with cochlear implant in Table III, there was a positive correlation, but a moderate uphill correlation between each paired dimension of self-concept. The results show that there is a significant relationship between each paired dimension of self-concept.

Results suggest that cochlear implants are most effective in developing hearing impaired children's self-concept.

Table IV: Regression Analysis of Dimensions of Self Concept for predicting linguistic competencies (N =223)

<table>
<thead>
<tr>
<th>Dimension</th>
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<th>PSC</th>
<th>SSC</th>
<th>GSC</th>
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<td>General Self-Concept (GSC)</td>
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</table>

**p < .05

The multiple regression analysis of all dimensions of self-concept in predicting linguistic competencies of hearing impaired children with hearing aid produced R² = 0.23, F = 73.57 and p < 0.05 accounted for 23% of the variance. The significance value (p < 0.05) having positive values of B and standardized beta values for academic self-concept (β=0.886), physical self-concept (β=0.402) and social self-concept (β= 0.921) had significant regression weights which showed
unique impact / contribution of all these predictors to the linguistic competencies of hearing impaired children with hearing aid. The social self concept with the highest beta value (β= 0.921) showed the strongest contribution to the linguistic competencies of hearing impaired children with hearing aid. This indicated that the impaired children with hearing aid who showed the highest score of social self-concept demonstrated the highest level of linguistic competencies after controlling for the other factors in the model. The academic self-concept with beta value (β= 0.886) demonstrated moderate contribution in predicting linguistic competencies of hearing impaired children with hearing aid. Whereas, the physical self concept with the lowest beta value (β= 0.402) showed that the contribution of this predictor to the competencies of hearing impaired children with hearing aid was less than other two predictors.

The multiple regression analysis of all dimensions of self-concept in predicting linguistic competencies of hearing impaired children with cochlear implant produced R²= 0.23, F=73.57 and p<0.05 accounted for 23% of the variance. The significance value (p < 0.05) having positive values of B and standardized beta values for academic self-concept (β=0.931), physical self-concept (β=0.621) and social self-concept (β= 0.921) had significant regression weights which showed unique impact / contribution of all these predictors to the linguistic competencies of hearing impaired children with cochlear implant. The academic self concept with the highest beta value (β= 0.931) showed the strongest contribution to the linguistic competencies of hearing impaired children with cochlear implant. This indicated that the impaired children with cochlear implant who showed the highest score of academic self concept demonstrated the highest level of linguistic competencies after controlling for the other factors in the model. The social self concept with beta value (β= 0.921) demonstrated moderate contribution in predicting linguistic competencies of hearing impaired children with cochlear implant. Whereas, the physical self concept with the lowest beta value (β= 0.621) showed that the contribution of this predictor towards the competencies of hearing impaired children with cochlear implant was less than other two predictors.

Discussion

Self-concept is a vital prerequisite for sound psychosocial development and empowers children to manage anxiety and address various challenges. The problems encountered in the study of the self-concepts of normal hearing children have been relatively small when compared to the difficulty met by the investigator in examining the self-concepts of hearing-impaired children whose ability to communicate is greatly impaired. The investigation of the development of the self-concept in the hearing-impaired child has been very limited. The lacks of empirical psychological studies on the effects of deafness on the developing organism have resulted in a polarization of theory and thought. One psychological school postulates that the hearing impaired child develops normally in all behavioral areas, except language acquisition The other adheres to an "altered organism" theory of the hearing-impaired child in which the deaf child is not only physically different from the normal hearing child, but is also emotionally and psychologically different. Hearing impaired students frequently face challenging situations; therefore, it is even more critical for them to have adequate levels of self-concept.

Based on the interrelationship among the dimensions of self-concept, results show that the: hearing impaired children with cochlear implant have a high self-concept; hearing impaired children with hearing aid have a moderate self-concept; and hearing impaired children without any hearing device have a low self-concept. This is because the cochlear implants allow hearing impaired children to have conversations, recognize warning signals as well as understand the sounds in the environment. The hearing aids amplify the sounds in the environment, which can become loud and bothersome and as such cause headache and nausea in hearing impaired children. Furthermore, with hearing aids, there is limited frequency assistance in high range sounds. Also, ear molds and their acoustic feedback issues may be repetitive, time-consuming and aggravating. Therefore, cochlear implants fare better in developing self-concept for promoting linguistic abilities in hearing impaired children than hearing aids.

The result of the present study bear a resemblance to
the result of the study conducted by Silvestre, Ramspott & Pareto which says social self concept has contribution in predicting linguistic competencies of hearing impaired children which consequently results into high self concept. Similarly the results of the present study are in line with the study of Calderon and Greenberg which says that the communication barrier between HI and NH children can function as an obstacle for successful interpersonal relationships and may hamper these children in developing solid social networks. There is limited research material available on children and especially on the hearing impaired children with regard to the different dimensions of self-concept. Most importantly, no studies have been undertaken to compare the effect of hearing aids versus cochlear implants on the linguistic competencies of young children's academic, physical, social and general self-concept. Therefore, the study will add to a new body of knowledge. The study regarding self concept can be conducted for hearing impaired adults and the population of study can also be disable people of other categories like visually impaired students and physically impaired students with variations in data collection techniques. Clinicians and teachers of hearing impaired students must always be aware of the peril and protective factors related to self-concept in order to help hearing impaired individuals to reach their full potential.

**Conclusion**

It can be concluded from the present study that the hearing loss has great on the self concept of hearing impaired students and the students with cochlear implants have better self concept as compare to the students using hearing aids and the students using no assisting technology, which consequently means that self concept is largely effected by the hearing loss and linguistic competencies of students.

**REFERENCE**

OBJECTIVE
To evaluate the efficacy and safety of collagen cross linking in stabilizing the visual acuity and keratometric readings one year after the procedure.

Study Design: A Case Series.

Place and Duration of Study: All the procedures were performed at Amanat Eye Hospital Rawalpindi from January to June 2011.

Materials and Methods: Sixteen cases suffering from progressive keratoconus which underwent collagen cross-linking were analyzed retrospectively. After epitheliectomy and instillation of topical Riboflavin, UV light exposure was given for 30 min. A bandage contact lens was applied postoperatively for 5 days. The patients were followed up after 5 days, one month, 3 months, 6 months and then one year. During all the postoperative visits, visual acuity, slit lamp examination and keratometry were performed.

Results: Sixteen cases completed one year's follow-up. Un-corrected visual acuity improved in 12 out of 16 eyes, remained stable in 4 out of 16 and deteriorated in none. Best-corrected visual acuity improved in 9 out of 16 eyes, remained stable in 6 out of 16 and deteriorated in one out of 16.

Mean pre-operative Keratometry was 50.23 D which reduced to 49.77 D after one year. Progression of original disease (increase in K-value by > 0.50 D) was seen in only 2/16 eyes after one year of follow-up. Keratometric improvement (decrease in K-value by > 0.50 D) was seen in 6/16 eyes while 8/16 eyes (50%) showed keratometric stability (i.e. K-value within 0.50 D of the preoperative value).

Conclusion: Collagen cross-linking is effective and safe in providing visual and keratometric stability for keratoconus.

Key Words: Collagen Cross linking, Keratoconus, Efficacy.

Introduction
Progressive myopia with astigmatism and frequent changes in glasses during the teen years is the hallmark of keratoconus. It is caused by thinning and ectasia of corneal stroma. Its association with other genetic conditions like Marfan’s and Down’s syndrome and family history suggest genetic factors in its etiology. In cases of corneal opacification. None of these procedures corrects the underlying problem. Collagen cross-linking (CXL) emerged as a promising procedure. It is indicated in cases having clear cornea but evidence of progression. CXL is the only procedure which addresses the underlying pathophysiology of keratoconus i.e. corneal collagen structural weakness. It was introduced by Wollensak et al with the idea of providing mechanical and biochemical stability to the corneal collagen structure. “Dresden Protocol” was established, which provided the safety measures for the procedure. According to this protocol, after epitheliectomy, the residual thickness must be at least 400 µm. This would protect the underlying endothelium, lens and retina from the harmful effects of UVA radiation. Isoosmolar 0.1% riboflavin in 20% dextran solution is used for 30 min and exposed to UVA radiation of 370 nm at 3 mW/cm2 for 30 min. CXL utilizes riboflavin eye drops (as photosensitizer) and ultraviolet radiation to strengthen the corneal collagen structure. Riboflavin also acts as a shield to protect the
underlying structures from the harmful effects of UV radiation. CXL can be performed both with epithelium on and epithelium off. However, the epithelium-on technique results in some reduction of UV penetration into the corneal stroma. Epithelium-on CXL can be utilized in cases with thin cornea (<400µm), where epitheliectomy would result in further thinning and more penetration of UV light. Other methods of CXL in thin corneas can be pachymetry-guided epithelial debridement before cross-linking, parameters modification (conc. of riboflavin, intensity/wavelength of UV radiation and exposure time) and utilization of hypo-osmolar riboflavin for CXL. Studies have shown stabilization in un-corrected visual acuity (UCVA), improvement in best-corrected visual acuity (BCVA) and reduction in keratometry after CXL. All these factors suggest stabilization of keratoconus. Safety of the procedure is suggested by stable corneal thickness, endothelial cell density and foveal thickness. Haze and increased density of anterior stroma have been cited as the only direct complications of the procedure.

There is scarcity of literature about CXL results in keratoconus in our population. The present study was conducted to evaluate the efficacy and safety of CXL in achieving visual and keratometric stability, one year after the procedure.

Materials and Methods

This is a case series of sixteen cases of progressive keratoconus which underwent collagen cross-linking with UVA light and riboflavin. All the cases completed one year's follow-up. The procedure was performed at Amanat Eye Hospital, Rawalpindi by a single surgeon from January to June 2011. The keratoconus was diagnosed by history, refraction, slit-lamp examination, keratometry and orbscan II. Those with evidence of progression of keratoconus and clear cornea underwent CXL. All the cases with stable keratoconus or corneal scarring were excluded from the procedure.

The procedure was performed with standard epitheliectomy. This was followed by instillation of 0.1% riboflavin eye drops in 20% dextran solution for 30 min. UVA radiation exposure (370 nm at 3 mW/cm²) was given for 30 min. A bandage contact lens was placed for 5 days. Postoperative treatment consisted of antibiotic/steroid combination alongwith lubricant, given for two weeks. Follow-up visits were conducted after 5 days, one month, 3 months, 6 months and one year. On follow-up visits, UCVA, BCVA, slit-lamp examination, refraction and keratometry were performed. In the final visit, alongwith the above, orbscan II was also performed. Efficacy was determined with respect to UCVA, BCVA, average and steepest meridian keratometry. Safety was determined by complications recorded.

Results

A total of 16 cases of CXL which had completed one year of follow-up were included in the study. 8 were male and 8 female eyes. The age range was 14 to 32 years. UCVA improved in 12 out of 16 eyes, remained stable in 4 out of 16 and deteriorated in none (Fig 1). There was improvement in BCVA in 9/16 eyes. BCVA remained stable in 6/16 and deteriorated in only 1/16 eyes (Fig 2). 5/16 eyes showed improvement in visual acuity by 2 or more lines.

Preoperative mean K-reading was 50.23D which reduced to 49.77D one year after the procedure. Progression of original disease was defined as increase in K-reading by >0.50 D and stability as keratometric reading within 0.50 D of original K-reading. According to that criteria, only 2/16 eyes showed progression. Stability of original disease was seen in 8/16 and improvement in 6/16 eyes, one year post-operatively (Table I). K-value in steepest meridian remained stable in 9/16 eyes, improved in 5/16 eyes and deteriorated in 2/16 eyes (Table II). Mean steepest meridian K-reading reduced from 52.38 D (SD 5.27) to 52.09 D (SD 5.08) and flattest meridian K-reading decreased from 48.06 D (SD 4.56) to 47.80 D (SD 3.44) during the same time period (Table IV). None of the eyes developed corneal haze or infection postoperatively.
In our study, the male and female ratio was 50:50. Both UCVA and BCVA showed improvement in visual acuity. The figures and tables below provide more detailed information on the keratometric readings and reduction in keratometry:

**Fig 2: Comparison of pre-operative vs post-operative BCVA**

**Table I: Comparison of pre-operative vs one year post-operative mean keratometry**

<table>
<thead>
<tr>
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<td>8</td>
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<td>49.62</td>
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<td>56</td>
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<td>50.37</td>
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<tr>
<td>16</td>
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<td>44.25</td>
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</table>

**Table II: Comparison of pre-operative vs one year post-operative steepest meridian keratometry**

<table>
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**Table III: Comparison of pre-operative vs one year post-operative flattest meridian keratometry**

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<td>51.75</td>
<td>Stable</td>
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<tr>
<td>16</td>
<td>43.5</td>
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</table>

**Table IV: Mean reduction in keratometric readings and p value**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-Operative Mean ±SD</th>
<th>Post-Operative Mean ±SD</th>
<th>Paired T test, P value (α = 0.05, 95% CI)</th>
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<tr>
<td>Flat Keratometric value (K1) (D)</td>
<td>48.06 ±4.56</td>
<td>47.80 ±3.44</td>
<td>p=0.625</td>
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<tr>
<td>Steep Keratometric value (K2) (D)</td>
<td>52.38 ±5.27</td>
<td>52.09 ±5.08</td>
<td>p=0.516</td>
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<tr>
<td>Average Keratometry (Kavg) (D)</td>
<td>50.23±4.76</td>
<td>49.77±4.31</td>
<td>p=0.258</td>
</tr>
</tbody>
</table>

**Discussion**

In our study, the male and female ratio was 50:50. Both UCVA and BCVA showed improvement in visual acuity.
majority of cases. Un-corrected visual acuity improved in 12 out of 16 eyes, remained stable in 4 out of 16 and deteriorated in none. Best-corrected visual acuity improved in 9 out of 16 eyes, remained stable in 6 out of 16 and deteriorated in one out of 16 eyes. The pre-operative mean cylinder was -3.97±2.29 D which improved to -3.60±2.40 D, one year postoperatively. Majority of the cases showed keratometric stability. Mean pre-operative Keratometry was 50.23 D which reduced to 49.77 D after one year. Progression of original disease (increase in K-value by > 0.50 D) was seen in only 2/16 eyes after one year of follow-up. Keratometric improvement (decrease in K-value by > 0.50 D) was seen in 6/16 eyes while 8/16 eyes (50%) showed keratometric stability (i.e. K-value within 0.50 D of the preoperative value). Safety of the procedure was established by lack of corneal haze and infection in any of the cases.

Razmjoo et al. completed topographical corneal changes on 66 patients. Just like our study, their cases also completed one year of follow-up. The age range was 18-29 years. The mean age was 22.4 ± 5.4 years. The age range resembled our study i.e. 14-32 years since keratoconus starts in teenager and continues till mid thirties. There were 54.55% males and 45.45% females.

Frederik et al. conducted the long-term study regarding dampening effect of riboflavin and UV-A on progressive keratoconus by collagen cross-linking. 6 months of follow-up was completed by 241 eyes. In the first year, there was a decrease in steepening by 2.68 D. It further decreased by 2.21 D in the second year and 4.48 D in the third year. There was a significant improvement in BCVA by ≥1 line in 53% among 142 eyes (in first year), 57% of 66 eyes in the year falling and 58% among 33 eyes in the third year. In the first year, BCVA remained stable in 20% of 142 eyes. In second year, 24% of 66 eyes and in third year, 29% of 33 eyes showed stable BCVA. Only two patients experienced continued progression and needed another CXL. The study proved a long-term stabilization and improvement after CXL.

A study of CXL with corneal de-epithelialization was conducted on 14 eyes of 14 patients by Goldich-Yakov et al. As compared to pre-operative BCVA, 24 months postoperative BCVA showed significant improvement (0.21±0.1 to 0.14±0.1, P=0.002). The steepest meridian K-reading showed a significant decrease i.e. 53.9±5.9 to 51.5±5.4 (P=0.001). The mean cylinder also showed significant decrease i.e. 10.2±4.1 to 8.1±3.4 (P=0.001). There was no significant alteration in foveal reflex. According to their conclusion, UCVA showed stability, BCVA showed improvement and keratometry depicted reduction after 2 years of CXL. Safety of the procedure was proved by stability in corneal thickness, density of corneal endothelial cells and thickness of fovea.

In young patients with keratoconus, there are more chances of rapid progression and they are more likely to require penetrating keratoplasty for visual improvement. 18 paediatric patients (25 eyes) were evaluated for efficacy of CXL in progressive keratoconus. The paediatric age was defined as 18 years of age or younger. The mean age of the patients was 14.3±2.4 years and mean follow-up of 20.1±14.25 months. Pre-operative mean K-reading in flattest meridian which was 46.34 D reduced postoperatively after 20 months to 45.67 D (P=0.03). Preoperative mean K-reading in the steepest meridian which was 50.06 D reduced to 49.34 D (P=0.005). There was a reduction in topometric astigmatism from mean 3.50 D to 3.25 D (P=0.51). Their study concluded that CXL is an effective option for paediatric patients with progressive keratoconus.

A twenty four months follow-up prospective study of CXL cases was performed in 57 eyes of 55 patients. As compared to our study where Orbscan was used, they examined the patients with Pentacam, IOL Master and Ocular Response Analyzer. Our study focused on visual acuity, mean keratometry, steepest
& flattest meridian keratometry. Their study additionally concentrated on thinnest point keratometry. Twenty four months after CXL, there was a significant improvement in BCVA (p<0.01), a significant decrease in corneal thinnest point keratometry readings at the corneal apex and corneal volume (p<0.01).

The limitations of our study are smaller sample size and shorter duration of follow-up. Future studies with a three to five year follow-up should be conducted to evaluate the long-term effects of CXL.

**Conclusion**

CXL is effective and safe procedure in providing visual and keratometric stability for keratoconus.

**REFERENCES**

ABSTRACT

Objective: To determine the effect of serum total cholesterol and triglyceride levels on stroke recovery in patients with acute ischemic stroke.

Study Design: This was an observational cross sectional study.

Place and Duration of Study: The study was conducted at Shifa International Hospital Islamabad. Total duration of the study was 6 months starting from 5th August 2011 up till 4th February 2012.

Materials and Methods: A total of 100 consecutive stroke patients fulfilling the inclusion criteria were recruited over a period of 6 months. Stroke severity was clinically assessed using the National Institute of Health Stroke Scale (NIHSS) at the time of admission and then again at the time of discharge from the hospital. Their blood sample were collected for Serum Cholesterol and Triglyceride estimation within first 24 hours of admission. Neurological improvement was assessed by the reduction in NIHSS score at discharge and was defined as good if it was ≥3. The data analysis was done by using SPSS version 20. Cross tabulation and Chi Square tests were applied to analyze the data.

Results: Out of the 100 patients, 63 were males and 37 were females with a mean age of 63.7 years (SD 11.9). Patients with a normal or low cholesterol showed good recovery at the time of discharge in 41.3% of cases as compared to 68% of patients showing good recovery with a high total cholesterol levels. For the triglycerides level, there was good recovery in 49.2 % of patients with normal or low triglycerides levels while in patients with high triglyceride levels, good recovery was seen in 46.3% of patients.

Conclusion: Our study shows a positive effect of high total cholesterol on early recovery following acute ischemic stroke but no positive or negative effect was evident with high serum triglycerides. This shows a possible role of serum cholesterol in prognosticating patients with acute ischemic stroke.

Key Words: Acute Ischemic Stroke, Cholesterol and Triglycerides, Stroke Recovery.

Introduction

Stroke is a common disease worldwide resulting in significant morbidity and mortality. It is the second leading cause of death above the age of 60 years and the fifth leading cause in patients aged 15 to 59 years old.1 Globally the number of stroke patients each year is on the rise. According to WHO, up to 15 million people worldwide suffer from stroke each year. Out of these 5 million die and another 5 million are left permanently disabled.2 Paradoxically, 80% people who suffer from stroke live in areas of low and mid income countries.2 In Pakistan also, stroke is becoming the leading cause of morbidity and mortality.3 Among the risk factors for stroke, hypertension and diabetes are more prevalent risk factors in the Asians (44% and 35 % respectively) as compared to the Caucasians (14% and 8% respectively).4 Dyslipidemia was also found to be more common among Asian stroke population as compared to the Western, but it was not statistically significant.5

Relation of high total cholesterol and triglycerides with ischemic heart disease is well established worldwide. High cholesterol level are estimated to cause 56% of ischemic heart disease.5 However, dyslipidemia as a risk factor for ischemic stroke has been quite controversial in recent times. It has been observed in several studies that higher cholesterol and triglyceride levels are associated with better outcome after ischemic stroke.6,7 Many studies have demonstrated that patients with acute ischemic stroke who had a high serum cholesterol and triglycerides on admission showed a better recovery from stroke related disability as compared to those

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stroke patients who had normal or low cholesterol and triglycerides at the time of admission. By determining a relationship of cholesterol and triglycerides with recovery of acute ischemic stroke; in terms of clinical improvement, we will be able to prognosticate the outcome of ischemic stroke in our patients. The purpose of this study is to find the effect of serum total cholesterol and triglyceride levels in patients with acute stroke on their recovery.

Materials and Methods
An observational cross sectional study was conducted at Shifa International Hospital Islamabad which is a tertiary care Hospital with 500 beds. The total study period was six months from August 2011 to February 2012. The sample size was calculated with the help of WHO sample size calculator and it was 100 patients. The study was started after permission from the Hospital’s ethical committee. Consecutive sampling was done. All the patients who were admitted in the neurology and medical departments of the hospital with the diagnosis of acute stroke were checked for the following inclusion and exclusion criteria. Patients included in study were 18 years of age or above, having signs and symptoms of acute stroke within previous 48 hours and it was diagnosed radiologically as ischemic stroke confirmed by diffusion positive stroke on MRI brain. Patients with previous history of major stroke, hemorrhagic stroke, venous stroke and focal neurological deficit lasting for less than an hour were excluded from study. The two most common reasons for exclusion of patients from the study were delayed presentation after acute stroke (more than 48 hrs. after the onset of symptoms) and patients with history of previous stroke.

All patients presenting to Department of Neurology or Medicine at Shifa International Hospital, meeting the sample selection criteria were included in the study. Written consent was taken from all the patients or their families. As a routine, all patients with stroke admitted at Shifa International Hospital undergo a set pattern of investigations according to the stroke pathway developed by a multidisciplinary team of our hospital. This includes fasting lipid profile and MRI of brain with stroke protocol. Other variables which have been included in data collection were age, gender, type and site of stroke, history of diabetes mellitus, ischemic heart disease, hypertension and smoking, duration of stay in the hospital and the stroke severity. For describing the type of stroke TOAST classification was used. For stroke severity, an initial clinical assessment of these patients was done by using NIHSS. On the day of discharge these patients were reassessed using the NIHSS score to measure clinical improvement. The data analysis was done by using SPSS version 20. Cross tabulation and Chi Square tests were applied to analyze the data.

Results
More than 170 patients were seen before the required sample size of 100 patients was met. Out of the 100 patients who were selected for the study, 63 were males and 37 were females. The mean age of the patients was 63.7 years. The range of age was between the minimum of 36 and a maximum of 95 years.

The total cholesterol level was normal or low in 75% of the patients and high in 25%. Triglycerides levels were low or normal in 59% and high in 41%. (Table II and III).

Regarding the stroke severity, 39% of the patients had a minor stroke, 44% had a moderate intensity stroke while 17% of the patient had a severe stoke.

At the time of discharge, good recovery was seen in 48 patients while poor recovery was seen in 52 patients. When we compared the level of cholesterol and Recovery, we found that 41.3% of patients with a normal or low cholesterol showed good recovery at discharge as compared to 68% of patients showing good recovery with a high total cholesterol levels (Table II).

For the triglyceride levels, there was good recovery in 49.2 % of patients with normal or low triglyceride levels while in patients with high triglyceride levels, good recovery was seen in 46.3% of patients. (Table III).

A total of 66% of patients had a history of hypertension. Diabetes Mellitus was seen in 54% of the patients. 18% of patients had a history of ischemic heart disease while 27% had a current or recent history of smoking.

Table I: Details of lipid levels in the study group (n=100)

<table>
<thead>
<tr>
<th>Plasma Lipids</th>
<th>Mean (mg/dL)</th>
<th>Maximum (mg/dL)</th>
<th>Minimum (mg/dL)</th>
<th>SD (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cholesterol</td>
<td>178.4</td>
<td>311</td>
<td>80</td>
<td>44.4</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>168.6</td>
<td>483</td>
<td>182</td>
<td>103.5</td>
</tr>
</tbody>
</table>
Discussion

Stroke is a common neurological emergency presenting to the tertiary care hospitals all over the world. The risk factors and the factors affecting the stroke outcome are still poorly understood and controversial.

High serum cholesterol and triglycerides have always been considered as a risk factor for the cardiovascular diseases including the ischemic stroke.\(^1\) However, many studies conducted in patients with acute stoke have shown an opposite effect of these risk factors on recovery from stroke.\(^2\) The patients with higher cholesterol and triglyceride did better in terms of recovery and mortality when compared with patients having normal or lower level of these substances. High admission cholesterol may be associated with increased long-term survival after IS.\(^3\) The data already available from other studies on this particular aspect of the stroke has mainly come from studies on patient population whose genetics and demographics are very different from the patients presenting in the hospitals of Pakistan.\(^4\)

The severity of the stroke on admission was assessed using the NIHSS system. Only 17% of the strokes fell under the category of severe stroke with NIHSS greater than 15. Moderate intensity stroke was 44% with NIHSS score between 5 and 15. The percentage of minor stroke was 39% having a NIHSS stroke between 1 and 4. The recovery from the stroke at the time of discharge, which was the main outcome measure, was assessed by the improvement in NIHSS score on the day of discharge. An improvement of 3 or more points from the admission NIHSS score was considered as a good recovery while those showing improvement of 2 or less points on NIHSS at discharge were categorized as having a poor recovery.

The results of this study showed that acute stroke patients with higher total cholesterol had a better recovery at the time of discharge as compared to the patients who had normal or low cholesterol on admission. Out of the 100 patients, 25 had cholesterol that was higher than 200 mg/dl. Out of these 25 patients, 17 (68%) patients showed good recovery from stroke that was improvement in NIHSS score by 3 or more points. When we compared this with the patients having normal or low serum cholesterol we saw a marked difference, with good recovery seen in only 41.3% of the patients and a poor recovery in 58.7% of patients (p value < 0.05). This is a significant finding and has also been seen in other studies.

Data from a Chinese study on acute stroke patients showed that the levels of serum cholesterol in the good outcome group were significantly higher as compared to the patients with normal or low cholesterol.\(^5\) Although this study also included patients of intracranial hemorrhage, the beneficial effect was seen in both types of stroke independently. Another major difference of this study from the current one is that the prognosis of the patients with acute stroke was assessed at 3 months' interval after the stroke but in my study the outcome has been measured at the day of discharge which is somewhere between 5 to 7 days after admission.

The effect of serum triglyceride on recovery from acute stroke was also compared with recovery from stroke. The results did not show any statistically significant difference in this regard. A total of 19

<table>
<thead>
<tr>
<th>Total Serum Cholesterol</th>
<th>Number of Patients (Out of 100)</th>
<th>Recovery at discharge by NIHSS scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Good Recovery</td>
</tr>
<tr>
<td>Normal Count (&lt;200 mg/dl)</td>
<td>75</td>
<td>n=31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41.3%</td>
</tr>
<tr>
<td>High Count (≥ 200 mg/dl)</td>
<td>25</td>
<td>n=17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>68.0%</td>
</tr>
</tbody>
</table>

Table III: Cross tabulation between serum triglycerides (high vs. low) and recovery (good vs. poor (n= 100)

<table>
<thead>
<tr>
<th>Total Serum Triglycerides</th>
<th>Number of Patients (Out of 100)</th>
<th>Recovery at discharge by NIHSS scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Good Recovery</td>
</tr>
<tr>
<td>Normal Count (&lt;150 mg/dl)</td>
<td>59</td>
<td>n=29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>49.2%</td>
</tr>
<tr>
<td>High Count (≥150 mg/dl)</td>
<td>41</td>
<td>n=19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>48.0%</td>
</tr>
</tbody>
</table>
(48%) of patients with high triglyceride levels showed good recovery from acute ischemic stroke. Similar good outcome (49.2%) was seen for patients with normal or low cholesterol levels. The mean hospital stay for the patients was 5.9 days. Some patients stayed for 48 hours while the maximum hospital stay was 24 days. The reason of early discharge was usually because of less severity of stroke or early recovery, however many patients were discharged on request as their families wanted to take the patient home or shift to some other hospital due to personal and economic reasons. One study speculated a potential neuroprotective mechanism of high cholesterol by increasing gamma-glutamyltransferase. Gamma-glutamyl transferase (GGT) mediates intracellular intake of extracellular glutathione which is an important component of antioxidant mechanisms. Glutathione is produced during normal metabolic processes and plays an important role in the protection of cells against oxidative stress. Another study suggested that this effect could be seen due to confounding effect of other prognostic factors. A study done by M Jane et al concluded that lower triglyceride levels seem to be associated with a worse prognosis in AIS. Low level of triglycerides predicts poor outcome following stroke and may be used as a prognostic marker for early mortality. Some of the studies suggested that higher cholesterol level was associated with less severe stroke and hence a better outcome as compared to patients with normal or low cholesterol levels. The reason for this association was given that cholesterol played a role in the development of small vessel disease of the brain which results in minor strokes as compared to the disease process leading to occlusion of large vessels of brain which results in more severe stroke.

In our study, we have not catered for the other confounding factors that is age, presence or absence of modifiable risk factors for example smoking, HTN, DM, IHD, diet and weather the patient was on lipid lowering drugs or not. All of these factors can have an independent as well as combined effect on stroke recovery which is difficult to measure. Length of hospital stay is also an issue which needs to be looked into as it is difficult to assess the recovery of a patient in less than 6 days following acute stroke. Although a positive correlation is seen between high cholesterol and good recovery following stroke, further studies are needed to confirm or reject this association. A better study design would be required with larger number of patients in both groups i.e. acute stroke patients with and without high cholesterol levels.

**Conclusion**

The study shows a positive relationship of high total cholesterol with early recovery following acute ischemic stroke but no positive or negative effect was evident of high serum triglyceride on early recovery from acute ischemic stroke. These findings are not likely to change the clinical practice regarding prevention and management of acute strokes any time soon, however there may be a role of serum cholesterol in prognosticating patients with acute ischemic stroke. This needs to be further investigated in larger studies.

**REFERENCES**

New Insights into the Role of Coenzyme Q10 in Serum LDL-Cholesterol Reduction
Sabeen Shakir, Zunnera Rashid, Naureen Hafeez

ABSTRACT

Objective: To explore effect of Coenzyme Q10 (Co Q10) on serum LDL-Cholesterol and compare its hypolipidemic efficacy with the normal control.

Study Design: Randomized control trial.

Place and Duration of Study: The study was conducted from 1st February 2013 to 30th June 2013 at the department of chemical pathology, Army Medical College and National Institute of Health Sciences (NIH) Islamabad.

Materials and Methods: Eighteen rabbits were divided into three groups of six rabbits each. Base line lipid profile was estimated for serum LDL cholesterol in mmol/L. Leaving one group as normal control, the other two groups were given high cholesterol diet to produce hyperlipidemia. Of the two hyperlipidemic groups, one group was treated with CoQ10 orally for 30 days. Blood samples were drawn for lipid biochemistry, 24 hours after administration of the last dose. The means of serum analysis were calculated and compared using SPSS version 20.

Results: Serum LDL-cholesterol (LDL-C) was reduced in the group taking CoQ10 as compared to the group with no CoQ10 treatment. The p value was significant for LDL-C in treatment group, (p<0.0001).

Conclusion: It is concluded that Coenzyme Q10 plays a vital role in hyperlipidemic rabbits in reducing serum LDL cholesterol levels.

Key Words: CoQ10, Hyperlipidemia, LDL-Cholesterol.

Introduction

The increasing incidence of deaths due to cardiovascular diseases (CVD) have become a foremost current health issue and are accountable for 76 percent of deaths and disabilities due to myocardial infarction, atherosclerosis and stroke. The most vital risk factor for coronary heart disease is high blood LDL-C levels that accumulate on the walls of the arteries. Trials have shown that there is 30 percent decline in the risk of CVD by pharmacologically lowering serum LDL cholesterol. Therefore it has been stressed that lowering the blood lipids are beneficial in cardiovascular patients. Blood cholesterol levels are maintained within normal range via antihyperlipidemic drugs exhibiting different lipid lowering mechanisms. Therefore majority of patients need a combination of two or more agents to cope with the major determinant of CVD i.e. hyperlipidemia. In order to prevent the unavoidable adverse reactions with traditional antihyperlipidemic agents, monodrug therapy with vitamin like substance exhibiting properties of controlling blood cholesterol in addition to acting as supernutrient may offer valuable consequences. Coenzyme Q10 (CoQ10) is a fat soluble, vitamin like enzyme and is an important supernutrient. It is synthesized in all the tissues of body especially liver. CoQ10 is recommended to prescribe nowadays along with the conventional treatment of cardiovascular diseases as a supplement. CoQ10 is found in wide variety of foods and is richly present in meat, poultry, fish products, nuts, broccoli, soy bean and spinach. CoQ10 is available in different formulations like tablet, gel, capsules as well as in injection form. CoQ10 is a large molecular weight substance and is hydrophobic in nature. Absorption of dietary CoQ10 is slow and limited but increases with meal. Solubilized formulations show enhanced bioavailability with Tmax of approx. 6 hrs. It has elimination half-life of 33 hours. CoQ10 is taken up by all the tissues including heart and brain mitochondria. It also undergoes enterohepatic circulation as it is reabsorbed from small intestine.
instead of excretion.\textsuperscript{16} CoQ10 is incorporated in its reduced form i.e. ubiquinol, into the mitochondria of almost all the body tissues especially brain and heart mitochondria and allow these tissues to produce more energy in the form of ATP.\textsuperscript{17,18} This energy is required to maintain basic metabolic functions such as to take up and utilize nutrients, to synthesize new proteins and to discard waste materials. CoQ10 also acts as a potent antioxidant by mopping up potentially harmful free radicals.\textsuperscript{19} Unstable free floating electrons when not attached to other molecules are capable of causing damage to cell membranes. As an antioxidant, it causes the regeneration of vitamin E and vitamin C and prevents prooxidant effects of vitamin E. Once it gives up its free electron to stabilize a free radical, it needs to be regenerated in order to become functional again. For this, drug hands over electrons to oxidized version of vitamin E and C, and thus converts back to its reduced form, ubiquinol (reduced CoQ10).\textsuperscript{20} In this way it protects mitochondrial DNA from oxidative stress. An important mechanism of action of CoQ10 involves the decrease in the oxidation of LDL cholesterol thereby reducing the risk of developing atherosclerosis and other cardiovascular diseases.\textsuperscript{21,22}

Unlike traditional antihyperlipidemics, no adverse drug reactions have been documented with CoQ10 so far, the objective of my study is to observe the potential of Coenzyme Q10 in LDL-Cholesterol reduction in hyperlipidemic rabbits to see whether this provitamin can be used in cardiovascular patients effectively.

**Materials and Methods**

It was a randomized control study. The approval for the study was sought from the Ethics committee of Centre for Research in Experimental and applied Medicine (CREAM). The study was conducted from \textsuperscript{1} February 2013 to \textsuperscript{30} June 2013 at the department of chemical pathology, Army Medical College and National Institute of Health Sciences (NIH) Islamabad. Study included eighteen healthy adult rabbits having a weight of 1.5 to 2.0 kg. They were of mixed breed with equal distribution of male and female rabbits in three different groups. Animals under 1.5 years of age and pregnant females were excluded from the study. Standard laboratory conditions were maintained in animal house of National Institute of Health and were provided with controlled environment assuring twelve hours day and night cycle and an average temperature of 24oC. Rabbits were acclimatized for one week before the study.\textsuperscript{23} After acclimatization, the study period comprised of twenty weeks. Blood samples (n=6.0) were drawn from the dorsal surface of rabbit’s marginal ear vein with the help of a 5cc syringe according to standard described techniques. All the samples were transferred to separate plain clot activator tube were centrifuged at 4500 rounds per minutes for 10 minutes. Serum was separated via an automatic micropipette and then shifted in clean dry vials for estimation of serum cholesterol, serum triglycerides and serum HDL-Cholesterol in mmol/L. All tubes were labelled accordingly.

The rabbits were randomly assigned into three groups of six animals each. Group A was the control group and received normal diet and water ad libitum for 150 days. Group B (hyperlipidemic control; n=6) animals received cholesterol powder (1g/day) mixed in a diet comprising of grain whole and wheat bran for 120 days. Cholesterol powder was excluded from the diet for the next 30 days. Rabbits were also given tap water ad libitum for drinking.

Group C (hyperlipidemic+Coenzyme Q10; n=6) animals received the high cholesterol diet (1g/day) as per group B for 120 days and then fed on normal/routine diet without cholesterol along with Coenzyme Q10 (10mg/kg) once daily via gavage for a period of 30 days.

Serum LDL was calculated in (mmol/L) by using the formula:

\[ \text{LDL} = \text{TC}-\text{HDL}-\text{TG}/2.20 + \text{HDL}–\text{Cholesterol}. \]

The statistical analysis was carried out using SPSS version 20. The results of serum analysis were established as means + standard error of mean.\textsuperscript{25} The difference was taken as significant for a p value of 0.05 or less.

**Results**

Group A (normal control) showed unchanged levels of serum LDL-C when recorded on day 120 and on day 150 in contrast to the levels recorded on day zero.

In group B (hyperlipidemic control), serum LDL-C levels on day 120 were increased significantly as compared to day zero with p=0.0005. The levels
remained unchanged on day 150 in comparison to day 120 in this group so p>0.05, but were increased on day 150 in comparison to group A (normal control) hence p<0.0005. Group C (CoQ10) LDL-C levels were also recorded on day zero and day 150. When this treatment group was compared with group B (hyperlipidemic control) to assess the post treatment reduction in serum LDL levels on day 150, a statistically remarkable decrease was recorded, i.e. group C (CoQ10) p value equal to 0.0001.

Table 1: Means ± SEM of serum LDL-C (in mmol/L) in group A, group B and group C in rabbits (n=6)

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0</td>
<td>1.64</td>
<td>1.61</td>
<td>1.63</td>
</tr>
<tr>
<td>±1.1</td>
<td>±1.1</td>
<td>±0.33</td>
<td></td>
</tr>
<tr>
<td>Day 120</td>
<td>1.64</td>
<td>3.45</td>
<td>3.35</td>
</tr>
<tr>
<td>±0.8</td>
<td>±0.2</td>
<td>±1.2</td>
<td></td>
</tr>
<tr>
<td>Day 150</td>
<td>1.64</td>
<td>3.45</td>
<td>1.80</td>
</tr>
<tr>
<td>±0.5</td>
<td>±0.3</td>
<td>±0.75</td>
<td></td>
</tr>
<tr>
<td>P-Value</td>
<td>0.006</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

n=6, Results are expressed as mean ± SEM (Standard Error of Mean)

Discussion

In our study we found that CoQ10 has the ability to reduce serum LDL cholesterol significantly in high cholesterol diet fed rabbits. This favors the dual role of Coenzyme Q10, i.e. although it is a supernutrient, CoQ10 also serves as an antihyperlipidemic agent. Similar results were also shown by Ketan et al., (2006). They established that CoQ10 has a potential of lowering all the parameters of lipid profile including serum total cholesterol, TGs, VLDL, and LDL with the exception of serum HDL which increases with the use of CoQ10. The only difference with our study is that, they used rats instead of rabbits as an experimental model. Our results are also consistent with the inference of Hiroshi et al., (2007). They certified from their study that treatment with CoQ10 significantly improves plasma lipid biochemistry. CoQ10 has the ability to decrease even aortic cholesterol and triglycerides in trans-fatty rich diet. Singh et al., (2000) explained the reduction in aortic and coronary artery plaque sizes along with the decrease in aortic and coronary artery scars in high fat diet induced rabbits. Keeping all this in view, our inference is that CoQ10 reduces the serum LDL-C in high cholesterol diet fed rabbits. Administration of this vitamin like substance can be used effectively in lowering high serum LDL-C levels in hyperlipidemia. Coenzyme Q10, a provitamin as it is a safe and highly tolerable drug, so can be used without the fear of adverse drug reactions that otherwise would occur with other traditional antihyperlipidemic agents. Future studies are required to observe the antihyperlipidemic potential of this super nutrient in human subjects so that it can be used to prevent or to treat cardiovascular diseases.

Conclusion

After conducting this experimental study on eighteen rabbits and assessing the results of serum analysis statistically, it is concluded that CoQ10 has a potential to reduce serum LDL-Cholesterol in hyperlipidemic rabbits. Further studies in humans are needed, however, to prove its action of improving serum lipid profile to be used effectively for the prevention and treatment of cardiovascular diseases.

REFERENCES

Objective: To determine the protective role of Pomegranate Juice (PJ) and Pomegranate Peel Extract (PPE) on steroid induced serum creatinine level in mice.

Study Design: Randomized control trial.

Place and Duration of Study: Department of Anatomy, Army Medical College Rawalpindi, in collaboration with the National Institute of Health (NIH), Islamabad, from May 1st to June 30th, 2015.

Materials and Methods: Forty healthy mice (BALB/c strain), weighing 25-30 gms on average were randomly divided into four groups, each group having five male and female mice. Group A was control group and groups B, C and D were experimental groups. Mice in experimental groups were injected Nandrolone decanoate, 1 mg/100 gm body weight, intramuscularly in the hind limb once a week for 8 weeks. Mice in experimental group C were also given pomegranate Juice daily, 3ml/kg body weight by oral gavage tube for 8 weeks. Mice in experimental group D were given Pomegranate Peel Extract daily, 200mg/kg bodyweight through oral gavage tube for 8 weeks. After eight weeks 5ml blood was drawn from mice through cardiac puncture just before the sacrifice of animals. Data were entered and analyzed by using SPSS version 21. ANOVA test was applied for intergroup comparison of quantitative variables. P-value of <0.05 was taken as significant.

Results: Serum creatinine level was significantly higher in experimental group B. It was improved statistically when compared with pomegranate juice and pomegranate peel extract administered experimental groups C and D, respectively. When results of experimental groups C and D were compared with each other no statistical significance was present.

Conclusion: Both forms of pomegranate equally ameliorate the steroid induced effects on serum creatinine level in mice.

Key Words: Androgenic Anabolic Steroids, Pomegranate Juice, Pomegranate Peel Extract, Serum Creatinine Level.

Introduction

Androgenic anabolic steroids (AAS) are synthetic drugs closely related to the hormone testosterone, capable of increasing muscle mass and physical strength. The anabolic effects of AAS are associated with protein synthesis in bone and skeletal muscle while androgenic effects of these hormones can be generally considered as those associated with masculinization. Recently, more than hundred AAS drugs have been developed. Androgens and other appearance and performance enhancing substances are abused worldwide.

Survey among people attending gyms equipped for bodybuilding, the proportion of AAS’s users was around 25–50%. AAS drugs cause ethical problems when they are used to increase performance by sportsmen in competitions and are often misused and self-administered by bodybuilders to rapidly increase muscle mass. Androgen abuse first spread from elite athletics and into the general population in the 1980s, and thus the oldest users – those who began androgens as youths in the 1980s – are only now reaching middle age, with consequently increasing risk of long-term adverse effects. Restrained usage of AAS may also induce serious side effects such as cardiovascular system failure, prostate gland diseases, lipid metabolic disorders or insulin sensitivity.1
Nandrolone decanoate (ND) is the conjugation of Nandrolone and Decanoic acid. Chemical name of Nandrolone decanoate is 19-nortestosteron decanoate. Its trade names are Decadurabolin (DD), Deca-Durabol and Retabolil. ND is available as both intramuscular (I/M) and subcutaneous (S/C) injections, dissolved in a vegetable oil vehicle and produced under 25-200mg /ml dose range. Such injections provide continuous androgen release into the blood stream and have remained the main route of pharmacological androgen therapy (PAT) for the last few decades.

Therapeutic uses of these substances include the treatment of hypogonadism, as in men, androgens are necessary for reproductive function as well as they play a vital role in cognitive function and a feeling of well-being. They are also beneficial in bone mineralization, some muscle wasting disorders, bone marrow failure syndromes, osteoporosis in postmenopausal women and aplastic anemias.

Besides having therapeutic effects, AAS have been recognized to produce some undesirable effects, most documented of which include elevated blood pressure, cardiac arrhythmias, myocardial infarction, altered RBC morphology, cholestatic jaundice, hepatocellular hyperplasia and adenoma. Furthermore, male reproductive side effects are testicular atrophy, gynecomastia, compromised spermatogenesis, masculinization and menstrual disorders in female.

Although AAS are taken only on prescription, but in some countries they are sold illegally. Athletes use these drugs to improve their stamina and performance; this is known as “doping”, which is banned by International Olympic Committee. A variety of AAS are often taken simultaneously, this is called “stacking” and drugs are taken in doses that cause ten to hundred times increase in androgen concentrations, and this apparently describes the increase in toxic effects.

Pomegranate is the figure and icon of the historical city of “Granada” in Spain – from which the city acquires its name. In earliest times it was mentioned as possessing powers of fertility, abundance and good luck. Apart from being eaten fresh, pomegranates are used to make juice, which is a worldwide popular beverage as well. About 100 g arils provide 72kcal of energy, 7mg vitamin C, 16.6g carbohydrate, 1.0g protein, 1mg sodium, 379mg potassium, 12mg magnesium, 13mg calcium, 0.7mg iron, 0.17mg copper and 0.3mg niacin. Pomegranate peel is a great natural source of phenolic compounds such as galloitannins, anthocyanins, free ellagic acid, ellagic acid glycosides, ellagittannins, punicalagin and punicalin. Numerous studies have demonstrated the antihelminthic, antimicrobial, and antioxidant potentials of pomegranate juice and peel extract ingredients, suggesting their protective and curative role.

Pathophysiology in kidney, liver and heart are often associated to oxidative stress, as these are major organs involved in drugs metabolism, detoxification and excretion. This oxidative stress is described by interruption of control regarding redox signaling. A cellular damage and lipid peroxidation products lead to an inflammatory response.

This study was conducted to observe the nephrotoxic effects of AAS, to cause awareness especially, in young abusers. When prescribed in chronic illnesses, AAS have both therapeutic as well as undesirable effects side by side. The present study was planned to determine the protective role of Pomegranate Juice (PJ) and Pomegranate Peel Extract (PPE) on steroid induced serum creatinine level in mice.

**Materials and Methods**

This randomized control trial was conducted in the Department of Anatomy, Army Medical College, Rawalpindi, in collaboration with National Institute of Health (NIH), Islamabad from 1st May- 30th June 2015. Experimental protocols were carried out with the approval of Ethical Committee of Centre for Research in Experimental and Applied Medicine (CREAM), Army Medical College, Rawalpindi.

Forty healthy male and female BALB/c mice average weighing 25-30 gms, were randomly divided into four groups, each having five male and five female animals. They were housed in NIH under controlled environment of light and temperature, and were fed with NIH standard laboratory diet for eight weeks. Group A served as a control group and groups B, C and D served as experimental groups. Mice in experimental groups B, C and D were injected ND at the dose of 1 mg/100 gm body weight, as a single intramuscular injection in the hind limb once a week for 8 weeks. In addition, mice in experimental group...
C was also given PJ at the dose of 3ml/kg body weight by oral gavage tube for 8 weeks daily, and mice in experimental group D was given PPE at the dose of 200mg/kg body weight by oral gavage tube for 8 weeks daily.

Preparation of Pomegranate Juice: The fresh and seasoned Pomegranate fruits were purchased from a local market. They were washed thoroughly and peeled manually. Juice was prepared by using an electrical blender. As seeds cannot be manually separated, juice was filtered through a filter paper. It was stored at-20°C after diluting with distilled water to volume of 1:3, at-20°C. In this study, 3ml of juice is dissolved in 27ml of plain water to make 30ml solution and 1ml was given to each mouse by gastric tube.

Preparation of Pomegranate Peel Extract: Pomegranate peels were manually separated, sun dried and grounded to powder. Extract was prepared by mixing the powder (25g), by using a magnetic stirrer, with 100ml of methanol at 30°C for 1hr. First it was filtered to remove the peel particles, and then the extracts was pooled and concentrated under vaccum at 40°C. In this study, 5.6mg of extract was dissolved in 2ml of plain water and was given to each mouse by a gastric tube.

Five ml sample of blood was taken through cardiac puncture in a test tube (Figure 1), for the quantitative measurement of serum creatinine level just before the sacrifice of the animals. After collection, the blood was centrifuged and serum was collected. The blood samples were labeled according to the groups as control group A and experimental groups B, C and D. Serum creatinine level were measured on spectrophotometer using enzymatic method. Data was entered and analyzed by using SPSS version 21. ANOVA test was applied for intergroup comparison of quantitative variables. P-value of <0.05 was taken as significant.

Results
Results of experimental groups B, C and D were compared with control group A and with each other. Mean serum creatinine level ±SD of control group A was 0.130±0.048mg/dl, and in experimental groups B, C and D it was 1.090±0.280mg/dl, 0.360±0.142mg/dl and 0.350±0.217mg/dl respectively (Table I). Intergroup comparison was statistically significant when control group A was compared with experimental group B (p-value=0.000*) and experimental group C (p-value=0.053) but there was no significant difference when compared with experimental group D (p-value=0.069).

Statistical significance was seen when experimental group B was compared with experimental groups C and D (p=0.000* in both cases). When experimental group C was compared with control group A (p-value=0.053) statistical difference was noted but no statistically significant difference was seen when experimental groups C and D were compared with each other (p-value=0.999).

Table I: Mean values of serum creatinine level in control group A and experimental groups B, C and D.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Normal value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum creatinine level</td>
<td>0.130±0.048</td>
<td>1.090±0.280</td>
<td>0.360±0.142</td>
<td>0.350±0.217</td>
<td>0.08–0.11 mg/dl</td>
</tr>
</tbody>
</table>

Discussion
The Father of Medicine, Hippocrates, about 25 centuries ago, stated, “Let food be the medicine and let medicine be the food”. In regard to this statement, globally, the interest in nutraceuticals has increased widely, and this plays a vital role in health management. Numerous studies have shown the beneficial effects of many vegetables, fruits, pulses, spices and herbs. Pomegranate has achieved the title of “superfood”, due to its presumed safety and potential nutritional as well as therapeutic benefits. Pomegranate juice contains phenolic compounds such as anthocyanins,
Improvement in experimental groups C and D is attributed to pomegranate’s ability to lower the oxidative stress. Edible part of pomegranate fruit is rich in vitamin C and phenolic compounds, which are strong antioxidants, and this was verified by Riezzo et al., 2014 who reported an increase in the malondialdehyde (MDA) level (marker of lipid peroxidation) as well as enhanced activity of antioxidant enzymes (GR and GPx) in the Pomegranate administered groups, resulting in the increased ability of the kidneys to scavenge toxic free radicals such as hydrogen peroxide and lipid peroxides. Furthermore, PJ considerably reduced the concentration of pro-inflammatory chemokines like IL-6, IL-12p40, IL-1βand cytokines, thus reducing inflammation and markedly improved kidney and liver functions.

This was also in agreement with the results of study conducted by Balbir et al., 2011, who described that oxidative stress plays a vital role in developing chronic complications in case of interstitial nephritis and it is related to increased lipid peroxidation, which can induce fragmentation of DNA leading to apoptosis in renal tubules causing an end stage renal disease. Pomegranate peel extract consumption at the dose of 0.5ml/day for 12 weeks considerably reduced both the occurrence and severity of collagen-induced interstitial nephritis in mice. High level of phytochemicals (antioxidants) in pomegranate could enhance the reduction of free radicals inside the cells, to protect the kidney tissue from oxidative stress damage. These findings were in accordance with another study conducted by Sastravaha and colleagues who demonstrated the beneficial effect of PPE by reducing cytokine activity, in patients having periodontitis. Patients suffering from this type of oral inflammation received intra-gingival PPE impregnated chips which resulted in reduced inflammatory cytotoxic cytokines (IL-1β, IL-6 and TNF-α) levels few months after treatment. The reno-protective roles of pomegranate in clinical trials were chiefly associated to its antioxidant and anti-inflammatory properties. This opinion was also reinforced by the findings of Viuda-Martos et al., 2013 who suggested that PPE activates the anti-inflammatory responses of the immune system within the cells.
Future researchers may focus their attention to explain AAS's (Anabolic androgenic steroids) and Pomegranate granatum interactions in conditions of long term co-exposure and their consequences for health in human population. Additional studies are recommended to see if the effects noticed in the current study are transitory or long-lasting in order to evaluate the use of Pomegranate granatum as a potential agent to be used as antidote along with anabolic steroids in clinical settings.

Conclusion
There was significant increase in serum creatinine level of animals in experimental group B, indicating renal damage, and improvement was seen in Pomegranate administered experimental groups C and D. Therefore, it is concluded that Pomegranate in both forms has equal antitoxic effects on steroid induced renal damage. Advance studies are required to be conducted to explain the exact mechanism of action, in protection provided by Punica granatum, on histomorphology of kidneys during steroid induced renal damage.

Acknowledgement
Special thanks to Dr Hussain Ali, Scientific officer animal house, NIH, Islamabad for his expert advices and support in conducting this study, and Mr. Muhammad Saad Shoib for his assistance in animal handling both during drug administration and dissection.

REFERENCES


Objective: The objective of this study was to see the frequency and histological variants of endometrial metaplastic changes in benign endometrial curettage.

Study Design: Cross sectional descriptive study.

Place and Duration of Study: The study was conducted at Pathology department of Bannu Medical College. The duration was five years. From January 1st, 2011 to December 31st, 2015.

Materials and Methods: In this study a total of 530 endometrial curettage specimen were analysed. All the data was collected during these five years from Pathology department register and the author was actively involved in examination and histopathology reporting. All benign endometrial curettage specimen from both pre and post-menopausal age were included. Autolysed, malignant and insufficient biopsy specimen were not included. A minimum of one and maximum of three blocks were prepared. Two to four 5 micron thick sections were taken, stained with H&E and PAS where required. Slides prepared were mounted and reported by Histopathologist (Author). The data was analysed in Statistical Package for Social Sciences (SPSS) version 20 for frequencies with percentages and mean with standard deviation.

Results: A total of 530 endometrial samples were collected in this study with mean age of 33.65 years and age range was from 21 to 63 years. The incidence of endometrial metaplasia was 4.90% amongst 530 endometrial samples. The metaplastic changes in order of frequency were tubal metaplasia followed by squamous metaplasia, clear cell metaplasia, ciliated cell metaplasia and mucinous metaplasia.

Conclusion: Endometrial metaplasia is a recognized histological entity in endometrial curettage specimen with variable histological presentation. In this study tubal metaplasia was the commonest metaplasia followed by squamous metaplasia.

Key Words: Endometrial Curettage, Proliferative Endometrium, Morules, Tubal Metaplasia, Histopathology.
Factors involved in EMC are multiple physiological, reactive, neoplastic or genetic abnormalities. EMCs occur in pure form or in combination with other histological types in the same specimen. There are multiple risk factors of EMCs may include the following:

Pubertal hormonal imbalance may induce metaplastic transformation, abnormal endometrium including hyperplasia, endometritis, endometrial carcinoma, polycystic ovarian syndrome, tuberculosis endometritis, foreign body such as intrauterine contraceptive device and chronic trauma. The significance of EMCs may present an indirect evidence of the presence of a causative factor. The underlying cause of EMCs may present significant signs and symptoms or complications and treatment may be required for the underlying cause of metaplasia in endometrium. The prognosis is related to the underlying cause and its treatment.

There are different types of endometrial metaplasias, the most common is tubal metaplasia followed by squamous metaplasia, hobnail cell metaplasia, arias stella reaction/change, esinophilic cell change and mucinous metaplasia. Other rare form of stromal metaplasia like clear cell metaplasia, cartilaginous, osseous, glial and smooth muscle can also be seen in endometrium.

The aim of this study was to see the frequency and histological variants of endometrial metaplastic changes in the southern districts of Khyber Pakhtunkhwa and to compare these with other studies.

Materials and Methods

This cross sectional descriptive study was carried out in Pathology Department Bannu Medical College Bannu KPK. Pakistan. The duration of this study was five years, from January 1st 2011 to December 31st 2015. The sample size was 530 endometrial curettage specimen. All the endometrial curettage samples were collected in 10% buffered formalin. The inclusion criteria was all endometrial curettage specimen of pre and postmenopausal age group, exclusion criteria was autolysed, insufficient and malignant specimen. All the specimen were overnight fixed in 10% buffered formalin, processed in various grades of alcohol, xylene and wax. A minimum of one and maximum of three blocks were prepared. Two to four 5 micron thick sections were taken, stained with H&E and PAS where required. Slides prepared mounted and reported by single Histopathologist. Data was analysed in Statistical Package for Social Sciences (SPSS) version 20 for frequencies with percentages and mean with standard deviation.

Results

A total of 530 endometrial curettage were included in this study. The mean age was 33.65 years with age range from 21 to 63 years. The incidence of endometrial metaplasia was 4.90% (n=26) cases amongst 530 endometrial curettage samples. The most common age group in metaplastic changes was between 46-55 years 34.61% (n=9) cases followed by 36-45 years 30.76% (n=8) cases. Table I. Tubal metaplasia was the commonest 34.61% (n=9) followed by squamous metaplasia 19.23% (n=5), mucinous 11.53% (n=3), hobnail 11.53% (n=3), clear cell 11.53% (n=3), eosinophilic 7.69% (n=2) and arias stella reaction 3.86% (n=1) cases. Table II.

Discussion

Endometrial metaplastic changes (EMCs) are frequently overlooked and misdiagnosed. EMCs by itself does not suggest a medical condition or an abnormality. However the cause of metaplasia may be of clinical significance and may require further
Endometrial metaplastic change is a recognized histological entity in endometrial curettage specimens with variable histological presentation. In this study tubal metaplasia was the commonest metaplasia followed by squamous metaplasia.

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11. McCluggage WG, Desai V, Manek S. Tamoxifen-associated...


Objective: The objective of this study was to find out the prevalence of pregnancy related low back pain in the third trimester and evaluate its impact on the quality of life, functional limitation and physical disabilities of pregnant women.

Study Design: A cross-sectional descriptive study.

Place and Duration of Study: The study was conducted at Benazir Bhutto women and children care hospital (DHQ), Abbottabad from Jan 5, 2014 to Feb 26, 2014.

Materials and Methods: Total 104 patients of 3rd trimester were selected on probabilistic sampling (simple random sampling). Diseased, disabled, women with height less than 4.5 feet (137cm) and third grade obese were excluded. A structured pre-tested questionnaire was used to access rating of pain intensity, its effect on quality of life, functional limitation and daily activities. Informed written consent was taken from the participants of study. Statistical analysis was done by SPSS version-21.

Results: Among 104, eight women data was not taken into account due to exclusion criteria. Mean age of remaining 96 women was 24.56 (min 18-max 37) years and height was 160.39 (min 144- max 176) cm. Among n96, n66 (68.8%) had pregnancy-related low back pain (PLBP). In which, n2 (3%) were totally dependent, n20 (20.8%) were physically inactive and n30 (31.3%) showed 61%-80% of disability scale. Pain intensity of n36 (54.5%) women was moderate.

Conclusion: The prevalence of pregnancy related low back pain is quite high (68.8%) in Abbottabad population. PLBP adversely affect their quality of lives, limit their routine activities and productivities and even make them physically disable. There is a significant difference between women having pregnancy related low back pain and women without it. (p=0.452). Women especially, young (p=0.390) and in first pregnancy (p=0.095) have severe pain intensity that interferes significantly with their daily living activities.

Key Words: Low Back Pain, Physical disabilities, Pregnancy.
contributions was led by Vesalins, Ambroise Pare, Severin Pinean, Albinus of Leyden, William Hunter, Luschkaamd and many others. Their core of discussion was whether LBP and/or PGP was a constant/normal phenomena or exceptional/pathological. In 1870, Snelling defined the pelvic syndrome and confirmed that LBP and/or PGP is not pathologic at its own. It is actually caused by relaxation of pelvic articulation, which is due to the pressure of fetal head on pelvic bone, likewise, fetal size, physical and muscular weakness, a retroverted uterus and difficult labor causes painful sensation. In 1962 Walde differentiated between PGP and Lumbar pain (LP) and Ostgaard et al. set the criteria for diagnosis. Studies show that its prevalence varies between 3.90%-89.88%. Literature is full of the risk factors associated with PLBP. The most common of them (in descending order) are previous LBP, increased weight (BMI), young age, strenuous work, multiparous, LBP with menstruation and smoking. More than 80% pregnant women with PLBP experience difficulties during their routine activates. It lowers their quality of life, makes them disable for many activities and compel them for frequent bed rest. Whether they have back pain or not they have functional disabilities.

The aim of this study was to find out the prevalence of PLBP and evaluate the impact of PLBP (in the third trimester) on the quality of life and physical limitation of pregnant women. To compare the standard WHO values of quality of life with this study, and to analyze the correlations among physical ability, pain intensity and functional limitations of the pregnant women with PLBP.

Materials and Methods
A cross-sectional descriptive study, conducted in Benazir Bhutto women and children care hospital (DHQ), Abbottabad, during 05 Jan 2017 to March 2014. Total 104 patients of 3rd trimester were selected by simple random sampling during OPD timing. Selected patients were screened for inclusion and exclusion criteria. The criterion for inclusion in the research was last trimester pregnant women and coming to the mentioned hospital for routine checkup, while those with preeclampsia, eclampsia, systemic disease and psychiatric problems, congenital or physical disable, patients with height less than 4.5 feet (137cm) and with third grade obesity were excluded from the research. Third trimester pregnant women were first confirmed for the complaint of low back pain by a specialist, sitting in the same OPD at same time. All the data and questions were recorded in a standardized subject profile. This profile was pretested at 10 patients and later on some unethical question were removed. Each patient was interviewed individually for quality of life, routine work, effect of low back pain on their daily activates, pain intensity and to what extent their pain cause disability. Socioeconomic data was also collected from each patient. Other questions related to pregnancy were, gestational age, previous pregnancies, and mode of deliveries. Height and weight was also taken for body mass index (BMI). The Katz’s Activity’s Daily Living Index (ADL), Short Form of WHO Quality of Life Questionnaire (WHOQOL-BREF), Urdu version, Rating of pain intensity, and the Oswestry Low Back Pain Disability Index (ODI) were also included. Pain intensity was measured by a Visual Analog Scale (VAS), Numeric Pain Intensity Scale. Functional Pain Scale (FPS) was also used to reach the effect of pain severity on their daily activities. Categorical variables were explained by percentages while numerical variables by histogram, mean, minimum and maximum. One-sample t-test was applied to reach the significance of different variables. All calculated data was computed according to validated scoring methods of each tool. Statistical analysis was done by SPSS software (version 21). Original patient’s data were filed and was locked by principle author. Informed written consent was taken from all patients. They were assured for maintaining their privileges and anonymity. The study was approved by ethical review board of aforementioned hospital.

Results
A total of 104 third trimester pregnant women participated. Eight women data was not taken into account due to exclusion criteria and only 96 were included in this study. Mean age of these 96 women was 24.56 (18-37) years, height 160.39 (144-176)cm, weight 67.67 (45-86)kg, BMI 26.4 (19-37), and mean duration of pregnancy was 8.08 (7-10)months. All women were housewives and most women were non-matriculated (n=48) and (n=30) were above matric. Younger women aged 22-28 years (n=27)
40.9% had greater prevalence of PLBP than adolescent and middle aged (Table I).

**Table I: Age categories versus pregnancy-related low back pain**

<table>
<thead>
<tr>
<th>Age categories</th>
<th>Years</th>
<th>Pregnancy-related low back pain</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adolescent</td>
<td>&lt; 22</td>
<td>10(33.3) 19(28.8)</td>
<td>29</td>
</tr>
<tr>
<td>Young</td>
<td>22-28</td>
<td>17(56.7) 27(40.9)</td>
<td>44</td>
</tr>
<tr>
<td>Middle aged</td>
<td>&gt;28</td>
<td>3(10.0) 20(30.3)</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>30(100) 66(100)</td>
<td>96</td>
</tr>
</tbody>
</table>

Among them, 50 (52.1%) were living in city and almost all of them were using pulses, vegetable of different variety, mutton and rice once in a week. None of them was anemic or male nutritional. Among 96 (100.0%) 3rd trimester pregnant women, 66 (68.8%) had pregnancy-related low back pain (PLBP). All these 66 had suffered PLBP in last two weeks. In other words, PLBP was considered when patients experienced it during last two weeks. There was a significant different between those women that had PLBP and those without PLBP (p<0.005). Among 66 women with PLBP, KATZ activities of daily life resulted in two (3%) patients physically totally dependent on their care providers, 2 (3%) were neither dependent nor independent and remaining 62 (93%) were independent. All women without low back pain were totally independent. Among 74 overweight women, 53 (80.3%) had PLBP. (Table II) Quality of life (QoL) of n=66 women with PLBP was measured in four domain and their score were transformed to meet the standard results of WHO. (Table III).

**Table II: BMI and Pregnancy-related low back pain**

<table>
<thead>
<tr>
<th>Weight categories</th>
<th>Pregnancy-related low back pain</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (%)</td>
<td>Yes (%)</td>
</tr>
<tr>
<td>Normal</td>
<td>6(20)</td>
<td>8(12.1)</td>
</tr>
<tr>
<td>Obese</td>
<td>3(10)</td>
<td>5(7.6)</td>
</tr>
<tr>
<td>overweight</td>
<td>21(70)</td>
<td>53(80.3)</td>
</tr>
<tr>
<td>Total</td>
<td>30(100)</td>
<td>66(100)</td>
</tr>
</tbody>
</table>

The domain were Physical, Psychological, Social Relationship and Environmental with mean values of (95.00, 79.64, 48.03, 126.30) respectively. (Table III). Pain intensity of n=96 has been showed in (Table IV). Among them, n=36 (54.5%) women was with moderate intensity which interferes significantly with their daily living activities. According to Oswestry low back pain disability scoring, most women (n=30, 45.5%) showed 61–80% disability, i.e., their back pain impinged on all aspects of life and positive intervention is recommended for such patients (Table V).

**Table III: Comparison of transformed domains of this study with WHOQOL-BREF values.**

<table>
<thead>
<tr>
<th>Nature of domains</th>
<th>Min</th>
<th>Max</th>
<th>(WHO Values)/ Mean Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformed score (physical domain)</td>
<td>48.00</td>
<td>140.00</td>
<td>(66.7969±14.548)/ 95.00±20.019</td>
</tr>
<tr>
<td>Transformed Score (Psychological Domain)</td>
<td>40.00</td>
<td>120.00</td>
<td>(73.5026±13.716)/ 79.64±19.327</td>
</tr>
<tr>
<td>Transformed Score (Social Relationship Domains)</td>
<td>20.00</td>
<td>60.00</td>
<td>(73.1771±17.089)/ 48.0303±10.27913</td>
</tr>
<tr>
<td>Transformed Score (Environment Domains)</td>
<td>72.00</td>
<td>156.00</td>
<td>(72.8027)/ 126.3030</td>
</tr>
</tbody>
</table>

When the same tool was applied to those women with moderate pain, majority of them n=23 (63.9%) also resulted in the same 61–80% disability index. Functional pain scale values was computed for limitation of daily activities. Among 66 patients, 61 patients had PLBP at the time of interview and functional pain scale was used for their limitation of daily activities. In this scale, number of women are shown on y-axis and physical limitation on x-axis. (zero [0] is considered as no effect of pain on their daily lives and ten (10) as incapable of doing anything). Its results are shown in Figure 1.

**Table IV: Severity of low back pain (n=96)**

<table>
<thead>
<tr>
<th>Severity</th>
<th>f=</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Pain</td>
<td>30</td>
<td>31.2</td>
</tr>
<tr>
<td>Mild pain</td>
<td>17</td>
<td>17.7</td>
</tr>
<tr>
<td>Moderate pain</td>
<td>36</td>
<td>37.5</td>
</tr>
<tr>
<td>Severe pain</td>
<td>12</td>
<td>12.5</td>
</tr>
<tr>
<td>Worst pain</td>
<td>1</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Discussion
To our best knowledge, this is the first ever study done in Hazara population (Pakistan) on the impact of quality of life, physical limitation and intensity of pregnancy-related low back pain (PLBP). It has been...
this study strongly suggest that greater the weight of pregnant women, greater will be the chances for PLBP.

Due to different criteria and tools used for pain intensity, very little data is found for comparison purpose. Two studies mentioned 33.3%3 and 44%4 women with moderate pain. Whereas this study revealed n=36 (37.5%) suggesting that this moderate intensity of pain is more common and much enough to affect their routine lives.

Quality of life (QoL) of n=66 women with PLBP was measured in four domain and their score were transformed to meet the standard results of WHO. The domain were Physical, Psychological, Social Relationship and Environmental. According to the results of the World Health Organization Quality of Life (WHOQOL BREF) Research, the mean scores of physical, psychological, social and environment domains for healthy women were found to be 13.4, 14.0, 14.1, 13.5 respectively5 and 14.5, 13.9, 15.3, 13.5 respectively in a study conducted on healthy 21 women in Turkey, whereas our study resulted in (95.00, 79.64, 48.03, 126.30) respectively.

Study limitations included difficult patient relation while interviewing, small sample size and language barrier. In order to meet the standard of social and psychological relationship with this region, and of course, according to the guidelines of WHOQOL-BREF, few questions were omitted and the syntax of this tool was modified.

It is recommended for gynecologists that they primarily educate their patients with PLBP for its prevention. Postural education, physical and alternative therapy and use of support belt, postural pillows and heating pad should always be encouraged. As PLBP appeared the most common problem, therefore its evaluation and proper care should be included in antenatal care programs as well as preventive health programs.

In order to alleviate PLBP and reach the standard criteria of WHO for quality of life, researchers have to study further in large population and improve mother’s life.

**Conclusion**

The prevalence of pregnancy related low back pain is quite high (68.8%) in Abbottabad population. PLBP is among the most common problems of pregnant women of Abbottabad. PLBP adversely affect their...
quality of lives, limit their routine activities and productivities and even make them physically disable. Younger aged women with first parity are more prone to sever PLBP. Finally, this study underscore the fact that such worse condition of pregnant women over here is always ignored by both parties, patients as well as by the doctor.

Acknowledgements
Special regards and lot of thanks to
1. Dr. Rahul Raul (DMS, WCH. Benazir Bhutto women and child care hospital (DHQ), Abbottabad).
2. Dr. Kawsar Inayat (Obs,Gynae. AP, Women medical college Abbottabad).

REFERENCES
ABSTRACT

Objective: To determine the effect of caffeine on the weight and length of femur of BALB/c mice.

Study Design: A Laboratory based randomized control trial.

Place and duration of study: The study was conducted at Anatomy Department, Army Medical College, Rawalpindi in collaboration with National Institute of Health, Islamabad for a duration of one year from 6th October 2014 to 5th October 2015.

Materials and Methods: Twenty BALB/c mice (10 male, 10 female), three weeks old, weighing 12-14 g, were taken and divided into two groups with 10 mice (5 male, 5 female) in each group. The control group G1 was given normal diet and water ad libitum. Each animal in the experimental group G2 was given 10 mg of caffeine per 100 g body weight on alternate day, three days in a week by oral gavage for 60 days. The effect of caffeine was evaluated by measuring the weight and length of femur of the BALB/c mice at the end of study. IBM-SPSS version 20 was used for data analysis. The student's T-test was applied for intergroup comparison of quantitative variable, which was taken as means and standard deviations (mean ± SD). A p value < 0.05 was taken as significant.

Results: The mean femur weight of BALB/c mice of control group G1 was observed as 0.387 ± 0.019 g while the mean femur weight of experimental group G2 was found to be 0.316 ± 0.020 g. However, the mean femur length of control group G1 was 20.70 ± 0.609 mm and experimental group G2 was 24.38 ± 1.087 mm. The weight of femur was decreased in experimental group G2 while the length of femur was increased in experimental group G2 as compared to control group G1.

Conclusion: Caffeine consumption causes reduction in femur weight and increase in femur length.

Key Words: Caffeine, Femur, Length, Weight.

Introduction

Caffeine is the most commonly consumed stimulant in the world. It is found in coffee, tea, cocoa products, soft drinks and energy drinks. Caffeine (1, 3, 7-trimethylxanthine), in addition to being food constituent, is also a common analgesic adjuvant. The pandemic consumption of caffeine in food, beverages, and pharmaceutical preparations, such as decongestants, muscle relaxants, and allergy drugs, has developed special attention in demonstrating the multitude of effects and mechanisms of action of this drug of daily life.

The laboratories based researches have illustrated that caffeine impairs bone development by decreasing the mineral content and calcium absorption. The low bone mass and microarchitectural deterioration of osseous tissue that leads to bone fragility as well as an increased susceptibility to fractures. Caffeine is anti-proliferative towards osteoblasts and it debilitates some important events in osteogenesis. The excessive coffee consumption was associated with a small but significant reduction in number of teeth with periodontal bone loss. There is a significant association between caffeinated beverages and dental erosion. The intake of caffeine in amounts >300 mg/day (514 g, or 18 oz, brewed coffee) accelerated bone loss at the spine in elderly postmenopausal women. It is also investigated that if young, rapidly growing rats are exposed to caffeine, disruption of osteoblasts and retarded bone development occur. An in-vitro study showed that caffeine may enhance the rate of osteoblast apoptosis and has potential deleterious effect on the osteoblast viability.
it could interrupt the development as well as mineralization of the osseous tissue. Consequently the process of skeletal ossification was delayed in fetal animals. During lactation, maternal exposure to caffeine resulted into specific effects on the enamel of the molar teeth of young animals and enhanced the sensitivity to dental caries. There would be fewer osteocytes per area of femur cross section, retarded structural remodeling of the lateral tibial metaphysis, abnormal osteoblasts and osteocytes with swollen mitochondria. Caffeine invariably lowered the Zn content and altered the bone tissue mass that caused fragility as well as predisposition to fractures. The excessive dietary caffeine is responsible to increase urinary calcium output, most probably as a result of the acidic load which is favored by it. The bones counterbalance against acidosis by the buffering capacity of a large reservoir of calcium salts.

The effects of coffee on bone metabolism are contentious, although caffeine intake is associated with an eloquent increase in risk of periodontal disease, osteoporosis and fracture. The animal studies have evaluated that rats exposed to caffeine during gestational period exhibited structural disturbances of bone with a decreased number of osteocytes and smaller cross-sectional area of bone. The histological manifestations showed immature bone trabeculae and inhibition of osteoblasts proliferation. Caffeine reduces calcium balance which is either by increased urinary excretion or decreased intestinal calcium absorption.

Caffeine is consumed in Pakistan in different forms through foods as well as beverages. Over the past decades, intake of caffeine is increasing day by day and it has become a part of our daily diet. However, the society is generally unaware regarding its deleterious effects on human health especially the bony tissues. This is because of non-availability of data on its various adverse effects. Until now, there have been limited local studies on the subject of amount of caffeine consumption and its effects on health. The present study is an effort towards generating this understanding by gathering information and demonstrating detrimental effect of high caffeine consumption on the developing thigh bone of animals (BALB/c mice).

**Materials and Methods**

The study was a laboratory based randomized control trial. It was carried out at Anatomy Department, Army Medical College, Rawalpindi in collaboration with National Institute of Health, Islamabad. It was spanned from 6th October 2014 to 5th October 2015 with the approval of ethical committee on animal experiments. The healthy three week old male and female BALB/c mice were taken for the experiment. The total number was twenty (20), 10 male and 10 female weighing 12-14 g. The simple random sampling technique was applied. They were kept in a well ventilated room and under a temperature range of 20-26°C. Mice were randomly divided by lottery method into two groups. Each group contained 5 male and 5 female mice (10 animals in each group). Male and female mice were kept in separate cages to avoid pregnancy. The mice of group G1 served as controls, they were given standard laboratory diet for 60 days. Mice in G2 group were given caffeine at a dose of 10mg/100gm body weight, on alternate day, 3 days a week for 60 days by oral gavage. At the end of experiment, the animals were euthanized with ether anesthesia. They were dissected and right femur was removed after separating from hip and knee joints. Femur was weighed by electrical balance while its length was measured by digital vernier calliper from greater trochanter to lateral condyle (Fig 1). IBM-SPSS version 20 was used for data analysis. Student’s T test was applied for intergroup comparison of quantitative variable which was taken as means and standard deviations (mean ±SD). A p value < 0.05 was considered significant.

**Results**

The mean femur weight of mice in experimental group G2 was considerably decreased as compared to control group G1. However, the mean femur length of experimental group G2 was appreciably increased as compared to control group G1 (Table I). The p-values of both femur weight and length of group G2 in comparison with group G1 were calculated to be < 0.05 and therefore found statistically significant (Table I).

### Table I: Mean values of weight and length of femur in control group G1 and experimental group G2

<table>
<thead>
<tr>
<th>Femur</th>
<th>Group G1</th>
<th>Group G2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean±SD</td>
<td>Mean±SD</td>
<td></td>
</tr>
<tr>
<td>Weight (gm)</td>
<td>0.387±0.019</td>
<td>0.316±0.020</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>Length (mm)</td>
<td>20.70±0.609</td>
<td>24.382±1.087</td>
<td>&lt; 0.05*</td>
</tr>
</tbody>
</table>

*P value < 0.05 is statistically significant*
of growth hormone (GH) through different mechanisms. Methylxanthines inhibit phosphodiesterase (PDE), which leads to an increase in pituitary cyclic adenosine monophosphate (cAMP) responsible for growth hormone release.\textsuperscript{22} Caffeine also effects neurotransmitters. Caffeine increases the turnover of norepinephrine\textsuperscript{23} and serotonin\textsuperscript{24} in the brain. Norepinephrine as well as serotonin cause GH secretion in adult rats and humans.\textsuperscript{25} The weight of femur was found less in experimental group G2 than control group G1. An earlier international study shows that caffeine reduces the weight of the leg bones of rat.\textsuperscript{26} Yet another study illustrates that intake of caffeine diminishes the volume and weight of femur.\textsuperscript{27} The caffeine consumption lowers the BMD and hence weight of skeletal bones.\textsuperscript{8} There is impairment of weight and longitudinal growth of bones by caffeine.\textsuperscript{28} The excessive caffeine ingestion is usually a marker for a low calcium intake.\textsuperscript{15} Caffeine decreases mineral and hydroxyproline content in bones. The amount of hydroxyproline in-turn indicates the collagen content of bones.\textsuperscript{2} Caffeine consumption effects the normal metabolism of bones, including lower bone mineral density (BMD), lighter bone weight and decrease in calcium content of the bone. The lower calcium content is also connected with caffeine induced defective development of bone.\textsuperscript{8} Moreover, caffeine has negative effects on normal growth and development of the osseous tissue.\textsuperscript{28} Caffeine also decreases zinc levels in several tissues including bones.\textsuperscript{29} The deficiency in zinc concentration in caffeine fed animals changes bone metabolism and permanently alters bone cytoarchitecture.\textsuperscript{13} The future work can be conducted by using different doses/duration of caffeine and studying the teratogenic effect of caffeine on genetic / chromosomal changes.

**Conclusion**

It was observed in the present study that caffeine altered the development of femur of BALB/c mice. High intake of caffeine caused increase in femur length and decrease in femur weight.

**REFERENCES**


ABSTRACT

Objective: To develop faculty consensus of orthodontic learning outcomes associated with knowledge and skills of “Treatment” required for undergraduate students.

Study Design: Qualitative study

Place and Duration of Study: Islamic International Dental College, Islamabad, 15th January, 2016 to 15th March, 2016.

Materials and Methods: A Delphi method was used in two rounds to develop consensus by orthodontic faculty from various dental colleges of Pakistan. Learning outcomes related to skills were formulated in the form of a questionnaire and sent to study participants. A five point likert scale was used to obtain perception of dental faculty. Later, a qualitative approach was adopted by giving open ended questions associated with skills required in “Treatment” part of undergraduate orthodontic course. The quantitative data was analyzed by using SPSS version 20. The qualitative data was obtained and analyzed using NVivo version 11.

Results: Twenty participants (N= 20) responded with their feedback to closed-ended first questionnaire and sixteen participants responded to the second open-ended questionnaire. Out of the 28 learning objectives, participants achieved consensus on 21 items particularly on knowledge and skills related to treatment planning for mixed dentition in first round. Whereas in second round, out of seven non consensus items, two learning objectives, three dimensional location of maxillary canine and skill in fabrication of functional appliances could not achieve consensus.

Conclusion: The orthodontic faculty agreed that undergraduate students must have skills of history taking, oral examination, x-ray, and removable appliances for orthodontic discipline.

Key Words: Dental Student, Learning Outcome, Malocclusion, Orthodontics, Teaching Methods.
members find difficulty when visit to other dental colleges as external examiner in the non structured examinations. They come across that there were not proper guideline to learning outcomes of orthodontic course at various colleges. They suggested performing careful planning in order to promote the study skills in undergraduate students. This study aimed to develop consensus on the optimal orthodontic course learning outcomes associated with skills to treat mixed dentition cases of orthodontics carried out in undergraduate bachelor of dental surgery programme.

**Materials and Methods**

The study was approved by the institutional ethical review committee. A Delphi technique was used with two rounds, in first round a quantitative questionnaire and in second round a qualitative questionnaire was circulated to the participants. A self-administered questionnaire was developed with item responses based on 5-point Likert scale. The validity and reliability of the questionnaire were done by involving subject experts of two institutions. The questionnaire was based on the principles given in AMME Guide 87 by Artino et al.

Inclusion criteria of study participants were professional education and experience. Thus orthodontic faculty members with minimum three years teaching experience and holding either fellowship from the College of Physician and Surgeons Pakistan (CPSP), Royal College of Surgeons England (RCSE), Royal College of Physician and Surgeon (RCPS) Edinburgh, Royal College of Surgeon, Glasgow and Royal College of Surgeon Ireland were included as study participants. Other than fellowship, faculty members holding Master of Dental Surgery (Orthodontics) and Master of Science (MS) were also included.

Twenty-eight Learning outcomes (LOs) associated with skills required in “Treatment” part of orthodontics in undergraduate course were circulated through emails to selected orthodontic participants (N=42). Learning outcomes were in the form of questionnaire with five point likert scale where 'Strongly disagree (SDA), Disagree (DA), Neutral (N), Agree (A) and Strongly Agree (SA) were parameters. Later 'SDA, DA, N' were combined as one set and labeled as No consensus and 'A, SA' were put together as 'Consensus'. In this way, consensuses were obtained. Learning outcomes are shown in table I.

**Table I: Learning outcomes associated with skills required during orthodontic course**

<table>
<thead>
<tr>
<th>No</th>
<th>Statement (Learning Outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Develop a problem list and preliminary treatment plan by using history and clinical examination</td>
</tr>
<tr>
<td>2</td>
<td>Examine extra &amp; intra oral features of deep bite</td>
</tr>
<tr>
<td>3</td>
<td>Examine extra &amp; intra oral features of open bite</td>
</tr>
<tr>
<td>4</td>
<td>Describe different methods of treating posterior cross bite</td>
</tr>
<tr>
<td>5</td>
<td>Formulate various treatment protocols of crowding</td>
</tr>
<tr>
<td>6</td>
<td>Demonstrate the spacing problems in various dentitions time</td>
</tr>
<tr>
<td>7</td>
<td>Compare various types of cross bites (Skeletal/Dental / Ant./Post.)</td>
</tr>
<tr>
<td>8</td>
<td>Explain the dental and skeletal cross bites in transverse and horizontal plane</td>
</tr>
<tr>
<td>9</td>
<td>Develop a preliminary treatment plan (by using basic diagnostic aids (Cephalographs, OPG, Study casts etc)</td>
</tr>
<tr>
<td>10</td>
<td>Develop a definitive treatment plan (by using basic diagnostic aids (Cephalographs, OPG, study casts etc)</td>
</tr>
<tr>
<td>11</td>
<td>Differentiate between dental and skeletal class II problems</td>
</tr>
<tr>
<td>12</td>
<td>Propose various methods of treating the skeletal class II problems</td>
</tr>
<tr>
<td>13</td>
<td>Arrange intra and extra oral features of class II non skeletal and skeletal problems</td>
</tr>
<tr>
<td>14</td>
<td>Demonstrate abnormal shapes of teeth on radiographs and clinically (e.g. peg laterals</td>
</tr>
<tr>
<td>15</td>
<td>Determine the dental age on Orthopantograph (OPG)</td>
</tr>
<tr>
<td>16</td>
<td>Differentiate between normal palatal bone and a cleft bone on x ray views (peri-apical / occlusal)</td>
</tr>
<tr>
<td>17</td>
<td>Describe general principles of treatment of Class II division 1 dental problems)</td>
</tr>
<tr>
<td>18</td>
<td>Assemble intra and extra oral features of class II Div 2 non skeletal problems</td>
</tr>
<tr>
<td>19</td>
<td>Locate the position of impacted teeth in 3 planes of space by Parallax technique (specially maxillary canines), by using lateral ceph and OPG</td>
</tr>
<tr>
<td>20</td>
<td>Formulate the rationale of treatment of skeletal class II in various age groups</td>
</tr>
<tr>
<td>21</td>
<td>Take the detailed orthodontic history in a systematic way</td>
</tr>
<tr>
<td>22</td>
<td>Measure the cross bite and expansion required on study casts</td>
</tr>
<tr>
<td>23</td>
<td>Apply the elastomeric separators on mixed dentition patient</td>
</tr>
<tr>
<td>24</td>
<td>Select and cement the bands for molar teeth on mixed dentition patient</td>
</tr>
<tr>
<td>25</td>
<td>Insertion and appliances activation of simple removable appliances</td>
</tr>
<tr>
<td>26</td>
<td>Insertion and adjustment of Hawley’s retainers</td>
</tr>
<tr>
<td>27</td>
<td>Fabricate and adjustment of the simple removable appliance with various designs</td>
</tr>
<tr>
<td>28</td>
<td>Registration of bite, fabrication, insertion and follow up of functional appliances in Class II &amp; III patients</td>
</tr>
</tbody>
</table>

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The questionnaire two in the second round was an open-ended questionnaire with six questions to know the depth of the non-consensus items from previous round. Interview were in between the period, feedback of faculty on telephone and two audio recorded meetings were arranged at regional centre, College of Physicians and Surgeons Pakistan (CPSP), Islamabad, with 16 faculty members. The audio recording was later transcribed to word file and the comments were added in the responses of the respective faculty members.

Statistical Package for Social Sciences (SPSS version 20.0) was used for descriptive analysis of quantitative data whereas qualitative data was analyzed using NVivo version 11.

Results
The response rate in the first round was 48 % whereas in the second round (qualitative) it was 80%. There were 3 professors, 8 associate professors and 9 assistant professors who participated in the first round. Sixteen faculty members participated in the second round.

The analysis of first round showed consensus in items particularly on knowledge and skills related to treatment planning, class II, class III, and space problems in mixed and permanent dentition. Twelve items related to fixed appliances, functional appliances, maxillary canine diagnosis and skills in mixed dentition period could not receive consensus.

One of the respondents enquired about the operational definition of the terms used in defining the learning objectives, so that all faculty members would be on same page.

Over 80% participants in round one agreed to include history taking and clinical examination in undergraduate dental programme as learning outcome. Similarly cephalographs, orthopontogram (OPG), study casts and photographs were also given ‘agreed’ to be included by the participants (Table II).

Less than fifty percent agreed on definite treatment plan by undergraduate dental students. Out of 10 learning outcomes (LOs) about ‘Malocclusion of Permanent Dentition’ all did not agree on two LOs which were ‘Formulate various treatment protocols of crowding’ and ‘develop a definite treatment plan’ while remaining 8 had obtained 90 % consensus (Table II).

Regarding LOs of skeletal and dental class II, most of the LOs were given consensus more than 90% (as agreed). Three out of eight learning outcomes were agreed 100% by all participants. In contrast, the LOs of “differentiation between palatal bone and cleft bone” and “location of impacted canine” did not receive consensus (Table III).

Los about skills performed by undergraduate students. In this category learning outcome ‘Measure the cross bite and expansion required on study casts, select and cement the bands for molar teeth on mixed dentition patient and registration of bite, fabrication, insertion and follow up of functional appliances in Class II & III patients’ were rejected by participants (Table IV).

Qualitative Aspect
In second round, seven non-consensus learning outcomes were further explored qualitatively through open-ended questions. The qualitative results are summarized (Table V).

Discussion
The number of practical exercises varies among dental institutes resulting into a variety of graduates with variable competencies to handle patients of orthodontic problems. These graduates when enter into clinical practice depict variety of skills in orthodontic technique and in treatment planning for the common orthodontic malocclusions. This results into low quality of orthodontic services and poor referral by the general dental practitioners. Thus the community dental health is directly related to the quality of its dental graduates, this study focused on realistic objectives or outcomes to be decided for graduates with good basic skills of

Table II: Consensus on learning outcomes associated with malocclusion of permanent dentition

<table>
<thead>
<tr>
<th>NO</th>
<th>Statement</th>
<th>SDA* n (%)</th>
<th>DA* n (%)</th>
<th>N* n (%)</th>
<th>A* n (%)</th>
<th>SA* n (%)</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Develop a problem list and preliminary treatment plan by using history and clinical examination</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>11 (55%)</td>
<td>9 (45%)</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>2</td>
<td>Examine extra &amp; intra oral features of deep bite</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
<td>14 (70%)</td>
<td>6 (30%)</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Examine extra &amp; intra oral features of open bite</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>8 (40%)</td>
<td>11 (55%)</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>

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practitioners provide orthodontic treatment by removable appliances. In fact, the efficacy of removable appliances is not as good as fixed appliances. Mixed dentition space management protocol is learnt at various levels. The majority of the respondents were in favor of the theory of these skills being taught at undergraduate level, but practice should be executed later during house orthodontics. However, there was a lack of assessment of students on the selected or consensuses learning outcomes which was a limitation of this study.

The faculty members had consensus related to skill of removable appliances for undergraduates. All faculty members were of the opinion to have basic knowledge and skill in basic removable appliance design, appliance fabrication, its activation and instructions of use. Faculty members generally had an opinion on functional appliances learning objectives. These results are comparable with the competencies defined by General Dental Council, UK, and as per the study conducted in the Newcastle University, UK, where they have defined that their students develop a basic skill in appliance design, fit, and monitor in correcting posterior cross bites and single tooth anterior cross bites. In some parts of the world, general dental practitioners provide orthodontic treatment by removable appliances. In fact, the efficacy of removable appliances is not as good as fixed appliances. Mixed dentition space management protocol is learnt at various levels. The majority of the respondents were in favor of the theory of these skills being taught at undergraduate level, but practice should be executed later during house...
General dental practitioners (GDPs) play a key role in making referral of orthodontic patients. But mostly they compete with orthodontists in providing the treatment especially simple cross bite cases. The quality of orthodontic treatment is a public health issue because inappropriate treatment of a malocclusion can lead to irreparable damage. General dentists tend to treat orthodontic cases and ultimately finish these cases worse than the average professional holding a postgraduate degree in orthodontics, The victims of orthodontic treatment dealt by GDPs are growing because those professional lacks the necessary expertise. This study may benefit to curriculum managers to develop or revise the current version of curriculum. The undergraduate orthodontic courses at Toronto and Liverpool dental schools have 250 hours of teaching and within that, more than 100 hours are allocated for clinical rotation. Both programmes contain laboratory teaching of removable and fixed appliance technique. Undergraduate students treat their own patients with both simple and complex appliances, within their clinical training period which extends over at least 2 years. In our study removable appliances were suggested to be included at undergraduate programme.

**Table IV: Consensus on learning outcomes associated with skills of orthodontic treatment**

<table>
<thead>
<tr>
<th>NO</th>
<th>Statement</th>
<th>SDA* n (%)</th>
<th>DA* n (%)</th>
<th>N* n (%)</th>
<th>A* n (%)</th>
<th>SA* n (%)</th>
<th>Consensus Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Take the detailed orthodontic history in a systematic way</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>4 (20%)</td>
<td>16 (80%)</td>
<td>Y</td>
</tr>
<tr>
<td>22</td>
<td>Measure the cross bite and expansion required on study casts</td>
<td>0 (0%)</td>
<td>4 (20%)</td>
<td>5 (25%)</td>
<td>8 (40%)</td>
<td>3 (15%)</td>
<td>Y</td>
</tr>
<tr>
<td>23</td>
<td>Apply the elastomeric separators on mixed dentition patient</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
<td>6 (30%)</td>
<td>6 (30%)</td>
<td>6 (30%)</td>
<td>Y</td>
</tr>
<tr>
<td>24</td>
<td>Select and cement the bands for molar teeth on mixed dentition patient</td>
<td>0 (0%)</td>
<td>4 (20%)</td>
<td>6 (30%)</td>
<td>9 (45%)</td>
<td>1 (5%)</td>
<td>Y</td>
</tr>
<tr>
<td>25</td>
<td>Insertion and activation of simple removable appliances</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
<td>5 (25%)</td>
<td>13 (65%)</td>
<td>Y</td>
</tr>
<tr>
<td>26</td>
<td>Insertion and adjustment of Hawley’s retainers</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
<td>5 (25%)</td>
<td>13 (65%)</td>
<td>Y</td>
</tr>
<tr>
<td>27</td>
<td>Fabricate and adjustment of the simple removable appliance with various designs</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
<td>3 (15%)</td>
<td>15 (75%)</td>
<td>Y</td>
</tr>
<tr>
<td>28</td>
<td>Registration of bite, fabrication, insertion and follow up of functional appliances in Class II &amp; III patients</td>
<td>0 (0%)</td>
<td>4 (20%)</td>
<td>6 (30%)</td>
<td>6 (30%)</td>
<td>2 (10%)</td>
<td>Y</td>
</tr>
</tbody>
</table>

*SDA=Strongly disagree, DA=Disagree, N=Neutral, A=Agree, SA=Strongly Agree

Orthodontic learning outcomes

**Theme: Fixed appliances**
- Yes they should have a skill of how to place separator, cement a band and place a bracket
- I think at final year level they should observe all basic fixed appliance procedures and may be can do on phantom head and later in house job can do on patients

**Theme: Mixed dentition space problems**
- Undergraduates should be able to complete all the basic diagnostic part (e.g. mixed dentition analysis). They should be able to have competence of space management, at least the space maintenance and regaining part. Space maintenance should be handled as a theme and taught in tandem with Pedodontics in operative dentistry
- A final year student must know the methods used for the mixed dentition space management protocol and they must be involved in diagnosing the mixed dentition cases in clinical rotation either by attaching their assignments with the
orthodontic treatment could affect the skeletal form when functional appliances are used but it has little effect on soft tissue and arch length. Improved dental health, relief crowding, correction of buccal occlusion, reduced over bite, reduced overjet, and alignment of teeth are some basic problems that are addressed in the treatment of orthodontics. All learning outcomes related to basic skills would benefit to students.

Limitations of the Study
Further rounds of Delphi could not be done due to limited time of the study.

Conclusion
Consensus on the learning outcomes associated with knowledge and skills of orthodontic treatment were achieved. They included history taking, radiographic interpretation and removable appliances.

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Though our dental schools follow national curriculum, but there is diversity in course content and the time to deliver the content also varies from institute to institute. There was also a wide variation in the orthodontic course form and content in the 12 UK dental schools. The greatest variation occurred in the clinical teaching hours (50 to 126), followed by the types of patient treatment undertaken (removable only to full fixed), the laboratory teaching hours (0 to 60), the content of the laboratory course (removable appliances to fixed appliance typodonts). But how many hours should be taught or practiced by students was a limitation. Treatment planning after the patient examination is most important part of orthodontic management. Mostly it is divided into two parts (a) treatment aims and (b) treatment plan. It is quite possible


ABSTRACT

Objective: To assess the perception of students regarding the usefulness of formative assessments.

Study Design: Cross-sectional descriptive study.

Place and Duration of Study: Islamic International Medical College, from January to June 2015.

Materials and Methods: A structured questionnaire was distributed to 150 medical students. Response rate was 90%. There were six questions regarding the scheduling, strategy and components of formative assessment while four questions were regarding the effectiveness of formative assessment in learning.

Results: It was found out that majority of the students (60%) were satisfied with placement of formative assessments in each module while 76.3% agreed that assessment were arranged regularly, though 22% disagreed with assessment plan. About 64% students agreed that it facilitates learning process and motivates students to learn more. On the other hand only 20% students disagreed with its role in learning. Feedback and remedial were relatively weaker as only 33% students thought that feedback was effective and timely while most of students disagreed but were satisfied with remedial offered by each discipline.

Conclusion: The medical students consider formative assessment an important tool to enhance their learning process. More efforts are required to enhance the usefulness of formative assessments by improving the quality of feedback and the remedial offered for improvement.

Key Words: Assessment, Constructive Feedback, Learning, Remedial Measures.

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Introduction

Formative assessment is the process used by teachers and students to recognise and respond to students’ learning in order to enhance learning. It helps in learning by generating feedback information that is beneficial for both students and teachers. It is suggested that feedback enables students to reconstruct their understanding and skills and hence improve their performance. Rick Stiggins concluded “most of the teacher change their instructional strategy according to the demand of the students or modify their teaching modalities according to their students’ needs, hence owning their own learning.”

Michael Scriven derived the term in 1967, during those times information gathered through formative evaluation was used to assess the effectiveness of a curriculum and guide school system choices to adopt a suitable curriculum. Later on Allal and Lopez traced the history of formative assessment from Scriven’s original definition of “formative evaluation” of educational programs, found out that term “assessment” had “progressively replaced ‘evaluation’ during 1967. Benjamin Bloom used the term in 1968 in his book Learning for mastery and he described the role of formative assessment as a tool for improving the teaching-learning processes for students and how it can be accommodated in content.

Formative assessment is the only mean by which subsequent educational decisions can be altered. The true purpose of formative assessment is fulfilled when it is applied on a frequent and regular basis to see students’ progress and understanding and helps to identify their learning needs and adjusting the teaching appropriately. It is a midstream tool that is used by teachers to measure student understanding of specific topic or skill they are teaching. Formative assessment is said formative because it leads to adjustments according to learners need to form new learning because every formative assessment is followed by feedback provided to students regarding their performance and taken from students regarding content, learning and teaching strategies etc. Therefore it helps teacher to adjust or modify their learning strategy and student
Results
Response rate was 90% as 135 filled questionnaires were received. Results were analyzed by using SPSS 21 for each while compiling the results male to female ratio was ignored. Most of the students (60%) were satisfied with placement of assessments in each module by concerned disciplines. However 76.3% agreed that formative assessment were arranged regularly by each discipline although 22% disagreed with assessment plan. About 64 % students agreed that it always facilitates learning process and it also motivates students to learn more. On the other hand only 20% students disagreed with its role in learning. However very few number of students i.e. only 33% agreed that feedback was provided to them in time and remedial measures offered in each discipline were helpful in their learning.

Table I: Frequency of students response on usefulness of formative assessment estimated by using 5-point Likert scale (N=135)

<table>
<thead>
<tr>
<th>Themes</th>
<th>Parameters of Likert scale</th>
<th>Not at all</th>
<th>Sometimes</th>
<th>Neutral</th>
<th>Most of time</th>
<th>All the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placement in each module</td>
<td>Suitable Placement</td>
<td>–</td>
<td>4 (10.4%)</td>
<td>–</td>
<td>40 (29.6%)</td>
<td>81 (60.0%)</td>
</tr>
<tr>
<td></td>
<td>Regularly in assessment plan in each module</td>
<td>–</td>
<td>2 (1.5%)</td>
<td>–</td>
<td>30 (22.2%)</td>
<td>103 (76.3%)</td>
</tr>
<tr>
<td>Role of formative assessment in their learning</td>
<td>Helpful in learning process</td>
<td>1 (0.7%)</td>
<td>27 (20.0%)</td>
<td>–</td>
<td>21 (15.6%)</td>
<td>86 (63.7%)</td>
</tr>
<tr>
<td></td>
<td>Enhances Motivation</td>
<td>2 (1.5%)</td>
<td>24 (17.8%)</td>
<td>–</td>
<td>23 (17.0%)</td>
<td>86 (63.7%)</td>
</tr>
<tr>
<td>Effectiveness of feedback and remedial measures</td>
<td>Timely feedback given</td>
<td>6 (4.4%)</td>
<td>58 (43.0%)</td>
<td>–</td>
<td>26 (19.3%)</td>
<td>45 (33.3%)</td>
</tr>
<tr>
<td></td>
<td>Remedial Measures used if required</td>
<td>10 (7.4%)</td>
<td>42 (31.1%)</td>
<td>–</td>
<td>15 (11.1%)</td>
<td>68 (50.4%)</td>
</tr>
</tbody>
</table>

Discussion
Formative assessment is strongly emphasized over summative assessment in a competency-based education program. It underscore the development of proficiency through conscious practice. This concept underlines the need for effective instruction, mentoring, and feedback to the students. The content, plan, rate and timing of assessment are important factors to establish an assessment policy in any medical school.

This study was designed to evaluate the process of formative assessment and perception of student
regarding its usefulness in learning. Study revealed that accurate and proper placement of formative assessment is assured in each module, but improvement in effective feedback with remediation offered is utmost need of the students. Nijhuis et al. specified three elements of the learning environment which may affect student’s learning. These elements are lucidity of the goals, aptness of the workload and the usefulness of the literature. The surface learners recognize these elements negatively.  

Academic reporting of achieved competencies has amplified the perplexity and decreased the motivation to learn in students. The current system of summative assessment encourages the students to find only right answers but opposes the true learning process. Learning is not merely the collections of right and wrong facts. Regular formative assessments have a greater impact on academic achievements in students. It entails the students about their deficiencies in studies. Therefore proper scheduling of assessment is important. Regular formative assessment (76.3%) in every module will facilitate learning process. The students get motivated (63.7%) to become involved in the learning process as it helps to promote their growth. Regular formative assessment also increases the learning of students (63.7%) and hence the academic achievements as it guide them to the path of accomplishments. It has a great impact on student academic success, especially in constant low achievers.  

Feedback is taken for granted but it helps in self-correction and improvement. Indirect forms of feedback maintain student motivation and self-confidence.  

Successful feedback should clearly specify to the student what is wrong and right. Effective feedback may be considered as a single most important tool for professional development of students. The timely feedback was overlooked (33.3%) and was irregularly given (43%) to students. Clear and suitable assessment criteria shall be given to the students to judge their own progress during taking the remedial. Formative assessment assists the students to realize the standards that teachers may expect from them. Therefore, formative assessment can be used in medical education to assess need, progress of medical students and to recognize and remediate the suboptimal performance of students. The optimum placement of formative assessment in each module for each subject with properly arranged effective constructive feedback to students may provide students to improve their learning.

Recommendations

- Implementation: It should be the integral part of program design. It should be implemented gradually but consistently.
- Enabling environment: the institution should provide an environment which nurtures the development of faculty and create awareness about need of formative assessment.
- Faculty training: Faculty should be trained to construct creative methods of assessment and to give timely and quality feedback. It has maximum effect on student’s learning and future performance.
- Student’s training: students must be informed about formative assessment and reason why it is carried out. They should know how to receive feedback and improve their weaker areas.
- Student’s feedback: it should be taken in routine to check the effectiveness of formative assessment in developing their concepts, modifying the way of delivery of content.
- Role of department of medical education: they should incorporate formative assessment in curriculum without compromising the content.
- Periodic evaluation of curriculum: regular formative assessment feedback given and taken from students may help in evaluation of curriculum.

Conclusion

Expanded use of formative assessment should be followed by prompt feedback, and stress on remedial measures in order to enhance usefulness of formative assessments.

REFERENCES

REVIEW ARTICLE

Biomedical Description of Ocimum basilicum L.

Saima Rubab¹, Irshad Hussain¹, Barkat Ali Khan³, Ayaz Ali Unar⁴, Khawaja Asad Abbas⁵, Zawar Hussain Khichi⁶, Mour Khan⁷, Shazea Khanum⁸, Khalil Ur Rehman⁹, Haroon Khan¹⁰

ABSTRACT

Ocimum basilicum L. is an annual plant (Figure 1) found wild in the tropical, subtropical and temperate regions of the world, specifically established itself in Ceylon, hot West Asia, Africa, Malayan and Pacific Islands. It is also found in tropical and hot temperate regions of India and Pakistan. It is indigenous in Punjab and in low hilly areas of KPK. It is also cultivated in Punjab and in lower part of Pakistan;¹,² and its worldwide distribution is in Tropical Africa, Arabia, Pakistan, Kashmir, Himalayas to Nepal, Sri Lanka and Malaysia.³-⁵ The bushy Stems grow to about two feet in height, with an upright stalk, herbaceous, branching on all sides with two leaves at every joint, a little snipped about the edges, strongly aromatic and sometime bushy. It is grown in gardens from mid to late summer.

The plant appear pubescent from the base to the upside. Leaves are opposite, glabrous, lanceolate, lanceolate-ovate or oblong, lightly toothed, shiny, with markings on veins. They are petiolate, narrow at the tips, unusually with angulate or entire-margined. The leaves have a typical aroma. Inflorescence often in terminal clusters of whorled flowers (called – Vertcilillasters). Flowers are often white, labiate (like lips), and are six in numbers, pedicel is almost sessile. Calyx 5-lobed, upper lobe expanded into a lid or cap over others, often bilabiate. Phytochemical investigation of whole Ocimum basilicum L. plant or its specific part have been done by many research workers and a number of active constituents have been identified. These include volatile oils, saponins, coumarins, alkaloids, tannins, anthraquinones, anthocyanins, flavonoides, diterpenoides, tri-terpenoides, pyredines, pyrolidines, polyphenols, irridoides, quinones, sugars and insect moulting hormones.⁶-⁸ Flavones apogenin, such as luteolin and chrysoeriol were also present in several members of plant family Labiatae including O. basilicum. In addition to these compounds; 6-hydroxy and hydroxyl-flavones in glycosidic combination and lipophilic flavones; such as ⁴,⁵,⁶-tribhydroxy-⁷,³-dimethoxy-flavone in the members of 24 genera of this family have also been detected.⁶ Among coumarin; scopoletin, astol and andelicin were isolated and identified ⁸,¹⁰ along with 3-p-coumarylglucoside-5-monoglucoside.¹¹ Z. E. and E. E., isomer of enolic ester were isolated by the condensation of dopaldehyde with caffeic acid. These esters efficiently formed complexes with iron and acted as powerful fungicides.¹¹ Acid

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basilicum, obtained from its seeds, leaves and other parts, either by using GLC alone, or by GLC-MS analytical techniques. This entire work came to the conclusion that the 'Basil oil' and 'Basil camphor' contained more than 41 constituents. These researchers detected following compounds on qualitative or quantitative bases. Few of such compounds with their quantity have been outlined as follow:

- α-guaiene, α-bulnescene, Eugenol, ocimene, cadinene, perillyl alcohol, Methyl chavicol, linalool, camphor, and limonene were identified from the seed oil.
- while methyl chavicol, linalool, and citral were identified from the leaf oil by GLC.
- These researchers also isolated β-caryophyllene, germacrene-D, α-copaene, humulene, β-elemene, β-bourbonene, γ-murolene and a sesquiterpenegratissimene from the leaf oil of O. basilicum and identified by GC-MS. In other investigations, the oil content of whole plant, flower and leaves, were determined, which later on, after analysis by GLC-MS, the following components were determined and identified. Eugenol, methyl eugenol, carophyllene, un-identified sesquiterpenes and terpenes. Limonene, cineole, p-cymene, linalool, thymol, linalyl acetate and β-carophyllene were also identified. In these findings, the seeds of the plant furnished essential oil, mostly composed of phenols engenol, nerol, methyl engenol, methyl ether; carophyllene; terpinene; 4-ol-deacetaldehyde; α-selinene, α-pinene; β-pinene; camphor and carvacol. In some plants, leaves contained the highest percentage of essential oil, whose major constituents were eugenol, carvacrol, methyl eugenol and carophyllene. Osilicum leaves also contained ascorbic acid, carotene, calcium, phosphorus and insoluble oxalates. Seed oil was further fractionated into polar and neutral lipids fractions. Neutral lipid afforded hydrocarbons; wax ester; tri-glycerides; free fatty acids; sterols and monoglycerides. Free fatty acid composition of the neutral lipids, as determined by GLC or GLC-MS, were caphic; lauric, myristic, palmatic, stearic acid, linoleic acid, linolenic and arachidonic acid. Fixed oil, procured from the seeds of O. basilicum was found to contain four major fatty acids i.e., palmatic acid, stearic acid, oleic acid and linoleic acid. Mucilage of the seeds composed of D-Glucose; D-Galactose; D-manno; D-abrabinose; D-zylose and L-
Ocimum basilicum L. is an important medicinal and culinary herb, that contains several highly antioxidants compounds. Solvent extracts of O. basilicum have been demonstrated to exhibit a significant effect at cellular level, including the platelet anti-aggregate property and inhibitory action against HIV-1 reverse transcriptase. In one of the patient’s study with chronic bronchitis, exposure to volatile oil of O. basilicum, induced lowering of plasma levels of dienic-conjugates and ketones along with the activation of catalase in red cells, which were typical features of antioxidant actions. Nitureet al. (2006) further reported that the solvent extracts of O. basilicum were able to raise the O-6-methylguanine-DNA-methyltransferase (MGMT) levels. Increased levels of MGMT–mRNA were capable of increasing the activity of DNA repair protein. The solvent extracts of O. basilicum were also effective for an increase in glutathione-S-transferase-pi (GSTP1) expression, but to a lesser extent than MGMT. The authors concluded that...
plant constituents regulate human MGMT and probably elevated the dietary approach for fading alkylations-induced carcinogenesis.\textsuperscript{27-30} Bravo et al. (2008),\textsuperscript{31} further indicated a protective consequence of basil (\textit{O. basilicum}) against oxidative DNA damage and mutagenesis\textsuperscript{31}, with a decreasing outcome in the cholesterol synthesis and lipid accumulation in human macrophages by ethanolic extract.\textsuperscript{31}

**Antibacterial Activity**

Antibacterial potentials of various parts of \textit{O. basilicum} have been investigated by many authors.\textsuperscript{16,19,32-38} \textit{O. basilicum} exhibited foreboding antibacterial action against Salmonella spp., Escherichai coli, Campylobacter jejunii and Clostridium perferringens.\textsuperscript{33} Similarly, Opalchenova and Obreshkova (2003)\textsuperscript{33} indicated that the volatile oil procured from the aerial parts of \textit{O. basilicum} also demonstrated a marked action against drug immune clinical isolates from different species of Staphylococcus, Enterococcus, and Pseudomonas genera.\textsuperscript{34} Minimum inhibitory concentrations (MICs) between 0.0030\% and 0.0007\% (v/v) were described by these authors.\textsuperscript{33} Antibacterial activities of various parts and essential oil of \textit{O. basilicum} have also been ascertained by many other research workers including— Tomaret al. (2010)\textsuperscript{34}, Gupta et al. (2009)\textsuperscript{35}, Tomoko et al. (2002)\textsuperscript{36}, Durgaet al. (2010)\textsuperscript{37} and Ahmet et al. (2005).\textsuperscript{38}

**Antimicrobial Activity**

Different plant parts of basil (\textit{O. basilicum}) have been exploited for its antimicrobial effects in the laboratory experimental studies and concluded with significant results.\textsuperscript{22,34,38,39,40} In India, basil is used for dental ailments due to its proposed antimicrobial effects but the mechanism of its action is not clear. Research workers found that the essential oils extracted from different plant parts, particularly the leaves and seeds of different species of genus Ocimun inhibited the growth of wide range of bacteria and other microbes.\textsuperscript{22,38-40,42-45} They further investigated that the whole samples of essential oil, as well as its individual phytochemical constituents proved to have strong curbing properties in vitro and in vivo, in relation to the microbes of various diseases and to infection in animals and in human beings.\textsuperscript{22,34,38-40,42,45} Both organic solvent and water extracts of various plant parts of \textit{O. basilicum} and basil oil are helpful in treating many serious systemic diseases, as well as the localized infections.\textsuperscript{22,34,38-40,42-45}

**Antifungal Activity**

Many infections of skin, hair, nail, and subcutaneous tissues, in animals and human beings, are induced by several organisms, mainly different species of fungi. These organism were named dermatophytes and the crusade diseases were called dermatophytoses.\textsuperscript{46,47,48} A number of dermatophytes had been separated from animals by many workers\textsuperscript{49,50} Use of synthetic antifungal drugs is restrained to treat human or animal due to their high perniciousness.\textsuperscript{51} Few of the antifungal agents, from plants and their natural products are at liberty and licensed for employing in the veterinary practice or for human being treatment in various countries of the world. It is said that most of the antifungal plant products are quite safe for the human as well as for animal consumption.\textsuperscript{51} Antifungal effectiveness of the solvent extracts of aerial parts, root extracts, basil oil and the isolated phytochemical compounds of \textit{O. basilicum} were investigated by many authors and compared with the standard antiseptics.\textsuperscript{52-58} In some of the findings, it was concluded that the minimum inhibitory concentration (MIC) of the solvent extracts of aerial parts, root extracts, basil oil and their isolated phytochemical compounds, when compared with that of the standard antiseptics, showed that higher concentrations are needed to inhibit the growth of wide ranges of test organisms.\textsuperscript{52-58} Further, it was demonstrated that the ethanol extract of aerial parts of the plant and its isolated phytochemical compounds, showed higher degree of antifungal activities than the root extracts, thus suggesting that the antifungal agents were most probably polar in nature.\textsuperscript{48,56} The essential oils also showed significant antifungal activity against many plant pathogenic fungi.\textsuperscript{52}

**Antiviral Activity**

Many research workers have conducted various laboratory experimental studies for investigating the demeanour of basil (\textit{O. basilicum}) for its antiviral activities. Nevertheless, each of the study indicated different compounds, responsible for its antiviral effects. In vitro studies of various plant parts of \textit{O. basilicum}, exhibited substantial inhibitory actions against HIV-1 induced cytopathogenicity in MT-4 cells.\textsuperscript{57} The active factors present in the solvent extracted samples were found to be water-soluble
polar substances. Furthermore, other than aqueous extracts, inhabitation of giant cell formation in co-culture of Molt-4 cells with and without HIV-1 infection, also demonstrated inhibitory activity against HIV-1 reverse transcriptase. In another laboratory experimental studies, Chiang et al. (2005), demonstrated that both the aqueous and ethanolic extracts of *O. basilicum* aerial parts, along with its phytochemical compounds, like apigenin, linalool, and ursolic acid, revealed a wide ranges of antiviral activity. These authors further ascertained that — Ursolic acid displayed a pronounced action against herpes-viruses (EC50=6.6mg/L, selectivity index (SI)=15.2); adeno-viruses (EC50=4.2mg/L, SI=23.8); coxsackie-virus-B1 (EC50=0.4mg/L; SI=251.3); and entero-virus-71 (EC50=0.5mg/L, SI=201). Apigenin possessed the highest activity against herpes-viruses (EC50=9.7mg/L, SI=6.2); adeno-viruses (EC50=11.1mg/L, SI=5.4); hepatitis-B-surface antigen (EC50=7.1mg/L, SI=2.3); and hepatitis-B-e-antigen (EC50=12.8mg/L, SI=1.3) and Linalool pointed out the potent activity against AVD-I (EC50=16.9mg/L, SI=10.5). No activeness was noted by these research workers, for carvone, cineole, β-caryophyllene, farnesol, fenchone, geraniol, β-myrcene, and α-thujone. They also ascertained that the antiviral action of these compounds against CVB1 and EV71 was to take place during the initial infection levels and at the replication phase.

**Cytoprotective Effects**

Renzulliet al. (2004) demonstrated that Rosmarinic acid is a natural phenolic compound, which is probably present in many herbs of the family Labiatae (Lamiaceae). This compound is also present in *O. basilicum*, which is said to inhibit the complement-dependent inflammatory processes. In vitro studies showed that rosmarinic acid was able to cut down oxygen species production, protein and DNA synthesis inhibition, which were induced by two types of mycotoxins. The cell death was thus prevented. It was established by the reduction of DNA fragmentation and also by the inhibition of caspase-3 activation. Manosroiet al. (2006) also carried out an investigation that the anti-proliferative activity of *O. basilicum* essential oil on KB and P388 cell lines. They concluded that *O. basilicum* oil had an IC50 value of 0.0362mg/mL (12.7 times less powerful than 5-FU) in P388 cell lines. Further, *O. basilicum* oil has an IC50 value of 0.0362mg/mL in KB cell lines.

**Anticonvulsant Activity**

In one of the reports of WHO, it was observed that about 450 million people in the entire world have endured mental, neurological, or behavioural problems at some time in their life. Large-scale research on plants, their active photochemical compounds and their derivatives have taken place in recent years that could furnish some new alternative treatments and therapeutic uses, for various diseases of central nervous system (CNS) in human beings. Epilepsy (a neurological disorder marked by sudden recurrent episodes of sensory disturbance, loss of consciousness, or convulsions, associated with abnormal electrical activity in the brain) is a group of disorders, delimited by repeated self-generated attacks that manifested from complex processes, implying various neurotransmitter systems such the glutamatergic, cholinergic, and gabaergic system. The estimation of the prevalence rate for epilepsy according to WHO is about 1–2% of the world population. Although a number of classic and more modern anticonvulsant drugs are available for the treatment of epilepsy patients worldwide, the seizures remained uncontrolled in more than 20% of the cases. Moreover, nearly all the existing anti-epileptic drugs, such as hydantoins, deoxybarbiturates, succinimides, benzodiazepines, iminostilbenes and carboxylic acids, were obtained through chemical synthesis.

On the other hand, many species of aromatic plants are medicinally used, due to the occurrence of essential oils and phytochemical compounds; some of them possessed certain CNS properties, including anti-epileptic action with history of usage in folk medicines. Recent studies on essential oils and their main phytochemical compounds have drawn the attention of many scientists for screening the natural products for such purposes and study their chemical and pharmacological aspects, which might potentially extend further, for the development of new anti-convulsant compounds having advantages over current synthetic drugs. For this purpose, the basil oil and its phytochemical compounds, obtained from the leaves and seed of *O. basilicum* were used by many research workers. Almeida et al. (2003), demonstrated that the *O. basilicum* essential oil, at higher doses, produced substantial increased in a
ascertained that the administration of combination of O. sanctum aqueous leaf extract and gentamicin, significantly prevented rise in levels of serum creatinine and blood urea when compared to the gentamicin alone treated group in rats. Aqueous leaf and seed extracts of O. sanctum plant have also been described to cut down the blood and urinary uric acid level in albino rabbits and also exhibited diuretic property. Rodrigues et al. (2001) also found that the aqueous leaf extract of O. sanctum prevents stress induced dendritic deficiency in hippocampal neurons in albino rats. All these researches indicated that the extracts of various parts of both O. basilicum and O. sanctum had a very high safety margin and very low toxic profile, providing safe beneficial effects at low doses without any undesirable side effects.

Spermicidal Effects
Buchet al. (1988), studied the effects of extracts of leaves and seeds of basil (O. basilicum) on human spermatozoa in vitro. They concluded that the basil plant had potent spermicidal action.

Dermatologic Effects
Balambalet al. (1985) studied the effects of extracts of various plant parts of basil (Ocimum basilicum L.) in humans, against acne vulgaris. They concluded that these extracts were quite effective in acne vulgaris, but the mechanism of their action was not clear.

Insecticidal Effects
Erleret al. (2006) studied the mosquito repellent activities of five essential oils, including the ‘basil oil’. Since Culexpiiens was very common pest mosquito in most of the urban and suburban regions; they used mosquito species — Culexpiiens for such purposes and found that this oil was very effective to repel these mosquitos.

Conclusion
Ocimum basilicum L., has reputed medicinal uses as antioxidant, antibacterial, antimicrobial, antifungal, antiviral, cytoprotective, anticonvulsant, hypoglycaemic, hypolipidemic, hepatoprotective, renoprotective, neuroprotective, spermicidal, dermatologic and insectisidal.

REFERENCES


INSTRUCTIONS FOR AUTHORS

The 'JIIIC' agrees to accept manuscripts prepared in accordance with the “Uniform Requirements submitted to the Biomedical Journals” published in the British Medical Journal 1991; 302: 334-41.

INSTRUCTION FOR AUTHORS

All material submitted for publication should be sent exclusively to the Journal of Islamic International Medical College, Pakistan. Work that has already been reported in a published paper or is described in a paper sent or accepted elsewhere for publication of a preliminary report, usually in the form of an abstract, or a paper that has been presented at a scientific meeting, if not published in a full proceedings or similar publication, may be submitted. Press reports of meeting will not be considered as breach of this rule but such reports should not be amplified by additional data or copies of tales and illustrations. In case of doubt, a copy of the published material should be included with a manuscript to help the editors decide how to deal with the matter.

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## EDITORIAL
Emerging Physical Therapy as an Autonomous and Specialized Health Care Profession

Syed Shakil-ur-Rehman, Hossein Karimi

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