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Editorial

Emotional Intelligence: An Effective Way to Manage Stress

Maria Aslam

Emotional intelligence (EI) is the "ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions".[1] Emotional intelligence has a strong impact on stress and psychological health. It facilitates the individuals to adopt effective coping strategies to deal with stress. There exists a significant association between higher EI and decreased stress levels.[2] Emotional intelligence acts as a stress buffer. It is related to positive life events such as psychological wellbeing, education, and success in the job. Individuals with higher EI show better adaptation with less reaction and fewer mood changes.[3] It involves the ability to recognize emotions and feelings in oneself/others, and the use of that information to resolve problems, manage stress, and improve communication.[4]

Emotional intelligence improves job performance by promoting positive relationships, teamwork, and social connections. Various institutions and companies are familiar with the significance of EI and prefer those having high EI at the time of recruitment. It also has a positive relationship with job satisfaction and productivity. Emotionally intelligent individuals have a greater learning ability. It is a predictor of success in the job because individuals with higher EI can handle stressful situations of increased pressure, have effective communication skills, and self-control. Emotional intelligence promotes positive feelings and emotions which in turn increase optimism, motivation, innovation, and problem resolution at the workplace.[5]

The knowledge about the notion of emotional intelligence and coping with stress is essential as it strongly affects the growth and development of a person. It makes a person capable to understand his own emotions & feelings and helps him to act according to the situation.[6] The person can control the negative emotions such as anxiety, low self-esteem & anger and replace them with positive emotions of empathy, confidence, and friendship.[7] It is difficult for persons with low EI to cope with stress-related issues and have aggressive behavior, conflicts, and poor compatibility.[8] Stress coping ability of a person depends on different factors like empathy, self-monitoring, and emotional competence.[6]

The concept of emotional intelligence became evident in the 1990s as a set of abilities comparable to general intelligence. It has several distinct forms. Ability EI measures the theoretical understanding of emotions and emotional functioning of an individual. Trait EI determines the response of an individual in different stress situations. Mixed model EI consists of personality as well as behavioral items. It measures traits, social skills, and competencies.[9] The model of emotional intelligence consists of four components: self-awareness, self-management, social awareness, and social skill. Self-awareness is the awareness of one's own emotions. Self-management deals with the management of one's emotional responses to different circumstances. Social awareness is the capability to recognize other people's emotions. Social skills consist of using the awareness of one's and other's emotions in the successful management of social interactions. A person with high emotional intelligence can manage stress effectively through effective coping strategies making him more resilient.[10] It covers both intrapersonal and interpersonal emotional capabilities of an individual and is associated with mental wellbeing.[5]

Burnout syndrome occurs due to occupational stress for a long time affecting many healthcare professionals worldwide. It greatly influences their quality of life and the services they provide. It can be dealt with emotional management. Emotional intelligence plays a vital role in emotional management.[11] The training of physicians on the EI skills can protect them from burnout and maintain their wellbeing.[12] Literature has shown that educational training had improved the EI skills in students, doctors, and employees.[10] There is a significant impact of EI training in groups on the recognition of emotions and their management. It also has a positive effect on health, psychological wellbeing, relationships, and employability. It plays a

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key role in effective performance & stress management and can be improved through training.[5]

Emotional intelligence has been emphasized as an important academic and practical construct. Developing skills of emotional intelligence is an essential but neglected parameter that needs to be focused on while designing medical education programs or workshops. The public, as well as private sectors, are emphasizing research on EI nowadays. It has significant importance in increasing the employee's happiness, productivity, satisfaction, efficiency, commitment, and interaction with other employees.[4] Ability to cope with stress successfully is the foundation of mental health. An individual with high EI gives a better emotional response even in extremely stressful circumstances. Emotional intelligence helps the individual to cope with stress and thus contributing to a healthy life.[5]

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Original Article

Histopathological Study of Prostatic Lesions in a Tertiary Care Hospital, Lahore

Madiha Arshad, Shahida Niazi, Qurat-Ul-Ain

ABSTRACT

Objective: To determine the spectrum of pathological lesions seen in prostatic biopsies & to grade prostatic cancers according to the modified Gleason score & grade.

Methodology: It was a retrospective study conducted at the Department of Pathology, Mayo Hospital/King Edward Medical University, Lahore commencing from January 2018 to December 2020. Previous histopathology reports, blocks, & recut slides were studied for the type of biopsy specimen, age of the patient, histopathological diagnosis, and morphological patterns (Gleason score and grade) in cases of prostatic carcinoma.

Results: A total of 629 prostate specimens were received during the study period. These constituted 500(79.49%) transurethral resection of prostate (TURP) specimens, 87(13.84%) core needle biopsies, and 42(6.67%) radical prostatectomy specimens. The specimens constituted 549(87.28%) benign lesions and 80(12.71%) malignant cases. Benign lesions included benign prostate hyperplasia constituting 461(73.3%) cases & hyperplasia associated with prostatitis constituting 88(14%) cases. Malignant cases included 76(12.1%) cases of prostatic adenocarcinoma and 4 cases of metastatic deposits. Two hundred and twenty eight (41.53%) cases of benign prostatic hyperplasia and 37(46.25%) cases of prostatic carcinoma were observed in 61-70 years age group. Collectively, a total of 543(86.73%) cases were seen in the age range of 51-80 years. The maximum number of prostatic cancers (45 cases/59.20%) had the highest Gleason scores of 9 & 10(grade group 5) & only 2 cases had the lowest score of 6(grade group 1).

Conclusion: Benign prostatic hyperplasia & prostatic carcinoma are the two most common pathological lesions affecting the prostate.

Keywords: *Benign prostatic hyperplasia. Prostatitis. Prostate adenocarcinoma.*

INTRODUCTION

The prostate gland, a fibromuscular organ that encircles the neck of the urinary bladder normally weighs up to 20 gms.[1] On histological examination, the normal prostate gland comprises of variable sized glands lined by bilayered epithelium surrounded by spindle-shaped stromal cells.[2] Pathological lesions of the prostate occur more frequently after the age of 50 years and constitute a significant cause of morbidity and mortality in males of advancing age.[3] The incidence of prostatic lesions increases with advancing age with 8% occurring during the 4th decade, followed by 50% in the 5th decade and rising dramatically to 75% in the 8th decade.[4] Patients usually present with symptoms of urinary dribbling/incontinence, hesitancy, urinary retention, and rarely hematuria.[5] Benign prostatic hyperplasia (BPH), prostatic carcinoma, and prostatitis are the main pathological lesions affecting the prostate gland.[6] Amongst these, benign prostatic hyperplasia is the most common urological condition in men. At 40 years of age, the incidence of benign prostatic hyperplasia is reported to be 20% whereas, it rises to 90% by the 8th decade of life.[7] Worldwide, prostatic carcinoma is the second most commonly reported malignancy after lung cancer and the 6th most common cause of cancer death amongst males.[8] Prostatitis, an inflammation of the prostate gland can be classified as acute, chronic, and granulomatous. It is usually seen in association with nodular hyperplasia of the prostate & accounts for approximately 10-15% of cases.[9]

Serum prostate-specific antigen (PSA), digital rectal examination (DRE), and transrectal ultrasound are the main first-line screening methods for prostate carcinoma but biopsy remains the ultimate gold standard diagnostic tool.[10] The normal range for PSA levels is 0-4 ng/dl, with a borderline value ranging between 4-10 ng/dl, and more than 10 ng/dl is considered high and worrisome. Prostatitis, prostatic trauma, benign prostatic hyperplasia, and prostatic carcinoma lead to raised serum PSA levels.[11] High-grade prostatic intraepithelial neoplasia (HG-PIN) is a well-established precursor lesion of invasive prostatic cancer and its identification in biopsies along with elevated serum PSA levels is an indication for repeat biopsy and close follow-up.[12]

The modified Gleason grading system is the gold standard for the management and grading of prostate cancers. It was introduced by Dr. Donald Gleason in 1966, modified by the International Society of Urology Pathology (ISUP) in 2005, subsequently revised in 2014, and accepted by the World Health Organization

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in 2016.[13] It depends on observing the degree of glandular architectural differentiation & growth pattern of the tumor relative to the stroma at low to medium power of the microscope rather than concentrating on the cytological details, therefore it is reliable, simple, and not time-consuming.[14]

The Gleason grading system comprises of 5 histological patterns of prostate adenocarcinoma. Gleason grade group 1 and 2 are the most differentiated types with discrete well-formed glands arranged back to back with little intervening stroma and may mimic benign lesions.[15] Grade group 3 cases have infiltrating glands, lined by single-cell layer, grade group 4 shows ragged infiltrating glands with cribriform & fusion of glands and lastly grade group 5 demonstrates sheets, cords, comedocarcinoma pattern with central necrosis as well as singly infiltrating cells but no glandular formations.[16]

The purpose of this study was to determine the age distribution and the histological spectrum of various prostatic lesions in our population and to grade prostate adenocarcinoma according to the modified Gleason grading system.

METHODOLOGY

The study was conducted in the Department of Pathology, Mayo Hospital/King Edward Medical University, Lahore, Pakistan. It was a 3-year retrospective study commencing from January 2018 to December 2020. The study was approved by the ethical review committee of the University (Letter No: 498/RC/KEMU, 09-07-2021). The data for prostate lesions was collected from the histopathology database of the Department of Pathology. During this period, a total of 629 prostate specimens comprising of transurethral resection of the prostate (TURP), radical prostatectomy (RP), and core needle biopsy (CNB) specimens were evaluated. The histopathology reports and blocks were retrieved from previous records. Fresh slides were prepared and reviewed to reconfirm the previous diagnosis and to analyze the following parameters: type of specimens, age of the patients, benign & malignant categories, & histopathological diagnosis.

In cases diagnosed as prostate cancer, modified Gleason scoring & grading were applied according to the new morphological guidelines as shown in Table 1.

STATISTICAL ANALYSIS

The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 21. Frequency & percentages were calculated for the type of prostate specimens received, age, benign & malignant categories, and Gleason score & grade.

RESULTS

The present study included a total of 629 prostate surgical specimens with 500(79.49%) cases of TURP specimens, 42(6.67%) cases of radical prostatectomy, and 87(13.84%) cases of CNB specimens. The specimen constituted 549(87.28%) benign lesions and 80(12.71%) malignant cases.

Out of a total of 629 prostate specimens, 461(73.3%) cases were reported as benign prostatic hyperplasia

Table 1: The New Contemporary Prostate Cancer "ISUP Modified Gleason Grading System"[13]

New Grading System Morphologic Patterns and Grade Group Pattern Composition	
Grade Group	**Pattern Definition**
Grade Group 1(Gleason score ≤6)	Only individual, discrete, well-formed glands
Grade Group 2(Gleason score 3 + 4 = 7)	Predominantly well-formed glands with a lesser component of poorly formed/fused/cribriform glands
Grade Group 3(Gleason score 4 + 3 = 7)	Predominantly poorly formed/fused/cribriform glands with a lesser component of well-formed glands[a]
Grade Group 4(Gleason score 8)	Only poorly formed/fused/cribriform glands or predominantly well-formed glands with a lesser component lacking glands[b] or predominantly lacking glands with a lesser component of well-formed glands[b]
Grade Group 5(Gleason scores 9-10)	Lacks gland formation/necrosis with or without poorly formed/fused/cribriform glands[a]

[a] For cases with more than 95% poorly formed/fused/cribriform glands or lack of glands on a needle core or at radical prostatectomy, the component of less than 5% well-formed glands is not factored into the grade.
[b] Poorly formed/fused/cribriform glands can also be a more minor component.

(Figure 1), 88(14%) cases as prostatic hyperplasia with associated prostatitis (Figure 2), including one case of granulomatous prostatitis (Figure 3), 76(12.1%) cases of prostatic carcinoma and 4(0.6%) cases of metastatic carcinoma deposits from the urinary bladder were observed. No case of prostatic-intraepithelial neoplasia (PIN) was reported.

The present study was distributed in the age range of 42-94 years. The age range was stratified as ≤50 years, 51-60 years, 61-70 years, 71-80 years, 81-90 years, and above 90 years of age. The maximum number of prostatic lesions were observed in the age range of 61-70 years accounting for 265(42.13%) cases, followed by the 71-80 years age range with 140(22.25%) cases. Two hundred and twenty eight (41.53%) cases of benign prostate hyperplasia and 37(46.25%) cases of prostatic carcinoma were observed in the 61-70 years age group (Table 2).

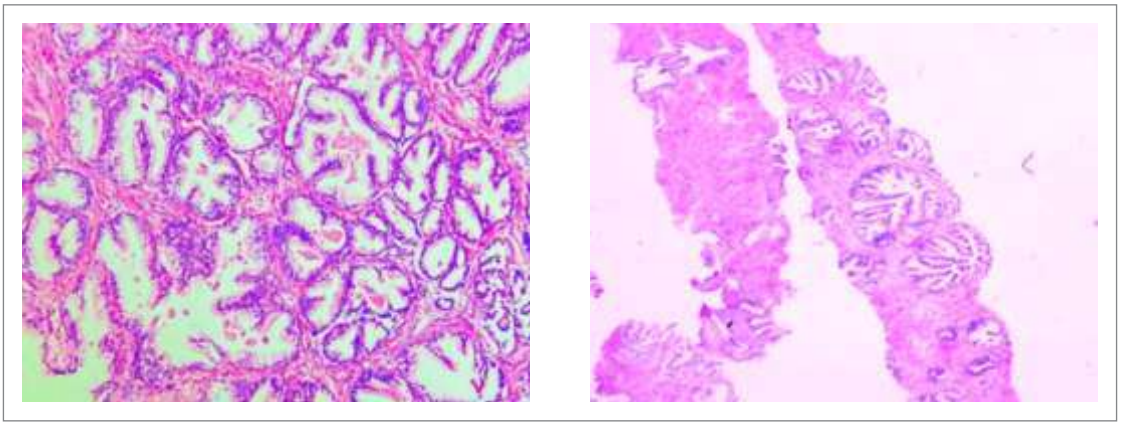

Figure 1: Benign Prostatic Hyperplasia (Left: Section from Radical Prostatectomy Specimen. Right: Core Needle Biopsy). Benign Hyperplastic Glands Lined by Bilayered Epithelium with Surrounding Fibromuscular Stroma. The Lumina Show Corpora Amylacea (Left: H & E stain, 100x magnification, Right: H & E stain, 40x magnification)

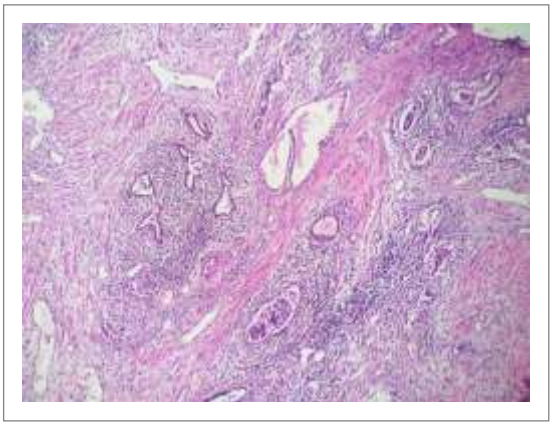

Figure 2: Chronic Prostatitis: Lymphoplasmacytic Infiltrate Surrounding Prostatic Acini & Ducts (H & E stain, 40x magnification)

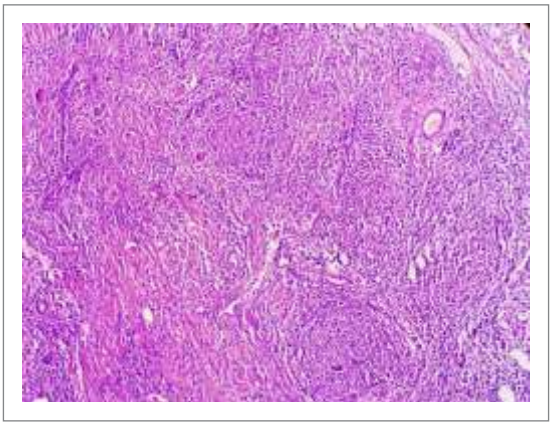

Figure 3: Chronic Granulomatous Prostatitis: Well-Formed Granulomas with Langhan's Type of Giant Cells (H & E stain, 40x magnification)

Table 3 depicts the number of prostate cancer cases with their assigned Gleason scores & grade groups. There were only 2(2.63%) cases having the lowest score of 6 with a grade group 1. A score of 7(grade group 2 & 3) was assigned to 8(10.52%) cases (Figure 4 & 5), 21(27.63%) cases were given a score of 8(grade group 4, Figure 6), 37(48.68%) cases were assigned a Gleason score of 9(grade group 5), & 8(10.52%) cases

were assigned a score of 10(grade group 5, Figure 7 & 8). Collectively, grade group 5 was observed in 45(59.20%) cases which accounted for the maximum number of cases in the study. In the present study, the perineural invasion was seen in 52 out of 76 prostatic cancers of which 32(43.2%) cases had high Gleason scores of 9 & 10 (Figure 9).

Table 2: Age Distribution of Cases (n=629)

Age in Years	Benign Cases 549(87.28%)	Malignant Cases 80(12.71%)	Total No. of Cases 629(100%)
≤50	73(13.3%)	4(5%)	77(12.24%)
51-60	109(19.85%)	29(36.25%)	138(21.93%)
61-70	228(41.53%)	37(46.25%)	265(42.13%)
71-80	132(24.04%)	8(10%)	140(22.25%)
81-90	4(0.73%)	1(1.25%)	5(0.79%)
>90	3(0.55%)	1(1.25%)	4(0.63%)

Table 3: Categorization of Prostatic Cancer Cases according to Modified Gleason Grade Group & Score (n=76)

Gleason Grade Group (Score)		Frequency (Percentage)
Grade Group 1(3+3=6)		2(2.63%)
Grade Group 2(3+4=7), Grade Group 3(4+3 =7)		8(10.52%)
Grade Group 4(4+4=8), (3+5=8), (5+3= 8)		21(27.63%)
Grade Group 5	(4+5=9), (5+4=9)	37(48.68%)
	(5+5=10)	8(10.52%)

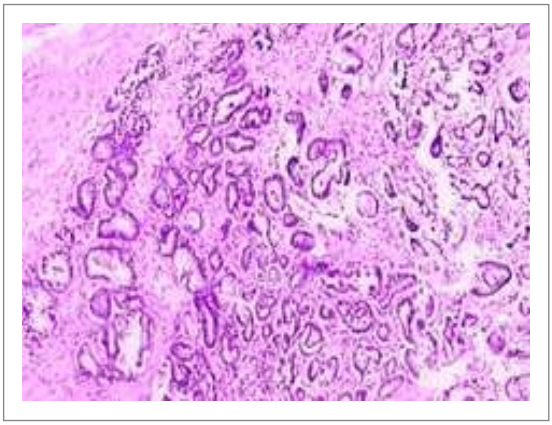

Figure 4: Gleason Grade Group 2(3+4=Score 7): Crowded, Predominantly Well-Formed Neoplastic Glands, Arranged in a Back to Back Pattern (H & E stain, 100x magnification)

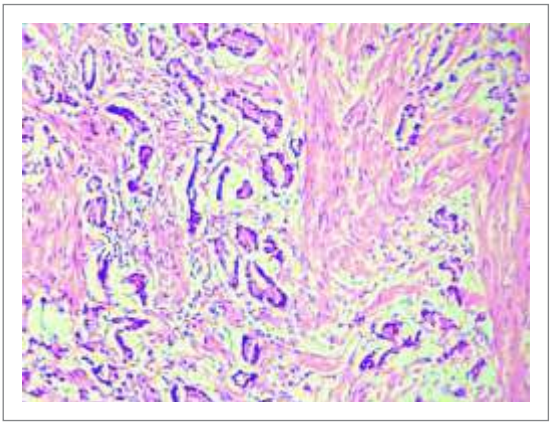

Figure 5: Gleason Grade Group 3(4+3 = Score 7): Neoplastic Glands Showing Infiltration into the Surrounding Stroma (H & E stain, 100x magnification)

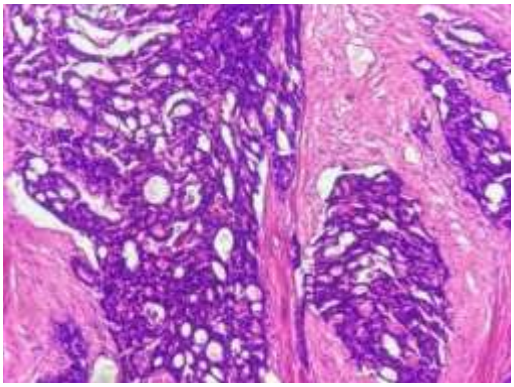

Figure 6: Gleason Grade Group 4(4+4 = Score 8): Fused Glands with a Cribriform Pattern (H & E stain, 100x magnification)

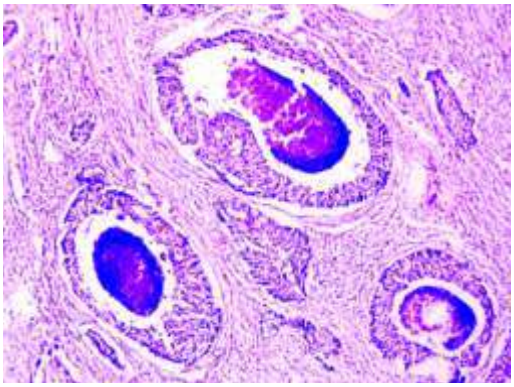

Figure 7: Gleason Grade Group 5(5+5 = Score 10) Showing Comedonecrosis: Central Necrosis with Intraluminal Necrotic Cells (H & E stain, 100x magnification)

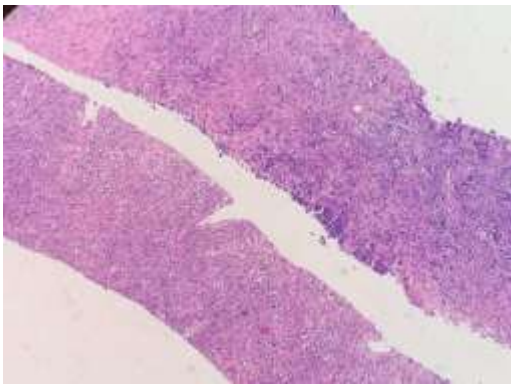

Figure 8: Gleason Grade Group 5(5+ 5 = Score 10): Core Needle Biopsy Showing Complete Lack of Gland Formations & Tumor Cells Disposed of as Sheets (H & E stain, 100x magnification)

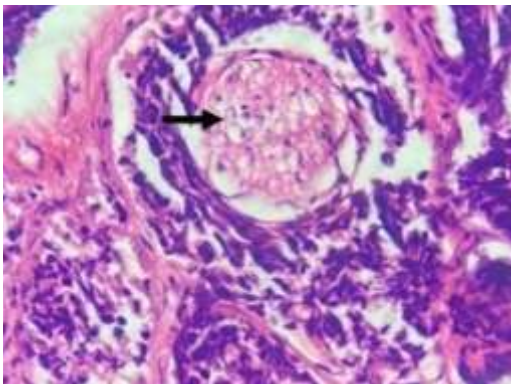

Figure 9: Perineural Invasion: Malignant Glands Circumferentially Enclosing & Surrounding a Nerve (Arrow) (H & E stain, 400x magnification)

DISCUSSION

Prostatic biopsy specimens constitute a substantial percentage of the histopathology workload in tertiary care hospitals.[7] Various benign and malignant entities present with similar clinical features, however, their further management and prognosis differ widely. So, exact histological diagnosis plays a crucial role.[10]

In the present study, TURP chips constituted 500(79.49%) cases, core needle biopsies 87(13.83%) cases, and radical prostatectomy specimens constituted 42(6.67%) cases. Other studies also reported a high percentage of TURP specimens in different settings.[3,4,17] Transurethral resection of the prostate is comparatively simple with fewer complications. It aids in the early diagnosis and identification of premalignant, malignant lesions, and incidental prostatic cancer lesions.[3]

According to our results, out of a total of 629 prostatic biopsies, 549(87.28%) cases were benign and 80(12.71%) cases were malignant. The commonest benign lesion reported was benign prostatic hyperplasia accounting for 461(73.3%) cases followed by 88(14%) cases of prostatitis associated with nodular hyperplasia. In the malignant category which constituted 80(12.71%) cases, 69(86.25%) cases were reported as acinar adenocarcinoma, 7(8.75%) cases as ductal adenocarcinoma, and 4(5%) cases as metastatic deposits to the prostate of urothelial origin.

A study published in 2018 on 321 prostatic specimens reported 279(86.91%) cases as non-neoplastic &

42(13.09%) cases as neoplastic which included 27 malignant cases & 15 cases of premalignant lesions like PIN. The most common non-neoplastic entity reported was nodular hyperplasia which constituted 279(86.91%) cases in which 117(42.09%) cases had an associated component of prostatitis.[17] A study by Sabalpara et al., in 2019 on 156 prostatic biopsies categorized 112(71.79%) cases as benign and 44(28.21%) cases as malignant. All benign cases constituted of nodular hyperplasia and no case of prostatitis was reported. Out of the 44 malignant cases, 43 were acinar adenocarcinoma and 1 case was ductal adenocarcinoma.[18]

In a 14-year retrospective review study conducted in Nigeria, 4292 prostate biopsies were reported in which benign nodular hyperplasia constituted 3257(76%) cases and prostate cancer 1035(24%) cases. In 81(2.5%) cases, nodular hyperplasia was associated with prostatitis.[19] A study conducted in Jaipur, Rajasthan, India reported that out of a total of 150 cases, 131(87.33%) cases were of nodular hyperplasia, 16(10.66%) cases were carcinoma prostate, and 3(2%) cases were PIN.[12]

Regarding the age distribution of prostatic lesions, 265(42.13%) cases were reported in the age group of 61-70 years and 140(22.25%) cases in the age group 71-80 years. Out of 629 cases, 543(86.73%) were seen in the age range of 51-80 years. Similarly, a study published in 2020 on 160 cases also reported a maximum of 63(39.38%) cases in the age range of 61-70 years.[2] Similarly, another study by Yadav et al., on 100 prostatic biopsies also reported 42(42%) cases in the 61-70 year age range with 38 benign and 4 malignant cases.[1]

Sumaya et al. reported a maximum of 37(41.1%) cases of prostatic lesions in the age group of 61-70 years followed by 71-80 years age group with 23(25.6%) cases.[3] In another study it was found that maximum cases (51.9%) of nodular hyperplasia and prostatic adenocarcinoma (43.8%) were in the age category of 61-70 years.[19] A similar result was noted by Bhatta et al., who reported that the benign lesions are common in the age group of 61-70 years but malignant cases predominate in the age group of 71-80 years.[9]

In the present study, prostatitis associated with hyperplasia was observed in 88(14%) cases. In the study by Yadav et al., prostatitis associated with nodular hyperplasia was observed in 10% of cases.[1] Rajani et al. reported 6.9% cases of chronic prostatitis with BPH.[2] In a study of 321 cases, 117 cases were reported as chronic prostatitis, of which 05 cases were granulomatous prostatitis and 112 non-granulomatous prostatitis.[17]

In the present study, out of 76 cases of carcinoma prostate, a maximum of 37(48.68%) cases were assigned a high Gleason score of 9(grade group 5) & 8(10.52%) cases the highest score of 10(grade group 5). A score of 8(grade group 4) was observed in 21(27.63%) cases, score 7(grade group 2 & 3) in 8(10.52%) cases, & only 2(2.63%) cases had the lowest score of 6(grade group 1). A study by Shah et al., reported a Gleason score of 9(grade group 5) in 40% cases, a score of 8(grade group 4) in 30% cases & a score of 7(grade 2) & 6(grade 1) in 20% & 5% cases, respectively.[6] Similarly, another study reported that 37.3% cases had Gleason score 9(grade group 5).[9] Sujatha et al. reported a Gleason score of 7 in 47.36% cases.[10] Another study showed that in 23 cases of prostate cancer, Gleason score 7 was assigned to 11(47.8%) cases, 7 cases had Gleason score 8 & 2(8.7%) cases had score 6 & Gleason score 9 also included 2(8.7%). Only one (4.35) case had the highest Gleason score of 10.[2]

An increasing Gleason score & grade is associated with a poor prognosis with 5-year recurrence-free survival rates. The study estimated that a Gleason score of ≤6(grade 1) was associated with an 88.8% 5-year survival rate, a score of ≤7(grade 2 & 3) with 55.8%, a score of ≤8(grade 4) with 50.4%, and a score of ≥9(grade 5) with 23.5 % 5-year survival rates.[20]

In the present study, the perineural invasion was seen in 52 out of 76 prostatic cancers, of which 32(43.2%) cases were associated with high Gleason scores of 9 & 10. Perineural invasion is associated with a poor disease outcome.[21] It is commonly seen in prostatic cancers with higher Gleason scores & is a predictor of extraprostatic extension of tumor & ultimately recurrence.[14] A study by Bhatta et al., reported perineural invasion in 37.5% cases & Sujatha et al., reported perineural invasion in 5(26.31%) cases out of 19 prostate cancers, which are in accordance with the present study statistics.[9,10]

CONCLUSION

Benign lesions of the prostate are more common than malignant cases. The most common benign lesion is nodular hyperplasia. Prostate adenocarcinoma is a commonly occurring malignant lesion.

RECOMMENDATIONS

- Modified Gleason grading and scoring system should be applied in cases of prostate adenocarcinoma to improve management and disease surveillance.
- All TURP chips should be thoroughly examined to rule out premalignant lesions like PIN and for the detection of incidental cancers.

- Mass awareness programs should be created and projected in the male population.

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Original Article

Comparison of 3D Titanium Miniplate versus Conventional 2D Miniplate Fixation in the Management of Isolated Mandibular Angle Fractures

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ABSTRACT

Objective: To compare 3D titanium miniplate versus conventional 2D miniplate fixation in the management of isolated mandibular angle fractures in the context of occlusion.

Methodology: It was a cross-sectional comparative study conducted in the Department of Oral & Maxillofacial Surgery, Sharif Medical City Hospital, Lahore from April to October 2020. After meeting the inclusion criteria, 90 patients were enrolled by convenient sampling technique. Patients were divided into two groups and each group included 45 patients. Patients in group A were treated with 3D miniplate placement on the lateral cortex following the principle of 3D fixation of Farmand and Dupoirieux whereas group B patients were treated with 2D conventional miniplate placed along Champy's line of ideal osteosynthesis. After the procedure, patients were admitted to the ward for three days. All patients were examined at 2nd postoperative month to assess posttreatment occlusion.

Results: Mean age of the patients was 34.04±12.19 years. Seventy seven (85.56%) patients were males, and 13(14.44%) patients were females. In the 3D plate group, occlusion was achieved in 38(84.4%) patients, and in the 2D plate group, the outcome was achieved in 29(64.4%) patients. A statistically significant difference (p-value=0.030) was found when posttreatment occlusion was compared in both groups at the 2nd postoperative month.

Conclusion: This study concluded that 3D titanium miniplate showed significantly better occlusion as compared to conventional 2D miniplate fixation in the management of isolated mandibular angle fractures.

Keywords: *Mandible. Titanium miniplate. Conventional miniplate.*

INTRODUCTION

Mandibular fractures are ranked as second (23.3%) most common facial bone fractures after nasal bone fractures (58.7%).[1] Road traffic accidents, gunshots, sports, and falls are responsible for most of the mandibular fractures.[2] The goal of treatment is to restore the anatomical form and function, as well as to maintain stable fixation and pay specific attention to the reestablishment of occlusion.[3]

Angle fracture is the most common kind of mandibular fracture (27-30%), followed by parasymphysis fracture (26.9%).[1,4] Mandibular angle fractures are prevalent and can be caused by several reasons, including thinner cross-sectional area, presence of 3rd molar, muscle forces, or the architecture of the rami abruptly shifting from horizontal to vertical.[5]

Mandibular angle fractures may be characterized as a fracture line beginning at the connection of the posterior boundary of the mandibular ramus and inferior border of the body of the mandible, generally in the region of the 3rd molar.[6] The management of mandibular angle fractures needs diligent knowledge of the surgical framework, insertion of the muscle, related biomechanics of the forces at the angle, significance of occlusion, and presence of mandibular third molar in the line of fracture.[7]

In the past, many techniques, such as closed reduction with intermaxillary fixation, transosseous wires for open reduction, plate osteosynthesis with lag screws, and a straight line miniplate on the superior and inferior edge have been documented for the treatment of mandibular angle fractures.[3,6]

The most widely used method for angle fractures is a single miniplate (2D miniplate) applied on the superior border of the external oblique ridge according to Champy's principles.[1] Recently, concerns about the lack of three-dimensional stability with traditional single miniplate fixation of mandibular angle fractures have sparked controversy among surgeons, as mandibular angle fractures have a greater rate of occlusion disorders than other mandibular fractures, ranging from 0% to 32%.[6]

The three-dimensional titanium miniplates (3D miniplates) are a relatively new plating technique. It is imagined that such a single matrix miniplate may give the needed functional degree of fixing stability with little surgical time and a low complication rate. The shape of the 3D miniplate theoretically allows for a

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higher number of screws, while maintaining three-dimensional stability and resistance to torque shearing and bending forces while maintaining a low profile or malleability.[8]

No major work on 3D miniplates has been done in Pakistan. The goal of this study was to compare 3D miniplate fixation on the superior border of the external oblique ridge with normal 2D miniplate fixation in isolated mandibular angle fractures. However, there isn't as much definitive research on 3D miniplate fixation in the literature as there is on traditional 2D miniplate fixation.

METHODOLOGY

A cross-sectional comparative study was conducted in the Oral & Maxillofacial Surgery Department, Sharif Medical City Hospital, Lahore from April to October 2020. It was carried out with approval from the ethical committee of the Institution (Letter No: SMDC/SMRC/80-18, 10-11-2018). Patients provided written informed consent. A total of 90 patients were included in this study by convenient sampling technique. Patients were further divided into two groups, each group included 45 patients. Adult males and females, aged 16 to 60 years with fracture line beginning at the area where the anterior border of the ramus meets the body of the mandible in the region of the third molar, were included in this study. These patients were diagnosed by using orthopantomogram (OPG) and posteroanterior (PA) views of the face. Patients with previously treated mandibular angle fractures, infected mandibular angle fractures, comminuted fractures, completely edentulous, and medically compromised patients were excluded from the study. Patients in group A were treated with 3D miniplates put on the lateral cortex using the Faramnd and Dupoiroeux approach of the 3D plating system. In group B, patients were treated with one 2D conventional miniplates placed along Champy's line of optimal osteosynthesis.

The treatment was carried out by a single surgical team. All patients were treated with the same surgical procedure using an intraoral incision. A temporary intraoperative maxillomandibular fixation was provided using eyelet wiring. The intermaxillary fixation was released once the fracture had been reduced and repaired. Patients were given Amoxicillin 1.2 g I/V BD & analgesics Diclofenac Sodium 75 mg I/M BD, instructions to follow a soft diet for five days, and maintain rigorous oral hygiene till the end of the study period. Patients were admitted to the ward for a maximum of three days, as they could take semi-solid food and could follow diet and medicine charts. All patients were examined postoperatively at 2nd month to assess posttreatment occlusion. Occlusion was considered satisfactory with maximum intercuspation of teeth at 2nd postoperative month visit. Findings were recorded by the resident doctor on the proforma.

STATISTICAL ANALYSIS

The data was analyzed in Statistical Package for the Social Sciences (SPSS) version 24. Age was presented as mean±SD. Qualitative variables like gender and occlusion were presented as percentage & frequency. Chi-square test was applied to compare occlusion at the 2nd month between 3D and 2D miniplates and data stratified for age & gender. A p-value ≤0.05 was considered significant.

RESULTS

The mean age of the patients was 34.04±12.19 years. Seventy seven (85.56%) patients were males and 13(14.44%) patients were females. The male-to-female ratio was 6:1. In the 3D plate group, the mean age of the patients was 35.18±11.45 years whereas, in the 2D plate group, the mean age of the patients was 32.91±12.92 years. This difference was statistically insignificant (p-value=0.381). In the 3D plate group, 36(80%) patients were male whereas, in the 2D plate group 41(91%) patients were male. Similarly, in the 3D plate group, 9(20%) patients were female whereas, in the 2D plate group 4(9%) patients were female. Statistically insignificant difference was found when both groups were compared regarding genders (p-value=0.134).

After 2nd postoperative month, the outcome (occlusion) was achieved in 67(74.44%) patients. In the 3D plate group, the occlusion was achieved in 38(84.4%) patients whereas the outcome was not achieved in 7(15.6%). In patients treated with 2D miniplate, the occlusion was achieved in 29(64.4%) patients whereas, in 16(35.6%) patients, occlusion was not achieved. A statistically significant difference (p-value=0.030) was found when posttreatment occlusion was compared in both groups at the 2nd postoperative month (Figure 1).

In patients aged ≤30 years, in the 3D plate group, the outcome was achieved in 17(100%) patients while in the 2D plate group the outcome was achieved in 17(70.8%) patients (p-value=0.014). In patients >30 years of age, in the 3D plate group, the outcome was achieved in 21(75%) patients while in the 2D plate group, the outcome was achieved in 12(57.1%) patients (p-value=0.228) (Table 1).

DISCUSSION

Mandibular fractures are the second most prevalent

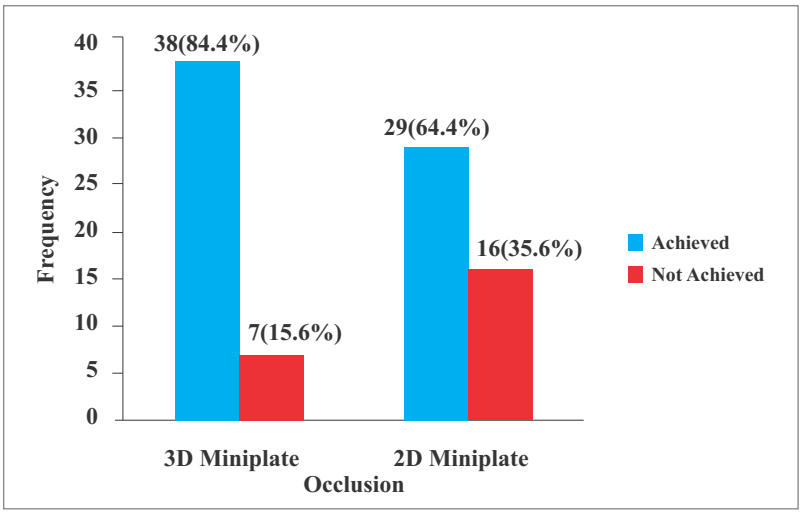

Figure 1: Frequency of Occlusion at 2nd Postoperative Month in Both Groups

Table 1: Comparison of Outcome after 2nd Postoperative Month between Study Groups Stratified by Demographic Data

Demographic Variables		Study Groups			
		3D Miniplate		2D Miniplate	
		Outcome		Outcome	
		Yes	No	Yes	No
Age Groups (Years)	≤30	17(100%)	0(0%)	17(70.8%)	7(29.2%)
	>30	21(75%)	7(25%)	12(57.1%)	9(42.9%)
p-value		0.014*		0.228	
Gender	Male	31(86.1%)	5(13.9%)	28(68.3%)	13(31.7%)
	Female	7(77.8%)	2(22.2%)	1(25%)	3(75%)
p-value		0.065		0.071	

* *Significant p-value*

type of face fractures, accounting for 15.6-59% of all facial fractures.[9] Direct fixation using different methods of plate and screw osteosynthesis has gained popularity. Various plate and screw osteosynthesis have been introduced such as the association of osteosynthesis (AO) bicortical plating system, 2D miniplating system & screws, and 3D miniplating system.[10]

In this study, we compared the 2D miniplating system and screws with the 3D miniplating system in patients with mandibular angle fractures. Our results showed that occlusion was attained in 38(84.4%) patients in the 3D plate group and 29(64.4%) patients in the 2D plate group at the 2nd postoperative month. This difference was statistically with a p-value of 0.030.

Another study conducted at Cairo University compared the outcome of 2D and 3D miniplates and it was noticed that the complication rate was comparable in both groups i.e. 30% in both groups.[3]

A prospective randomized control trial was conducted in India to compare the 3D miniplate with conventional miniplate fixation in the management of mandibular fractures. The trial included 50 patients and all the patients were followed-up postoperatively for 12 weeks. Patients were randomly divided into two groups. Group A was treated with 3D miniplate and group B with conventional miniplate. They concluded that no statistically significant difference was found between the two groups. According to the study, both 3D and conventional miniplate were equally effective for the treatment of mandibular fracture.[11]

The 3D plate has a distinctive design since it is made up

of two linear plates united by strengthening vertical struts. As a consequence, strut plates may give stronger resistance to gaps forming at the superior border owing to masticatory force.[12] However, as compared to traditional miniplates, the 3D plating process requires fewer plates and screws to hold the bone fragments together because just one 3D plate is required. As a result, it employs less foreign material, decreases operation time, and lowers overall treatment cost.[13]

In another study, the 3D miniplate achieved mean decreased occurrences of malocclusion (p-value=0.05) and hardware failure (p-value=0.05) as compared to the regular miniplate. The author concluded that the 3D miniplate outperforms the standard miniplate in terms of lowering the postoperative complication rates.[14]

According to Mittal et al., there was no statistically significant difference between 3D and 2D miniplate osteosynthesis of mandibular parasymphysis fractures. Three-dimensional miniplates outperformed two-dimensional miniplates in terms of cost, the convenience of operation, implant materials, and duration of the operation.[15]

In another study, 3-dimensional plates were used to treat mandibular symphysis, parasymphysis, and angle fractures. They reported that 3D plate gave 3-dimensional stability with minimal morbidity and infection rates.[16] Singh et al. reported that the 3D miniplates system is a reliable & effective treatment modality for mandibular angle fractures as compared to traditional 2D miniplates. Patients with 3D miniplates had reduced sensory deficit and more mouth opening.[17]

Another study conducted in 2019 showed that both the 2D and 3D plating were equally effective and no major difference in surgical outcomes was found between these two plates. They also concluded that 3D miniplate is more economical and less time taking in symphysis and parasymphysis fractures. However, it is difficult to place a 3D plate in angle fractures and fractures involving the mental nerve.[18]

CONCLUSION

This study concluded that 3D titanium miniplate showed significantly better occlusion as compared to conventional 2D miniplate fixation in the management of isolated mandibular angle fractures.

LIMITATIONS & RECOMMENDATIONS

It was a single-centered study with a follow-up of two months only. Surgical complications can occur after two months, so a multi-centered or randomized control trial with prolonged follow-up is required to validate the results of our study.

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Original Article

Iatrogenic Radial Nerve Palsy in the Management of Midshaft Humerus Fracture with Dynamic Compression Plate on Anterolateral versus Anteromedial Surface through Henry Approach

Bilal Ahmad Abbas, Farooq Azam Khan, Talha Qureshi

ABSTRACT

Objective: To compare the frequency of iatrogenic radial nerve palsy after the management of midshaft humerus fractures with dynamic compression plate on the anterolateral versus anteromedial surface through Henry approach.

Methodology: It was a cross-sectional comparative study conducted at the Orthopedic Department, Allied Hospital, Faisalabad after taking approval from the Institutional Ethical Review Committee. The study was conducted from January to June 2018. Eighty patients were included in this study by non-probability consecutive sampling technique. Informed consent was taken from each participant of the study. Patients of both genders aged 18 to 70 years with isolated fracture shaft of humerus or non-union after conservative management, were included in this study. Patients with polytrauma, history of previous surgery on the same humerus, and preoperative radial nerve injury were excluded. Patients with non-union of the humerus after conservative management were enrolled through the outpatient department. Patients presented in the emergency department with a history of trauma and fracture shaft of the humerus were also included in this study. Patients were divided into two groups A and B, each group included 40 patients. Group A was treated with a dynamic compression plate applied through Henry approach on the anterolateral surface and in group B, the plate was applied on the anteromedial surface through the Henry approach.

Results: Mean age was 34.79±9.73 years in group A and 32.76±8.01 years in group B. In group A, 8(20%) patients had radial nerve injury and 32(80%) patients did not have nerve injury. In group B, 1(2.50%) had radial nerve injury and 39(97.50%) had no findings of nerve injury. A statistically significant difference was found when postoperative radial nerve injury was compared in both groups (p-value=0.02). At 2nd follow-up after three months of surgery, radial nerve injury in eight patients (100%) of group A and one (100%) of group B was settled.

Conclusion: Iatrogenic radial nerve palsy is significantly lower in patients treated with dynamic compression plate on the anteromedial surface as compared to the anterolateral surface through Henry approach in midshaft humerus fracture.

Keywords: *Humeral fracture. Radial nerve injury. Henry Approach.*

INTRODUCTION

The fracture of the humeral shaft is a common presentation in Orthopedic Surgery and accounts for approximately 1-5% of all fractures. These fractures occur more commonly in young age. The most common cause of humeral shaft fracture is road traffic accident (RTA), however, falls also account for a significant number of patients. In addition to RTA and falls, metabolic bone disorders like Paget's disease and osteoporosis can also cause fracture of the humeral shaft.[1]

The shaft of the humerus serves as an attachment site of major muscles which results in the major displacement of the fracture fragments. The main deforming forces are pectoralis major, deltoid, and rotator cuff. Fractures of the humeral shaft can be classified according to anatomical location and deforming forces. The deforming forces can be bending, twisting, or axial compression. The fracture pattern resulting from these deforming forces can be simple transverse, oblique, spiral, or segmental.[2]

The fracture of the humeral shaft can be treated both conservatively and by operative techniques. Conservatively, these fractures are treated by braces and plaster splints. Surgically, these fractures can be treated using plates, intramedullary nails, and external fixators.[3]

The gold standard in the operative management of these fractures is the use of plates. The union rate with the use of plate is higher than other available operative modalities. Anterolateral and anteromedial approaches are mostly carried out to apply plate in the shaft of humerus fracture.[4]

Several studies have shown a higher success rate with the use of plates but the risk of radial nerve injury is relatively higher and remains a point of concern.[5,6]

Gouse et al. reported a higher incidence of radial nerve injury by anterolateral approach. According to the study carried out in 2016, the documented incidence approached approximately 16%. All of the reported nerve injuries were mostly physiological neuropraxia which recovered spontaneously within 6 months duration.[2,7] In another study carried out by Senthil et al.,

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the anteromedial approach for humerus shaft fracture was considered safe and no radial nerve injury was reported.[8]

The rationale of this study was to compare the outcomes of these approaches to formulate better recommendations for operative management of midshaft humerus fracture.

METHODOLOGY

It was a cross-sectional comparative study conducted at the Orthopedic Department, Allied Hospital, Faisalabad after taking approval from Institutional Ethical Review Committee (Letter No: 823/2017, 18-08-2017). The study was conducted from January to June 2018. Eighty patients were included by non-probability consecutive sampling technique. Patients of both genders aged 18 to 70 years, with isolated fracture shaft of humerus or non-union after conservative management, were included in this study. Patients with polytrauma, history of previous surgery on the same humerus, and preoperative radial nerve injury were excluded.

Patients with non-union of the humerus after conservative management were enrolled through the outpatient department. Patients presented in the emergency department with a history of trauma and fracture shaft of the humerus were also included in this study. Patients were divided into two groups A and B, each group included 40 patients. Group A was treated with a dynamic compression plate applied through Henry approach on the anterolateral surface and in group B, the plate was applied on the anteromedial surface through the Henry approach.

Surgically, Henry approach starts from the deltopectoral groove and reaches up to the cubital fossa with a slight curvilinear pattern around the bicep brachii muscle. The approach utilizes an internervous plane between the musculocutaneous and radial nerve. The radial nerve crosses the lateral intermuscular septum in the mid-arm is at close proximity to the humerus shaft. This nerve is at risk particularly as it passes the radial groove on the humerus bone during mid and distal third shaft fractures.[9]

Information regarding gender, age, contact number, address, and injury to the radial nerve as determined by clinical examination on the 1st postoperative day & after 3 months was entered in proforma. Patients in both groups were operated on by the same orthopedic surgeon and team. The iatrogenic radial nerve injury during application of plate on humerus shaft either on the anterolateral or anteromedial surface was assessed clinically on the first postoperative day. The patients in which radial nerve was affected, were unable to extend the fingers due to the effect on nerve supply of extensor digitorum muscle. Nerve conduction studies and electromyographic studies were only required if the injury persisted beyond 3 months.

STATISTICAL ANALYSIS

The data was analyzed by using Statistical Package for the Social Sciences (SPSS) version 25. Mean & standard deviation was calculated for age. Frequency and percentage were calculated for all qualitative variables like gender and radial nerve injury. Chi-square test was applied to compare radial nerve injury in both groups, between two age groups, and in males & females. A p-value of ≤ 0.05 was considered as significant.

RESULTS

Mean age was 34.79±9.73 years in group A and 32.76±8.01 years in group B. In group A, 31(77.5%) and 34(85%) in group B were between 18-44 years of age whereas 9(22.5%) in group A and 6(15%) in group B were between 45-70 years of age. Thirty (75%) patients in group A and 26(65%) in group B were males and 10(25%) in group A and 14(35%) in group B were females.

In group A, 8(20%) patients had radial nerve injury and 32(80%) patients did not have nerve injury. In group B, only 1(2.5%) had radial nerve injury and 39(97.5%) had no findings of the nerve injury (Figure 1).

A statistically significant difference was found when postoperative iatrogenic radial nerve injury was compared in both groups (p-value=0.02). At 2nd follow-up after three months of surgery, radial nerve injury in eight patients (100%) of group A and one (100%) of group B was settled.

Table 1 shows the stratification of radial nerve injury according to age & gender. No statistically significant difference was found when radial nerve injury in males & females and between two age groups were compared.

DISCUSSION

Humeral shaft fractures account for 3-5% of orthopedic surgeries. The gold standard for operative management is plate osteosynthesis. The most commonly used approach was described by Henry. Using Henry approach, anterolateral or anteromedial dissection is carried out. The radial nerve is the extension of the posterior cord of the brachial plexus. The nerve traverses the spiral groove and processes lateral intermuscular septum to enter in the anterior compartment. This nerve is susceptible to injury at this level.[9] In this study, iatrogenic radial nerve injury after the operative management of midshaft humerus

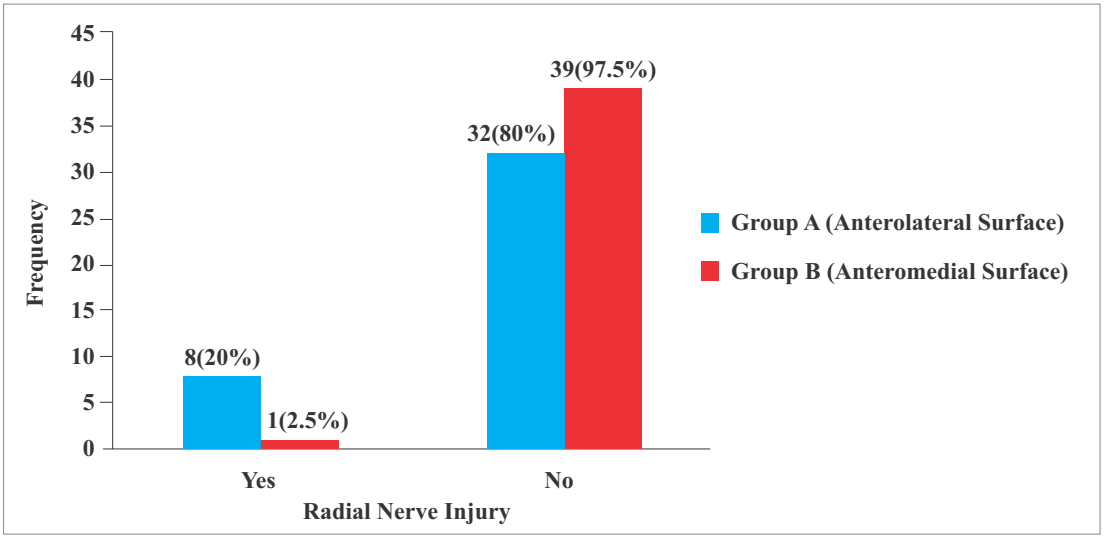

Figure 1: Comparison of Radial Nerve Injury in Group A & B

Table 1: Stratification for Radial Nerve Injury in Study Groups according to Age and Gender

Variables		Group	Radial Nerve Injury		p-value
			Yes	No	
Age (Years)	18-44	A	7	24	0.006*
		B	0	34	
	45-70	A	1	8	0.71
		B	1	5	
Gender	Male	A	6	24	0.11
		B	1	25	
	Female	A	2	8	0.08
		B	0	14	

* *Significant p-value*

fracture with dynamic compression plate applied on anterolateral or the anteromedial surface of the humerus was compared.

The results of our study showed that out of 40 cases in each group, 31(77.50%) in group A and 34(85.00%) in group B were between 18-44 years of age whereas 9(22.50%) in group A and 6(15.00%) in group B were between 45-70 years of age. Mean age was 34.79±9.73 years in group A and 32.76±8.01 years in group B. Regarding gender, 30(75.00%) in group A and 26(65.00%) in group B were males and 10(25.00%) in group A and 14(35.00) in group B were females. On comparison of radial nerve injury in management of midshaft humerus fracture with dynamic compression plate on anterolateral with the anteromedial surface through Henry approach, 8(20.00%) in group A and 1(2.50%) in group B had radial nerve injury (p-value was 0.02), which was settled within 3 months.

Another study conducted in Pakistan showed that radial nerve injury is lower in patients treated with anteromedial plating as compared to anterolateral plating through the Henry approach.[10] A study conducted in India showed that 10.6% of patients treated with anterolateral approach had radial nerve palsy, whereas, radial nerve palsy was not seen in any patient treated with an anteromedial approach.[11]

A study was carried out on 150 patients with fractures of the humerus shaft. One hundred and thirty patients were males with a mean age of 38±5.6 years. These findings are consistent with our study which showed

that the mean age was 34.79±9.73 years in group A and 32.76±8.01 years in group B. The fracture of the humerus shaft was more common in males, which is also consistent with our results. There was no documented radial nerve palsy in any of the patients after surgery using anteromedial plating. This finding is also consistent with our results, which showed a lesser degree of radial nerve injury with anteromedial plating. They concluded that anteromedial plating is easier and quicker fixation is achieved as compared to anterolateral plating. This study also concluded that the risk of radial nerve palsy is relatively less than anterolateral plating as it does not require radial nerve exposure.[12]

A study conducted in 2016 by Kumar et al., showed that there was no significant risk of iatrogenic radial nerve palsy using anteromedial plating. The mean age group of the patients included in this study was also similar to our results. This was a prospective study and 54 patients with a fracture of the shaft of the humerus were operated on by using anteromedial plating. This study showed a lesser duration of surgery, no incidence of iatrogenic radial nerve palsy, and good functional outcome 60.5% of the patients by using anteromedial plating.[13]

In another study conducted at the Department of Orthopedics, Beijing Chaoyang Hospital, China in 2016, a comparison was done between the mechanical properties of anteromedial and anterolateral plating. They concluded that anteromedial plating was superior to anterolateral plating in all mechanical aspects and suggested that anteromedial plating is a clinically safe and effective way for humerus shaft fracture.[14]

A recent study conducted by Chu et al., concluded that the advantage of anteromedial plating includes the absence of soft tissue injury, less blood loss, shorter operation time, and a lower rate of complication including radial nerve palsy. The study focused on the geometrical analysis of the humerus and showed that torsional deformities can be reduced with proper angle adjustment by the use of medial plating.[15]

In a study by Lotzien et al., the mean age of the patients presented with midshaft humerus fracture was slightly higher than the results shown in our study. They also reported that only 3.75% incidence of radial nerve palsy using anteromedial plating which is similar to our study (2.5%).[9]

CONCLUSION

Iatrogenic radial nerve palsy is significantly lower in patients treated with dynamic compression plate on the anteromedial surface as compared to plating on the anterolateral surface through Henry approach in midshaft humerus fracture.

LIMITATIONS & RECOMMENDATIONS

The major limitations of this study was the small sample size and single study settings. In this study other surgical complications were not observed. Furthermore, randomized control trial or multi-centered study should be conducted to strengthen the results of our study.

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Original Article

Frequency of Raised C-Reactive Protein in Acute Heart Failure

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ABSTRACT

Objective: To determine the C-reactive protein (CRP) levels in patients presenting with acute heart failure.

Methodology: This cross-sectional study was conducted at Punjab Institute of Cardiology, Lahore for a period of six months after approval from the Ethical Review Committee of the Institution. Three hundred and forty five patients were enrolled in this study by non-probability consecutive sampling technique. Patients of either gender having age 18-60 years who presented in the emergency department with acute heart failure within 12 hours were included in this study. After informed consent, their venous blood samples were drawn for the measurement of CRP levels. All the data was collected on a predefined proforma. The data was entered and analyzed in Statistical Package for the Social Sciences (SPSS) version 25.0.

Results: The mean age of patients was 45.5l±10.64 years. There were 192(55.7%) males and 153(44.3%) females. The mean duration of heart failure was 6.46±3.53 hours. The mean CRP in the study patients was 6.27±4.70 mg/L. One hundred and ninety two (55.7%) patients had raised CRP while 153(44.3%) patients had normal CRP levels.

Conclusion: Increased CRP levels were seen in a higher number of patients with acute heart failure. This may be established as a significant risk factor for in-hospital mortality due to heart failure.

Keywords: *Heart failure. C-reactive protein. Inflammation.*

INTRODUCTION

Acute heart failure (AHF) is a clinical syndrome characterized by sudden worsening of shortness of breath (SOB) & fatigue. Patients usually present with signs of congestion, tachypnea, striving for more oxygen, and organ dysfunction due to hypoxic insult.[1]

Acute heart failure is a cardiac emergency that requires prompt attention and treatment. Despite a better understanding of underlying pathophysiology and advancements in the treatment, mortality remains in the range of 4 to 10%. One year mortality rate after discharge is also quite high and is up to 30%.[2] According to the Center for Disease Control and Prevention, 379,800 mortalities occurred due to heart failure in 2018 in the USA. The risk factors for cardiovascular illness have increased in the Asian population due to industrialization and organization. Hence, there is a corresponding increase in the incidence of diabetes, hypertension, and cardiovascular disease. Disease burden and mortality due to ischemic heart disease (IHD) and heart failure has also increased.[3] Inflammation plays an important role in the pathogenesis of heart failure. So, heart failure indicates low-grade inflammation in the body. Inflammatory biomarkers are raised in patients presented with acute heart failure.[4]

C-reactive protein (CRP) is an acute phase reactant and an important inflammatory biomarker. It is synthesized in the liver in response to an inflammatory stimulus.[5] A significantly higher risk for developing acute heart failure was found in patients suffering from systemic sclerosis, systemic lupus erythematosus (SLE), and rheumatoid arthritis.[6] Certain biomarkers especially Natriuretic peptides i.e. (BNP), NT pro BNP, ANP, have been studied in the management of heart failure and have secured a place for themselves in the diagnosis and prognosis of HF patients. But these are still not readily available everywhere and are relatively costly too. Among the inflammatory markers, C-reactive protein (CRP) is a protein that has been found to have a consistent association with cardiovascular diseases including HF.[7,8]

The purpose of this study was to detect the frequency of elevated CRP in acute heart failure patients and to study the association of CRP patients' characteristics like age, gender, BMI, and duration of heart failure. It is a cost-effective and widely available test. It will be helpful for the physicians in the diagnosis and management of HF patients.

METHODOLOGY

This cross-sectional study was conducted at Punjab Institute of Cardiology, Lahore from September 2018 to February 2019. After approval from the Ethical Review Committee of Institution (Letter No: RTPGME-Research/077, 09-03-2018), 345 patients were enrolled by non-probability consecutive sampling

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technique. Patients of either gender having age 18-60 years who presented with acute heart failure in the emergency department within 12 hours were included in this study. Patients with a history of acute infection, malignancy, recent trauma or surgery (<3 month), autoimmune disorders, and chronic obstructive pulmonary disease were excluded. After informed consent, their venous blood samples were drawn for the measurement of CRP levels. All the data was collected on a predefined proforma. After taking informed consent from the patients and without causing any delay in the provision of emergency treatment, all demographic and personal information was charted on a predefined proforma.

STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS) version 25.0 was used for data analysis. For qualitative variables like gender and BMI, frequency and percentages were calculated. Mean value and standard deviation was calculated for quantitative variables like age, CRP levels, and duration of heart failure. Data was stratified for age, gender, BMI, and duration of acute heart failure. Chi-square test was applied for data stratification and a p-value of ≤0.05 was taken as significant.

RESULTS

A total of 345 patients were enrolled aged 18 to 60 years, with a mean age of 45.51±10.64 years. Total of 192(55.7%) were males while 153(44.3%) were females. Duration of heart failure at the time of presentation ranged from 1-12 hours. The mean duration of heart failure was 6.46±3.53 hours. C-reactive protein was elevated in 192(55.7%) patients while 153(44.3%) had normal levels at presentation (Figure 1). The mean level of CRP was found to be 6.27±4.70 mg/L, with the lowest value being 0.1 mg/L and the highest value being 28 mg/L. One hundred and thirteen (58.9%) males and 79(51.6%) females had elevated CRP levels. No significant difference was found when CRP levels were compared according to the age groups, gender, BMI, and duration of heart failure (Table 1).

DISCUSSION

C-reactive protein is an acute phase reactant and synthesized by the liver. Acute phase reactants are plasma proteins that show a change in their serum levels during the early phases of inflammation. This phenomenon is known as acute phase reaction because of its shorter half-life and its significance in determining acute flares in a chronic inflammatory condition is high. Though historically, these reactants have been associated with acute infections or autoimmune disorders, studies have suggested the association of CRP with ischemic heart disease and heart failure as well. The mechanism of its rise in acute heart failure is still unknown.[7,9] Literature shows that during hypoxic stress interleukin-6 is released from endothelial cells and monocytes, which leads to increased levels of CRP in the body.[8]

Our results showed that the mean level of CRP was 6.27±4.70 mg/L and CRP was raised in 192(55.7%) patients. Kausadikar et al. studied the role of CRP in ST-elevation myocardial infarction (STEMI) patients and found raised CRP levels in 34% patients with heart failure. They concluded that higher levels were associated with lower ejection fraction (EF) (i.e. <40%) and higher mortality.[9] Stumpf et al. studied the

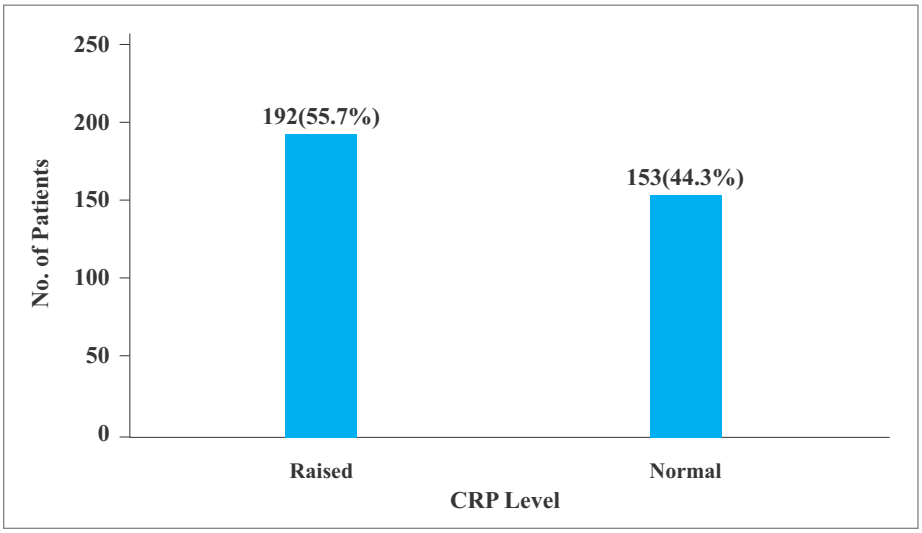

Figure 1: CRP Levels in Patients

Table 1: Distribution of Raised CRP Patients in association with Age Groups, Gender, Duration of Heart Failure, and BMI

Variables		Raised CRP		Total	p-value
		No	Yes		
Age Groups (Years)	18-40	48(40.7%)	70(59.3%)	118(34.2%)	0.323
	41-60	105(46.3%)	122(53.7%)	227(65.8%)	
Gender	Male	79(41.1%)	113(58.9%)	192(55.7%)	0.180
	Female	74(48.4%)	79(51.6%)	153(44.3%)	
Duration of Heart Failure	<6 hours	66(45.8%)	78(54.2%)	144(41.7%)	0.638
	6-12 hours	87(43.3%)	114(56.7%)	201(58.3%)	
BMI	Obese	66(39.3%)	102(60.7%)	168(48.7%)	0.065
	Non-Obese	87(49.2%)	90(50.8%)	177(51.3%)	

role of CRP as a predictor of heart failure in STEMI patients. They reported that the higher peak CRP level after 48 hours of the event is associated with a higher incidence of heart failure. It also showed higher cardiovascular mortality in the first year post-STEMI.[10] Another study by Al Aseri et al., in 2019 concluded that high-sensitivity C-reactive protein (hs-CRP) is associated with heart failure after STEMI.[11] The results of these studies strengthen the present study results. Polyakova et al. studied the role of CRP in acute myocardial infarction and found a linear correlation between it and infarct size. Also, higher CRP levels predicted a higher incidence of complications including recurrent acute coronary syndrome (ACS), arrhythmias, and heart failure.[12]

Our study showed a higher trend of raised CRP in male patients (58.9%) as compared to females with acute HF (51.6%). Another study showed that higher CRP levels were found in males as compared to females.[13] Khera et al. studied the race and gender effect on CRP level and found that black ethnicity and females had higher levels of CRP as opposed to white ethnicity and men.[14] The association of gender with raised CRP is still controversial.

According to this study, CRP levels were raised in young patients aged between 41-60 years and no significant correlation was seen between BMI with raised CRP levels. In a study by DuBrock et al., in 2018, it was seen that the high CRP levels were associated with the middle age and higher body mass index.[15] These results are in contrast to the present study.

CONCLUSION

C-reactive protein levels were found to be elevated in a significant number of acute HF patients. This may be established as a significant risk factor for in-hospital mortality due to heart failure. Particular attention should be given to prior management in the presence of raised CRP levels in acute heart failure patients.

LIMITATIONS & RECOMMENDATIONS

Our study was limited to the measurement of CRP levels merely at presentation. Future studies should focus on sequential CRP levels that will help to determine when the CRP levels peak in acute heart failure patients. Also, it would tell if a linear correlation exists between declining levels of CRP and clinical improvement so that recovery could be monitored using serial CRP levels. A multi-centered study with a higher number of patients should be conducted. After carefully excluding other possible causes of higher CRP via clinical history and examination, this marker can be used to detect HF patients who would require more intensive therapies during the hospital stay and also postdischarge. More studies are required to detect long-term prognostic implications of this marker in our population. Ultimately, this will lead to studies on the institution of drugs that would specifically target inflammatory markers in HF patients to improve survival.

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Original Article

Comparison of Efficacy, Safety, and Patient Satisfaction with Tranexamic Acid Mesotherapy versus Ascorbic Acid Mesotherapy in Melasma

Uzma Ahsan

ABSTRACT

Objective: To determine the efficacy, safety, and patient satisfaction with tranexamic acid mesotherapy versus ascorbic acid mesotherapy in melasma.

Methodology: It was a quasi-experimental study conducted in the Department of Dermatology, Sharif Medical & Dental College, Lahore, after taking approval from the Institutional ethical committee. Eighty patients of either gender with melasma of any type (epidermal, dermal, or mixed) with Fitzpatrick skin type IV & V were enrolled in the study by non-probability convenient sampling technique. Patients were divided into two groups A & B, each group included 40 patients. Group A had tranexamic acid in mesotherapy and in group B mesotherapy was done with 20% ascorbic acid. Melasma severity score was calculated before and after each session using melasma area and severity index (MASI) score. The procedure was performed every 6 weeks, with a total of 3 sessions. Patients were followed-up after 6 weeks of the last treatment session to see any change in MASI score. The efficacy of the products used was assessed by comparing pretreatment MASI scores with posttreatment scores. Safety was established by assessing the side effects and observing the degree of tolerability to the products used. Patient satisfaction was evaluated using the Likert scale.

Results: In group A, 32(80%) patients responded effectively (>50% reduction in MASI score) whereas in group B, ascorbic acid mesotherapy was effective in 24(60%) of the patients. The difference in responses was statistically significant ($p < 0.05$). Overall, the MASI score of both groups also declined. In group A, only 6 patients had complaints of mild irritation and burning over the treated areas, which subsided in a few days. In group B, 4 patients had transient itching after the procedure that settled with the use of emollients. Patients in group A were more satisfied as compared to group B.

Conclusion: Tranexamic acid mesotherapy is more effective as compared to ascorbic acid mesotherapy in patients with melasma.

Keywords: *Melasma. Ascorbic acid. Mesotherapy. Tranexamic acid.*

INTRODUCTION

Melasma is chronic hyperpigmentation affecting the face symmetrically.[1] It presents as dark brown hyperpigmented patches, which become more prominent after solar exposure. It has a prolonged and reverting course, frequently associated with low self-esteem, despair, and frustration in patients. Affected patients usually suffer from a significant psychological impact due to this discoloration.[2] Management of this chronic disorder is frequently pressing. It is of utmost significance to understand the chronic, resistant, and relapsing nature of the disease along with the provision of guidance to the patient about the importance of photoprotection, iron deficiency, hormonal disproportion, and other factors, before initiating any invasive therapy. This chronic cutaneous hyperpigmentation is frequently resistant to various therapies and management is challenging and frustrating both for the patient as well as for treating physicians.[3] Melasma is classified into epidermal, dermal, and mixed types, based upon Wood's lamp examination. Melasma area and severity index (MASI) score is used to assess the severity of melasma. A variety of options are available for the management of this chronic relapsing disorder, which include topical therapies as well as oral and procedural options. Commonly used procedures include chemical peeling, microinjections, and lasers.[4] Mesotherapy has been introduced recently in the management of a variety of dermatological disorders. The technique involves a minimally invasive, non-surgical method of drug delivery intradermal.[5] Apart from melasma, it has shown promising results in skin rejuvenation, androgenetic alopecia, and body contouring.[6] Using mesogun and meso needles the drug is delivered intradermal to produce the desired effect. A variety of agents are being used with mesotherapy in the management of melasma with variable results.[7] Owing to variation in skin types and increased risk of post-inflammatory hyperpigmentation, in darker skin types, the results cannot be precisely applied in the local context. The two most common agents used in mesotherapy are tranexamic acid (TA) and ascorbic acid. Recently, tranexamic acid has been used as an innovative treatment for melasma.[2]

Tranexamic acid employs anti-pigmentary effects via

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its inhibiting UV light-induced plasminogen activator and plasmin activity. Following UV radiation, the synthesis of plasminogen activator by keratinocytes is induced, resulting in the amplified conversion of plasminogen to plasmin. Plasminogen activator itself leads to increased melanin synthesis by inducing tyrosinase activity.[8] The conversion of plasmin consequences in melanogenesis and neo-vascularization due to augmented production of both arachidonic acid and fibroblast growth factor by plasmin.[3] By inhibiting plasminogen activation, tranexamic acid lessens UV melanogenesis and neovascularization produced by exposure to ultraviolet light.[2] Ascorbic acid exerts its anti-pigmentary effects via its antioxidant effects and on its effect on tyrosinase inhibition.[9] It has shown its efficacy when given intravenously in a variety of ailments like recurring infections, malignancies, ischemic heart disease, rheumatologic, and metabolic disorders. It promotes healing in fractures, wounds, ulcers, and pressure sores as well.[10] Anti-pigmentary effects of ascorbic acid are due to its ability to chelate copper ions, resulting in inhibition of intracellular enzymatic steps obligatory for pigmentation. Owing to its hydrophilic and unstable molecule, it possesses poor penetration into the skin due to the hydrophobic stratum corneum. Additionally, the negatively charged structure of ascorbic acid limits its penetration.

In the local context, TA mesotherapy has been studied, but the data pertaining to efficacy & safety of ascorbic acid, its comparison with TA, and evaluation of patient's satisfaction is limited. To the best of our knowledge, it's the first study, comparing the two newer agents. Results of this comparison may provide a better understanding and insight for the selection of agents in mesotherapy based upon duration and type of melasma.

METHODOLOGY

The study was conducted in the Department of Dermatology, Sharif Medical & Dental College, Lahore after taking approval from the Institutional ethical committee (No: SMDC/SMRC/179-21, 26-03-2021). The study was conducted from April to September 2021. It was a quasi-experimental study. A total of 80 patients were included in the study, using the non-probability convenient sampling technique. Patients were divided into two groups A & B, each group included 40 patients. Group A had TA in mesotherapy and group B mesotherapy was done with 20% ascorbic acid. The sample size was calculated by using the WHO calculator for groups for the difference in the proportion of 20% between the groups giving the significance of 0.05 and power of 80%. Patients with Fitzpatrick skin type IV & V on physical examination, between ages 18-40 years, having melasma (epidermal, dermal, or mixed type under Wood's Lamp examination), and who had not responded to at least one of the topical treatments for melasma in past 6 months were included. Patients on oral contraceptive pills, pregnant and lactating females, those with active acne, herpes simplex infections, keloid or hypertrophic scars at the site of melasma were excluded from the study, due to the possibility of worsening of the disease after the procedure. Patients on systemic steroids from the last 6 months, vitiligo, history of photosensitivity, and patients with a history of bleeding disorder were also excluded. A written and informed consent was taken from the patients after explaining the procedure in detail. A detailed personal, medical, and family history was taken. Melasma severity score was calculated before and after each session using melasma area and severity index (MASI) score. This was used to quantify the severity of melasma and changes observed during therapy.

After gentle cleaning, topical anesthetic 10.56% lidocaine cream (LeedFrost)^{R} was be applied over the area to be treated for about 30-40 minutes, to produce an adequate numbing effect. Photographs were taken before and after treatment, with the patient's consent. In group A, injection Transamine of 500 mg/5 ml ampoule was be used. It was diluted in an insulin syringe of 100 IU with normal saline to give strength of 4 IU (4 mg) of TA and 96 IU of normal saline.[2] Pure L-ascorbic acid 20% (locally dispensed in pharmacy) was used all over the affected area in patients of group B. In both groups, multiple microinjections were given on patches of melasma. The patients were advised to follow protecting measures against sunlight and use sunscreens with sun protection factor SPF 50+ even at home. The procedure was performed every 6 weeks, with a total of 3 sessions. Patients were followed-up after 6 weeks of the last treatment session to see any change in MASI score. Since the treatment protocol for mesotherapy is still under debate, we performed every 6 weeks, with a total of 3 sessions to allow for full recovery in between the sessions. Patients were evaluated for any complications such as infection, irritation, peeling, and redness. The efficacy of the products used was assessed by comparing pretreatment MASI scores with posttreatment scores. Fifty percent or greater reduction in MASI score after 3 treatment sessions were considered to be effective. Safety was established by assessing the side effects and observing the degree of tolerability of the products used. Patient satisfaction was evaluated using a Likert scale of 1-5, (1=extremely satisfied, 2=satisfied, 3=moderately

satisfied, 4=dissatisfied, 5=extremely dissatisfied).
Percentages of the respondents in grade 1 & 2 were combined to be categorized as extremely satisfied, grade 3 was taken as moderately satisfied and respondents in grade 4 & 5 were combined in the category of extremely dissatisfied.

STATISTICAL ANALYSIS

Data entry and analysis was done using Statistical Package for the Social Sciences (SPSS) version 23. Categorical data was presented by using mean and SD. Frequencies and percentages of efficacy, safety, and patient satisfaction to treatment in both groups were reported. Data was stratified for duration of disease in both groups and then compared using the Chi-square test. Improvement in MASI score was compared by independent t-test. A p-value of ≤0.05 was taken as significant.

RESULTS

The demographic details of patients in both groups are mentioned in Table 1. In group A, 32(80%) patients responded effectively (>50% reduction in MASI score) whereas in 8(20%) patients TA mesotherapy was not effective. In group B, ascorbic acid mesotherapy was effective in 24(60%) of the patients while in 16(40%) patients treatment was not effective. The difference in responses was statistically significant (p <0.05). Overall, the MASI score of both groups also declined 6 weeks after the last session. Pretreatment scores declined from 18.78±10.32 to 5.44±2.11 in group A, and from 19.44±12.41 to 7.44±5.21 in group B (Table 2). A statistically significant difference was found in both groups, when pretreatment MASI score was compared to posttreatment score after 6 weeks (p-value=0.0001).
The data was stratified based upon the duration of disease. The patients with a longer duration of disease (>2 years) had significantly less response compared to opposites in both the groups (Table 3).
Safety was established by evaluation of side effects. In group A, only 6 patients had complaints of mild irritation and burning over the treated areas, which subsided in a few days. In group B, 4 patients had transient itching after the procedure that settled with the use of emollients. At the end of 3 sessions, the patient's satisfaction was calculated.
In group A, 28(70%) patients were extremely satisfied, 10(25%) were moderately satisfied, and 2(5%) were dissatisfied. In group B, 20(50%) patients were

Table 1: Demographic Details of Study Groups

Study Variables		Group A	Group B
Gender	Male	12	14
	Female	28	26
Mean Age (Years)		22.07±4.003	29.27±3.071
Mean Duration of Disease (Years)		11.43±1.340	10.87±1.320

Table 2: Comparison of Pretreatment and Posttreatment MASI Scores in Group A & B

Study Groups	Pretreatment	Posttreatment	p-value
A	18.78±10.32	5.44±2.11	0.0001*
B	19.44±12.41	7.44±5.21	

**Significant p-value*

Table 3: Stratification of Data on the basis of Duration of Melasma

Group	Duration of Disease (Years)	Number of Patients	Effective n(%)	Not Effective n(%)	p-value
A	<2	31	29(72.5%)	2(5%)	<0.05
	>2	9	3(7.5%)	6(15%)	
B	<2	28	22(55%)	6(15%)	
	>2	12	2(5%)	10(25%)	

extremely satisfied, 15(37.5%) were moderately satisfied, and 5(12.5%) were dissatisfied respondents (Figure 1).

DISCUSSION

Melasma is a chronic disorder of hyperpigmentation. It generally has a chronic and relapsing course and affected individuals are frequently depressed and stressed.[1] A variety of management options are available for this condition but the results are highly variable. Various topical and invasive treatment modalities are available across the globe with variable results.[2] Various agents have been used in mesotherapy for the management of melasma. Literature review reveals that tranexamic acid and ascorbic acid have been used either alone or in combination with peeling agents in patients with melasma, with variable results. In this study, we compared tranexamic acid mesotherapy with 20% ascorbic acid in mesotherapy in patients with melasma. This study showed that the duration of melasma ranged from 1 to 10 years. According to results, 80% of the patients treated with tranexamic acid mesotherapy had an effective response, while those with ascorbic acid mesotherapy had a 60% success rate in terms of decline in MASI score.

Kaleem et al. reported a significant reduction in MASI score with tranexamic acid mesotherapy. They reported a significant decline in the mean score ($p < 0.05$). They also reported minimal side effects from this agent and declared it to be a safe and cost-effective therapy for the management of this chronic disorder.[2] The results of this study were in accordance with the current study, as it was found that average MASI scores in the TA group was 18.78±10.32 prior to the treatment sessions and dropped down to 5.44±2.11 after 3 mesotherapy sessions, representing a drop by 14.22(68.11%) in the MASI scores of this group.

Ascorbic acid formulations have been introduced in the recent past and are extensively utilized in mesotherapy; however, data pertaining to its safety and efficacy in the management of melasma is limited.[11]

Literature review reveals that most of the studies are limited to the role of a topical form of ascorbic acid in the treatment of melasma. Iraji et al. compared a cocktail of TA, ascorbic acid, and glutathione with TA and ascorbic acid cocktail, in a split-face, double-blinded randomized controlled trial. Improvement was more in the triple agent-treated group, however, the colorimetric comparison was similar in both the groups.[5] McKesey et al. conducted a systematic literature review of all the treatment options available for melasma. He reported that oral tranexamic acid may be a safe, systemic adjunctive treatment for melasma and suggested more studies to establish its efficacy.[12] Lueangarun and colleagues reported significant efficacy of TA mesotherapy in patients with melasma, however, at 48 weeks follow-up majority of the patients developed recurrence.[13] Balevi et al. used salicylic acid peel and compared it with salicylic acid peeling combined with ascorbic acid mesotherapy in patients with mixed types of melasma. He reported a significantly better outcome in terms of improvement of MASI score in the ascorbic acid treated group.[14] Our study found an effective response by the intradermal application of ascorbic acid. Karrabi et al. compared topical cysteamine 5% cream with TA mesotherapy in patients with melasma and reported significantly better results in the group treated with TA.[15]

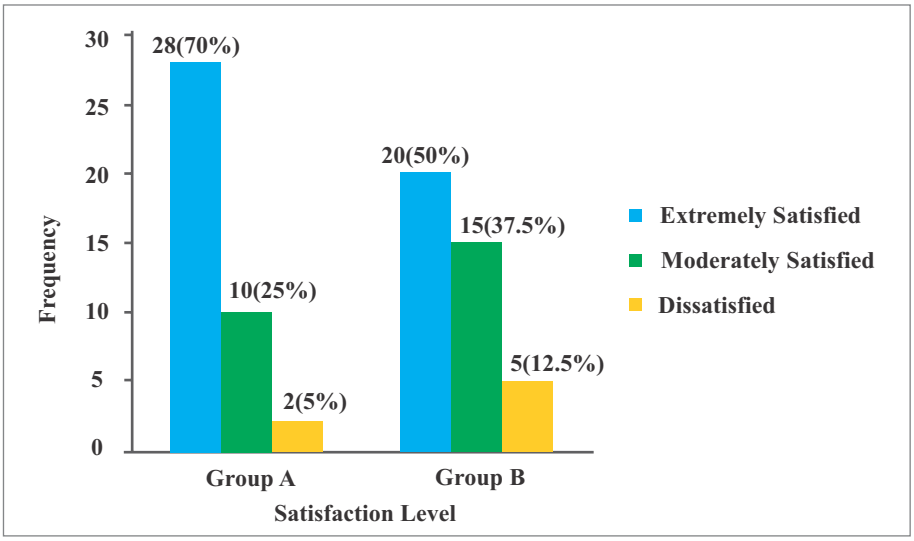

Figure 1: Patients' Satisfaction with therapy

CONCLUSION

Both tranexamic acid and ascorbic acid mesotherapy are safe and effective management options for the treatment of melasma. Tranexamic acid, however, is significantly better in terms of reduction in MASI scores.

LIMITATIONS & RECOMMENDATIONS

The study needs to be seen in the context of its limitations. The study included a small sample size and was conducted at a single center with a short-term follow-up. However, the accordance of the results with those from across the globe suggests the generalizability of the results. Further research to evaluate the efficacy of other treatment modalities like lasers or other agents combined with TA or ascorbic acid mesotherapy is recommended.

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Original Article

Different Contraceptive Choices among Married Couples: A Study in a Tertiary Care Hospital of Lahore

Amara Usman Tahseen, Muhammad Naeem

ABSTRACT

Objective: To assess the different contraceptive choices among married couples visiting the Gynecology & Obstetrics Outpatient Department in a tertiary care hospital, Lahore.

Methodology: It was a descriptive cross-sectional study conducted in Hayat Memorial Hospital, Lahore. The study analysis was performed among married couples who attended Gynaecology and Obstetrics OPD of the hospital from January to September 2021. A total of 362 married couples were enrolled in the study by non-probability purposive sampling technique. The study population included couples of reproductive age between 15-45 years who gave informed consent. Women with a history of hysterectomy and those with suspected cases of infertility were excluded from the present study. After informed consent, data was collected from married couples using a preformed questionnaire. The questionnaire had questions regarding practices of couples for different contraceptive choices and reasons.

Results: The mean age of the study population was 28±1.5 years. Knowledge of contraception practices was found in 347(96%) women whereas 15(4%) were not aware of the use of contraceptives. Three hundred and twenty six (90%) couples were practicing contraceptives and 36(10%) were not using any contraceptives. The most common reasons to avoid contraceptives were pressure from family members or husbands in 19(5.3%), unawareness about contraceptives was found in 11(3%), and religious beliefs were the reason in 6(1.7%) women. One hundred and ninety five (53.9%) couples were using male condoms, 21(5.8%) hormonal injections, 32(8.8%) contraceptive pills, 50(13.8%) intrauterine contraceptive devices, and 20(5.5%) were with bilateral tubal ligation.

Conclusion: Knowledge and awareness regarding contraceptive use was 95% in females. The most common method of contraception was male condoms.

Keywords: *Contraceptives. Family planning. Condoms.*

INTRODUCTION

There is an alarming situation in developing countries due to the increasing population. Many countries have controlled the growth rate and some of them have negative growth rate now. India is expected to leave China behind in the growth rate by 2050.[1] Pakistan has significant challenges in terms of population growth.[2] Fertility rate and prevalence of contraception have remained unmarkable with very ineffective and slow improvements during the last two decades.[3] Pakistan is the 5th most populated country in the world. The current population of Pakistan is almost 220 million and the growth rate of the country is around 1.9%.[4]

The total fertility can be reduced in Pakistan up to 3.0 births per woman by controlling 15% of unwanted births. The required level of family planning in Pakistan is 55.5% with a 35% contraceptive prevalence rate and 20% unmet need. For reproductive health and maternal services, the government has set up a population welfare program in Pakistan.[5] Fertility is an essential element that defines better health and economic recovery. The reduction in fertility, child, and maternal mortality has a remarkable association. South Asia has a 54% mean contraceptive prevalence rate whereas Pakistan has 35%. The awareness of family planning and counseling is a major task suggested to lady health workers of the National Programme for Family Planning and Primary Health care. These lady health workers are serving almost 66-73% of women of the remote and rural population.[6]

The family planning practices guide married couples about various definite objectives like maintaining birth spacing, proposing wanted birth, preventing unwanted birth, and determining the number of children in the family. Oral contraceptives and condoms are the most commonly used methods in developed countries.[7] The situation is somewhat different for developing countries. Among the contraceptive methods used, condoms are 11%, intrauterine contraceptive devices (IUCDs) stand at 30%, male sterilization is 4%, oral contraceptives pills account for 12%, and female sterilization makes 36% in developing countries. There are always certain doubts and barriers regarding the use of contraceptive choices such as fear of side effects, which reflects a lack of knowledge for safety and use of contraceptive choices.[8]

The population pyramid in Pakistan gives a broad base and there is a need to work on contraceptive usage with family planning, and to improve policymaking for

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health planning. The present study was conducted to assess the different contraceptive choices among married couples visiting the Gynecology & Obstetrics Outpatient Department in a tertiary care hospital, Lahore.

METHODOLOGY

It was a descriptive cross-sectional study conducted at Hayat Memorial Hospital, Lahore. The study included married couples attending the Gynecology and Obstetrics patients' outdoor of the hospital for a period of 9 months, from January to September 2021 (Letter No: IRB-UOL-FAHS/747/2020, 25-09-2020). Non-probability purposive sampling technique was used to select a total of 362 married couples visiting the outdoor department of the hospital. The study population included couples of reproductive age between 15-45 years who gave informed consent. Women with a history of hysterectomy and those with suspected cases of infertility were excluded from the present study. After informed consent, data was collected from married couples using a preformed questionnaire. The questionnaire included demographic information, knowledge regarding contraception, questions regarding practices by couples for different contraceptive choices, and also the reasons for not using contraceptives. The questionnaire was validated by a pilot study conducted on 20 participants.

STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS) version 25 was used to analyze the data. Categorical data was presented as frequency & percentage. A p-value ≤ 0.05 was taken as significant.

RESULTS

The mean age of the study population was 28±1.5 years and age ranged from 26 to 30 years. Knowledge of contraception practices was found in 347(96%) women whereas 15(4%) were not aware of the use of contraceptives (Figure 1). Two hundred and fifty (69.1%) women got awareness and knowledge from doctors, 47(13%) from relatives, 44(12.2%) got from lady health workers, and 6(1.7%) from local health care centers.

Three hundred and twenty six (90%) couples were practicing contraceptives and 36(10%) were not using any contraceptives. The most common reason to avoid contraceptives was pressure from family members or husbands in 19(5.3%), unawareness about contraceptives was found in 11(3%) and religious beliefs were the reason in 6(1.7%) women. The most favorable method was a male condom. Table 1 shows that 195(53.9%) couples were using male condoms, 21(5.8%) hormonal injections, 32(8.8%) contraceptive pills, 50(13.8%) intrauterine contraceptive devices, and 20(5.5%) were with bilateral tubal ligation. Regarding reasons to choose a specific contraceptive method, couples who were using contraceptives on doctor's instructions were 103(32%) and 99(30%) chose a particular contraceptive just because of its cost. Reasons to choose a specific contraceptive method are tabulated in Table 2.

DISCUSSION

Pakistan has the second-highest fertility rate in South Asia and its increasing population growth presents a significant challenge for the country's path to progress and development.[9] Modern contraceptive methods only account for a slow-rising (26%) use in Pakistan which is further lowest in the underserved areas (<20%), with a high unmet need for family planning (20%).[10]

This study was carried out to assess the different contraceptive choices among married couples visiting the Gynecology & Obstetrics Outpatient Department

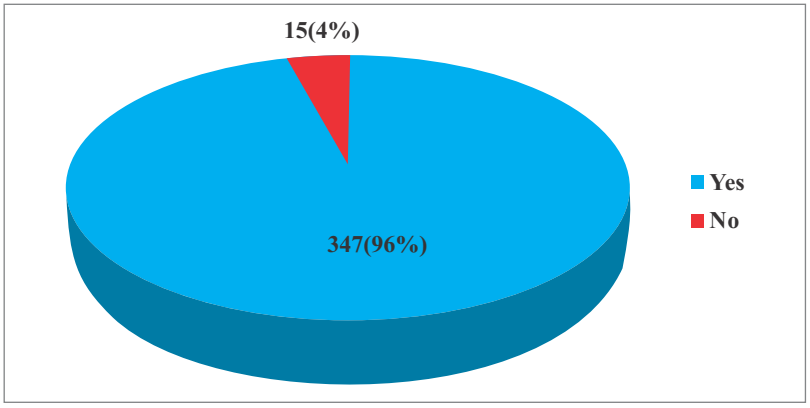

Figure 1: Knowledge regarding Contraceptive Methods among Study Subjects

Table 1: Distribution regarding Types of Contraception Usage

Types of Contraception	Frequency	Percentage
Male Condom	195	53.9%
IUCDs	50	13.8%
Oral Contraceptive Pills	32	8.8%
Hormonal Injections	21	5.8%
Bilateral Tube Ligation	20	5.5%
Implant	3	0.8%
Withdrawal Method	3	0.8%
Emergency Contraceptive Pills	2	0.6%
Not Using any Contraceptive	36	9.9%
Total	**362**	**100%**

Table 2: Reasons to Choose a Specific Contraceptive Method

Choice of Specific Contraceptive Method	Frequency	Percentage
Easy to Use	38	12%
Preference of Husband	56	17 %
Preference of Doctor	103	32%
Cost of Contraceptive	99	30%
Availability	6	2%
Family Complete	3	1%
Preference of Wife	20	6 %
Any Other	1	0%
Total	**326**	**100%**

in a tertiary care hospital, Lahore. In this study, the mean age of the study population was 28±1.5 years. In our study, 96% of couples had knowledge regarding contraceptives and 90% adopted contraception methods. Practice for barrier method was highest. The majority of the study subjects i.e. 195(53.9%) were using male condoms, 50(13.8%) were with IUCDs, 32(8.8%) contraceptive pills, 21(5.8%) were using hormonal injections, 20(5.5%) had a bilateral tubal ligation, whereas implants 3(0.8%), withdrawal method 3(0.8%), and emergency contraceptive pills 2(0.6%) were the least commonly used methods. Similar results were reported in a study by Siddiqui et al. They found that 93.4% had knowledge of contraception and 49.7% were using different contraceptive methods. Contraception is more common in educated couples. The most common choice of contraceptives was condoms (65.5%) followed by withdrawal (28.5%) and oral contraceptive pills (24.9%).[11]

The family planning is linked to Sustainable Development Goal program and a key to national and international health. Irrespective of the significance of increased use of contraceptives among married couples of reproductive age, the concern about women's reproductive health is still an issue.[12] In this study, with respect to contraception decision, the majority adopted contraceptives with the advice by their doctors (28.5%) and 27.3% due to the factor of cost, 15.5% due to husbands preference, 10.5% due to easiness, 5.5% due to wife preference, 1.7% due to the availability, and 0.3% due to other reasons. It is important to understand who promotes the information about contraception. The unawareness of contraception has a significantly

bad effect. In this study, the common sources were relatives and doctors. Two hundred and fifty (69.1%) of the women got awareness from doctors, 13% from relatives, 12.2% got from lady health workers, and 1.7% from local health care centers. In another study that was conducted in Punjab, Pakistan revealed that the common sources are the relatives, hospital/clinics, and private sectors.[13] A cross-sectional study on assessing the eligible couple's perception about family planning and contraceptive methods in Gujarat, Pakistan was conducted by Shafiq et al. The results showed that there was a positive attitude toward contraceptive usage, and the male condom was the most widely used method (85%) followed by rhythm (82%). Most of the women (90%) had awareness about contraception. The main sources were the clinic/doctors that accounted for 30%.[14] An analysis of data based on the Egypt demographic Health survey 2000 and 2008 was carried by Hamza et al. The results showed that contraceptive prevalence rates in 2000 and 2008 were 48.5% and 51.6%, respectively.[15]

In this study, the most common reason to avoid contraceptives was pressure from family members or husbands in 19(5.3%), unawareness about contraceptives was found in 11(3%), and religious beliefs were the reason in 6(1.7%) women. Another study that was conducted in a hospital in Karachi showed that the most common reasons for avoiding the usage of contraceptives were pressure from the family and religious beliefs.[16]

CONCLUSION

Knowledge and awareness regarding contraceptive use was 95% in females. The most common method of contraception was male condoms. Pressure from family members or husbands, religious beliefs, and lack of awareness regarding family planning and contraception are major factors for non-adoption of contraception.

LIMITATIONS

Respondents were selected only from one hospital, and the study included a sample size of 362 patients. Time constraints and resources were limited. Further research in different hospitals and with a larger sample size is required. Due to the prevailing scenario of COVID-19, comparison between public/private settings was not admissible.

RECOMMENDATIONS

- Motivation and communication to create awareness among couples about family planning and pregnancy spacing should be part of campaigns to encourage decision-making between eligible couples.
- Involving community leaders, religious clergyperson, and lady health workers in raising campaigns about traditional and modern methods can help address socio-cultural and religious concerns. Contraception can result in better family planning and cause an improvement in society by reducing the burden of population explosion in this part of the world.

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Original Article

Severe Mitral Regurgitation after Inferior Wall Myocardial Infarction and Coronary Artery Dominance

Kashif Zafar, Imran Abid, Zohaib Sadiq, Asim Iqbal, Nida Tasneem, Sohail Yousuf

ABSTRACT

Objective: To analyze the frequency of development of severe mitral regurgitation in patients with right or left coronary artery dominance after inferior wall myocardial infarction.

Methodology: This cross-sectional study was conducted at the Emergency Department, Punjab Institute of Cardiology, Lahore for a period of six months. Two hundred and thirty patients presenting with inferior wall myocardial infarction (IWMI) were enrolled in the study by non-probability consecutive sampling. After informed consent and emergency treatment, echocardiography, and angiography of the patients were performed. Coronary artery dominance and the presence of severe mitral regurgitation (MR) were noted. The data was entered and analyzed in Statistical Package for the Social Sciences (SPSS) version 23.0.

Results: The mean age of the patients was 52±13.73 years. There were 120(52.2%) males and 110(47.8%) females. The right coronary artery (RCA) was involved in 136(59.13%) while the left circumflex artery (LCX) was involved in 94(40.87%) of the IWMI patients. In patients having RCA as a dominant artery, severe MR was observed in 30(22.1%) while in patients having LCX as a dominant artery, severe MR was observed in 5(5.3%) cases. Out of 230 patients, heart failure was found in 107(46.5%) patients, hypertension in 114(49.6%), uncontrolled diabetes in 101(43.9%), and current smoking was found in 61(26.5%) patients.

Conclusion: Right coronary artery was the more common artery involved in IWMI. Patients with dominant RCA were more severely affected by MR as compared to the patients with LCX as dominant artery.

Keywords: *Mitral regurgitation. Coronary artery. Inferior wall myocardial infarction.*

INTRODUCTION

Cardiovascular diseases are among the leading causes of morbidity and mortality throughout the world. These diseases account for thirty percent of deaths occurring annually.[1] The number may vary among different ethnic groups and countries. This difference can be described according to the healthcare system i.e. rapid and quality treatment protocols that lead to decreased mortality. In settings lacking enough resources, short as well as long term prognostic features and characteristics are essential for the effective triage of the patients.[2,3]

Myocardial infarction is one of the major cardiovascular diseases.[4] The most common location of the myocardial infarction is the left ventricular inferior wall which is mostly supplied by the right coronary artery (RCA).[5] In about 20% of the individuals, the inferior wall of the left ventricle is also supplied by the left circumflex artery (LCX). The artery supplying blood to the ventricular walls is labeled as the dominant artery. The severity of complications varies with the dominance of either artery, secondary to the physiological mechanisms.[6]

Most of the patients with myocardial infarction report early during the course of their disease but the patients who report later might be at risk of development of mechanical complications because of weakened cardiac structured integrity leading to rupture of the interventricular septum or the rupture of the ventricular free wall or severe mitral regurgitation. The development of mitral regurgitation (MR) after myocardial infarction occurs from ruptured papillary muscle or chordae. This may lead to life-threatening emergencies.[7,8]

The current study was carried out to analyze the difference in frequency of development of severe mitral regurgitation in patients with RCA or LCX dominance after inferior wall myocardial infarction. A difference in frequency of mitral regurgitation in patients with RCA versus LCX dominance may form the basis of future research and may also help to triage the patients for more intensive care.

METHODOLOGY

This cross-sectional study was conducted at the Emergency Department, Punjab Institute of Cardiology, Lahore for a period of six months i.e. December 2017 to May 2018 after approval from the ethical review committee of the Institution (Letter No: RTPGME-Research/062, 20-10-2017). Two hundred

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and thirty patients were enrolled in the study through non-probability consecutive sampling technique after taking the informed consent. Patients of either gender, ages between 30 to 75 years, and those presenting with inferior wall myocardial infarction within 72 hours of the start of symptoms were included in the present study. Patients with a history of previous mitral regurgitation, history of previous myocardial infarction or concomitant involvement of other coronary artery areas like anterior wall or septal wall, history of renal failure (serum creatinine on admission >1.1 mg/dl), and patients with a history of rheumatic heart disease were excluded from this study. Patients were treated according to the standard departmental protocols. Severe mitral regurgitation was determined using echocardiography followed by subsequent angiography and coronary artery dominance was noted. Patient's history regarding heart failure, smoking, uncontrolled diabetes & hypertension were also noted. Patient was considered diabetic if glycosylated hemoglobin (HbA1C) was more than 6.5%. Patients with blood pressure >130/90 mmHg were taken as hypertensive. A proforma was filled for each patient, designed to mention the patients' demographics i.e. name, age, gender, and admission number.

STATISTICAL ANALYSIS

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 23.0. Continuous variables were expressed as mean±SD. Categorical data, i.e., gender, severe mitral regurgitation, and coronary artery dominance were expressed as frequencies and percentages. Data was stratified for age, gender, history of uncontrolled diabetes, hypertension, and smoking. Chi-square test was applied and a p-value of ≤0.05 was used as significant.

RESULTS

The mean age of patients was 52±13.73 years with an age range of 30 to 75 years. There were 120(52.2%) male and 110(47.8%) female patients. The frequency of co-morbid conditions of study subjects is shown in Table 1. Right coronary artery was involved in 136(59.13%) while left circumflex artery was involved in 94(40.87%) of the patients. Severe MR was observed in 30(22.1%) post-IWMI patients with RCA as a dominant artery, while 5(5.3%) cases of LCX as a dominant artery suffered from severe MR. The difference was statistically significant (p=0.001, Chi-square value=12.072) (Figure 1). Comparison of severe MR with a dominant artery in association with age, gender, heart failure, current smoking, uncontrolled diabetes, and hypertension was done (Table 2).

DISCUSSION

Acute inferior wall myocardial infarction (IWMI) occurs due to the rupture of plaque in different coronary arteries leading to the blockage of sufficient blood supply to the cardiac walls that ultimately leads to infarction. Usually, these plaques are present in the dominant artery supplying the ventricular wall i.e.,

Table 1: Demographic and Associated Co-morbid Characteristics of Study Participants

Variables		Total
Age (Years)	**Mean±SD**	52±13.73
Gender	**Male**	120(52.2%)
	Female	110(47.8%)
Heart Failure	**Yes**	107(46.5%)
	No	123(53.5%)
Current Smoking	**Yes**	61(26.5%)
	No	169(73.5%)
Uncontrolled Diabetes	**Yes**	101(43.9%)
	No	129(56.1%)
Hypertension	**Yes**	114(49.6%)
	No	116(50.4%)

Table 2: Association of Severe MR with Dominant Artery and Age, Gender, Heart Failure, Current Smoking, Uncontrolled Diabetes, and Hypertension

Variables		Severe MR	Dominant Artery		p-value
			RCA	LCX	
Age (Years)	30-50	Present	14(46.7%)	1(20%)	0.024
	51-75	Present	16(53.3%)	4(80%)	0.005
Gender	Male	Present	30(100%)	1(20%)	0.000
	Female	Present	0(0%)	4(80%)	0.011
Heart Failure	Yes	Present	16(53.3%)	1(20%)	0.007
	No	Present	14(46.7%)	4(80%)	0.026
Current Smoking	Yes	Present	17(56.7%)	1(20%)	0.001
	No	Present	13(43.3%)	4(80%)	0.104
Uncontrolled Diabetes	Yes	Present	13(43.3%)	2(40%)	0.020
	No	Present	17(56.7%)	3(60%)	0.010
Hypertension	Yes	Present	16(53.3%)	1(20%)	0.005
	No	Present	14(46.7%)	4(80%)	0.030

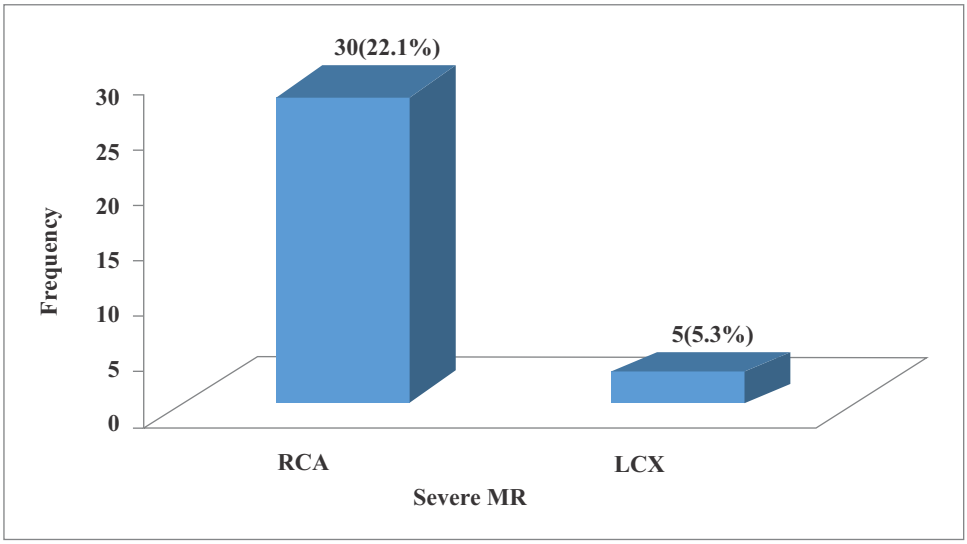

Figure 1: Frequency of Severe MR in RCA and LCX

right coronary artery (RCA) or left circumflex artery (LCX).[9] Certain complications occur in the patients who report later during their course of disease i.e. myocardial infarction. One of the complications includes mitral regurgitation developed due to ruptured chordae or papillary muscles.[10]

The current study enrolled 230 patients. The average age of the patients was 52±13.73 years with an age range of 30 to 75 years. There were 120(52.2%) male and 110(47.8%) female patients. A study conducted by Pendse et al., in 2016 enrolled 52 patients of acute inferior wall myocardial infarction, out of which, 41 were males and 11 were females. In their study, 42 patients were found to have RCA as the dominant vessel and 9 patients had LCX. They also concluded that the incidence of acute inferior wall myocardial infarction is highest in the age group of 50 to 59 years.[6] In a study by Gaude et al., it was observed that 98% of

the patients presented with severe IWMI had RCA dominance.[10] Sohrabi et al. documented that in patients presented with acute IWMI, 64.5% of the patients had right coronary artery whereas, 35.5% had left circumflex artery involvement.[11] Another study by Li et al., in 2017 demonstrated RCA to be a more commonly infarct related artery in acute inferior wall myocardial infarction as compared to the LCX.[12] The results of all these studies are comparable with the current study.

A study in 2020 observed the involvement of lesions in RCA and LCX arteries in 419 inferior myocardial infarction patients. The study showed that 14.2% of the patients had both RCA and LCX artery lesions on coronary angiography which is a contrasting finding to the present study.[13]

In our study, the dominant artery was the right coronary artery (n=136, 59.13%). These results can be compared to the study by Pendse et al., in which they noted that 80% of the patients presenting with inferior wall myocardial infarction had involvement of RCA.[6]

Our study revealed that severe MR was present in 30(22.1%) post-IWMI patients with RCA as a dominant artery, while 5(5.3%) cases of LCX as dominant artery suffered from severe MR. These results are in accordance with the study by Sohrabi et al., in which they observed 16.5% of the patients having severe MR in patients having RCA as dominant artery as compared to the 2.4% of the patients having LCX as a dominant artery.[11] Vives-Borras et al., studied ECG algorithms to differentiate RCA and left circumflex coronary artery (LCCA) occlusion in patients with acute IWMI. They reported that patients with LCCA occlusion were more likely to develop mitral regurgitation at hospital discharge.[14] This finding is in contrast to the present study. Another study in 2018 showed that left circumflex infarcts in ST-elevation myocardial infarction had a higher rate of mortality and complications as compared to RCA infarcts. The study also reported that in male patients both LCX and RCA were dominant, however, a relatively higher proportion of females were observed in the RCA group.[15] Our study results indicated that the patients having severe MR and RCA as dominant artery were only males and that no female had RCA as a dominant artery. The results are opposing to the current study.

In our study, comparison of severe MR with a dominant artery in association with age, gender, heart failure, current smoking, uncontrolled diabetes, and hypertension was done. We found that the presence of heart failure, current smoking, uncontrolled diabetes, and hypertension were strongly correlated with the presence of RCA as the dominant artery in the presence of severe MR.

The reason of right coronary occlusion leading to severe MR more frequently as compared to left circumflex artery was elaborated in the study of Labrada et al. They reported that the basic pathogenesis of MR is weakening of tensile strength of papillary muscle due to infarction, thus contributing to its early rupture.[16]

CONCLUSION

The right coronary artery is the more common artery involved in inferior wall myocardial infarction. Complications like severe mitral regurgitation are more frequent among the IWMI patients having right coronary artery dominance as compared to left circumflex artery dominance. Also, males with RCA as dominant artery are more commonly affected by mitral regurgitation post-IWMI.

LIMITATIONS & RECOMMENDATIONS

The study included patients presenting within 72 hours of the development of symptoms. Also, other prognostic factors i.e. level of CPK-MB, cardiac troponins, heart blocks, and ejection fraction were not evaluated. Moreover, we did not study the differential impact of mitral regurgitation caused by either artery dominance on LV remodeling and ejection fraction. The correction of mitral regurgitation by culprit coronary revascularization was also not observed. A more extensive study considering these limitations should be conducted.

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Original Article

Medical Students' Perception of Online Learning – A Mixed Method Study

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ABSTRACT

Objective: To investigate medical students' views and opinions about the experience of online learning during the lockdown period.

Methodology: It was a mixed method study conducted at Azra Naheed Medical College, Lahore. Students of MBBS from 1st to final year were invited to complete a self-developed online survey . Participation was solely on voluntary basis. The survey was anonymous and consisted of 15 questions with multiple options and two open-ended questions in addition to three questions about demographics.

Results: A total of 407 students participated in the study. The main problems with the online learning experience were communication difficulties, no hands-on training, internet connectivity problems, and health problems related to the extended use of electronic devices. The main advantages of online learning were being able to use other resources simultaneously, being more at ease, feeling less shy asking questions, and being able to focus more. Students' suggestions to improve the online learning experience were to upload pre-recorded video lectures, provide improved internet access, equip teachers with the necessary training, provide study materials prior to the online teaching activity, and ensure greater participation of students in online learning activities.

Conclusion: A majority of students were unhappy with online learning but a significant number found it comparable to or better than on-campus learning. Online learning can, perhaps, not replace on-campus learning but can be a useful addition to traditional medical education. The experience of online learning can be improved by incorporating students' suggestions in the development of future online learning systems.

Keywords: *Medical education. Medical students. Online learning.*

INTRODUCTION

Online learning has been gaining popularity in the last couple of decades in a variety of disciplines, including the field of medical education. As the internet has become more accessible worldwide, the possibilities of online learning have grown tremendously. Online learning involves students learning study materials at home in the form of an online lecture, tutorial, group discussion, or by watching a pre-recorded video. Many platforms are available to conduct such activities on the World Wide Web including Skype, Google Meet, and more recently Zoom.[1]

For medical or allied health sciences students, it is certainly more difficult to rely on online learning as a sole resource for learning. This is because bedside teaching/lab training is an integral part of teaching in medicine and allied health professions. Studies, however, show that students from non-medical backgrounds also report that online learning does not compare favorably to on-campus learning.[2]

In Pakistan, colleges and universities were closed nationally from the middle of March 2020 onwards due to the COVID-19 pandemic. At Azra Naheed Medical College, Superior University, Lahore we were fortunate to have an established and thriving Department of Information Technology which meant that online classes started almost immediately after the lockdown. Online activities for medical students included three video lectures daily of one hour each, followed by a ward class/small group discussion where a limited number of students joined a teacher to have an online tutorial or group discussion about a given topic.

Many studies have previously investigated the usefulness of online learning resources in medical education.[3,4] According to the literature a higher number of preclinical students access and complete the assignment in online learning.[5] Nowadays, medical students have easy availability of a wide range of quality online learning resources. Transformations in traditional teaching methods switching to online teaching are inevitable and not easy. It will be a mandatory part of medical teaching in the near future.[6]

Some students have rated online learning resources more favorably than live lectures.[7] Students generally are in favor of a blended approach to medical education but do not want online learning to replace on-campus learning.[8] This survey of medical students was conducted after students had the chance to experience the online teaching activities for more than a month. The purpose of this survey was to assess students' perception of online learning and seek suggestions to

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improve the experience in the future.

METHODOLOGY

It was a mixed method study conducted at Azra Naheed Medical College, Lahore after approval from the Institutional ethical review board (Letter No: IRB/ANMC/2020/003, 07-05-2020). Students of MBBS from 1st to final year were invited to participate in the survey. A Google survey form was developed to investigate students' online learning experience and to seek suggestions for improvement in the online learning delivery methodology. The survey consisted of 15 questions with multiple options and two open-ended questions in addition to three questions about demographics. The survey was sent to two experts in the field of medical education who found all items of the questionnaire to be relevant & clear and did not recommend striking out any of the questions. The questionnaire was validated by a pilot study including 20 students. The survey was posted in each MBBS class' official WhatsApp group and students were invited to participate in the survey. Three reminders were posted for students to complete the form. The survey was anonymous, no email ID or any information by which students could be identified was sought. The study was conducted from 15th May to 15th June 2020. The participation was solely on a voluntary basis and confidentiality of the data was ensured. None of the questions was compulsory to answer. A total of 407 students were included in this study after giving informed consent.

STATISTICAL ANALYSIS

Quantitative data generated was studied by the use of descriptive methods like frequencies & percentages. Data from open-ended questions was analyzed using recommended methods for the analysis of qualitative/semi-qualitative data in the literature.[9,10] All the data from open-ended questions was coded line by line and all the entries that expressed a similar content were grouped to make a single sub-theme. Continuous coding was performed to connect all established relationships between similar sub-themes and to develop themes. Two authors independently coded the data and the coding trees generated were compared and consolidated after extensive discussion among the authors. Results thus compiled were again reviewed by the authors once the write-up of the results section of the manuscript was completed. Triangulation of the data was ensured by using both qualitative and quantitative methods to understand students' perception of the experience of online learning as well as by using two investigators independently to interpret and analyze the data.

RESULTS

A total of 407 students responded to the survey & the response rate was 54.26%. The study included 119(29.24%) students of the final year, 60(14.74%) students of the fourth year, 44(10.81%) students of the third year, 72(17.69%) students of the second year, and 68(16.71%) students of the first year class. Some students (n=44, 10.81%) did not provide their year of study details. The study included 245(60.3%) male and 162(38.7%) female students. The individual responses of the students to the multiple choice questions are described in Table 1 and Figure 1, 2 & 3.

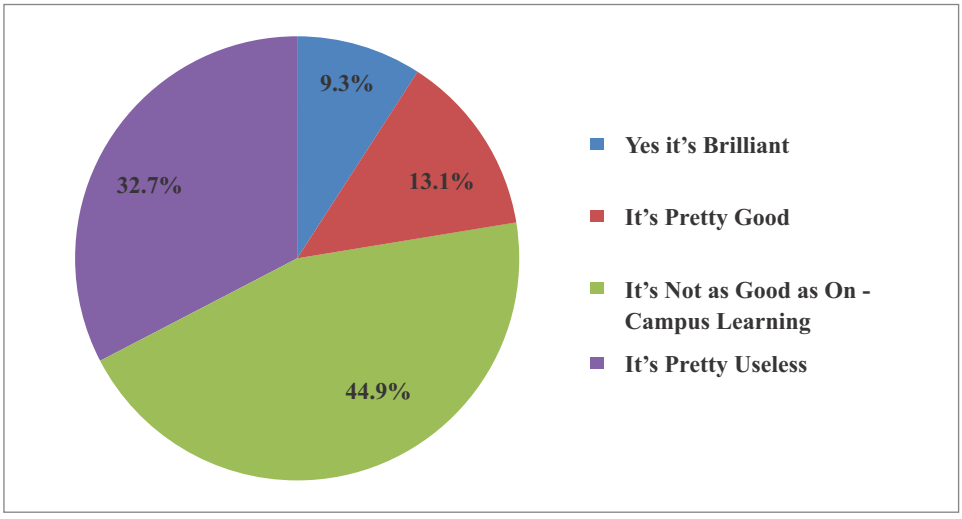

Figure 1: Online Learning/A Good Form of Learning

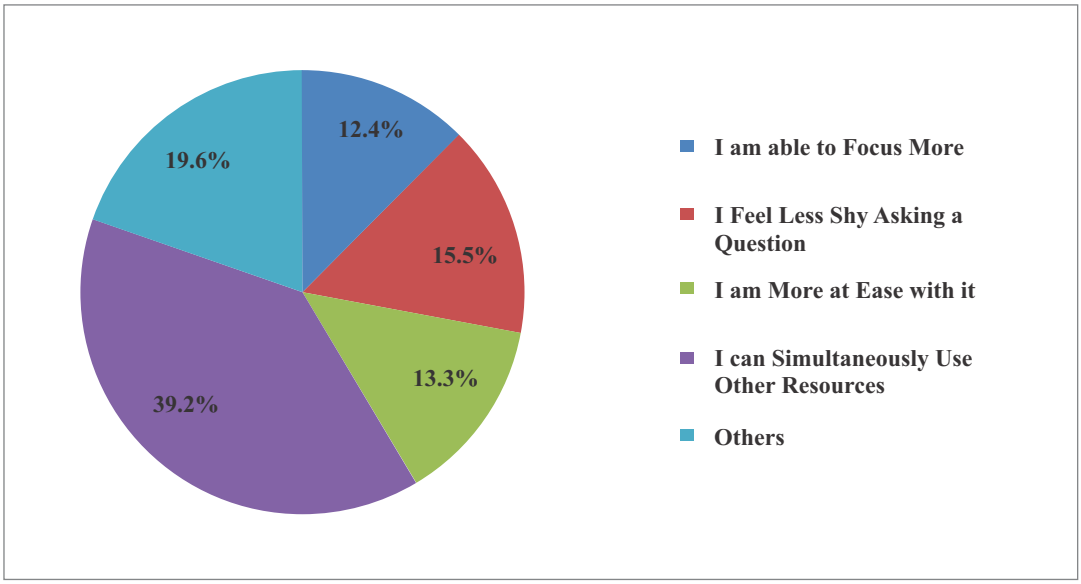

Figure 2: Good Aspects of Online Learning

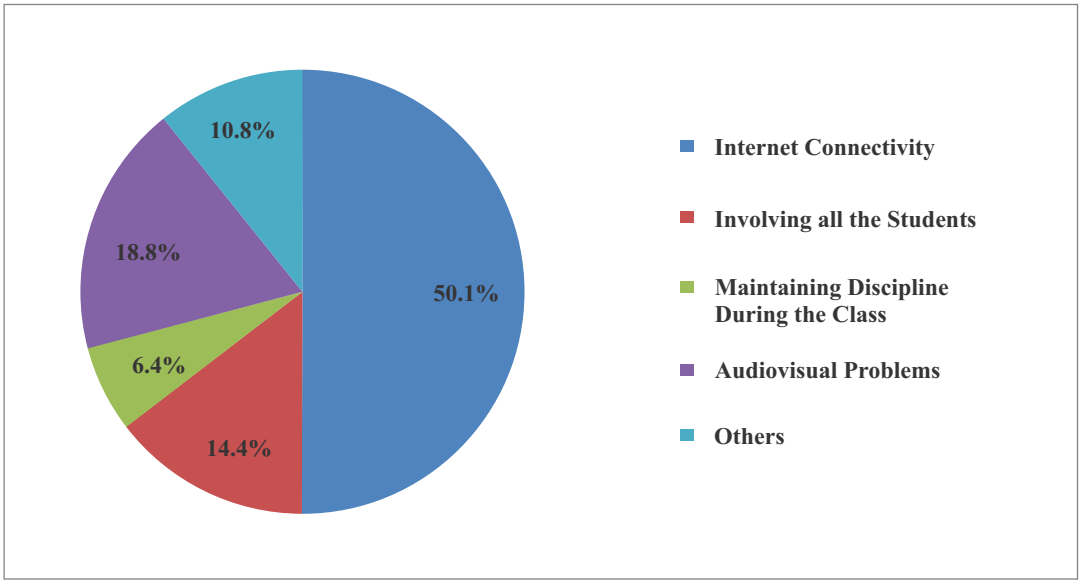

Figure 3: Online Learning/Difficult to Grasp for the Teachers

The last two questions of the survey were open-ended questions. The first question stated, "Do you have any other comments regarding online learning". The total number of words written by students in reply to this question was 6,742, while the total number of replies was 242. Four themes emerged from students' replies. These included technology related issues, pedagogy related issues, comments that exhibited unhappiness or dissatisfaction with online learning, and comments that exhibited satisfaction or a preference for the online learning experience. Major themes and sub-themes generated by students' replies to the first open-ended question are given in Table 2.

The second open-ended question was "Do you have any suggestions on how to improve the online learning experience". The total number of words written by students in reply to this question was 4,253 and the total number of replies was 188. In total, 24 valuable suggestions were offered by students. Two higher themes emerged from these suggestions for improvement; aspects that can be improved on an institution-wide basis and aspects that can be improved by teachers (Table 3).

Table 1: Responses of Students to Individual Items

Do you think online learning is a good form of learning 396(97.3%)	Yes it's brilliant	It's pretty good	It's not as good as on - campus learning	It's pretty useless				
	9.3%	13.1%	44.9%	32.7%				
Which learning method do you prefer? 394(96.81%)	Online learning		On-campus learning					
	12.2%		87.8%					
Which technique is more conducive to online learning 372(91.4%)	Being given a task	Online lecture	Audio conferencing	Video conferencing				
	22.6%	30.4%	26%	21%				
What are some of the difficulties associated with online learning? 392(96.31%)	No hands-on training	The noisy atmosphere at home	Difficulties in understanding the teacher	Difficulties in learning from other students	Others			
	31.1%	7.1%	35.5%	4.1%	22.2%			
What are some of the good aspects of online learning? 362(88.94%)	I am able to focus more	I feel less shy asking a question	I am more at ease with it	I can simultaneously use other resources	Others			
	12.4%	15.5%	13.3%	39.2%	19.6%			
Have you tried using an online discussion with your peers? 394(96.81%)	Yes	Occasionally	No	I didn't find it useful				
	21.8%	23.9%	24.4%	29.9%				
To what percentage do you think online learning is comparable to on-campus learning 394(96.81%)	It's better than on-campus learning	It's about the same	80-90% effective	70-80% effective	60-70% effective	Less than 60% effective		
	6.1%	3%	2.8%	5.1%	9.4%	73.6%		
What aspect of online learning was difficult to grasp for teachers? 389(95.58%)	Internet connectivity	Involving all the students	Maintaining discipline during the class	Audiovisual problems	Others			
	50.1%	14.4%	6.4%	18.3%	10.8%			
How well were online teaching activities executed for your class/group? 385(94.59%)	As well as they could have been	There was room for improvement	Not very well executed	Poorly executed				
	21.8%	28.1%	22.6%	27.5%				
How much time do you study by yourself after the online class? 393(96.56%)	1 to 2 hours	2 to 3 hours	3 to 4 hours	More than 4 hours				
	52.4%	22.8%	11.4%	13.4%				
How well has online teaching prepared you for the final examinations 396(97.3%)	Very well prepared	Quite well prepared	Not that well prepared	Not prepared at all				
	3.3%	12.9%	27.3%	56.5%				
Is this your first experience of online learning? 396(97.3%)	Yes		No					
	92.2%		7.8%					
If this continued for longer periods do you think it would be okay or not? 393(96.56%)	It would be definitely okay	I think my studies would suffer	I would have a hard time passing final exams	It would be very difficult to pass the exams				
	12%	19.3%	22.4%	46.3%				
Did you find yourself doing unrelated tasks (e.g. checking messages on your phone, surfing the web, etc.) during online teaching? 397(97.54%)	Quite frequently	Frequently	Not that often	Not at all				
	24.7%	27.7%	33%	14.6%				
Distraction (mind wandering) is easier in 396(97.3%)	Online learning		On-campus learning					
	83.1%		16.9%					

Table 2: An Overview of the Themes, Sub-Themes (with Extracts) Generated from Inviting Open-Ended Comments from Students about the Experience of Online Learning

Themes	Sub-Themes	Extracts from Answers
Technology related issues	• Internet connectivity • Audiovisual quality • Lack of regular tests	*"It (online learning) is very useless. Not all the students have a good internet connection because almost 60 percent of students belong from peripheries "* *"Internet connectivity is a major problem as many students are from backward areas where internet is not available. We cannot focus on lectures"*
Pedagogy related issues	• Lack of hands-on-training/bedside teaching • Health related issues due to continued use of electronic devices • Non-availability of books • Atmosphere at home • Lack of interaction • Lectures continuing beyond the allotted time	*"Using a phone for straight 5-6 hours is affecting eyesight. We become exhausted and cannot make our mind to study by ourselves"* *"When we don't have bones then how could we study the anatomy of that particular bone"*
Unhappiness or dissatisfaction with online learning		*"Please we want campus learning. Online learning is useless and if this will continue we would never pass our final examination"* *"Online learning is not useful for at least MBBS students. HOW can we learn bones without having them in hand?"*
Satisfaction or a preference for the online learning experience		*"This online learning is more attentive less interaction with my class fellows make me focus more on the class it is really helpful to us for the time being and we are enjoying it thanks for doing this all for us so our studies don't get affected"* *"Everything is going good, teachers are trying their best, university is taking a good initiative"*

DISCUSSION

There has always been a strong emphasis on hands-on training/bedside teaching in the field of medical education.[2] It was therefore not surprising that most of the students were not happy with online learning as the sole form of learning. However, there is a subset of students that find online medical education either brilliant (9.1%) or pretty good (13.1%). Also, 12.2% of the students would prefer online medical education to on-campus learning. This means that for a significant number of medical students, online learning can be a useful addition to the medical college's curricula. Perhaps the ideal curriculum would be a mix of traditional medical education and good quality online learning system where students have the choice to attend lectures or tutorials either on-campus or online, depending on their preference. Physical attendance for laboratory training/bedside teaching would, however, be mandatory for all students. A combination of traditional and e-learning, for example, can be more effective in teaching radiological interpretation skills to medical students as compared to controls.[11]

Multiple useful suggestions were given by students to improve the experience of online learning. These included uploading pre-recorded lectures on YouTube or University's learning management system, training of teachers, better internet services supervision, study materials to be provided before the online activity, implementation of online tests/viva, and demonstration of clinical skills on patients/actors by teachers during online sessions. Some of the challenges associated with online learning can be overcome by incorporating these suggestions in the development of future online learning systems.

Findings that are similar to our study were reported in an integrative review of ten papers on medical

Table 3: Themes, Sub-Themes (with Extracts) Generated from Open-Ended Comments from Students about Suggestions on How to Improve the Online Learning Experience

Themes	Sub-Themes	Extracts from Answers
Institution Related Factors	Restarting classes	*"Just open the university please, online learning is not at all supportive, MBBS CANNOT be studied with online classes. I am really depressed and worried about my final exams"*
	Break from studies	*"We request to cancel these classes and give us time so that we can study on our own. This will be better because we can focus with a relaxed mind without fear of any attendance"*
	Recorded lectures should be uploaded on video sharing platforms	*"Kindly focus more on audio and video recorded lectures from teachers instead of Zoom which is very difficult for people from the periphery and those having bad internet connections. Recorded lectures will also help us after lecture timings"*
	Shorter study hours	*"Kindly keep the scheduled time short. It is very difficult to take a class at home from 8 am-2:30 pm. It should be from 8 am-12 pm or 9 am-12 pm, and tutorials or labs should be only for two days of the week"*
	Better internet services provision	*"Proper platform should be arranged and devices with recharged internet packages should be given by the university to the students. Teachers and students should use 16 Mbps data connection for a better internet"*
	Revision/practical classes	*"Special classes should be arranged after this lockdown to cope with clinical classes"*
	Online tests	*"Teachers should try making a good online system for the test as well because tests are a necessity"*
Teacher Related Factors	IT training for teachers	*"By helping some of our teachers in managing the whole environment they must be taught some IT classes"*
	Improving attendance marking system	*"Improved system of marking attendance is required"*
	List of topics/soft copies to be provided	*"List of topics to be studied with their references from where to study them should be given"*
	Regular assignments to be given	*"Regular assignments should be given and next day it should be submitted and discussed"*
	Observing time limits	*"Kindly make some strict rules for students and teachers to be on time for class, this could reduce many of the problems regarding online learning"*
	Teachers should demonstrate clinical methods	*"For ward teaching, the facilitator must show the examination on the patient so we can easily understand as in online class patient and examination problem matters a lot so this can be solved. Moreover, it would be best to understand if the teacher is in the ward with the patient and the teacher should tell us about the important viva & OSCE questions and patterns for practical"*

education in which the main barriers to implementing online learning in medical education were time constraints, poor technical skills, inadequate infrastructure, and absence of institutional strategies.[12] A survey conducted in 30 medical colleges in India reported that the main reason students liked online classes during the COVID-19 pandemic was that they were able to learn at leisure. The main reasons students did not like online classes were network problems and lack of sufficient interaction.[13]

Our results show the main advantages of online learning were being able to use other resources simultaneously, being more at ease, feeling less shy asking questions, and being able to focus more. A qualitative study from Lahore, Pakistan which included faculty members as well as medical students reported that the advantages of online learning were comfort, accessibility, and remote learning while the disadvantages were inefficiency and lack of academic integrity.[14] A study from Saudi Arabia reported that the major issues related to online medical education were related to communication, use of technology, student assessment, pandemic related mental health problems, time management, and technophobia.[15]

Experts in the field of medical education favor the addition of emerging interventions such as the flipped classroom model, massive open online courses, and digital batches to the traditional medical education programs.[16,17] Other studies have investigated the use of online resources in addition to traditional medical education. Students who experienced a blended learning approach for studying pharmacology wished for more blended learning in their courses but only if it was of high quality, highly structured, and supported by tutorials.[18] Most of the students participating in an online general embryology course in Egypt were strongly satisfied with the efficacy of the instructional method and the clarity of the offered course.[19]

A literature review of studies from 2010 to 2020 suggested that online learning will continue to play an important role in medical education in the coming future and that there is a need to develop secure, cost-effective, and reliable academic systems to achieve this goal.[20] A study from Liaqat College of Medicine and Dentistry reported that more than three quarters of the students were unhappy with the experience of online learning.[1] Our study reported very similar percentages of students who did not like the experience of online learning. Another survey of medical students from Ayub Medical College reported very similar percentages.[21] Experts in the field of medical education favor a collaborative approach that involves all the stakeholders in the field of online medical education.[22]

LIMITATIONS & STRENGTHS

Following are a few limitations & strengths of this study. All the respondents were from one private medical college. A larger sample from both public & private medical colleges would have given a better understanding of the topic.

Major strengths are; participation by a reasonably large number of medical students from first to final year MBBS. Both quantitative and qualitative questions were asked. The questionnaire was designed by senior medical teachers with good experience in online teaching & learning. Anonymity was assured to get honest responses. Even two qualitative questions generated huge responses to obtain rich data.

RECOMMENDATIONS

To improve online learning there are a few recommendations;

- Faculty development programs should be conducted to equip the faculty with the skills in the use of information technology and online resources.
- Better internet service provision at the college/university as well as the national level.
- Recorded lectures should be uploaded on popular video sharing websites or college/university's learning management system.
- Students should be provided with learning material a day or two before the online activity.
- Small group discussions should be incorporated into the timetable instead of lectures.

CONCLUSION

Although a majority of medical students were unhappy with the experience of online learning, around one fifth of medical students found online learning either comparable or better than traditional learning. Online learning will continue to play an important role in the field of medical education in the coming days. It is important to incorporate suggestions generated by students as a result of this as well as previous studies to improve the experience of online learning for medical students.

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