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CONTENTS

Volume 16 Number 4 December 2021

EDITORIAL

Recently Discovered Omicron: Fifth Wave of Pandemic in Pakistan What Strategies Can be adopted to Control its Spread? — Prof. Mulazim Hussain Bukhari — **212**

ORIGINAL ARTICLES

Rifaximin: An Option for the Treatment of Irritable Bowel Syndrome — Muhammad Abdul Quddus, Arslan Shahzad, Rukhsana Munawar, Khawaja Tahir Maqbool, Amna Mansoor, Naveed Gani, Sheikh Muhammad Taqqi Anwer — **215**

Diagnostic Accuracy of Umbilical Artery and Middle Cereberal Artery Doppler in Detection of Intrauterine Growth Restriction — Asia Raza, Azra Saeed Awan, Seema Gul, Nadia Ahmed Bokhari, Hina Tabassum, Samina Irshaad — **219**

Susceptibility Pattern of Bacterial Isolates from Surgical Site Infections in a Tertiary Care Hospital at Rawalpindi — Sundas Ishtiaq, Ishtiaq Ahmed — **224**

Head Injuries in Pediatric Population at DHQ Teaching Hospital Haripur — Javed Iqbal Khan, Hassan Nasir, Tahir Iqbal Khan, Noreen Sultan, Tahir Angez Khan, Mehwish Naz — **232**

Potentiation Effects of Acetylcholine at Neuromuscular Junction by Ranitidine — Abdul Azeem, Akbar Waheed, Sidra Mumal, Salman Bakhtiar, Jawaria Iftikhar, Talal Zafar — **237**

Prevalence and Extent of Anterior Loop of The Mandibular Canal Using Cone Beam Computerized Tomography — Shoaib Rahim, Nighat Haroon Khan, Saira Bilal, Nadia Hanif, Uzma Habib, Fahad Haroon — **243**

Comparison between KPG Index and OPG Measurements: Predicting Orthodontic Treatment Duration and Difficulty Level in Impacted Canines — Ayesha Iftikhar, Tayyaba Jahanzeb — **248**

Parenting Styles and Attention Deficits Hyperactive Disorder Symptoms: Mediating Role of Temperament Traits in Young Adults — Rehana Mushtaq, Sadia Saleem — **255**

Primary Prevention of Aggression Induced by Media Exposure: A Cross Sectional Study — Ambreen Ansar, Sadia Nadeem, Amna Sajjad, Aleena Sohail, Aisha Bukhari, Aima Akhtar — **260**

Why Stress? A Comparative Descriptive Study of Perceived Stress Levels among Working and Non-Working Female Medical Doctors — Shaista Zeeshan, Rukhsana Roshan, Rehama Ahsan Gilani, Maham Zahid — **265**

MEDICAL EDUCATION

Exploring The Journey of Students in an Online CHPE Program of a Pakistani University: An Exploratory Qualitative Study — Khaulah Jawed, Syeda Sanaa Fatima — **274**

CASE REPORT

Metaplastic Squamous Cell Carcinoma of Breast-An Uncommon Tumor with an Unusual Presentation A Case Report — Javeria Faridi, Saeed Alam — **281**

ABOUT JIIMC — **284**

INSTRUCTIONS FOR AUTHORS — **288**

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EDITORIAL

Recently Discovered Omicron: Fifth Wave of Pandemic in Pakistan. What Strategies Can be adopted to Control its Spread?

Prof. Mulazim Hussain Bukhari

Since November 24, 2021, we are hearing about a new SARS CoV-2 Variant of Concern (VOC) with 50 mutations (30 important) in Spike Proteins. "Omicron" is the name given to it by WHO. Literally little "O" is the 16th letter of Greek and B.1.1.529 is the name of the variant first detected in South Africa, Botswana, in HIV Patients.[1] Although, WHO first reported this variant of SARS- CoV-2 on November 24, 2021, but originally it was reported in a specimen collected from a patient suffering from AIDS on November 9, 2021, in South Africa. There is a lot of concern about more than 50 mutations in the new SARS-COV-2 variant. The world is still waiting if it is more contagious, deadly, and will escape our existing immunity due to previous infection or vaccines.[1-2]

It is believed that this new SARS-CoV-2 variant will spread all over the world very soon. It is likely that the virus may also reach Pakistan in near future. WHO has learnt some lessons from the previous experience of SARS- CoV-2; therefore, they are alert and vigilant to face the consequence of this new variant's spread.

How bad will it behave?

The R0 of this new variant is only 2 as compared to delta variant, which is 5-8. Therefore, its possible spread is not expected to be as rapid as that of previous delta variant. At this stage, due to shortage of real-pathological/clinical data, we are unable to clearly predict the impact of this new variant on the COVID-19 epidemiology.

The world is already panic due to pandemic for the last 2 years and highly concerned about the efficacy of currently available vaccines against "OMICRON", their side effects, and the requirement of booster doses. Moreover, every new mutation in the virus further increases the concerns and worries of people as well as the healthcare providers. With this background the "Omicron's" genetic profile has raised many concerns. It is spreading at a faster rate, but it is not possible to comment on the eventual consequences at this stage. If it is a milder virus, then there be less worries and let the people develop immunity against it. But as a Pathologist, I believe, that it is not expected to cause much health problems by its rapid spread.

Why it has been included as a Variant of Concern (VOC) by WHO?

Why WHO has kept it in the list of VOCS like four previously identified alpha, beta, gamma, and delta variant, which appeared during this pandemic. We need to search the answers to the following questions before making an opinion about its future.

- Is there an increase in transmissibility or detrimental changes in epidemiology?
- Is there increase in its virulence or change in clinical presentation?
- Is there decrease in effectiveness of public health and social measure or available diagnostics, and vaccine effectiveness?

Is there any increase in its transmission?[1-2]

We are looking at a mutation like delta on its spike proteins, which will enhance its efficiency of binding with ACE2 receptor binding sites. One change P681H is at furin cleavage site (delta P681R), where enzymes TMPR SS2 will do its cleavage after attaching its S1 part of SP and will enable rapid fusion of S2 fusion site to ACE2. On behalf of this, the binding affinity may be better and electromagnetic forces may be high. It takes one or more days for transmission and during that your immune system may ramp up. But the reported incubation period is prolonged, about up to 8 days, it means it is not a rapidly killing virus, better affinity does not mean, it is a more lethal virus.

Is it causing detrimental changes in epidemiology?[1-3]

After its evolution from Botswana, SA, the virus is now spreading to other countries of the world, but if we look on the world meter of COVID-19, the

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number of cases is not so much rapidly rising as we have seen with delta virus. The mutations like N679K, N501Y, N679K, D614G, may enhance its ACE2 binding affinity, with more infectivity, viral load and shedding of virus but still the cases are not advancing. We believe it will not cause any detrimental change in epidemiology. The currently available PCRs kits are still working to detect this new VOC. Many laboratories have indicated that for one widely used PCR test, one of the three target genes is not detected. It means there is S gene dropout or S gene target failure. This test can therefore be used as marker for this variant, pending sequencing confirmation.

Using this approach, this VOC has been detected at faster rates than previous surges in infection, suggesting that this variant may have a growth advantage over previous mother virus. What is interesting is that the absolute increase in number is low and yet incubation period is seen as longer, which may perish it in future due to stability issues with large 50 mutations.

Is there increase in its virulence or change in clinical presentation?[1-5]

There is still small data available to comment on this question, but based on current information, it has been observed that there are no increased cases of hospitalization, use of ventilators or admissions in ICUs. The daughter VOC may behave aggressively, or it may be less efficient than the parent virus. On the available data from South Africa, it has been learnt that the symptoms are entirely different from its other relative variants.There is some encouraging news and some mysteries are still associated with "Omicron" symptoms. According to Dr. Angelique Coetzee who is the Chair of the South Africa Medical Board and a practicing GP in Pretoria, the symptoms are extremely mild. Symptoms of this new variant are not clear, however in reported cases they are like previous South African Variant and the Beta Indian Variant. Anosmia is not present, so it means it is not affecting olfactory bulbs. Taste is also present. Neurological symptoms may also be less, and long haul may not be there. There is no or very mild cough and only some mild scratchy throat symptoms, indicating less damage to the epithelium, so the direct spread is less. But as the patient is not aware of the disease, due to fewer symptoms so he may be spreading it silently at home, during meals etc. Therefore, the importance of following the SOPs like social distance, wearing face masks, frequent hand wash must be strictly observed. Tiredness, Muscle pain, Fatigue and Body aches are the more common symptoms. Patients are mostly youngsters and recover at home in short period with less or no demand of oxygen. In older age group data is still not clear.[5]

Is there decrease in effectiveness of public health and social measure or available diagnostics and vaccine effectiveness?

The changes in Receptor Binding Domain which is interacting with ACE2 are interesting and may raise the question about its escape from current available vaccines but still we are not looking such drastic change. All the changes are changing the dynamic of bindings of virus with ACE2 receptors of human; they may make it more efficient? They may make the electromagnetic forces better. They may make them to be bad. They may make the phenotype be better and better fit or may make them? The 30 changes in SP and 20 others, which are making it VOC, can make the virus unstable as WHO is expecting, and these changes may make the virus incompetent.

Vaccination and Omicron

The current vaccine is based on the important structural Spike Protein (SP) of the Coronavirus. The SP is made up of 3831bp (1277 amino acids), while in "Omicron" only 50 amino acids are changed, it means there is only 3.9% change in this new virus. While all other antigenic sites are like previous mother virus, therefore the available vaccines will still work against this strain. The people who have taken one dose must go for the second and those who have taken two doses about six months back, must go for the booster dose.

What strategies can be adopted to stop the major mortalities in our population?

The government of Pakistan should increase the number of lab testing and the campaign of vaccination and booster dose, as it may prove to be a dangerous variant. Hopefully, the vaccination will be effective against it. However, health authorities should be vigilant on the 'world tracing system' of its spread and all airports should be advised to take strict measures to reduce the escape of travelers without testing reports and follow up. It is also

important to ban the travel from the African countries to reduce the spread of virus to our country (e.g., USA, UK, Canada, European union, and Russia have already taken such steps).

Conclusion

There are some encouraging news, that the new variant is infecting the youngsters and symptoms are very mild. The rate of infected people is increasing with this new VOC, but the absolute number of cases are not rising. We must see the clinical outcomes, how rapidly are the patients deteriorating and becoming worse. It is not hugely damaging virus as compared to delta and the large number of mutations will make the virus unstable.

It may not spread to the world like South African's previous Beta and Brazilian's P1 variants as initially feared the world. But we should remain prepared to fight this VOC, more definite information will reach in about 2 weeks.

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ORIGINAL ARTICLE

Rifaximin: An Option for the Treatment of Irritable Bowel Syndrome

Muhammad Abdul Quddus[1], Arslan Shahzad[2], Rukhsana Munawar[3], Khawaja Tahir Maqbool[4], Amna Mansoor[5], Naveed Gani[6], Sheikh Muhammad Taqqi Anwer[7]

ABSTRACT

Objective: To study the response of irritable bowel syndrome patients presenting with diarrhea and abdominal pain to the treatment with rifaximin.

Study Design: Observational descriptive study.

Place and Duration of Study: Study was carried out from 1st February 2019 to 1st December 2019 at Gastroenterology department of Combined Military Hospital Rawalakot.

Materials and Methods: Total of 113 patients were consecutively chosen from the Gastroenterology Outpatient Department, Sheikh Khalifa Bin Zayed Al Nahyan Hospital/ AK Combined Military Hospital Rawalakot. Irritable bowel syndrome, diarrhea was diagnosed using Rome III criteria. All participants received 550 mg Rifaximin in two divided doses for a period of fourteen days and were observed for six weeks. The assessed symptoms were diarrhea and abdominal pain, which were recorded at baseline and then at 6 week follow up. Descriptive statistics were done to look for the response of patients' clinical symptoms to Rifaximin.

Results: Mean age of the participants was 26.96 years. Out of 113 subjects, 45% were male (51/113) and 55% (62/113) females. Rifaximin was found to be effective in relieving symptoms in 99(87.6%) cases while it did not relieve symptoms in 14 (12.4%) cases. Only 14(12.4%) patients developed headache as a side effect, while the rest 99(87.6%) tolerated it well.

Conclusion: Rifaximin is a useful, effective and a safe drug for the treatment of irritable bowel syndrome patients suffering from diarrhea and abdominal pain.

Key Words: *Abdominal Pain, Diarrhea, Irritable Bowel Syndrome, Rifaximin.*

Introduction

Irritable bowel syndrome is marked by abdominal pain with disturbed defecation. It is amongst the most diagnosed conditions by health care physicians across the world.[1] Epidemiological data suggest that there has been an increase in diagnosis of this condition in all settings.[2] In the western countries, prevalence of IBS is around 17-22%, while in Asian countries its around 2.3-34%.[3-5] Studies from Pakistan have limited information regarding various aspects of IBS. In one of the studies from Abbottabad, prevalence of 13% was found for this condition. Altered gastrointestinal motility, visceral hypersensitivity, post infectious reactivity, brain-gut interactions, alteration in fecal micro flora, bacterial overgrowth, food sensitivity, carbohydrate malabsorption, and intestinal inflammation all have been implicated in the pathogenesis of IBS.[6]

Due to unknown reasons, somehow irritable bowel syndrome presents more commonly amongst females.[6,7] An Indian study however contradicts this finding showing a higher prevalence for males versus females i.e., almost 8% males against 7% females.[8-9] Manning criteria, Rome I, Rome II and Rome III criteria are used for diagnosis of this condition. Rome III criteria is more commonly used clinically but Manning criteria has a better yield when compared to Rome I or II criteria.[10] All these criteria involve wide range of gastrointestinal symptoms and quality of life parameters.

Various treatment strategies have been available for the patients suffering from irritable bowel syndrome. In one of the placebo-controlled trials 41% patients showed marked improvement in

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symptoms with Rifaximin versus 31% for the placebo.[11] Another study that compared the efficacy of Neomycin with Rifaximin found that around 69% showed a remarkable clinical response with Rifaximin versus only with 44% with Neomycin and other antibiotics.[12]In another study patients of irritable bowel syndrome put on Rifaximin were followed up for four weeks and showed marked improvement in symptoms.[13]

Limited data has been generated from patients of our own population regarding efficacy of Rifaximin. Therefore, this study was designed to assess the efficacy of Rifaximin in treating diarrhea and abdominal pain in patients with irritable bowel syndrome.

Materials and Methods

This was an observational descriptive study conducted at the department of Gastroenterology, Sheikh Khalifa Bin Zayed Al Nahyan Hospital/ AK Combined Military Hospital Rawalakot from 1st February 2019 till 1st December 2019. Duration of this study was ten months. Sample size was calculated by using WHO sample size calculator by using population prevalence proportion of 69%[12] and margin of error as 10%. Sample size turned out to be 83. Nonprobability consecutive sampling technique was used to gather the sample for this study. The study was commenced after taking approval from Hospital Research Ethical Committee.

We included patients of both genders with age between 18 and 35 years, diagnosed as suffering from irritable bowel syndrome for more than 6 months. Irritable bowel syndrome was diagnosed based on Rome III criteria. According to Rome III criteria irritable bowel syndrome is characterized by repeated episodes of abdominal pain or discomfort for at least 3 days/month during last 3 months associated with two or more of the coming characteristics:[14]

- Which improve by passing stool and/or
- Attack associated with a change in frequency of stool. And/or
- Attack associated with a change in form (appearance) of stool.

Exclusion criteria were the patients with ulcerative colitis, Crohn's disease, protozoal intestinal parasites Entamoeba histolytica and Giardia lamblia, duodenal or gastric ulcers, diverticulitis, bacterial and viral gastroenteritis. Patients with history of use of antibiotic, probiotics, prebiotics, corticosteroids, proton-pump inhibitors, or patients on treatment of irritable bowel syndrome in last one month were excluded as well. Detailed colonoscopic examination was undertaken to rule out any co morbid lower gastrointestinal problems. All participants received 550 mg Rifaximin in two divided doses for fourteen days and were further followed for another forty-two days to monitor drug efficacy. Patients were called to outpatient department for follow up when examined at baseline. If they didn't show up, they were called as their contact numbers were taken at time of baseline interview. Diarrhea and abdominal pain were recorded at baseline and then at 6 weeks follow up.

The data was analyzed using SPSS 22.0. For the numerical values like age, mean± Standard Deviation and for the categorical, frequencies and percentages were presented.

Results

A total was 113 patients who had IBS-diarrhea were included in the study after inclusion/exclusion criteria and dropouts. Mean age of the participants was 26.96 ± S.D 4.606 with an age range of 20-34 years. Out of 113 patients, 45% (51/113) were males while 55% (62/113) were females. Regarding the efficacy of Rifaximin, it was found that 99(87.6%) patients showed significant improvement in symptoms while 14 (12.4%) patients had no significant improvement in symptoms (Table I). Regarding the safety profile, it was found that only 14(12.4%) patients developed headache as a side effect, while the rest 99(87.6%) had no significant side effects (Table II).

Table I: Improvement in Symptoms with Rifaximin Among Patients of Irritable Bowel Syndrome

Response to Rifaximin	Frequency(n)	Percentage %
Improvement in symptoms	99	87.6
No improvement in symptoms	14	12.4

Table II: Safety Profile of Rifaximin

Safety profile of Rifaximin	Frequency(N)	Percentage %
Side effects and poor tolerability	14	12.4
Well tolerated and safe	99	87.6

Discussion

Timely managing irritable bowel syndrome is essential as there is considerable associated functional impairment leading to poor overall health of the individual.[15,16,17] A lot of research has been done in various parts of the world involving various pharmacological modalities to control the symptoms of IBS. This study was designed to assess the role of an antibiotic for this purpose.

Patients in our study showed a better response with Rifaximin 550mg in a twice daily dosing offered for 2 weeks. We studied improvement in diarrhea and abdominal pain as primary outcome of our study and found significant improvement in both symptoms in response to Rifaximin. This is in line with the study conducted by Pimentel et al., where they found that around 41% patients responded well to Rifaximin, in terms of overall improvement and also improving diarrhea and bloating.[11] There are other studies which support the use of Rifaximin due to its efficacy in irritable bowel syndrome-diarrhea.[12,13, 18,19] Considering this, there is sufficient support for Rifaximin efficacy in improvement of physical disturbances of irritable bowel syndrome-diarrhea. It is a conveniently available, cost-effective, treatment, should be a part of future regimens for irritable bowel syndrome.

Our study showed that only about 11.5% patients had relapsed and did not show adequate response to Rifaximin. This contradicts the findings from few other studies where most patients failed to show adequate response to rifaximin.[20,21] Reason may be difference in pharmacokinetic or pharmacodynamic profiles of Rifaximin in our population. It is worth mentioning here that we included a small sample which could lead to bias in our study. Choosing a larger sample could have indeed helped in determining the exact efficacy and safety profile of Rifaximin in our population.

Regarding the safety and tolerability, our study found that about 12.38% of our study participants experienced headache as a side effect, otherwise it was well tolerated. This is in line with the research by Pimentel et al which showed that only 1.6% patients on Rifaximin experienced serious adverse effects. Similar safety profile has been reported in other studies as well.[11] Therefore if efficacy of this agent gets established then side effects profile would not raise concerns for clinicians and hinder in the routine use of this medication.

This Study was useful in a sense that it provided sufficient evidence to suggest the Rifaximin is an effective treatment for irritable bowel syndrome symptoms. In Pakistan, it is a novel drug and holds a promise for treating this disorder effectively with minimum side-effects. This study had few limitations as well. Due to small sample size and observational descriptive design; it lacks the generalizability of the findings to a larger population. Therefore, the conclusions should be drawn cautiously. Furthermore, there was lack of control group for comparison and no randomization was done, which make it a methodologically weak study.

Conclusion

Rifaximin is a useful, effective and a safe drug for the treatment of irritable bowel syndrome patients suffering from diarrhea and abdominal pain.

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ORIGINAL ARTICLE

Diagnostic Accuracy of Umbilical Artery and Middle Cereberal Artery Doppler in Detection of Intrauterine Growth Restriction

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ABSTRACT

Objective: To determine the diagnostic accuracy of umbilical artery and middle cerebral artery Doppler in detection of intrauterine growth restriction among pregnant women.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: The Department of Gynecology and Obstetrics, Fauji Foundation Hospital, Rawalpindi, over a period of six months from May 2019 to October 2019.

Materials and Methods: Study participants were 159 pregnant women presented to antenatal clinics. The inclusion criteria were gestational age more than 30 weeks with singleton pregnancies, sure last menstrual period, period of gestation confirmed by dating ultrasonography, small for dates or clinical suspicious of intrauterine growth restriction, and women who provided informed consent. Doppler scan was performed in all those women.

Results: Mean age of all the enrolled women was 26.8 (± 6.6) years. Out of 159 women, 32 (20 percent) were nulliparous. On Doppler scan, 29 (18.2 percent) women had intrauterine growth restriction. The mean gestational age at the time of delivery was 35.3 (± 0.95) weeks. Caesarean section was performed in 131 (82.5 percent) of the deliveries. At birth, 24 (15.1 percent) had intrauterine growth restriction. The sensitivity, specificity, positive and negative predictive values of Doppler scan to detect intrauterine growth restriction were 83.3 percent, 93.3 percent, 69.0 percent, and 96.9 percent respectively. The diagnostic accuracy of Doppler scan was 91.8 percent.

Conclusion: Our study shows a high sensitivity and specificity of Doppler scan in detecting intrauterine growth restriction.

Key Words: *Intrauterine Growth Restriction, Middle Cerebral Artery, PulsatilityIndex, Pregnant Women, Resistive Index, Umbilical Artery.*

Introduction

Intrauterine growth restriction (IUGR) is a condition in which a fetus is unable to attain its genetically predetermined growth potential.[1] Fetuses with intrauterine growth restriction are at higher risk of perinatal mortality, neurological abnormalities, and poor performance at school.[2] It is also one of the major problems in developing countries like Pakistan with incidence of 25%, more than World Health Organization criteria for taking public health action.[3] IUGR may be caused by maternal, fetal, placental, and external factors.[4]

Early detection of compromised IUGR fetuses and timely intervention is among the major objectives of current prenatal care services.[5] Abnormal findings of fetal size, weight and symmetry ultrasound leads to suspicion of IUGR. Various methods used to determine IUGR comprise of abdominal palpation to measure symphysis-fundal height, fetal ultrasound biometry and ultrasound Doppler flow velocimetry.[6] However, symphysis-fundal height measurements have inadequate accuracy to diagnose an IUGR fetus. However, abdominal circumference and estimated fetal weight are the more accurate sonographic diagnostic measurements to predict IUGR.[7] Nevertheless, recent research has shown that ultrasound Doppler flow velocimetry is the best tool to detect IUGR.[8]

However, variations in sensitivity and specificity of Doppler ultrasonography in detecting IUGR have

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been reported worldwide.[9] Therefore, use of Doppler ultrasonography as a predictive test to detect IUGR in our clinical settings is questionable. Hence, the aim of the present study was to determine the diagnostic value of Doppler in detecting the IUGR among the pregnant women in our clinical settings. This study would help to determine the diagnostic value of Doppler ultrasonography in detecting intrauterine growth restriction in our setup for better management of IUGR fetuses. Early diagnosis and timely management will help in reduction of perinatal mortality in these fetuses.

Materials and Methods

A Descriptive cross-sectional study was conducted in Obstetrics and Gynecology Department, Fauji Foundation Hospital, Rawalpindi, over a period of six months from May 2019 to October 2019. A total of 159 pregnant women were selected using nonprobability purposive sampling technique. Women having gestational age more than 30 weeks, visiting antenatal clinics were included in the study. The sample size was estimated by using the World Health Organization (WHO) sample size calculations. The confidence interval level was considered at 95 percent and absolute precision was taken as 10 percent. By choosing the sensitivity of 89 percent[9], specificity of 92 percent[9] and prevalence of 24 percent[10], the required sample size was 159 pregnant women who underwent Doppler scan to detect IUGR. Women having singleton pregnancies beyond 30 weeks of gestation, sure about last menstrual period (LMP) and dates confirmed by ultrasonography in second trimester (before 22 weeks of gestation) and Small for date or clinical suspicious of IUGR (more than 2 weeks difference between gestational age and ultrasound parameters) were included in the study. Women having multiple pregnancies, presence of fetal congenital anomalies, unsure about last menstrual period or no dating scan available were excluded. Data was collecting on a predesigned proforma after taking informed verbal consent from the study participants.

A brief demographic and clinical history including age, parity, socio-economic status and about the previous obstetric details, and duration of gestation were asked to every enrolled woman. Doppler scan was performed in all women who were diagnosed to have IUGR based on ultrasonography findings. An umbilical artery Doppler abnormality was defined when the resistive index (RI) was above the 95th centile for gestational age or the presence of an absent end-diastolic flow (AEDF) or reversed end-diastolic flow (REDF). Middle section of the MCA and free loop of umbilical artery were chosen for measurement during periods of fetal apnea. The values of pulsatility indexes (PI) of the MCA and umbilical artery Doppler were calculated. The measurements were taken on weekly basis when doppler values were not normal or fortnightly with growth scan. The measurement before delivery was taken for the analysis. At a minimum, three measurements were obtained, and the mean values were used. All the enrolled women whether with normal or abnormal Doppler findings were followed till the time of delivery to observe the neonatal outcomes for the diagnosis of IUGR based on birth weight (below the 10th percentile for its gestational age and a term neonate with birth weight less than 2,500 grams). All this information was collected on pre-designed proforma.

Data was analyzed using Statistical tests for Social Sciences (SPSS) version 21. Means and standard deviations were calculated for continuous variables while proportions and frequencies were calculated for categorical variables. Results were presented in the form of tables. To examine the accuracy of Doppler scan in detection of IUGR, we calculated the values of sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy (DA) by using the following 2x2 table (Table-I).[11]

Table I: Calculation of Diagnostic Accuracy of Doppler Scan in Detecting IUGR

	Neonatal Birth Weight	
	IUGR	Normal
IUGR	A	B
Normal	C	D

- Sensitivity = a/ a+c X 100
- Specificity = d/ b+d X 100
- Positive predictive value = a/ a+b X 100
- Negative predictive value = d/ c+d X 100

Results

This study was conducted on 159 participants. Mean (SD) age of all the enrolled women in our study was

26.8 (SD = ± 6.6) years.

Table II: Age Distribution of Enrolled Women (n=159)

Variables	Mean	Range	Standard Deviation (SD)
Age in years	26.8	16-38	± 6.6

Out of 159 women, 32 (20 %) were nulliparous and 127 (80%) were parous (Table-III). The mean (SD) gestational age at the time of delivery was 35.3 (± 0.95) weeks, 18 (11.3 %) women were delivered by normal vaginal whereas a great majority, 131 (82.5 %) women were delivered by C-section. In 10 (6.2 %) women, forceps were applied during the delivery time. Values of normal, absent, and reverse diastolic flow in middle cerebral artery are given in Table III.

Table III: Descriptive Statistics (n=159)

Parity	Nulliparous	32	20%
	Parous	127	80%
Gravidity	Primigravida	24	15%
	Multigravida	135	85%
Diastolic flow in middle cerebral artery of enrolled women	Normal	99	63.2%
	Absent	22	13.8%
	Reverse	38	23.9%

Doppler findings (Umbilical artery and MCA) of all the enrolled women (n=159) are given in Table IV.

Table IV: Doppler Findings (Umbilical Artery and MCA) of all the enrolled women (n=159)

Values	Doppler findings					
	UA			MCA		
	RI	PI	S/D	RI	PI	S/D
Mean	0.66	1.05	3.48	0.77	1.40	3.61
Standard deviation	0.12	0.28	1.87	0.04	0.20	0.50
Median	0.63	0.95	2.58	0.79	1.58	3.44
Minimum	0.54	0.74	2.18	0.71	1.17	3.09
Maximum	0.86	1.51	6.94	0.81	1.67	4.05

Note: UA, Umbilical Artery; MCA, Middle Cerebral Artery, RI, Resistance Index; PI, Pulsatility Index; S/D, Systolic to Diastolic Ratio.

On Doppler ultrasound, IUGR was present in 29 (18.2 %) pregnant women whereas in 130 (81.8 %) pregnant women IUGR was not detected (Table-V). At birth, 24 (15.1 %) babies were low birth weight whereas in 135 (84.1 %) babies had normal birth weight (no IUGR). So, 20 (12.5%) women had IUGR on Doppler ultrasound and had low birth weight on delivery. The sensitivity, specificity, positive and negative predictive values of Doppler scan to detect intrauterine growth restriction were 83.3 percent, 93.3 %, 69.0 % and 96.9 % respectively. The diagnostic accuracy of Doppler scan was 91.8 % (Table-V).

Table-V: Diagnostic value of Doppler scan to detect IUGR among all the enrolled women (n=159

		Neonatal birth weight		
		Low birth weight	Normal	Total
Doppler scan Findings	**IUGR**	20	9	**29**
	Normal	4	126	**130**
	Total	24	135	**159**
Sensitivity		83.3%		
Specificity		93.3%		
Positive predictive value		69.0%		
Negative predictive value		96.9%		
Diagnostic accuracy		91.8%		

Discussion

Every fetus has a specific growth potential that is inherited from parents. Intrauterine growth restriction (IUGR) may be due to abnormal genetic makeup of the fetus or placental development, maternal medical disorders and environmental factors like toxins and viral infections[12].

IUGR is linked with substantial perinatal morbidity and mortality. Its long-term complications in childhood include cerebral palsy due to permanent brain damage, while in adult life it is found to be associated with noninsulin-dependent diabetes mellitus and hypertension.

Diagnosis of intrauterine growth restriction becomes problematic sometimes[13]. Most SGA fetuses are normal, but much unnecessary intervention can be done if they are mistaken as cases of IUGR. On the other hand, growth retarded fetuses may not be SGA[14]. Doppler velocity measurement has been widely used in antenatal diagnosis of IUGR for more than twenty years. Fetal wellbeing is predicted through blood flow in many vessels, particularly in the umbilical artery.[15]

In our study, 159 pregnant women with mean age of 26.8 years were enrolled. Out of 159 pregnant women, IUGR was detected in 29 (18.2 %) pregnant

women on Doppler scan, while based on birth weight 24 (15.1 %) babies were declared as IUGR. The results are like another study where color Doppler Ultrasonography showed the IUGR in 73 (56.59%) patients and birth confirmed IUGR in 71 (55.04%) cases where as 58 (44.96%) patients revealed no IUGR[16]. In our study, the sensitivity, specificity, positive and negative predictive values of Doppler scan to diagnose IUGR were 83.3 percent, 93.3 percent, 69.0 percent, and 96.9 percent respectively. The diagnostic accuracy of Doppler scan was 91.8 percent. In another study, Umbilical artery Doppler ultrasound had sensitivity 85.3%, specificity 72.5%, positive predictive value 84.1%, negative predictive value 74.4% and diagnostic accuracy of 80.1%. Our study showed a substantially high sensitivity and specificity of Doppler scan in detection of IUGR in our clinical settings and our findings are comparable with other similar studies around the world.

Similar to our study, a recent study has been carried out in our neighboring country, India, where the diagnostic accuracy of UA and MCA Doppler scan was used in detecting IUGR in their study population. The investigators enrolled 90 pregnant women between gestational ages of 30 weeks and above having fetuses with intrauterine growth restriction, similar to our study population. The diagnostic accuracy of Doppler scan in detecting IUGR in their study population was lower than what we have found in our study.[17] Quite similar to our findings, in United Kingdom, a study enrolled 52 women for Doppler studies of IUGR fetuses, the authors reported a sensitivity and specificity of 96 percent and 84 percent respectively.[18]

There are several reasons that our study found a higher sensitivity and specificity than what they found. However, the most common reason is that in our study we conducted Doppler scan after 30 weeks of gestation while many studies reported have conducted Doppler in first or second trimester of pregnancy.

In a recent study, Doppler studies have been used to detect early onset IUGR in first two trimesters, with detection rates of about 50 percent with false positive rate of 7 percent. However, its use as an isolated screening tool had low sensitivity and positive predictive value if used alone as a screening tool to detect IUGR in first and second trimesters.[19]

In fetuses with IUGR, blood flow is redistributed from periphery towards the brain. Umbilical artery (UA) Middle cerebral artery (MCA) is the most studied fetal arteries for Doppler studies due to its easy accessibility.[20]

Conclusion

Findings of our study suggest high sensitivity and specificity of Doppler scan in detecting IUGR in our study population. However, there is a need to conduct large scale, multicenter randomized controlled trials to determine the diagnostic accuracy of fetal Doppler ultrasonographies in detecting IUGR in our local population.

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ORIGINAL ARTICLE

Susceptibility Pattern of Bacterial Isolates from Surgical Site Infections in a Tertiary Care Hospital at Rawalpindi

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ABSTRACT

Objective: To analyze the culture and sensitivity pattern of micro-organisms cultured from patients who develop surgical site infection following various elective surgical procedures.

Study Design: A cross-sectional observational study.

Place and Duration of Study: Department of Surgery, Fauji Foundation Hospital, Rawalpindi, from 7th May 2018 to 7th November 2018.

Materials and Methods: All patients with surgical site infection after a surgical procedure under general anesthesia of any duration were included. The operative site was inspected on 3rd, 7th, 14th, 21st and 30th post-operative day for wound infection and pus swab from infected wounds were sent for culture and sensitivity. The samples positive for growth were further examined for the type of organisms with Gram staining and antibiotic sensitivity according to Kirby Bauer technique.

Results: Among a total of 128 patients included (Male : Female - 1:4.8), a total of 129 organisms isolated, 48.4% were gram-positive, 49.22% were gram-negative and 3.13% others (i.e fungi). Of all specimens, 57.03% showed single organism, 20.31% multiple and 22.66% specimens yielded no growth. Commonly isolated bacteria were Staphylococcus aureus (21.09%), Methicillin Resistant Staphlococcus aureus (MRSA) (20.31%), Escherichia coli (18.75%) and Pseudomonas aeruginosa (14.06%). The majority of gram -ive bacteria were sensitive to Amikacin (83.33%), followed by Imipenem (75%), Meropenem (70.83%), Gentamicin (66.67%) and highly resistant to Ampicillin, Ceftazidime (91.67% each), Cefotaxime (75%), Chloramphenicol, Ciprofloxacin (62.50% each). Gram +ive isolates were mostly sensitive to Vancomycin, Cefradine, Chloramphenicol, Doxycycline and resistant to Penicillin, Amikacin, Imipenem and Cefotaxime.

Conclusion: Both gram positive and negative micro-organisms are responsible for Surgical Site Infection with Staphylococcus aureus, E Coli, MRSA and Pseudomonas are the commonest. None of the antibiotic were found to be sensitive to all micro-organisms culture. Resistant to Penicillin, Cloxacillin, Augmentin and Quinolone were the highest among all antibiotics.

Key Words: *Antibiotics, Culture, Elective Surgery, Micro-Organisms, Pus Swab, Surgical Wound, Surgical Site* Infection*, Surgery, Sensitivity.*

Introduction

Surgical site infections (SSIs) are defined as wound infections up to 30 days after surgical procedure (or up to one year after surgery in patients receiving implants) and that which affects either the incision or deeper tissue at the site of operation.[1] Wound infection is a common post-operative complication and SSIs are found in the incision site after surgery.[2] Despite improvements in surgical techniques and infection prevention strategies, the SSIs remain a significant challenge for clinicians due to their association with substantial morbidity and mortality and also imposes severe burden over healthcare resources. Literature shows that the incidence of SSIs may be as high as 20%, which depends upon the type of surgery, the surveillance criteria used and data collection quality.[3,4] Mostly, in SSIs, the causative pathogens originate from patient's own endogenous flora which usually depends upon the type of surgery or hospital acquired skin and mucosal organisms and rarely due to airborne transmission of skin squames.[2,5] The pattern of isolated micro-organisms and their anti-microbial

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sensitivity may vary from one hospital to another and from one region to the other region.[6,7] Most commonly isolated micro-organisms are Staphylococcus aureus, coagulase-negative staphylococci, Enterococcus spp. Clostridium, Beta-hemolytic Streptococci and Escherichia coli.[5,7,8] A variety of patient and procedure-related factors greatly influence the risk of infection and hence prevention always requires a 'bundle' approach which comprises of systematic attention to different risk factors to reduce the bacterial contamination in wound and improvement in patient's defenses.[1,3,5]

Wound contamination with the micro-organisms is a serious health issue in surgical practice. Despite, meticulous application of basic principles of asepsis and wound care, SSI develops among a few patients that require proper management and identification of pathogen as well.[9,10] The SSI can be prevented or reduced effectively by controlling the risk factors preoperatively. Even in sterile operative procedures, micro-organisms can contaminate the wound or enter blood and cause infection.[1,10] pre-operative administration of antibiotics has been proved to inhibit the growth of microorganisms contaminating the wound and thus reduces the risk of infections. The antibiotic prophylaxis to reduce wound infections is indicated for operative procedures associated with high infection rate and procedures with prosthetic material insertion.[3,7]

In underdeveloped and resource-poor countries, SSIs are still an important cause of mortality and morbidity. The studies from these countries generally show local and regional variations in terms of the bacterial isolates and sensitivity of micro-organisms [2,7,9]. Due to these variations, the physicians need to be aware of prevalent pathogens and their antimicrobial sensitivity and resistance patterns existing in their localities.

Economically, patients with SSI incur up to $10 billion in costs yearly as compared to the uninfected patients [5]. Studies show that a patient with SSI stays in the hospital almost 7 days longer, is 60% more likely to spend time in the ICU, his/her incidence of being more likely to be readmitted within 30 days of discharge is five time higher and has almost double the mortality rate.[6,7]

In the context of our existing health system, where average hospital care and postoperative environment is not up to the mark, the risk of postoperative infection is high. Henceforth, it is very important to determine the existing isolates from infected wounds and thereafter rational use of antibiotics according to organisms that are isolated. The present study will not only provide a detailed account of present bacterial isolates from surgical wounds, but also give an overview of sensitivity pattern of isolates which helps in rational prescription of antibiotics and will also guide in reducing the prevalence of surgical site infection.

Our study was designed to establish baseline indices of wound infection at the Fauji Foundation Hospital, Rawalpindi, by looking at the prevalent microorganisms involved in wound infections, associated factors and drug resistance patterns. This will be helpful in establishing the hospital antibiogram on quarterly basis, which will give an idea of trend in pattern of culture and sensitivity of micro-organism from surgical site infection. This will also be helpful in charting out the antibiogram of our hospital in future. So, we conducted this study with an objective to analyze the culture and sensitivity pattern of micro-organisms cultured from patients who develop surgical site infection following various elective surgical procedures.

Materials and Methods

This Cross-sectional observational study was conducted at the Department of Surgery, Fauji Foundation Hospital, Rawalpindi from 7th May 2018 to 7th November 2018.Through non-probability consecutive sampling, sample size was calculated by using WHO standard method of sample size calculation. All patients who developed SSI after a surgical procedure under general anesthesia of any duration, in the main operation theater, were included. Patients who underwent emergency surgical procedures, or had signs of infections pre-operatively (e.g. peritonitis, abscesses, sinus, fistulas) or those who were immunocompromised, on steroids, or on chemotherapy were excluded. Approval of the study was obtained from the hospital's ethical committee (Ltr no. FUMC/EC/Trg/D-23/2018).

All patients underwent elective surgical procedures were evaluated pre-operatively meticulously. After

surgery, the surgical site was thoroughly examined on 3rd, 7th, 14th, 21st and 30th post-operative day for any signs of wound infection like erythema, swelling, increased local temperature or pus discharge. In case of SSI, the pus swab was taken directly from infected wound under strict aseptic measures and sent to the hospital laboratory for culture and sensitivity. The samples showing growth were further examined for the type of organisms and antibiotic sensitivity.

All findings, including type of surgical procedure, post-operative day of SSI, wound examination findings, date and time when specimen were sent to laboratory, name of organisms and type (Gram + or -) isolated from wound swab as well as the culture sensitivity pattern of organisms to various antibiotics (as sensitive, intermediate and resistant) as reported by the hospital's laboratory and specimens showing no growth were recorded carefully on a separate proforma for each patient. The collected data was analyzed at the end of study.

Statistical Software SPSS version-20 was used for data analysis. Frequency and percentage of variables i.e. growth, gender, age, types of organisms grown and their sensitivity pattern to different antibiotics were calculated. Mean and standard deviation were calculated for age. P value ≤ 0.05 were considered as significant.

Results

A total of 128 patients were studied during the study period and among them majority were female (n=105, 82.8%) as compared to male (n=22, 17.2%) with male to female ratio of 1.4:8. The age ranging between 4 years to 76 years (mean age 49.1 SD+/- 1.2 years). Majority of patients were from the 6th decade of life (n=35, 27.3%) followed by 5th decade (n=24, 18.8%) and 7th decade (n=18, 14.1%) of life.

The highest rate of SSI was observed in patients undergoing open cholecystectomy (n=64, 50%), followed by Inguinal Hernioplasty (n=21, 16.40%) and Modified Radical Mastectomy (MRM) were the 3rd commonest operation (n=14, 10.94%). Almost 5.46% (n=7) patients undergoing paraumbilical hernia repair has developed wound infection as compared to only 0.78% (n=1) patients who underwent thyroidectomy.

Table – I, shows the frequency of growth of micro-organisms among 128 pus specimens of the wound having SSIs. The single isolates were cultured from 57.03% (n=73) specimens, whereas 20.31% (n=26) specimens showed multiple organism growth from specimens.

Among 99 pus specimens showing growth of micro-organisms, the frequency of Gram-positive isolates was almost same (62.63%, n=62) as compared to Gram-negative bacteria (63.64%, n=63). Whereas 4.04% (n=4) pus specimens also show growth of Fungi (Figure 1).

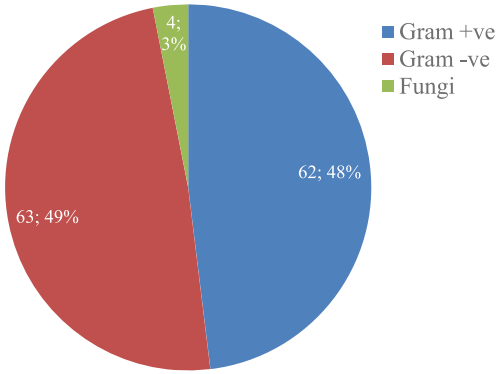

Fig 1: Frequency of Micro-Organism Grown as Per Gram Staining (N=128)

	95% Confidence Interval of the Difference	
	Lower	Upper
Gram +ve	-68.2548	109.5882
Gram -ve	-69.3557	111.3557
Fungi	-4.4035	7.0702

From 128 pus specimens, among all organisms cultured, the Staph aureus was the commonest (n=27, 21.09%) organism cultured followed by MRSA (20.31%, n=26), Escherichia coli (18.75%, n=24) and Pseudomonas Aeruginosa (14.06%, n=18). The frequency of some of the other micro-organisms is Acinetobacter baumanii (8.59%, n=11), Enterococcus faecalis (5.47%, n=7), Klebsiella pneumonia (3.91%, n=5) and Candida albicans (3.13%, n=4). Only one specimen (0.78%) shows the growth of Morganella morganii, Streptococcal Spp., Bacillus subtilis, Stenotrophomonas maltophilia, Proteus mirabilis, Enterobacter agglomerans and VRE (Table-I).

Table – II, shows the varied sensitivity pattern of micro-organisms cultured from pus specimens from SSI wounds. According to this, commonest organism isolated, Staph aureus is highly sensitive to Vancomycine (n=27, 100%), followed by Ceftazidime

Table I: Frequency of Micro-Organisms Grown from Pus Culture (N=128)

Bacteria cultured from wound swabs	Total No of Bacteria Cultured	95% Confidence Interval of the Difference		% of total N=128	
		Lower	Upper		
Staphylococcus aureus	27	4.2984	15.1753	27.27%	21.09%
Escherichia coli	24	-26.4212	42.4212	24.24%	18.75%
Pseudomonas aeruginosa	18	-19.8159	31.8159	18.18%	14.06%
MRSA	26	-28.6230	45.9563	26.26%	20.31%
Enterococcus faecalis	7	-7.7062	12.3729	7.07%	5.47%
Klebsiella pneumonia	5	-5.5044	8.8378	5.05%	3.91%
Acinetobacter baumanii	11	-12.1097	19.4431	11.11%	8.59%
Morganella morganii	1	-1.1009	1.7676	1.01%	0.78%
Streptococcal spp.	1	-1.1009	1.7676	1.01%	0.78%
Bacillus subtilis	1	-1.1009	1.7676	1.01%	0.78%
Stenotrophomonas maltophilia	1	-1.1009	1.7676	1.01%	0.78%
Proteus mirabilis	1	-1.1009	1.7676	1.01%	0.78%
Pontoea agglomerans	1	-1.1009	1.7676	1.01%	0.78%
VRE (Vancomycine Resistance Enterococci)	1	-1.1009	1.7676	1.01%	0.78%
Candida albicans	4	-4.4035	7.0702	4.04%	3.13%
No Growth	29	-169.7400	198.7400		22.66%

(n=26, 96.30%), Gentamycin and Co-trimoxazole (n=22, 81.48% each). The 2nd commonest gram -ive organism, E coli is highly sensitive to amikacin (n=20, 83.33%), followed by imipenem (n=18, 75%), Meropenem (n=17, 70.83%) and Gentamycin (n=16, 66.67%). MRSA the 3rd commonest isolate is found to be highly sensitive to Vancomycine (n=24, 92.30%) followed by Chloramphenicol (n=20, 76.90%) and Doxycycline (n=18, 69.2%). Another commonest organism Pseudomonas aeruginosa were found to be highly sensitive against Polymicin (n=13, 72.22%), Colistin (n=12, 66.67%) and Amikacin (n=11, 61.11%). None of the antibiotic were found to be sensitive to all micro-organisms.

Table II: Frequency of Sensitivity Pattern of Micro-Organisms to Different Antibiotics (N= 128)

	Augmentin	Ciprofloxacilin	Cloxacillin	Cotrimoxazole	Doxycycline	Erythromycin	Chloramphenicol	Gentamicin	Vancomycin	Meropenem	Sulzone	Cefotar	Ampicillin	Amikacin	Ceftazidime	Colistin	Polymixin	Imipenem	Linezolid	Ceftuoxime	Ceftriadine	Penicillin	Aztreonam	Methicil
S. aur n=27	5 18.52%	18 66.67%	14 51.85%	17 62.96%	22 81.48%	19 70.37%	20 74.07%	22 81.48%	27 100.00%	6 22.22%		2 7.41%		2 7.41%				6 22.22%	1 3.70%		26 96.30%	1 3.70%		3 11.11%
E. coli n=24		8 33.33%		9 37.50%	7 29.17%		4 16.67%	16 66.67%	1 4.17%	17 70.83%			2 8.33%	20 83.33%	2 8.33%			18 75.00%						6 25.00%
P. aeru n=18		6 33.33%						8 44.44%		6 33.33%	5 27.78%			11 61.11%	4 22.22%	12 66.67%	13 72.22%	5 27.78%					5 27.78%	
MRSA n=26		3 11.54%	1 3.85%	12 46.15%	18 69.23%	6 23.08%	20 76.92%	10 38.46%	24 92.31%	2 7.69%						1 3.85%	1 3.85%	2 7.69%	1 3.85%		2 7.69%			
E. face n=7		1 14.29%		1 14.29%	1 14.29%	1 14.29%	2 28.57%	1 14.29%	5 71.43%	1 14.29%			1 14.29%	1 14.29%				1 14.29%	1 14.29%					1 14.29%
Streno n=1																1 100.00%	1 100.00%							
Kleb n=5		1 20.00%			1 20.00%			3 60.00%		3 60.00%				3 60.00%		2 40.00%	2 40.00%	3 60.00%						
Acine n=11					3 27.27%											6 54.55%	6 54.55%							
Morga n=1		1 100.00%		1 100.00%				1 100.00%		1 100.00%				1 100.00%				1 100.00%						1 100.00%
Bacill n=1		1 100.00%						1 100.00%		1 100.00%				1 100.00%				1 100.00%					1 100.00%	
Prot n=1										1 100.00%	1 100.00%							1 100.00%					1 100.00%	
E. aggl n=1		2 200.00%		2 200.00%				2 200.00%		2 200.00%				3 300.00%				2 200.00%						2 200.00%
VRE n=1							1 100.00%			1 100.00%			1 100.00%					1 100.00%	1 100.00%					

The resistance pattern of different micro-organisms against different antibiotics (Table – III) shows that Staph aureus is highly resistant to penicillin (n=23, 85.10%), followed by Ciproxin (n=9, 33.33%). The E coli were resistant to ampicillin (n=17, 70.83%), Cefatar (n=13, 54.17%), Doxycycline (n=12, 50%) and

Ciproxin (n=11, 45.83%). The MRSA were found to be highly resistant to Ciproxin (n=22, 84.60%), Cefradine (n=21, 80.77%), Augmentin (n=19, 73.08%), Penicillin, Cloxacillin, erythromycin and Imipenem (n=17, 65.38% each). Klebsiella is observed to be 100% (n=5) resistant to Ciproxin.

Table III: Frequency of Resistance Pattern of Micro- Organisms to Different Antibiotics (N= 128)

	Augmentin	Ciprofloxacin	Cloxacillin	Cotrimoxazole	Doxycycline	Erythromycin	Chloramphenicol	Gentamicin	Vancomycin	Meropenem	Sulzone	Cefotar	Ampicillin	Amikacin	Ceftazidime	Colistin	Polymixin	Imipenem	Linezolid	Cefuroxime	Cefradine	Penicillin	Aztreonam	Methicil
S. aur n=27		9 33.33%		8 29.63%	6 22.22%	7 25.93 %	5 18.52 %					2 7.41%	1 3.70%									23 85.19 %		
E. coli n=24		11 45.83%		8 33.33%	12 50.00%	1 4.17%		3 12.50%		2 8.33%	1 4.17%	13 54.17%	17 70.83%	2 8.33%	3 12.50%			2 8.33%		1 4.17 %				
P. aeru n=18		10 55.56%		1 5.56%	2 11.11%	1 5.56%	5 27.78 %	6 33.33%		5 27.78 %	7 38.89%	2 11.11%	2 11.11%	6 33.33%	3 16.67%		1 5.56%	9 50.00%					7 38.89 %	
MRSA n=26	19 73.08%	22 84.62%	17 65.38 %	14 53.85%	6 23.08%	17 65.38 %	1 3.85%	8 30.77%	1 3.85%	15 57.69 %	1 3.85%	1 3.85%	2 7.69%	2 7.69%	1 3.85%			17 65.38%			21 80.77 %	17 65.38 %	1 3.85%	2 7.69 %
E. face n=7		5 71.43%		6 85.71%	6 85.71%	3 42.86 %		1 14.29%	1 14.29%	2 28.57 %		5 71.43%	6 85.71%					2 28.57%						
Streno n=1		1 100.00 %						1 100.00 %			1 100.00 %			1 100.00 %	1 100.00 %			1 100.00 %						
Kleb n=5		5 100.00 %		6 120.00 %	4 80.00%			4 80.00%		3 60.00 %	2 40.00%	6 120.00 %	6 120.00 %	3 60.00%	2 40.00%			3 60.00%						
Acine n=11		10 90.91%		7 63.64%	4 36.36%			10 90.91%		7 63.64 %	3 27.27%	8 72.73%	9 81.82%	10 90.91%	2 18.18%			8 72.73%		1 9.09 %			3 27.27 %	
Morga n=1					1 100.00 %								1 100.00 %											
Bacill n=1	1 100.00 %																							
Prot n=1		1 100.00 %		1 100.00 %	1 100.00 %			1 100.00 %				1 100.00 %	1 100.00 %		1 100.00 %	1 100.00 %	1 100.00 %							
E. aggl n=1													1 100.00 %											
VRE n=1				1 100.00 %	1 100.00 %			1 100.00 %	1 100.00 %			1 100.00 %												

Discussion

Among a total of 128 infected wounds in our study, growth of micro-organism does not follow any specific pattern. Literature review shows that other than institutional or geographic variations, it also varies from time to time.[3,4] Moreover, not all pus specimens show growth of pathogens as 77.35% specimens showed a positive culture in our specimens which is almost comparable to most of the studies.[3,4,9,10] (i.e., 75% to 90%). Few studies[11,12] reported up to 98% of growth or in all their specimens.[11-14] This variation depends upon the different factors such as patient factors, theatre contamination, surgeon's practice, use of prophylactic antibiotics and so on.

Mostly single[9,10,13] and less likely multiple organisms[13,15] can be cultured from a specimen depending upon the nature of contamination, local flora and many other factors. Our findings are consistent with most of the studies[9,10,13,15] published, that 73.73% specimen's single micro-organism growth.

In literature, different studies have reported various frequency of gram staining of organisms.[4,9,13,16] In our study, the frequency of gram-negative isolates is slightly higher (63.64%) as compared to gram-positive isolates (62.63%) and 4.04% of the specimens also show the growth of Candida spp. Similarly, the predominance of gram -ive microorganisms is also observed in majority of local studies [11,15,17-20] as compared to few studies showing predominantly Gram-positive growth.[21,22]

A varied range of both Gram-positive and Gram -ive organisms were detected i.e. Staph aureus (21.09%), followed by MRSA (20.31%), Escherichia coli (18.75%) and Pseudomonas aeruginosa (14.06%). Literature review also shows that Staphylococcus aureus was the predominant isolate [3,9,10,12,,19,23] reported in literature in last decade and our finding are also consistent with national[21,22,24,25,26] and international literature.[13,14,16]

Among Gram -ive organisms, Escherichia coli (18.75%) and Pseudomonas aeruginosa (14.06%) were 3rd and 4th commonest organisms detected among our patients. Literature shows a varied presentation of micro-organisms observed after Staph aureus as a commonest microbe [10,13, 16,27] whereas, some other studies[6,19] also reported varied presentation of microbes in their patients.

Among antibiotics, Penicillin resistance reported highest (96.30%) followed by Amikacin (92.59%), Cefotaxime (88.89%), Imipenem, Meropenem (77.78% each) and Augmentin (71.48%). High resistance of Coagulase Negative Staph aureus reported by Pondei and colleague [4] ie., (88.9%) for Amoxicillin, Ampicillin, Amoxicillin-clavulanic acid and Tetracycline ((77.8% each). Almost same observations were made by Lunawat et al[12] and Mohammad et al[9], Sultana[l3], Kumari[19] and Ahmed et al[22] and Bibi et al in their studies. Our findings are consistent with the literature that Staphylococcus aureus is highly sensitive to Vancomycin and cefradine whereas Penicillin and Augmentin has a poor response to this organism.

The 3rd commonest organism in our study ie., Escherichia coli (18.75%,) most commonly sensitive to Amikacin (83.33%), Imipenem (75%), Meropenem (70.83%), Gentamicin (66.67%) and highly resistant to Ampicillin, Ceftazidime (91.67% each), Cefotaxime (75%), Chloramphenicol and Ciprofloxacin (62.50% each). Different international[4,10,12,16] and national [19]has reported almost same sensitivity and resistance. Findings of all these studies are almost consistent with our findings, that is, Escherichia coli being sensitive to Amikacin, Gentamicin, and Imipenem.

Literature review from different parts of world shows that the sensitivity pattern of Pseudomonas is usually found to be multi-drug resistant at present and in past as well.[3,16,19,20,22,27] Similar resistance pattern was observed among our patients that majority of antibiotics used in hospital are not effective and pseudomonas found highly resistant to Tazobactam and Piperacillin (94.83%), Amikacin (88.89%), Ceftazidime, Cefoperazone and Aztreonam (72.23% each).

Klebsiella pneumoniae another commonest microbe in our patients, observed high sensitivity against Gentamicin, Meropenem and Amikacin (60% each) and highly resistance to Penicillin, Doxycycline and Ciprofloxacin (up to 80% each). In literature, the Pondi et al[4] reported it sensitive to Nitrofurantoin and Lunawat et al[12] observed the maximum sensitivity *to* Amikacin1(00%). However, different studies reported that the Klebsiella species were sensitive to Ceftazidime and Gentamicin which strongly supports that Gentamicin is a suitable antibiotic in Klebsiella infection.[16,22,19,23]

Among gram-negative bacteria, all the Proteus species were observed to be 100 % resistant to Amoxicillin and Tetracycline and 80% sensitive to Gentamicin.[4,24,26] We have observed that sensitivity of Proteus is high against Vancomycin, Cefoperazone, Imipenem and Aztreonam, whereas they were found resistant to Penicillin, Cloxacillin and Polymycin.

In summary, among the Gram-positive organisms isolated from our specimens (i.e., Staph aureus, Enterococcus faecalis, Streptococcus spp., Bacillus subtilis, VRE and candida species) most are commonly sensitive to Vancomycin and Cefradine. Chloramphenicol and Doxycycline were also effective in varied frequency against these micro-organisms but these Gram-positive were resistant to Penicillin, Amikacin, Imipenem and Cefotaxime. Similarly, Gram -ive organisms isolated from our patients (i.e., Escherichia coli, Pseudomonas aeruginosa, Klebsiella, A. baumanii, Proteus, S. maltophilia and Enterobacter agglomerans) were sensitive to Amikacin, Polymicin B, Colistin, Meropenem, Gentamicin and Imipenem. They were found to be highly resistant to Ampicillin, Doxycycline, Co-trimoxazole, Ceftazidime and Cefotaxime.

The antibiotics susceptibility pattern of Staph aureus shows 100% resistant to Penicillin, cefoxitin, Erythromycin, Clindamycin, Nalidixic acid,

Ciprofloxacin, chloramphenicol, Doxycycline each, 50% to Teicoplanin, 33% to Vancomycin and 17% to Co-trimoxazole, Gentamicin, Amikacin each. The second most prevalent organism of the study coagulase negative Staphylococci were multidrug resistant (MRSA) but few isolates showed sensitivity at least towards antibiotics such as Cefoperazone (20%) and Cotrimoxazole (20%).

Conclusion

It is concluded that both gram positive and gram-negative microorganisms are responsible for Surgical Site Infection with Staph aureus, E Coli, MRSA and Pseudomonas are the commonest organisms in order of frequency. On culture sensitivity, none of the antibiotic were found to be sensitive to all micro-organisms culture. Resistant to Penicillin, Cloxacillin, Augmentin and Quinolone were the highest among all antibiotics. Judicious use of antibiotics according to hospital anti-biogram or antimicrobial guidelines, which should be revised at frequent intervals to minimize the incidence of Surgical Site Infection is recommended.

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ORIGINAL ARTICLE

Head Injuries in Pediatric Population at DHQ Teaching Hospital Haripur

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ABSTRACT

Objective: To study the frequency of head injuries in pediatric population at DHQ Hospital Haripur.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: We carried out this study for six months from 01.09.2018 to 28.02.2019 at the department of Surgery, DHQ Teaching Hospital Haripur.

Materials and Methods: In this study,110 children aged upto12 years who sustained head trauma were included in this study. After initial assessment (conscious levels was checked by using Glasgow coma scale, any changes in pupils were noted and CT scan was performed wherever indicated), patients were shifted to the department of surgery for admission. Those needing surgery were operated after further clinical evaluation and CT scan findings.

Results: Total number of patients was 110. Age ranged from 1 to 12 years with a mean age of 5.7 years. Out of the total 110 patients, 75% presented between 3 to 8 years. The presenting symptoms were vomiting in 52.7%, peri-orbital swelling in 14.5%, scalp swelling in 20.9% and 36.3% had loss of consciousness.

Conclusion: It is concluded that the frequency of head injury is quite common in our community. Children of younger age with male preponderance are more vulnerable to acquire this injury and fall from height and road traffic accidents are major preventable causes.

Key Words: *Brain injuries, Coma, Head trauma, Unconsciousness.*

Introduction

Head trauma is a frequent occurrence in children and on most occasions, it results in traumatic brain injury needing active intervention and emergency management. It is a common cause of the loss of consciousness, long term functional problems and mortality in trauma patients.[1,2]

Head injury is defined as an injury to the cranium, meninges and/or brain.[3] Children with their proportionately large heads and flexible consistency of skull bones frequently sustain head injuries.[4] Many protective measures have been adapted to reduce head injuries in pediatric population but still it is major health threat because of above mentioned facts.

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Because of several known reasons head is most frequent part of the body affected by traumatic insults in children and the reason for hospitalization. However, majority of head injuries are minor.[5] Road traffic accident (RTA) and falling from heightened places are most common causes of traumatic head trauma. In developing countries like Pakistan, some important causes include ignorance of traffic rules, badly maintained vehicles, limited zebra crossings, nonfunctioning air bags, less use of seatbelts and overcrowded roads. This and similar studies can help to set protocols for early recognition of potentially treatable causes of mortality and morbidity and will help in better usage of available resources.[6]

Severity of traumatic brain injury is assessed with Glasgow Coma Scale (GCS) along with other parameters and is characterized as minor, moderate, and severe brain injuries on the basis of score with little changes in scoring for children. A GCS sore of 9 or less indicates serious head injury, 13 and above denotes minor head injury and in between is taken as moderate injury.[7]

Another way of assessing severity of head trauma is to locate part of tissue damaged. Bleeding from scalp vessels can severely affect hemostasis of child. Similarly subdural hemorrhage, intracranial hemorrhage and injury to brain parenchyma or its

edema can threaten child's survival. In the same way hemorrhage below galea can spread around and lead to significant loss of blood which can cause hypovolemic shock and hence endanger the life of a child and must not be ignored.[8] A lot of research has been conducted and being conducted to improve the assessment of severity of brain injury, devise protocols for prompt resuscitation and immediate intervention in indicated patients and all this has contributed significantly in the management of such injuries.[9,10]

Hemorrhage inside brain parenchyma or its direct tear, bleeding in sub arachnoid space, sub dural or extra dural space can lead to coma and later death or disability. Even in minor head trauma, 6 to 30 % cases have injuries to brain or its coverings.[8]

In all cases of head injuries, one common mode of damage to brain tissue is loss of either complete or partial blood supply and this single factor has most important impact on outcome of poor child.[11,12] After identifying this factor, efforts are being made to determine methods to urgent revascularization if ischemic area in the hope of recovering its function.[13,14]

Head injury patients usually require x-ray skull, CT scan, MRI and other routine investigations to access clinical evaluation for their proper management.

This study will help to outline different types of brain injuries and to set protocols for their early management and better prognosis of these children and will achieve objective of improving understanding and management of head injuries in children and will open gates for further research in this context. Hence, a study was planned to study the frequency of head injuries in pediatric population at department of surgery, DHQ hospital Haripur

Materials and Methods

It was a cross sectional descriptive study in which 110 children aged below 12 years with head injury who presented in emergency department at DHQ Teaching Hospital Haripur from 1st september2018 to 28th February 2019 were included through convenient sampling technique after permission from hospital ethical review committee. Children with other comorbidities were excluded.

A quick primary survey and emergency resuscitation was performed on all patients wherever indicated. This was followed by a detailed secondary survey to look for the associated injuries. Data was collected by the medical officers through already designed proforma.

Complete blood count, and x-ray skull, CT scan was done. Provisional diagnosis was made in the emergency department and necessary treatment was instituted. Complications like meningitis, post-traumatic seizures, CSF fistula, Epilepsy and hemiplegia were all documented.

Statistical analysis was done using SPSS version 20.0. Frequencies and percentages were calculated for categorical variables such as gender, mechanism of injury, clinical presentation, skull injury, associated injuries, investigations, provisional diagnosis, treatment, and complications. Mean with standard deviations were reported for continuous variables.

Results

The mean age of study patients was 5.7 $\pm$ 2.7 years ranging from 1 to 12 years. Almost 75% of the children were between 3 and 8 years. Out of the total, 11 (10.0%) were between 1 and 2 years while 18 (16.4%) were between 9 and 12 years.

In our study majority of the cases 62 (56.4%) were males as compared to 48 (43.6%) females. The male to female ratio was 1.3: 1.

On average patients remained hospitalized for 1.9 $\pm$ 1.2 days, ranging from 1 to 8 days. Almost 80% of the study patients required 1 to 2 days of hospital stay while 25 (22.7%) of the patients needed 3 or more days of hospital stay.

The mechanism of injury is illustrated in table 1. The GCS level was noted in the study patients. In 3 (2.7%) cases it was less than or equals to 8. In 10 (9.1%) cases the GCS level was between 9 and 12. However, in majority of the cases 97 (88.2%) the GCS level was between 13 and 15.

Vomiting was the presenting symptom in 58 (52.7%) patients, orbital swelling in 16 (14.5%) cases and scalp swelling in 23 (20.9%) patients. Forty (36.3%) patients had history of loss of consciousness. Other complaints included nasal bleeding and convulsions in 3 (2.7%) patients, ear bleeding in 4 (3.6%) patients.

The mean systolic BP was 98.8 $\pm$ 11.4 while the diastolic BP was 66.0 $\pm$ 8.5 mmHg. The average heart rate in the study patients was 78.8 $\pm$ 10.5 ranging from 60 to 136. Similarly, the average respiratory rate was 29.2 $\pm$ 6.2 ranging from 20 to 45.

Out of total, 44 patients had skull injuries, 32 (29.1%)

had single skull fracture, 6 (5.4%) had linear fracture, whereas 5 (4.5%) had multiple fractures. One (0.9%) patient had wound on the right temporal and frontal region.

Out of the total 110 patients, 53 (48.1%) had no fracture on x-ray skull. Twenty-eight (25.4%) patients had linear fracture, 21 (19.1%) had single fracture while 6 (5.4%) had depressed fracture and 2 (1.8%) had multiple fractures.

CT scan was done in 93 patients and CT scan findings are illustrated in table 2. Different management options needed by the patients are illustrated in table 3.

Table I: Mode of Injury in the Study (n = 110)

	Number	%age
Fall from roof	52	47.3%
RTA	26	23.6%
Fall from stairs	13	11.8%
Fall from bed	3	2.7%
Fall from window	1	0.9%
Abuse	1	0.9%
Others		
Fall from tree	8	7.3%
Fall from wall	3	2.7%
Fall from Almira	1	0.9%
Fall from mountain	1	0.9%
Stone hit	1	0.9%

Table II: CT Findings in Patients (n=93)

CT Findings	Number	%Age
Normal	71	64.5
Diffuse axonal injury	8	7.2
Epidural hematoma	7	6.3
Subdural hematoma	2	1.8
Temporal hematoma	2	1.8
Frontal hematoma	2	1.8

Table III: Mode of Treatment Given to Patients (n=110)

Treatment mode	Number	%Age
Iv fluids +antibiotics	108	98.2
Iv steroids	26	23.6
Neurological management	11	10
Iv mannitol	1	0.9
Elevation of depressed fracture	7	6
Evacuation and debridement	5	4.5

Discussion

Head injury is common occurrence in children and presents to the accident and emergency (A&E) department quite frequently but majority of them sustain minor injuries (in this study97% children were having GCS of 13-15). In our study, most (75%) of children were in age group from3-8 years and fall from height was major cause (47.3%). According to most of the previous reports, male gender has suffered more than females.[22]

In third world countries incidence of head injuries is on the rise and most important contributing factors include increased traffic, ignorance about road sense, decreased safety protocols in major industries, falls from heights and firearm penetrating injuries. Road traffic injuries are an increasing dilemma globally but the incidence in South and East Asia is increasing rapidly and need special attention.[15]

Trauma to brain is responsible for 25 to 35 % of all deaths resulting from accidents and is a cause of most deaths in trauma patient in different hospitals worldwide as reported by some studies.[16] One major cause of head injuries is accident caused by motor cars, trolleys, and motorcycle injuries. Fall from heighted places like mountains or high-rise buildings, physical attacks from enemies and firearm penetrating injuries to skull are another important causes of head injuries which is well depicted in present study. Sometime injury to brain is a part of poly trauma involving many organs, but it can also occur in isolation which is comparable to present study.[17]

There is evidence from different parts of the world indicating that incidence of head injuries is rising steadily.[18] A study by Sosin et. al. reported that a huge proportion (28%) of deaths in trauma patients were caused by traumatic brain injury alone.[19]

Another report from Indian held Kashmir who worked on head injury related morbidity and mortality, revealed that pediatric population of age less than 10 years was major sufferer of these catastrophes which is very much like present study satistics.[20,21] These statistics are comparable to present study.

In one report RTAs (44.4%) were mainly responsible for sustaining traumatic head injury followed by falls from heighted places which were responsible for approximately 32.2% cases.[20] Different types of physical assaults accounted for 19.0% cases of head injury. Comparatively in our study fall from roof was most common (47.3%) mode of head injury and RTAs

were responsible for many patients (24%) to land in emergency department with head injuries, while other significant modes of injury were also fall either from tree, stairs, or bed. This very well may be attributed to our living styles.

In most of the cases minor and moderate head injured patients required up to 2 days of hospital stay.[23] In our study, the average hospital stay was 1.9 days with almost 80% had hospital stay of 1 to 2 days. This could be due to grading of injury, as in our case, most of the head injuries were diagnosed as concussions.

The study by Yattoo GH and colleagues reported that 80% of their patients had GCS score of 15 while 10% had 13-14 and 5.3% had 8 to 12 GCS level while another 5% had GCS score less than 8.[20] In our study almost 88% patients had GCS between 13 and 15, 9% had it between 9 and 12 while 3% had GCS level below or equals to 8. Again, this could be due to severity of injury as mentioned most of the patients had concussions in our study. CT scan findings were also comparable.

The nature of head injuries in our study was mostly minor to moderate. None of our patients died. Those patients (6%) having depressed fracture were elevated and in 5% of the patient's evacuation and debridement was done via surgery. No significant side effects or complications were witnessed in our patients except for headache in 2.7% and hemiplegia in 1% children was witnessed.

One of the limitations of our study was its descriptive methodology.

The strengths and advantages of the current study are the scope of information gathered. In the current study data regarding patient's demographics, hospital stay, mechanism of head injury, presenting complaints, physical examination, nature of skull injuries and associated injuries, radiography in the form of both x-rays and CT scan were recorded. This is one of the few studies auditing head injuries in children in the local settings.

The details of present study suggest that we should focus on prevention of head injuries in pediatric population by educating children at different stages of their life. This can be started at home by parents, later by teachers in school going children and can be supplemented by social organization working for children in liaison with health care workers. Anticipatory counseling of caretakers can be done to understand the patterns and priorities during early age of a child.

Conclusion

It is concluded that fall from height is a common cause of injury and early radiographic evaluation specially, CT scan is very important in determining nature of head injury and its management.

There is a need of initiatives for careful planning to prevent head injuries in children with active involvement of people responsible for their care at different stages of their development and growth.

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ORIGINAL ARTICLE

Potentiation Effects of Acetylcholine at Neuromuscular Junction by Ranitidine

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ABSTRACT

Objective: To evaluate the activity of Ranitidine at neuromuscular junction with and without Pancuronium.

Study Design: Experimental randomized control study.

Place and Duration of Study: Department of Pharmacology, Islamic International Medical College, RIU Rawalpindi from October 2018 to September 2019.

Materials and Methods: Changes in the length (contraction) of rectus abdomininis muscle of frog were recorded using students oscillograph and cumulative dose response curve with Acetylcholine was obtained (control group). The effect of Ranitidine before and after adding Pancuronium was observed using three groups. Statistical analysis of variance (ANOVA) between the groups was performed by using the student's '*t*' test and a P-value < 0.05 was considered statistically significant.

Results: Ranitidine in a dose of 1mM concentration produced a shift of the curve to the left with mean deviation of 61.5% (SEM ± 20.5) showing an enhancement of effects of Acetylcholine. Ranitidine also produced a shift of the curve to the left in the presence of 1µg Pancuronium with the mean deviation of 104.5% (SEM ± 39.7). The shift was statistically significant (P < 0.05) showing the antagonistic effect of Ranitidine on neuromuscular junction (NMJ) blockers like Pancuronium at this concentration.

Conclusion: Ranitidine in a concentration of 1mM increases the effects of Acetylcholine at neuromuscular junction (NMJ) and antagonizes the effects of NMJ blockers like Pancuronium at this concentration.

Key Words: *Acetylcholine, Neuromuscular Junction, Pancuronium, Ranitidine.*

Introduction

Histamine H_2 receptor blockers are widely used in medicine for the treatment of acid peptic disease as they reduce the basal and stimulated acid secretion.[1] They are also used pre-operatively before general anaesthesia for prophylaxis of gastric acid aspiration.[2]

Ranitidine is a competitive antagonist at H_2-receptors.[3] Ranitidine is therapeutically used in the treatment of duodenal ulcer, benign gastric ulcer, stress ulcer, Zollinger Ellison Syndrome, reflux oesophagitis, and other conditions where gastric acid reduction is beneficial.[4] Also used for prophylaxis of gastric acid aspiration during anaesthesia.[5,6]

In the past there is conflicting evidence regarding the interaction between H_2receptor blockers and various neuromuscular junction blockers.

There is evidence that ranitidine can inhibit acetylcholinesterase in low dose and at high doses produce neuromuscular blockade.[7] Also in a study Ranitidine potentiated the effects of neuro muscular junction blocker.[8]

This is of particular interest to anesthesiologists as non-depolarizing neuromuscular junction blockers like Pancuronium are administered during various surgical procedures for muscle relaxation.[9,10] A potential for synergism / potentiation with neuromuscular junction (NMJ) blockers exist in such situations. Thus, there may be a chance of side effects during surgery. This would be clinically relevant because of respiratory depression and prolonged apnoea.

It was therefore pertinent to determine the activity of Ranitidine at neuromuscular junction and its interaction with neuromuscular junction blocker like Pancuronium.

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So, the present study was performed to evaluate the activity of Ranitidine at neuromuscular junction with and without Pancuronium.

Materials and Methods

The experimental randomized control study was carried out in the department of Pharmacology and Therapeutics, Islamic International Medical College, Rawalpindi from October 2018 to September 2019 in collaboration with department of Pharmacology and Therapeutics, Rawalpindi Medical University Rawalpindi. Accredited Ethical Review Committee of Islamic International Medical College approved the research proposal before starting the study. A total of 24 frogs selected randomly, six rectus abdominis muscles in each group were used.[11] Both male and female adult frogs (*Rana-tigrina*).[12] weighing 100 to 150 gm[13,14] were included in the study. Frogs weighing less than 100gm and more than 150 gm were excluded.

The drugs used were Acetylcholine solutions of 10^{-3}, 10^{-4} and 10^{-5} strength, 1g of Pancuronium Bromide (Molecular weight 732.7),[4] 1mM concentration of Ranitidine (Molecular weight 350.9),[15] Frog Ringer solution with the following composition.[16]

NaCl 6.493 g/L, KCl 142mg/L, $CaCl_2$ 133mg/L, NaH_2PO_4 7.68mg/L, $NaHCO_3$ 197mg/L, Dextrose 198mg/L.

Six rectus abdominis muscles from randomly selected frogs were used for recording the observations in each group. Each frog was dissected. The two rectus abdominis muscles were cut across just above the sternum, dissected and shifted to a dish containing frog ringer at room temperature.[17] One muscle was mounted in the organ bath aerated with oxygen and connected to the oscillograph.[18,19] The effects of different drugs were recorded as changes in the muscle length (contraction) via isotonic transducer according to the following schedule.

In Group-I (Control), 1 g Acetylcholine was added to the organ bath and the contraction of the frog's rectus abdominis muscle was recorded on the graph paper for 3 minutes. Next reading with 2g of Acetylcholine was obtained and similarly a cumulative dose response relationship was observed and recorded by doubling the dose of Acetylcholine after every 3 minutes till the maximum or ceiling effect was obtained. Oscillograph was stopped and the Ringer solution was drained and replaced. The tissue was given a rest for 30 minutes and 2nd cumulative dose response curve was obtained on the same rectus abdominis muscle in a similar manner.

Muscles of six different animals were used for the recording as mentioned above. This group was used as a control group for the study.

In Group-II (Pancuronium), cumulative dose response curve was obtained on each of the six preparations with Acetylcholine as already described above. The tissues were given a rest for 30 minutes and a fixed dose of 1 g of Pancuronium was added to the organ bath. After a reaction time of 15 minutes another cumulative dose response curve with Acetylcholine was recorded in the presence of Pancuronium for every preparation.

In Group-III (Ranitidine), cumulative dose response curve was obtained on each of the six preparations with Acetylcholine as already described above. The tissues were given a rest for 30 minutes and a fixed dose of 1 mM solution of Ranitidine was added to the organ bath. After a reaction time of 15 minutes another cumulative dose response curve with Acetylcholine was recorded in the presence of Ranitidine for every preparation.

In Group-IV (Pancuronium + Ranitidine), cumulative dose response curve was obtained on each of the six preparations with Acetylcholine as already described above. The tissues were given a rest for 30 minutes and a fixed dose of 1 g Pancuronium and 1 mM Ranitidine were added to the organ bath. After a reaction time of 15 minutes another cumulative dose response curve with Acetylcholine was recorded in the presence of Pancuronium and Ranitidine for every preparation.

Statistical analysis of variance (ANOVA) between the groups was performed by using the student's 't' test and a P-value < 0.05 was considered statistically significant.

Results

Observations of Groups

Group I (Control Group)

In a series of six experiments the mean ± SEM values of responses for 1, 2, 4, 8, 16, and 32 µg of Acetylcholine were recorded. Percent responses were calculated by taking the response with 32 µg as 100% and were 12%, 31%, 57%, 82%, 95%, and 100% for the above-mentioned doses respectively. After

washing the preparations with frog-Ringer solution and after an interval of 30 minutes the percent responses were 8, 24, 50, 80, 92 and 96 % for each dose respectively. Semi log dose response curves were plotted by taking the percentage responses which showed that the second curve i.e., after washing with frog-Ringer solution and rest on an average shifted to the right and downwards. The deviation was slight which started with the 1st dose of 1 µg and continued in the entire extent of the curve. Percent deviation was calculated for each dose and was 29.4 %, 23.9%, 11.9%, 2.5%, 2.9%, and 4.1% respectively, with mean 12.45%. (SEM± 4.77). P > 0.05.

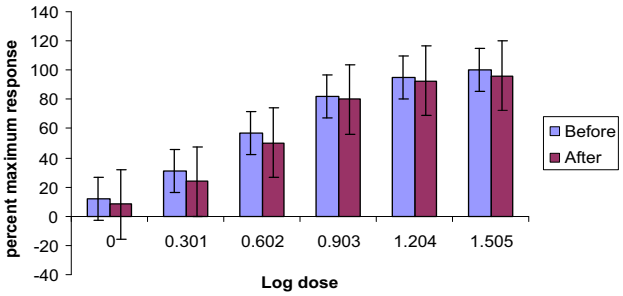

Fig 1: Semi Log Dose Percent Response Bars for Acetylcholine Induced Contractions

Group II (Pancuronium)

In a series of six experiments the mean ± SEM values of responses for 1, 2, 4, 8, 16, 32, 64, and 128 µg, of Acetylcholine were recorded. Percent responses were calculated by taking the response with 128 µg as 100% and were 6%, 24%, 42%, 62%, 83%, 91%, 98% and 100% for each dose respectively. After washing the preparations, giving them a rest of 30 minutes, and adding a fixed dose of 1µgm of Pancuronium the percent responses were 1%, 1%, 9%, 19%, 47%, 75%, 90%, and 96% for each dose respectively. Semi log dose response curve were plotted by taking the percent responses which showed that the second curve i.e., after washing with frog-Ringer solution and rest and adding 1µg of Pancuronium shifted to the right and downwards. The deviation started with the 1st dose of 1 µg and continued in almost the entire extent of the curve, minimizing at the higher doses. Percentage deviation was calculated for each dose and was 88%, 94%, 79.7%, 69.0%, 43.1%, 17.3%, 8.0% and 4.3% respectively with mean 50.4%. (SEM ± 15.17). P < 0.05.

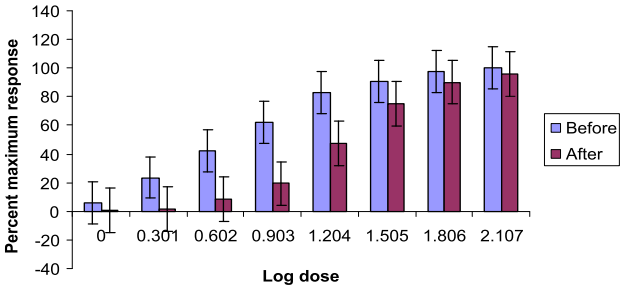

Fig 2: Semi Log Dose Percent Response Bars for Acetylcholine-Induced Contractions, Before and After Adding 1µg Pancuronium

Group III (Ranitidine)

In a series of six experiments the mean ± SEM values of responses for 1, 2, 4, 8, 16, 32, 64, and 128, µg of Acetylcholine were recorded. Percent responses were calculated by taking the response with 128 µg as 100% and were 2%, 9%, 25%, 48%, 66%, 87%, 95%, and 100% for each dose respectively. The same experiment was repeated on the same tissue preparation using similar concentration and doses of Acetylcholine after washing the preparations, giving them a rest of 30 minutes, and adding a fixed dose of 1mM concentration of Ranitidine. The percentage responses with the same doses were 6%, 16%, 47%, 70%, 93%, 111%, 117%, and 117%, for each dose respectively. Semi log dose response curves were plotted by taking the percent responses which showed that the second curve i.e., after washing with frog-Ringer solution and rest and adding 1µM Ranitidine on an average shifted to the left and upwards. The deviation started with the 1st dose and continued in the entire extent of the curve. Percentage deviation was calculated for each dose and was 166%, 83%, 90.9%, 44.6.%, 42.0%, 25.6%, 22.7%, and 17.2% respectively with mean 61%. (SEM ± 20.59). P < 0.05

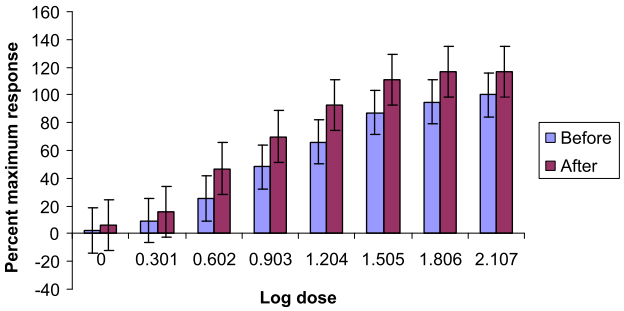

Fig 3: Semi Log Dose Percent Response Bars for Acetylcholine-Induced Contractions Before and After Adding 1mm Ranitidine

Group IV (Pancuronium+ Ranitidine)

In a series of six experiments the mean ± SEM values of responses for 1, 2, 4, 8, 16, 32, 64, and 128 µg of acetylcholine were recorded. Percent responses calculated by taking response with 128 µg as 100% and were 1%, 6%, 15%, 30%, 57%, 89%, 95%, and 100% for each dose respectively. After washing the preparations and adding a fixed dose of 1µg Pancuronium and 1mM Ranitidine the percent responses were 3.2%, 11%, 37%, 71%, 97%, 114%, 120%, and 121% for each dose respectively. Semi log dose response curve were plotted by taking the percentage responses which showed that the second curve i.e., after washing with frog-Ringer's solution and rest and adding Pancuronium and Ranitidine shifted to the left and upwards. The deviation started after the 2nd dose and continued in the entire extent of the curve. Percentage deviation was calculated for each dose and was 312.5%, 100.86%, 142.4%, 135.3%, 69.8%, 28.4%, 25.6%, and 21.1% with mean 104.5%. (SEM ± 39.7). P < 0.05.

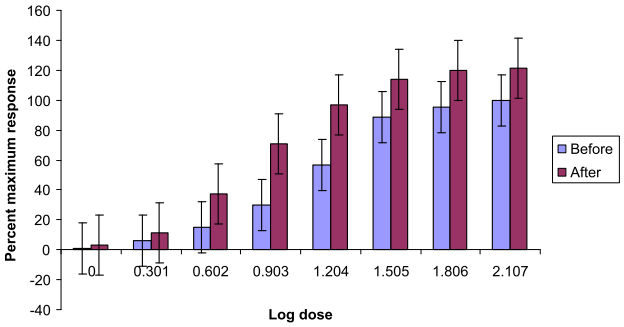

Fig 4: Semi Log Dose Percent Response Bars for Acetylcholine-Induced Contractions, Before and After Adding 1µg Pancuronium and 1mm Ranitidine

Comparison of Control Group I (Acetylcholine) and Group III (Acetylcholine + Ranitidine).

The difference in the percent deviation of response to acetylcholine in the two groups. Fig 5 (P < 0.05).

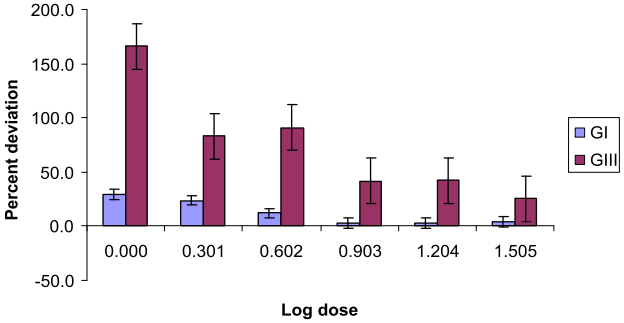

Fig 5: Comparison of Percent Deviation of Group I (Acetylcholine) With Percentage Deviation of Group III (Ranitidine)

Comparison of Group II (Acetylcholine + Pancuronium) and Group IV (Acetylcholine + Pancuronium + Ranitidine)

The difference in the percent deviation of response to acetylcholine in the two groups Fig 6 (P < 0.05).

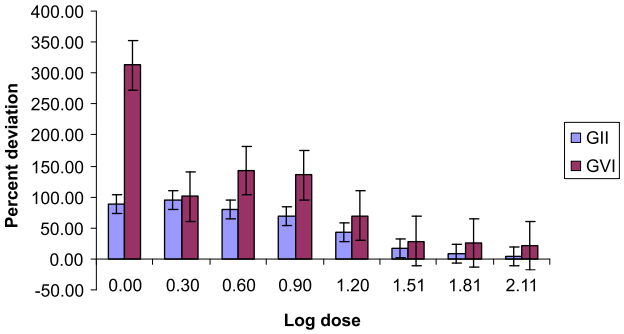

Fig 6: Comparison of Percent Deviation of Group II (Acetylcholine + Pancuronium) and Group IV (Acetylcholine + Pancuronium + Ranitidine)

Comparison of Group II (Acetylcholine + Pancuronium) and Group IV (Acetylcholine + Pancuronium + Ranitidine)

The difference in the percent deviation of response to acetylcholine in the two groups Fig 6 (P < 0.05).

Discussion

In the present study Ranitidine in a dose of 1mM concentration produced a shift of the curve to the left with mean deviation of 61.5% (SEM ± 20.5) showing an enhancement of effects of Acetylcholine.

Ranitidine also produced a shift of the curve to the left in the presence of 1µg Pancuronium with the mean deviation of 104.5% (SEM ± 39.7). The shift was statistically significant (P < 0.05) showing the antagonistic effect of Ranitidine on neuromuscular junction (NMJ) blocker Pancuronium at this concentration.

The difference in the percent deviation of response to Acetylcholine in the two groups (control group I and group III) was highly significant (P < 0.05).

The difference in the percent deviation of response to Acetylcholine in the two groups (group II and group IV) was also highly significant (P < 0.05).

This was consistent with previous studies by Mishra and Kounenis and a clinical case report of resistance to non-depolarizing blocking agents in a patient on a prolonged treatment with Ranitidine.[20,21,22]

This reversal is concentration dependent and is seen only at lower doses while at higher doses the effect is reversed and ranitidine enhances the effects of NMJ blockers possibly by its ion channel blocking

activity.[20] Ranitidine induced reversal of the effects of Pancuronium may be due to the anti-cholinesterase activity of the drug whereby it enhances the effects of Acetylcholine by interfering with its metabolism.[15] This is further reinforced by the fact that Ranitidine does not enhance the tissue responses and conversely shifts the curve to right when Carbachol is used instead of Acetylcholine. Carbachol is resistant to hydrolysis by cholinesterase[23] and in such situations Ranitidine decreases the response to Carbachol in dose range of 0.25mM to 01mM.[24] This NMJ blocking activity of Ranitidine may be due to direct blockade of the ion channel independent of its anti-cholinesterase inhibiting activity.[22] Due to this effect of Ranitidine with Carbachol, it can be inferred that the anti-cholinesterase activity of Ranitidine is relatively stronger as compared to its ion channel blocking properties. Moreover, in actual clinical situations it is Acetylcholine which serves as neurotransmitter at neuromuscular junction, consequently this antagonistic effect of Ranitidine may have important interactions with NMJ blockers in anaesthetic practice.

Conclusion

The present study concludes that Ranitidine in a concentration of 1mM increases the effects of acetylcholine at NMJ and antagonize the effects of NMJ blocker Pancuronium at this concentration.

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ORIGINAL ARTICLE

Prevalence and Extent of Anterior Loop of the Mandibular Canal Using Cone Beam Computerized Tomography

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ABSTRACT

Objective: To determine the presence of mandibular canal anterior loop and its length in patients reporting to a tertiary care center using Computerized Cone Beam Tomography (CBCT).

Study Design: Descriptive cross-sectional.

Place and Duration of Study: Prosthodontics Dept., Armed Forces Institute of Dentistry, From 1st February 2019 to 30th November 2019

Materials and Methods: A total of 126 subjects, between the age of 16-60 years, were selected using nonprobability consecutive sampling technique from Prosthodontics Department. Patients in whom CBCT investigation was required were selected based on exclusion and inclusion criteria. With the help of NNT viewer software presence of mandibular canal anterior loop determined. The Extent of anterior loop anteriorly into the mandible was analyzed using the measuring tool in the NNT viewer software.

Results: Out of 126 patients, anterior loop was found in 19% (n=24) patients among which 7.1% (n=09) patients had on the left side and 3.9% (n=05) on the right side. A total of 7.9% (n=10) patients had anterior loop present bilaterally. The Mean ± SD extent of anterior loop on left and right side were 3.87 ± 0.88 and 3.96 ± 0.84 respectively.

Conclusion: A low prevalence of mandibular canal anterior loop was observed in subjects of present study with variations in the extensions of anterior loop. Computerized Cone Beam Tomography (CBCT) imaging modality was found to be effective in the detection of anterior loop.

Key Words: *Cone Beam, Computerized Tomography, Mandible, Mental Foramen.*

Introduction

The mandibular anterior/ para-symphyseal region is a common sight for surgical procedure like dental implant therapy, especially in edentulous mandible, thus sound knowledge about clinical anatomy is of great importance. Even though the region between both the mental foramens anteriorly in mandible is a safe location for such procedures, but anatomical variations do exist among different populations.[1,2] These variations maybe in the form of accessory mental foramen (AMF), anterior loop of mandibular canal or the presence of incisive branch of the nerve. Mental foramen (MF) provides a pathway for the terminal branch of inferior alveolar nerve (IAN) which is known as the mental nerve. The IAN may also continue into the anterior mandibular region in the form of Incisive nerve.[3] Certain studies have suggested that after giving off the incisive branch, it reaches postero-superiorly to the mental foramen to continue as the mental nerve, which can be seen in the form of radiolucent loop also known as anterior loop of mandibular canal (MC) or anterior loop of mental nerve.[4-7] In study conducted by Pradeep out of 85 patients, anterior loop was found to be present in 11.76% patient with a mean length of 2.79 mm.[4] In another study the mean extent of anterior loop was found to be 0.89mm.[8] Yet in another study the mean length of anterior loop was found to 4.13mm (range 01 to 11mm).[9]

Although these anatomical variations are rare but inadvertent damage during surgical implant placement can occur if such variations are ignored thus leading to sensory dysfunction.[10] Therefore, it is of utmost importance to appreciate the anatomy of this region to avoid any injury to the neurovascular bundles. Orthopantomograms (OPG) is among one of the commonly advised investigation in dentistry to

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get an overview of all the dentition and its surrounding hard tissues. Although the accuracy and precision of OPG in detection of accurate location of MF and the presence of anterior loop of MC and AMF maybe considered questionable[7]. Study have also been done to determine the anatomical variability in the dried mandible of cadavers which is also considered to be accurate for that population.[9] It is therefore necessary to have a clear vision/image of the jaw to prevent these damages, which can be achieved with the 3D imaging technique, that is, Cone beam computed tomography (CBCT). CBCT provides a better image quality/resolution and an accurate representation of the structures with a low radiation dose as well as the ability to use different tools available in the software.[2,11,12]

Keeping in view the above background, the rationale of our study was to use CBCT imaging modality for determining the variability anterior loop of MC as it corresponds to clinical practice and provides images of greater accuracy and low dosage to satisfy the presurgical planning requirements and hence the present study was designed to determine the prevalence and extent of anterior loop of MC using CBCT.

Materials and Methods

The data collection for this Cross-Sectional Study (Descriptive) was carried out in the Prosthodontics Department at Armed Forces Institute of Dentistry. The study duration was 09 months (February 2019 to November 2019). A sample size of 120 subjects was calculated to be the minimum sample for this study using the WHO calculator. A total of 126 patients were selected for this study. Sampling technique used for collection of data was Non-probability Consecutive Sampling. Inclusion criteria consisted of patients of both male and female gender with age ranging from 16-60 years, patients for whom CBCT has been advised as part of their treatment, patients with no history of mandibular symphyseal or Para symphyseal fracture, both dentate and partially dentate patients with all lower anterior teeth and premolars present, patients with who had their CBCT investigation done previously were also considered in this study provided they fulfill the criteria. Exclusion criteria consisted of patients with a history of tumor, cyst or any other bony lesion or deformity involving the anterior portion of the mandible within the region of right and left mandibular, patients with any identifiable syndrome, patients on bisphosphonate therapy, patients with osteoporosis and non-visualization of the mental foramen bilaterally, Patients undergoing orthodontic treatment or patients with crowding of mandibular anterior teeth and/or root resorption.

Prior approval from Ethical Review board was obtained (Ref. no. ERC-5/25-2019). As a protocol all patients presenting to hospital were examined in dental OPD/ diagnostics department and patients with prosthodontic needs were referred to Prosthodontics department. Those patients who fulfilled the criteria (Exclusion and Inclusion) were selected for the study. CBCT investigation was advised to patients as a part of their treatment. CBCT was recorded using Newtom vgi CBCT (Verona, Italy) and analyzed with the help of radiologist. Position of MF was identified using Multiplanar view, panorex view and or 3D model and its relationship with the teeth was noted. Presence or absence of anterior loop of MC and AMF was noted. Patients in whom anterior loop was found to be present, its extent was measured using a measuring tool in CBCT software (NNT viewer). SPSS version 20 was used analyze the data. For qualitative and quantitative variables descriptive statistics were calculated. For variables like position of MF, presence of anterior loop of MC, gender, and accessory mental foramen (qualitative). For quantitative variables like age, distance/extent of anterior loop mean $\pm$ SD were calculated. To determine the association between the location of MF on left and right-side chi square test was applied. To analyze the difference in the extent of mandibular canal anterior loop independent sample t test was applied.

Results

Out of 126 patients, 52 (41.3%) were males and 74(58.7%) were females. The age range was 16 to 58 years. The Mean of age of patients was 34.40±10.49 years. The location of MF in relation to the teeth on the left and right side have been given in Table-I and Table-II. Out of 126 patients, anterior loop of mandibular canal was found in 24 patients (19%). Out of these 24 patients 19 (15.07%) were female and 5 (3.96%) were male. Anterior loop was present in 10 patients (7.9%) bilaterally and 09 (7.1%) patients had anterior loop only on left side and 05

(3.9%) had on right side. The Mean distance/extent of anterior loop was 3.87±0.88 millimeters (mm) on left side and 3.95±0.84 mm on right side. The minimum and maximum extent of anterior loop on left side was 2.33 mm and 5.36 mm respectively and on right side it was 2.20 mm and 5.11 mm respectively. Accessory mental foramen (AMF) was found in 09 (7.1%) patients on left side and 06 (4.8%) on right side.

To determine the association between the location of MF on left and right-side chi square test was applied and p value < 0.001 was found to be significant (Table-III). Independent sample t-test was applied to determine the difference in the extent/distance of anterior loop of Mandibular canal between Left and Right side. Statistically no significant difference was found with p value of 0.784 (Table-IV).

Table I: Frequency of Position of Left Mental Foramen in Relation to Teeth (n= 126)

Sr. No.	Location/Position of Mental foramen	Frequency	Percentage
1	Canine	17	13.5%
2	Between Canine and 1st Premolar	12	9.5%
3	1st Premolar	36	28.6%
4	Between 1st Premolar and 2nd Premolar	28	22.2%
5	2nd Premolar	33	26.2%
Total		126	100%

Table II: Frequency of Position of Right Mental Foramen in Relation to Teeth (n= 126)

Sr. No.	Location/Position of Mental foramen	Frequency	Percentage
1	Canine	10	7.9%
2	Between Canine and 1st Premolar	06	4.8%
3	1st Premolar	44	34.9%
4	Between 1st Premolar and 2nd Premolar	25	19.8%
5	2nd Premolar	41	32.5%
Total		126	100%

Table III: Chi Square Test for Location of Mental Foramen

Association of Location of Mental Foramen on Left and Right side	Pearson Chi Square Test			Strength of Association			
	Value	df	Asymp. Sig.	Phi		Cramer's V	
				Value	Approx. Sig.	Value	Approx. Sig.
	54.968	16	<0.001	0.66	<0.001	0.33	<0.001

Table IV: Independent Sample t-test For Extent of Anterior Loop

Extent of Anterior Loop	Side of Mandible	Mean (mm)	Std. Deviation	T test		
				t	df	p value
	Left	3.875	0.886	-0.276	32	0.784
	Right	3.959	0.848			

Discussion

The results of current study show that the anterior loop of mandibular canal was present in 19% (n=24) of the patients with the maximum extension of 5.36 mm. No significant difference noted in the extension between left and right side among different patients (p value 0.784). It is critical to identify the exact position of MF along with extent of anterior loop of MC. The MF was most found to be in proximity with the root of the 1st premolar tooth in most of the patients, both on left and right side. Chi square test showed significant association between the location of left and right MF along with strong correlation (p value <0.001). AMF was also found to be present in certain patients alongside MF. These results suggest that adequate investigations and treatment planning is required before proceeding with the surgical treatment in the mandibular interforaminal region to avoid any chance of possible injury to the nerve bundle and vessels during surgery. The precise position of these important structures becomes even important when performing surgical therapy in completely edentulous patients.[13-15]

Certain authors have conducted research to determine the incidence of mandibular canal anterior loop. In a study conducted by Arati, who selected 32 CBCT images of the patients for locating the anterior loop, it was reported to be extant in 41% (n=13) of the subjects with a mean extent of 2.90±2.79 mm.[16] In another study conducted by Pradeep who selected 85 patients, anterior loop was found to be present in 11.76% (n=10) patient with a mean length of 2.79 mm.[4] Yet in another study conducted by Dimirios on 93 patients, anterior loop was found to be present with a mean length of 0.89 mm in 48% (n=45) of cases.[8] Other studies have also reported difference in incidence of anterior loop of mandibular canals.[17,18] The findings in the above mentioned studies do not coincide with one another and neither does the findings of our study coincide with the finding of these studies, that is, 19% (n=24). This suggests that there is variation in the incidence

of anterior loop among different population and geographic dysmorphism has been noted. It is therefore important to carefully observe the radiographic investigations of each patient for presence of anterior loop as its incidence is variable. An opinion from radiologist should always be considered in case of any doubt to avoid undue damage to neurovascular bundle during the surgical procedure. The mean length of mandibular canal anterior loop in our study was slightly more than the mean length reported in these studies. Although the maximum range of length of anterior loop was coinciding with our study.[4,8,16-18] The difference in the mean values may be due to the difference in sample size, the incidence of anterior loop and the individual length of anterior loop being on the lower side. Smrithi et al found that the anterior loop had more prevalence in male as compared to female whereas in our study it was more prevalent in females. One of the reasons for this difference maybe the gross difference in sample size between the study conducted by Smrithi and our study.[17] Another major reason for this difference is that, in our study more than half of the subjects were female so the resultant incidence might have higher because of that difference.

Numerous studies have been carried out in the past to determine the position of MF in relation to the roots of a tooth namely canine, 1st premolar and 2nd premolar. The limitations of such studies which is also common in our study is that they are only helpful in dentate patient. In our study the MF was most found along the roots of mandibular 1st premolar on both sides followed by 2nd premolar position. The results of our study do not coincide with the results of other studies as most of them report the common location of mental foramen to be coinciding with 2nd premolar followed by 1st premolar.[19-21] Although further improvements in this finding can be made by increasing the sample size or utilizing more objective and stable landmarks for determining the position of the MF. Whenever a landmark such as tooth is used to determine the position of MF, the factor of unreliability cannot be ignored as the position of teeth is not constant and difference can be expected because of mal-alignment, trauma, missing teeth and many more reasons.

The limitations of our study were that we did not consider the variation in the size, shape and direction/Classification of Anterior loop of mandibular canal. Numerous variations have been reported in the literature.[22-24] The information gained from this study suggests that anterior of the mandible is an area with a variety of anatomical variations when it comes to the vital structures. Careful treatment along with adequate investigations are keys requirements for safely placing dental implants in the interforaminal region without any chances of surgical complications. Some advice from radiologist should always be considered when planning in such cases for better outcome of dental implant therapy.

Conclusion

In conclusion, a low prevalence of the anterior loop of mandibular canal was noted in the present study, with variations in the length of extension of anterior loops. The maximum length observed was of 5.36 mm using CBCT. Keeping in view the limitations of the study it is therefore recommended that, for establishing a safety limit for implant surgical procedure an accurate evaluation using CBCT is necessary.

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ORIGINAL ARTICLE

Comparison between KPG Index and OPG Measurements: Predicting Orthodontic Treatment Duration and Difficulty Level in Impacted Canines

Ayesha Iftikhar, Tayyaba Jahanzeb

ABSTRACT

Objective: To compare 2D (Orthopantomogram) and 3D KPG index based on (CBCT) measurements to predict the treatment duration and difficulty level of orthodontic treatment for canine impaction.

Study Design: Cross sectional analytical study.

Place and Duration of Study: Orthodontic Department, Rehman College of Dentistry, Peshawar from 4th September ,2017 till 8th August ,2020.

Materials and Methods: OPG and CBCT (Cone beam computed tomography) records of 49 impacted canines were scored for both 2D and 3D indexes. KPG index measurements were taken for each impacted canine in x, y, z planes, scored from 0- 5 and summed up. Based on these scores, each impaction was classified into two categories, Easy to Moderate (0–14), Difficult to very Difficult (15 -30). Following 2D measurements were taken on OPG, cusp tip distance to the occlusal plane, cusp tip position relative to adjacent lateral incisor, and inclination of canine relative to midline. Comparisons were made using Chi square test and Spearman's correlation was used to find any association between 2D and 3D methods. P values ≤0.05 were considered significant.

Results: 68.8% of the impacted canines were found on the palatal side with a female (73.5%) predilection. The 2D Ericson and Kurol analysis and Stewart's indexes showed a significant difference when compared with 3D KPG index (p= 0.001) and a moderate correlation (r=0.47). Comparison between the 2D indexes showed an insignificant difference (p=0.90) and a weak correlation (r=0.26).

Conclusion: 3D KPG index measurements, compared to the 2D indexes, showed a significant difference and a moderate correlation. Therefore, KPG index can be used in place of 2D indices to accurately locate, determine the difficulty level and treatment duration of orthodontic treatment of impacted canines.

Key Words: *Canine Impaction, CBCT (Cone beam Computed tomography), KPG Index.*

Introduction

Impacted canine is a frequently seen anomaly after third molar impaction.[1,2] Its general prevalence ranges between 0.3%-0.9% with a female predilection.[2] Prevalence of canine impaction varies with ethnicity and hence, its reported to be 5% in Pakistani population.[3] Almost 85% of the impactions are found to be on palatal side.[3-5]

Determining the precise location of impacted teeth is crucial not only for the definite diagnosis but also for determining the management difficulty estimation and related treatment duration. [6] Up till now, Conventional 2D radiological methods , Orthopantomogram (OPG), cephalometric radiography, and intraoral occlusal or periapical X-rays were being used to serve the diagnostic purpose.[7-9] 2D radiographs rely on 'Buccal Object Rule " to determine the position of canine .Separate set of radiographs is needed when the direction of X-ray beam is changed .[6] Diagnostic accuracy and validity of 2D methods can be underestimated due to limitations such as distortion, radiographic films volume reduction related patient positioning and tissue superimposition.[6,9-11]

Due to recent advances in diagnostic technology, CBCT is being considered a gold standard in dental radiology.[10] Today, CBCT is preferred over 2D radiological methods due to its reliability and accuracy.[9] Currently , CBCT is being used in various fields including maxillofacial, dental implantology and orthodontics.[7,11,12] Alqerban et al compared

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CBCT and OPG and revealed, CBCT to be more sensitive in precisely locating the position of impacted canine and also the root resorption of adjacent teeth.[9,13]

Conventionally, 2D indexes were used to localize the impacted teeth. Stewart and Ericson and Kurol .[10] proposed classification methods for localization of impacted canine. KPG index based on CBCT was introduced in 2009. This was the first index that helped to understand the spatial relationship of the impacted tooth in 3D space.[6] Due to the reported reliability, validity, and accuracy of KPG index, it can be used as a standard for the diagnosis and prediction of treatment difficulty.[2,7,10,14]

Numerous studies have been conducted in the past to determine the influence of various CBCT software's, settings for field of view (dosage variation), voltage and exposure time on the scoring of KPG index.[9] Various studies have compared Newton 3G, Kodak 9500, Planmeca voxel and found the reproducibility of KPG index was not influenced if dimensions and slice thickness were kept similar.[7,14,15]

Domenico et al conducted a study to evaluate level of agreement and predict difficulty levels between 2D and 3D KPG index and suggested, 2D indices were sometimes discordant while 3D (KPG index) could solve that conflict.[14]

According to our knowledge no such comparison has yet been reported in Pakistan between classical 2D measurements (Stewart's and Ericson and Kurol's) and KPG index analysis.

The purpose of this study was to compare the 2D vs 3D KPG index from the CBCT scans taken from CBCT apparatus (CS 9000) to predict the difficulty level of impacted canine and treatment duration. The results of this study would help the orthodontist to precisely plan the time duration and biomechanical issues related to the diagnosis and management phase based on the difficulty level of impacted canine.

Materials and Methods

This cross-sectional study was conducted at Orthodontic Department, Rehman College of Dentistry (RCD), Peshawar, from 4th September, 2017 till 8th August, 2020. Sample size was calculated as 49 per group using G power calculator (effect size=0.75, α- error=0.05, power=0.95). Data were collected using non-probability consecutive sampling technique after the ethical approval from (Reference N0: 2020-08-050) Research Committee of (RCD). Informed consent was taken from the patients for the use of records in research or academic activity.

CBCT scans (CS 9000) with 49 impacted canines were collected and assessed for the patients who were referred by the orthodontist to have CBCT for the diagnostic evaluation of the impacted canines for both maxillary and mandibular regions. All unilateral, bilateral maxillary and mandibular canine impaction were included in the study. Patients with dentofacial deformities, syndromes, traumatic injuries jaws /teeth, were excluded from the study.

The images were acquired with Carestream (CS 9000) CBCT scanner at 60 -90 kV, scan time of 4 – 16 seconds, Field of view (FOV 50-37mm) and voxel size (76 ×76× 76 mm). Images were analyzed using CS 3600 3D imaging software. The impacted canine was manipulated in, X (Mesio distal), Y (Vertical), and Z (Labiolingual) planes. The software's measurement tool provided the milli metric data to classify the position of canine using KPG Index. The KPG index rated the canine impactions (cusp and root tips). The scores were based on the distance from ideal position in x, y and z planes. Six measurements were taken per tooth ranging from 0 to 5. The cumulative scores later were classified into 4 difficulty categories, Easy (0–7), Moderate (8–14), Difficult (15–19), and Extremely Difficult (20+). Four categories were reduced to two categories, Easy-moderate category (0–14) and a difficult-very difficult category (15–30) to compare 2D indexes with 3D KPG index .[14] (Figure I)

The OPG, s was reconstructed using the same CBCT apparatus (CS 9000), Scanning. We identified three different angular and linear measurements on OPG. Based on Stewart's analysis, vertical (d-distances) from the cusp tip to the occlusal plane was taken.[14] Measurement less and greater than 14 mm were associated with short and long duration of treatment respectively. (Figure II A) Based on Ericson and Kurol analysis, position of canine in mesio-distal dimension with the adjacent tooth (lateral incisor) was assessed.[14] Position of canine distal to lateral incisor corresponding sectors 1 and 2 were related to short duration and mesial to lateral incisor corresponding to sectors 3 and 5 were related to long duration. (Figure II B) According to Crescini canine inclination (α-angle) with the line drawn vertically

between the central incisors was measured. [14](Figure II C)

Statistical analysis was performed using IBM SPSS v.20 (Chicago, III). Chi square test, Cohen's Kappa and Spearman's Correlation was used to compare and correlate 2D and 3D KPG methods, respectively. Coefficient values was not relied on when P value was > 0.05.P value ≤0.05 were considered significant.

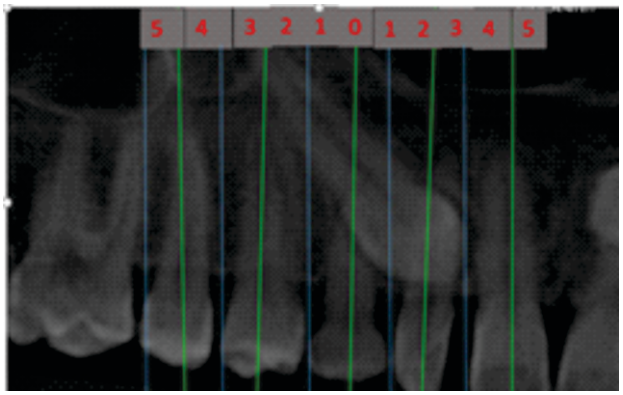

Fig 1: (A)

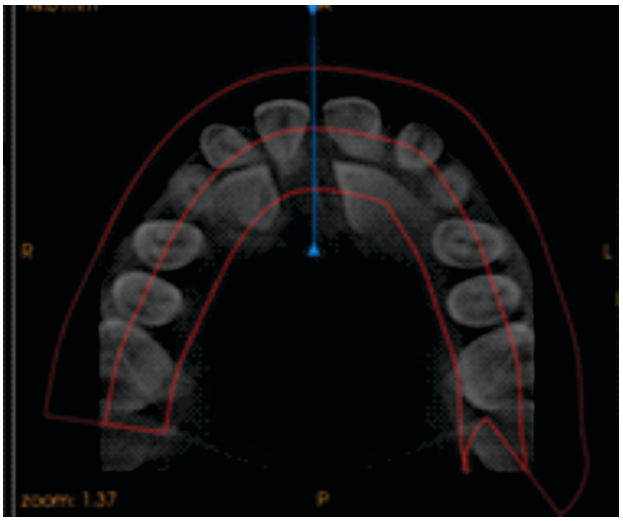

Fig 1: (B)

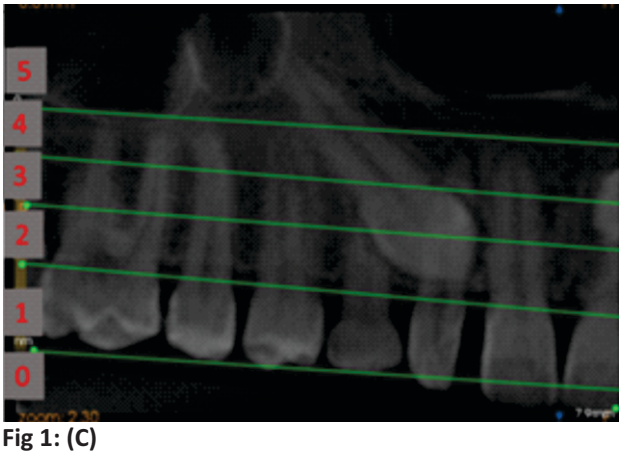

Fig 1: (C)

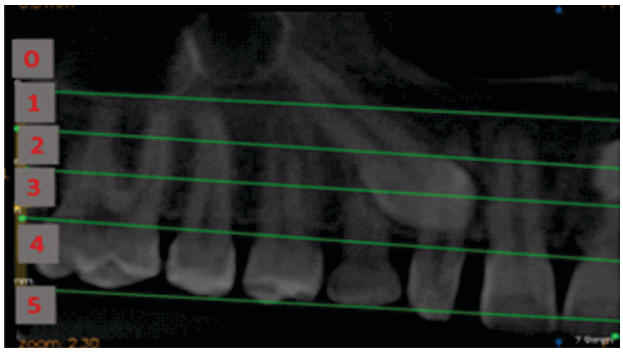

Fig 1: (D)

Figure 1: KPG index scoring 18 years old female patient with Right maxillary canine impaction. (A) Panoramic reformatted CBCT view showing impacted canine root and cusp tip (scored 3 & 3 respectively). (B) Axial cut from CBCT with occlusal reference line showing cusp and root tip in z axis (scored 3 and 3 respectively). (C and D) Panoramic reformatted CBCT view showing Impacted canine in y axis cusp and root tip (scored 2 & 0 respectively). Cumulative score KPG index=3+3+2+0+ 3+3=14 representing Moderate category.

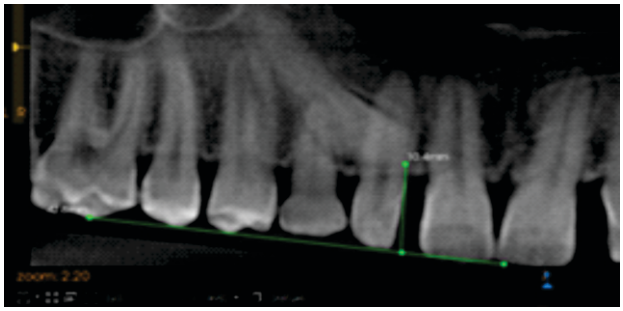

Fig 2: (A)

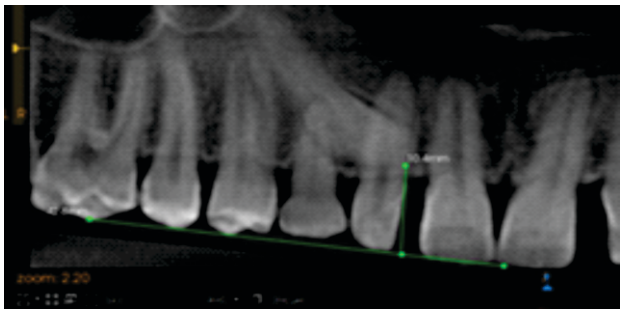

Fig 2: (B)

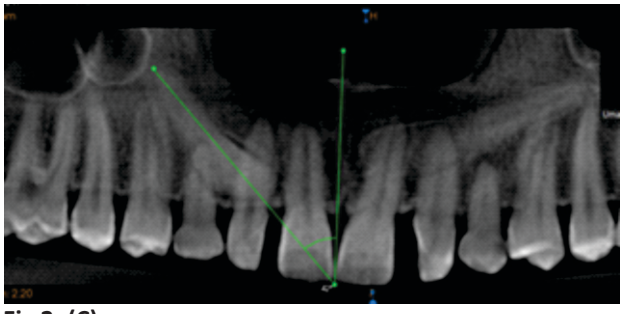

Fig 2: (C)

Figure: 2 (A) Vertical distance taken from canine cusp tip to 90 degree to occlusal palne (upper first molar to upper central incisor). In this example 10.4mm , that corresponds to shorter treatment duration according to stewart .
(B) Mesial and distal position of impacted canine with respect to the lateral incisor. In this example canine is mesially positioned. In this example it corresponds to difficult treatment according to Ericson and Kurol.
(C) α-angle (canine inclination with line drawn between central incisors. In this example α-angle is 42

Results

Our study was conducted on 49 impacted canines from 44 patients. The sample included 36(73.5%) females and 13(26.5%) males with a mean age of 16.02 years ± 3.96 years. Most of the canine impactions were on the palatal 68.8 % side (Palatal vs Buccal 31.9%) had an equal distribution on right and left sides. The mean value of the canine impaction angle with the midline was 34.6 ±14.7.

In Ericson and Kurol analysis, impacted canines were mostly (73.5%) mesial to the lateral incisors (mesial vs distal 36.5%). In Stewart analysis most of the impacted canines 41 (83.7%) were found to be less than 14mm (d-distance) from the occlusal plane.

Means and frequency distribution of KPG, Stewarts and Ericson and Kurol analysis are shown in (Table I).

Ericson and Kurol analysis showed more (73.5%) mesially positioned impacted canines with respect to the lateral incisors (mesial vs distal 36.5%). Measurements of Stewart's analysis revealed the (d-distance) for 41 (83.7%) impacted canines to be less than 14mm from the occlusal plane.

Comparison between 3D KPG index and 2D (Ericson and Kurol analysis and Stewart's measurements) methods, showed a significant difference (p = 0.001). Both 2D indices (Ericson and Kurol analysis and Stewart's) were only moderately correlated with the KPG index(r=0.47) Table II, Table III.

Comparison between the 2D methods (Ericson and Kurol analysis and Stewart's measurements) showed an insignificant difference and a weak correlation (r=0.26) (Table IV).

Table I: Means and frequency distribution of KPG, Stewarts and Ericson and Kurol Analysis

KPG analysis	Easy to difficult 26 (53.1%)	Difficult to very difficult 23(46.9%)
Stewart's analysis	Short Duration 41 (83.7%)	Long Duration 8 (16.3 %)
Ericson and Kurol analysis	Difficult 36(73.5%)	Easy 13 (26.5%)

Table II: Showing Comparison Between KPG Index Vs Ericson and Kurol Analysis

KPG index	Ericson and Kurol analysis		P value	r value
	Easy N=13	Difficult N=36	0.001*	0.473
Easy to moderate	12(24.4%)	14(28.5%)		
Difficult to very difficult	1(2.04%)	22(44.8%)		

P =< 0.05* R= Spearman's Correlation **

Table III: Showing Comparison Between KPG Index and Stewart's Analysis

	Stewart's analysis		P value	r value
KPG index	Short duration N=40	Long duration N=8	0.001*	0.470
Easy to moderate	26(53.0%)	0(0%)		
Difficult to very difficult	15(30.6%)	8(16.3%)		

Table IV: Comparison Between Ericson and Kurol Analysis and Stewart's Measurements

		Stewart's		P value	r
		short duration N=40	Long duration N=8		
Ericson and Kurol	Easy	13(26.5%)	0(0%)	0.90	0.265
	difficult	28(57.1%)	8(16.3%)		

P =< 0.05* R= Spearman's Correlation **

Discussion

CBCT due to its accuracy and reliability is being used extensively in dentistry for diagnosis, visualization, and precise assessment of canine location.[2,9] The aim of our study was to compare 2D (Ericson and Kurol and Stewart's analysis) with 3D KPG canine impaction index to determine impaction difficulty factor and orthodontic treatment duration of the impacted canines. We found a significant difference and a moderate correlation in measurements between 3D KPG index and 2D indexes.

We chose 3D KPG index as a standard to compare with the 2D (Ericson and Kurol and Stewart's) indexes, due to its reliability, validity, and accuracy in prediction of treatment difficulty and treatment duration.[2,7]

In our study, the impactions were predominately found in females and palatal side with an equal distribution on right and left sides. This corroborates with previous studies, showing female to male ratio to be 2:1.[2,3,16-18] The gender differences may be attributed to the smaller jaw size in females and aesthetic consciousness.[16,19,20] Dina M et al in their study reports equal distribution on right and left sides. In literature, this pattern has been considered as a general feature of the malformation with no specific scientific evidence.[19]

In our study, based on the Ericson and Kurol analysis, most of the impacted canines were found mesial to the lateral incisors (sector 4 and 5). Arriola G et al showed similar results [20] and suggested , presence of impacted canines in sector 4 and 5 in comparison to sector 1,2 and 3 , could affect not only the management approaches, biomechanical planning but also the duration of canine traction.[20] Similarly ,Cuc Thi et al reported palatal canine impactions to be frequently found in sector 3, 4 and 5 compared to the labial impactions and a significant relationship was observed in their study between the root resorption with the impacted canines found in Sector 4 and 5 .[8] Literature suggests that normally the eruption path of canines is in the mesial direction but later after 9 years of age due to guidance from the lateral incisors, shape of maxilla, roots of other teeth and genetic control, canines change their path of eruption (position) to vertical . If the canine does not upright or stays in the mesial position it adds to the difficulty factor.[21]

In current study, in Stewart's analysis lateral incisor was closer to the occlusal plane (d-distance) in most of the cases. Stewart JA et al concluded in their study, if the d-distance was less or greater than 14 mm, duration of orthodontic treatment would be approximately 23.8 months and 31.1 months respectively.[14.21] It has also been suggested that every 1 mm of distance of the cusp tip of the impacted canine from the occlusal plane needed approximately one more week of orthodontic traction.[22]

According to 3D KPG index, in our study most of the impacted canines (cusp and root tips) in x, y, z planes were in sector 3 except roots in x axis that were found in y axis. Luis Ernesto et al in their study found, (86.7%) impacted canines in sector 0 ,1,2 and 3 and 6 % in Sector 4 and 5 .[20]Crescini A et al reported that the mesial placement of the impacted canines requires at least 6 more weeks of orthodontics treatment. [22] Malik et al also confirmed the credibility of sector class identification by reporting the presence of palatal maxillary impactions in Sector 3 and 4 compared to normally erupting canines .[23] Arriola G et al suggested that treatment duration and complexity of treatment is influenced by not only gender but also position of impacted canine in the bone. According to their study, 2.05 more months are needed for treatment in females.[20]

In our study the mean canine angle with midline was 34.6 ˚±14.7. According to Crescini A et al the opening of every 5 degree of α- angle required approximately 1 more week for orthodontic traction.[22]

Ericson and Kurol analysis and Stewart's measurements were not significantly related. This difference could be due to the fact that, former one is used to assess the treatment difficulty and the latter is used to predict the treatment duration.[14] Previous studies have reported some specific features of canine impactions that are directly associated with duration of orthodontic traction that include α angle, d- distance, and impaction sector.[20,22,24]

Moderate and significant association was found between KPG index and Ericson and Kurol analysis and Stewart's measurements in our study. These results are not in accordance with another study where a strong association was found with only Ericson and Kurol analysis .[14] Similarly, Dina M et al reported insignificant difference between KPG index and Counihan et al guidelines. [19] The reason for the weak correlation measurements with Stewarts could be due to the fact, that canine tip position is one of the six factors considered by KPG index. Therefore, the contribution of the index can be masked by rest of the five. Also, the labiolingual cusp and root position was not assessed in 2D method.[14] The significant association in our study can be related to the anatomical factors, as mesial position of the canine leads to increased angulation of the canine. This impacts the KPG index scoring when rating the apex of the root in x and y planes .[14]Similarly, Kim et al found an association between panoramic radiograph sector location and labio-palatal position of impacted canines on CBCT. They reported labial and palatal impacted tooth root apices to be closer to

lateral incisor and premolar roots respectively.[25]

The reliability of the 3D radiographic images is more as compared to the 2D radiographic images. The measurement from 3D methods is more accurate and so are the indexes derived from them as it determines the treatment peculiarity.[9,14]There can be overestimation of the angles and the linear measurement taken. As in the anterior maxilla small inter-incisal angle or inter-maxillary discrepancy teeth can become either invisible or out of focus due to narrowing of focal trough.[26]This could explain why some measures in 2D indexes were found to be related to treatment duration or difficulty degree only in some studies, while they were considered non-influential by some others. This study compared 2D and 3D indexes to determine the complexity and treatment duration of the impacted canines. As, the accuracy of 2 D radiographs, more reliable results could be achieved with comparisons with other 3D methods. Moreover, the complexity of the canine impaction cannot be based only on few variables. In future, further studies can be conducted considering age, gender, type of malocclusion, complexity, oral hygiene maintenance, etc to clinically validate the KPG index. Furthermore, we can conduct a study to compare the sensitivity and specificity of various CBCT machines in determining in accurate localization and root resorption of the impacted canine.

Conclusion

KPG index (3D) measurements, compared to the 2D indexes (Ericson and Kurol and Stewarts analysis), showed a significant difference. There was a moderate correlation between the 3D KPG index with 2 D indexes. Hence, 3D KPG index can be used in place of 2D indices to effectively locate the position of and determine the difficulty level of orthodontic treatment of the impacted canines.

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ORIGINAL ARTICLE

Parenting Styles and Attention Deficits Hyperactive Disorder Symptoms: Mediating Role of Temperament Traits in Young Adults

Rehana Mushtaq[1], Sadia Saleem[2]

ABSTRACT

Objective: To explore the mediating role of temperament traits in parenting styles and Attention Deficits Hyperactive Disorder (ADHD) symptoms in young adults.

Study Design: A Cross-sectional research design.

Place and Duration of Study: This study was carried out in Lahore from September 2019 to March 2020.

Materials and Methods: A sample of 310 university students (men 38%, and women 63%) with the age range of 18-24 were given Demographic Performa, Attention Deficits Hyperactive Symptoms Scale (ADHSS)[21], Student Temperament Scale (STS)[4] and My memories of upbringing (EMBU-A).[22] Pearson Correlation was used to find the association among parenting styles, ADHD symptoms, and temperament traits and mediation analysis was used to investigate the mediating role of temperament traits between parental overprotection and ADHD symptoms and model 4 was used. The level of significance was taken as $p<.05$, $p<.01$ and $p<.001$.

Results: Women were 63% with higher percentage than men 38%. The mean of age was 20.12 years $\pm$1.60 SD. Correlation analysis indicate that a significant positive relationship among temperament traits, parental overprotection and ADHD symptoms. Mediation analysis indicate that impulsivity, cautiousness, and apprehension were partially parallel mediated the relationship between parental over-protection and ADHD symptoms.

Conclusion: The current study provides empirical evidence that temperament traits mediate the relationship between parental overprotection and ADHD symptoms.

Key Words: *ADHD, Over Protection, Parenting, Temperament Traits, Young Adults.*

Introduction

Parenting and temperament are said to be two influential factors in the development of several mental health concerns[1,2] including anxiety, depression, adjustment problems, and attention deficits hyperactive disorder (ADHD)[3,4,5,6]. ADHD symptoms enhance due to Lack of consistency in Parenting and temperament dimensions.[7] Parenting is a complex process that needs various skills to influence the behavior of a child.[8] Wilmshurst[9] explored that parenting style plays in the manifestation of the development of pathology and found that if parenting is warm, supportive, and encouraging, adults have good academic performance and high self-esteem.[10] Parents who exert excessive control on individuals may promote resentment and hinder autonomy in their emerging adults that may create frustration, loneliness, hyperactivity, shyness, careless and anxious[11]. Moreover, they expect parental support, and failure to receive may lead to inattention, hyperactivity, and anxiousness.[6] ADHD is a neurodevelopmental disorder characterized by inattention, hyperactivity, and impulsivity[12] with the prevalence rate in adults 2.8%-3.4.[13] Inconsistent parenting manifests impairment in parenting control like lack of organized or planned household routines and appreciation of an individual's needs or failure to monitor the individual which leads to impulsiveness and ADHD symptoms. ADHD deficits may also disturb the development of adults which leads to mental health problems.[6] In emerging adults, a link is found between parental and offspring psychopathology like ADHD symptoms, internalizing and externalizing behaviors.[14] A transitional period of ADHD adults continuously displays impairments that are associated with parenting[6]. When noticing the development of young adults with ADHD Jones[15]

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explained the interaction between parent-child-related factors and ADHD symptoms. In the framework of developmental psychopathology, reciprocal and transitional relations are proposed between problems in parental emotional responsiveness or behavioral control and child maladjustment including ADHD symptoms and closely related conditions like oppositional defiant and conduit disorder.[16]

All individuals with ADHD do not experience the same level of severity and type of symptoms but relevant factor temperament will identify as the greatest risk for adverse results.[2] Temperament influences psychological functioning and a greater risk for mental health problems (depressive symptoms, sleep problem, ADHD symptoms).[3] Temperament traits are early markers of different developmental pathways that lead to ADHD[17] and ADHD is an extreme manifestation of temperament traits[2]. In temperament, two broader pathways apprehension and impulsivity were associated with greater psychopathology.[18]

Temperament traits are explored as possible ways to the emergence of ADHD symptoms and may be relevant to the functioning of the parenting domain.[11] A link between certain temperament traits (impulsivity and Apprehension) and ADHD symptoms was found[2]. Temperament traits are related to the occurrence of ADHD in adulthood[16]. A link among parenting and temperament traits (impulsivity, Apprehension, and cautiousness) was also found[19]. Parenting, temperament, and ADHD symptoms are correlated[19]. Parenting and temperament traits are bidirectional correlated.[11] Parenting affects an individual's temperament and behavior problem.[19] Gau[20] reported that ADHD adults perceive more overprotection and control from their mothers. Researches[18,20] explained the relationship between parenting factors (overprotection) and child psychopathology.

It can be concluded that parenting and temperament play a vital role in human development especially in psychopathologies like ADHD. The current research was carried out to explore how Parenting influence the temperament traits and ADHD symptom in a sample of Pakistani young adults. Pakistani is collectivistic culture, where parents focus on overprotection and provide guidance and expect obedience from individuals. Therefore, the present study was aimed to explore the relationship among Parenting, temperament traits, and ADHD symptom in a sample of Pakistani young adults and find out the mediating role of temperament traits between Parental overprotection warmth and ADHD symptom.

Materials and Methods

A cross-sectional research design and government and private university settings were used. This study was carried out in Lahore from September 2019 to March 2020.

A sample of 310 undergraduate university students were taken from 2 government and 2 private universities of Lahore through convinient sampling. The current research was approved by Institutional Review Board (IRB). Only university students of Bs Hons and Msc Program were taken. University students of Mphil and Ph.D. were excluded from this study.

Demographic performa consists of age, gender, and academic class. Attention Deficits Hyperactive Symptoms Scale (ADHSS)[21] was used to measure ADHD symptoms in young adults. It is a self-report measure consisting of 40 items with 3 factors *inattention*, *hyperactivity,* and *prosocial* on 5 point Likert scale such as 0 (*not at all*), 1 (*too little*), 2 (*to some extent*), 3 (*often*), and 4 (*too much*). In the current research, only 28 items of inattention and hyperactivity were used. The score of ADHSS (inattention and hyperactivity) lies between 0-112. A higher score represented more symptoms of ADHD. Internal consistency is *inattention* α=.85 and *hyperactivity* α=.79.

Student Temperament Scale (STS)[4] measures temperament styles in university students consist of 56 items with 6 factors, *apprehension, impulsivity, cautiousness, introversion, submissiveness,* and *Extroversion* but in current research, only 38 items of apprehension, impulsivity, and cautiousness were used. The response options are on 4 point rating scale of 0(*never*), 1(*sometimes*), 2(*often*), and 3(*most of the time*). Internal consistency is apprehension α=.82, impulsivity α=.81, cautiousness α=.80, introversion α=.77, submissiveness α=.72 and Extroversion α=.70. My memories of upbringing EMBU-A[22] is a self-report measure that provides the individual perception of parental rearing practices. It

has two forms for Father and mother separately. It consisted of 27 items with 3 factors emotional warmth, rejection, and overprotection but in current research, only 6 items of overprotection subscale were used for both Father and mother in Urdu. The response options are 0 (never), 1 (sometimes), 2 (often) and 3 (always). The scoring range is between 0-18 and higher represent more perceived rejection from both parents. With ensuring confidentiality and privacy, researcher collected the data from the participant in the group with a debriefing session. They were asked to rate each statement to the extent to which it applies to them. Mean and standard deviaoition and percentages were done through SPSS 21. Data were analyzed in SPSS 21 for Correlation and Mediation analysis was carried out through PROCESS and model 4 was used. The level of significance was taken as $p<.05$, $p<.01$ and $p<.001$.

Results

Women were 63% with higher percentage than men 38%. The mean of age was 20.12 and standard deviatrion is 1.60. The relationship among parenting style, ADHD symptoms and temperament traits were explored through Pearson Product Moment Correlation. Finding indicated significant positive association among father over protection, impulsivity cautiousness, apprehension, ADHD symptoms and mother overprotection Moreover, results showed significant negative association between cautiousness and ADHD symptoms.

Pearson Product Moment Correlation indicates significant relationship among study variable, hence,

Table I: Summary of Inter-Factor Correlations of Parenting Style, ADHD Symptoms and Temperament Traits (N=310)

Variables	1	2	3	4	5	6
1. FOP	---	.65***	.27***	.24***	.21***	.23***
2. MOP	---	---	.15**	.19**	.11*	.15**
3. Impulsivity	---	---	---	.09	.55***	.50***
4. Cautiousness	---	---	---	---	.14*	-.15**
5. Apprehension	---	---	---	---	---	.36***
6.ADHSS-Total	---	---	---	---	---	---
.	.48	.54	.77	.74	.77	.91
M	23.45	24.15	18.89	14.73	15.41	42.99
SD	9.13	8.73	6.73	4.27	5.87	18.47

Note. FOP= Father overprotection, MOP= Mother overprotection, ADHSS = Attention Deficits Hyperactive Symptoms Scale

*$p<.05$, **$p<.01$, ***$p<.001$.

the mediating role of apprehension, impulsivity and cautiousness in the relationship between parental overprotection and ADHD symptoms was explored by conducting parallel mediation analysis through Hayes[23] bootstrapping approach. Figure 1 shows the mediating role of impulsivity, cautiousness and apprehension in the association between father overprotection and ADHD symptoms. Total effect of father overprotection on ADHD symptoms ($\beta = .23$, $SE = .06$, $p < .001$, $R^2 = .05$) was significant. Furthermore, the direct effects of father overprotection on impulsivity ($\beta = .26$, $SE = .06$, $p < .001$, $R^2 = .07$), cautiousness ($\beta = .23$, $SE = .06$, $p < .001$, $R^2 = .06$) and apprehension ($\beta = .21$, $SE = .06$, $p < .01$, $R^2 = .04$) were significant. In contrast, an examination of the direct effects of the mediating variables on ADHD symptoms exhibited that the direct effects of impulsivity ($\beta = .40$, $SE = .06$, $p < .001$, $R^2 = .32$), cautiousness ($\beta = -.23$, $SE = .05$, $p < .001$, $R^2 = .32$) and apprehension ($\beta = .14$, $SE = .06$, $p < .05$, $R^2 = .32$) were significant. Findings suggests that impulsivity, cautiousness and apprehension partially mediate the association between father overprotection and ADHD symptoms as after controlling the mediating variables the direct effect of father overprotection on ADHD symptoms is reduced ($\beta = .15$, $SE = .05$, $p < .01$, $R^2 = .32$) but c' path is still significant. Figure 2 shows the mediating role of impulsivity, cautiousness and apprehension in the association between mother overprotection and ADHD symptoms. Findings indicated that total effect of mother overprotection on ADHD symptoms ($\beta = .15$, $SE = .06$, $p < .01$, $R^2 = .02$) was significant. Moreover, the direct effects of mother overprotection on impulsivity ($\beta = .15$, $SE = .06$, $p < .01$, $R^2 = .02$), cautiousness ($\beta = .19$, $SE = .06$, $p < .001$, $R^2 = .04$) and apprehension ($\beta = .11$, $SE = .06$, $p < .05$, $R^2 = .01$) were significant. Furthermore, the direct effects of the mediating variables on ADHD symptoms exhibited that the direct effects of impulsivity ($\beta = .42$, $SE = .06$, $p < .001$, $R^2 = .31$), cautiousness ($\beta = -.22$, $SE = .05$, $p < .001$, $R^2 = .31$) and apprehension ($\beta = .15$, $SE = .06$, $p < .01$, $R^2 = .31$) were significant. Findings suggests that impulsivity, cautiousness and apprehension partially mediate the association between mother overprotection and ADHD symptoms as after controlling the mediating variables the direct effect of mother overprotection

on ADHD symptoms is minimized (β = .11, SE = .05, p < .05, R^2 = .31) but c' path is still significant. Therefore, it can be concluded that temperament traits partially parallel mediate the association between parental overprotection and ADHD symptoms.

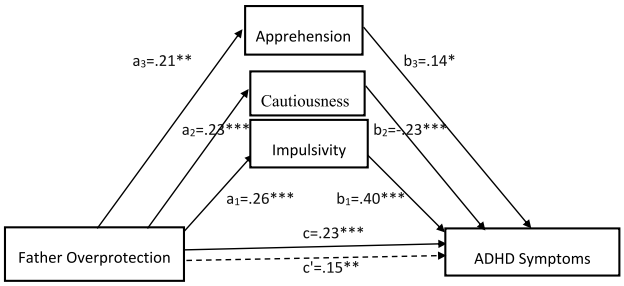

Fig 1: Mediation Path Framework of Father Over Protection, Temperament Traits, and ADHD Symptoms

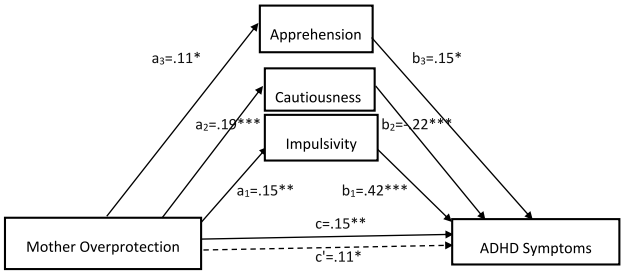

Fig 2: Mediation Path Framework of Mother Over Protection, Temperament Traits and ADHD Symptoms

Discussion

Family is the most significant context in the development of an individual. It plays an essential role in the upbringing process of an individual because parents provide a healthy relationship which is compulsory for the maturity of an individual.[24] Parenting may influence an individual's behavior problems, which may increase or decrease depending on the type of relationship[19]. The parent-child relationship defines according to different approaches and individualistic and collectivistic culture[3]. Parenting factors including warmth and overprotection may influence the relationship between parent and child psychopathology and problems of young adults increased over time.[25]

Parental overprotection may have different consequences in young adults with a difficult temperament.[25] Therefore, the present research was aimed to explore the relalationship among parental overprotection, temperament traits and ADHD symptoms and it was also aimed to explore the temperament traits that mediate the relationship between parental overprotection and ADHD symptoms. The results revelaed that Women were 63% with higher percentage than men 38%. The mean of age is 20.12 and standard deviatrion is 1.60. The greater ratio of women was found in university population. The finding of correlation anlysis revealed a significant correlation was found among parental overprotection and maternal overprotection, temperament traits (impulsivity, cautiousness, and apprehension) ADHD symptoms of inattention and hyperactivity at the .001, .01 and .05 level of significance. The previous literature supports the results of the current study.[2,10,11,13,19] The finding of mediation analysis revealed that temperament traits (impulsivity, cautiousness, and apprehension) partially parallel mediate the relationship between parental and maternal overprotection and ADHD symptoms of inattention and hyperactivity at the .001, .01 and .05 level of significance. The previous literature supports the results of the current study[2,10,11,13,15,16, 17,.18,19] and indicated that Parents who exert excessive control on their children may promote resentment and hinder autonomy in their emerging adults. It may create, hyperactivity, shyness, careless and anxious[11] and as a result of these consequences young adult could not pay attention to their studies, and increase impulsivity temperament trait (cautiousness).

One interesting finding revealed that father overprotection is the most significant predictor of temperament and ADHD symptoms. fathers are found to be an authoritative figure of the family and a sign of power. Overprotection from fathers affects more on their temperament and inattention and hyperactivity. According to these findings, it can be said that parental overprotection may lead to a negative impact on an individual's life.

Conclusion

The current study provides empirical evidence that temperament traits mediate the relationship between parental overprotection and ADHD symptoms in young adults. Parenting style plays an important in the manifestation of the development of pathology in a clinical setting. As well perceived parenting plays a crucial role in an individual's life. Parent and child relationship is to be positive for decreasing their symptoms of ADHD.

In the current study, a cross-sectional research design was used. In the future longitudinal studies

will be done for mediation. Another limitation, data was taken from adults. In the future, data would be collected from both parents and Adults for exploring parent-child bonding. The implication of this study is to understand the risk and protective of overprotection and counseling services needed for reducing the symptom of ADHD in young adults.

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ORIGINAL ARTICLE

Primary Prevention of Aggression Induced by Media Exposure: A Cross Sectional Study

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ABSTRACT

Objective: The purpose of the study was to determine the association between the media exposure and the aggression levels in the students of 13-24 years residing in Wah Cantt.

Study Design: Cross-sectional

Place and Duration of Study: Educational Institutes of Wah Cantt for 1 year from January 2019 to January 2020.

Materials and Methods: The standardized questionnaires i.e., CME-scale & Bus-perry scale were used to measure Media exposure and aggression levels besides basic demographic data. Data was analyzed by using SPSS version 20. Media exposure and aggression exhibited by the students was categorized into low, medium, and high levels.

Results: Majority of students had low or medium levels of media exposure (59.4%) and low or medium aggression scores (84.1%). There was no difference in level of aggression between Males and Females (P=0.230). Association of aggression with Media exposure was significant (P=0.000) and the Pearson correlation was weakly positive (r= 0.393, p= 0.000). Although a majority (80.6%) of participants possessed electronic devices, but they were mostly (55.9%) monitored by parents. Hours spent per day on screen were positively skewed with mean hours of 4.58±3.8.

Conclusion: There was a weak positive correlation between media exposure & aggression**.** A longitudinal study might be done to assess the possible effect of the cultural and societal values of indulgence in sports and scholarship by the citizens of this area on the levels of media exposure and aggression levels in youth.

Key Words: *Adolescent, Aggression, Education, Media, Primary prevention*

Introduction

Social psychologists define aggression as behavior that is intended to harm another individual who does not wish to be harmed. Aggression is caused by the thoughts and feeling lying in our subconscious mind.[1] This is the reason why exposure to violent media put children's and adolescent's health and wellbeing at risk. Relationship between exposure to violent media and aggressive behaviors are well explained by general aggression model, externally stimulated aggression and the learned aggression theory.[2]

In an era of technology, social media plays dynamic role in almost every field of life. Through this people can communicate with each other at different platforms. Media exposure is defined as the extent to which audience members have encountered specific messages or classes of messages/media content.[3] Media makes remarkable contributions but, regretfully the negative effects of social media cannot be kept far aside. Concerns have been raised that social media deeply impact behaviors and adolescents who are exposed to violent behaviors through media are more likely to participate in violence.[4] Several news reports of cyber bullying, criminal activity on social media or through it, gang violence and suicide have surfaced and social media appears to fuel these troubling incidents.[5] The influence of media on psychological development of children is repeatedly documented in literature.[6] Violent media are defined as "Those that depict intentional attempts by individuals to inflict harm on other, an individual can be non-human cartoon character, a real person or anything in between".[7] The evidence also reveals that exposure to violent media is associated with physical and psychological problems including aggression, bullying, fear,

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depression, nightmares & sleep disturbances.[8] The problem is not only confined to violent media exposure. Even the excessive recreational use of computer and video games and long screen hours >2-3/day increase the odds of mental health two times.[9]

Pakistani youth is also facing the same threat from media exposure. Social science literature and news blogs are regularly narrating media's advantages and disadvantages and suggesting a change required in media content to create good impact on changing minds. Control to media exposure needs to be promoted and practiced. As an educated community we have to work together to find and eliminate these triggers.[10]

To counter these negative consequences protective and mediating factors like parental involvement, parental monitoring, restrictive and active measures taken by the parents [11] and as Whitney and Christopher reported that Violent media exposure is not a single or very promising predictor of youth aggression. Their empirical research based on large sample size (n=5133) and a diverse youth group concludes that family and social variables are more influential factors implying that preventive measures targeted at community level like promotion of sports and scholarship among youth might play a very important role.[12]

In lieu of the above evidence by Whitney et al. this research is aimed to explore the effects of social media on aggressive behavior of college students in Wah Cantt. Wah Cantonment is a military city located in the Punjab province of Pakistan, near Taxila 30 km to the north west of Islamabad. According to the 2017 Census of Pakistan, its population is 380,103. The most distinct feature of the town is its very high literacy rate reaching up to 99%. Wah Cantt, having an area of about 35 square kilometers, has the highest number of educational institutes per square kilometer. Apart from many private and government schools up to 12th level, foundations of professional universities have been laid down in past 5 years.[13] In addition to the educational institutes with big playing grounds there are parks and grounds for hockey, cricket, football, basketball, and athletics as well as the swimming pool and a large golf club.

With this background we expect the levels of media exposure and aggression in youth of Wah Cantt to be lower than what is found elsewhere. This study was aimed to measure the levels of media exposure and aggression among youth residing in Wah Cantonment and quantify the association between these two.

Materials and Methods

A descriptive cross-sectional study was conducted in Wah Cantonment from Jan 2019 to Jan 2020 on a sample of 323 students -95% level of confidence and expected proportion to be 70%- after taking permission from IRB of WMC. All the male & female students ranging from 13-24 years of age residing in Wah cantt were included using convenient sampling. The study participants were contacted either directly or through school/college teachers who were in contact of all the researchers. Students not resident of Wah cantt but studying in this area were excluded. All the researchers explained the study objectives and questions in the questionnaires to school/college teachers they knew personally who then provided us the time & opportunity to reach the different cohort of students, take their informed consent and collect the data. The university students were contacted directly via various social contacts. After taking informed consent and ensuring anonymity and confidentiality questionnaires were filled by the researchers in English. As English is the medium of teaching in all schools and colleges of Wah Cantt so there was no need to translate the questionnaire. It comprised of three parts; demographic information, media exposure measured by using content-based media exposure scale (c-me scale) [14] an 8-item inventory for measuring anti-social and risk behavior content and 9 neutral filler items; Buss-Perry Aggression Scale to measure level of aggression.[15] Data was analyzed using SPSS version 20. Descriptive statistics was calculated for all the variables. The association between levels of aggression and levels of Media exposure was tested using chi-square test keeping alpha at 0.05.

Media exposure was categorized into**:** High exposure = those scoring from 32 to 40, Medium exposure =those scoring between 24-31 and Low exposure = those scoring <23. Total score was 85 on CME-scale but the items on anti-social and risk behavior content had maximum score of 40. The aggression levels were also categorized into 3**:** High aggression = those

scoring 80% or more on Buss-Perry scale, medium aggression = those scoring between 60-80% and Low aggression = those scoring 60% and below.

Results

Age of the students ranged from 13 to 24 years and mean was 18.3±3.1 and half of population was male. Eighty-point six percent (n=258) students owned electronic devise mobile being the most common possessed by 68% (n=217) students followed by mobile & laptops 27% (n=86) students. Fifty-five-point nine percent students (n= 179) were monitored by their parents for media content. Total hours spent on screen were positively skewed with mean duration of 4.58± 3.89 hours & skewness =2.53 ± 0.139. Overall, the levels of both aggression and media exposure were low among youth of Wah Cantt in both genders.

Table I: Age and Gender-Wise Distribution of Aggression Levels and Media Exposure Levels in Wah Youth (N= 372)

Variable	Frequency n (%)		P value	Frequency n (%)		P value
	Males	Females		Adolescents 13-17yrs	Adults 18-24 yrs.	
Aggression level						
High	31(19.3)	20(12.6)	0.230	31(22.8)	20(10.9)	0.000
Medium	78(48.4)	79(49.7)		93(68.4)	64(34.8)	
Low	52(32.3)	112(35)		12(8.8)	100(54.3)	
Media exposure						
High	62(38.5)	68(42.8)	0.027	124(91.4)	6(3.3)	0.000
Medium	31(19.3)	14(8.8)		10(7.4)	35(19)	
Low	68(42.2)	77(48.4)		2(1.5)	143(77.7)	

Association of aggression with media exposure was statistically significant (x^2= 63.446, df=4, p= 0.000) and Pearson correlation was positive (r=0.393, p=0.000). Aggression was also positively correlated with hours spent on electronic devices (r=0.125, p=0.028).

Significant associations were found between aggression levels and student's education, father's education & occupation, parental monitoring. Whereas media exposure was significantly associated with all these independent variables as shown in table 2.

Table II: Measure of Association between Aggression Score (Dependent Variable) and Independent Predictors Besides Media Exposure

Variables	P value (Aggression level)	P value (Media Exposure)
Mother's education	0.604	0.402
Father's education	0.010	0.000
Mother's occupation	0.07	0.003
Father's Occupation	0.004	0.000
Parental monitoring	0.000	0.000
Student's education	0.000	0.000
Monthly income	0.680	0.003

Discussion

Literature proves that media provokes violent behavior in youth, and it leaves deep psychological impacts on their minds. Authors have highlighted various protective factors against Violent media exposure[11] but very few highlighted the effect of cultural background, peaceful societies, and non-violent, non-punitive behaviors of adult; a type of primordial prevention, in shaping behaviors.[16] Both the levels of media exposure and aggression were low in majority of students in our sample which could be attributed to above-mentioned factors in Wah Cantt. This cultural value, very much unique to this geographical location, has a profound effect on thinking patterns and goal setting process of the youth. Unlike most of the cited literature[6,17], there were lower aggression scores strongly associated with lower media exposure in this study most probably related to the context in which this youth was brought up.

According Khurana & Padilla-Walker understanding certain aspects helps to predict the aggressive behavior at an adult age, one of which is less interaction of children with parents.[11] Padilla-walker et al. in their latest study reported controlled media exposure especially maternal monitoring can bring about decrease in aggression.[17] Highly literate maternal population i.e., 81.9% in our sample along with majority of them being i.e., 87.8% housewives should also have contributed to low levels of aggressions and media exposure but unexpectedly children of working mothers had significantly lesser aggression & media exposure levels and maternal education was not associated with either aggression or media exposure. Fathers, however, seem to have important role in shaping children's behaviors in our culture. Higher the education of father lesser are the aggression & media exposure scores in children. These results correlated well with the findings of

Jaynes & Rebecca.[18]

A three year longitudinal study reports an association between viewing relational aggression on TV and exhibiting it in the future, even when controlling for existing levels of multiple forms of aggression.[6, 19, 20, 21] But parental monitoring can mediate these effects positively as proved in meta reviews.[22] Parental monitoring in our context was 35.9% and was positively correlated with hours spent on ED, and negatively associated with Aggression & media exposure scores.

Although cross sectional study design has hampered the complete understanding of interplay of various factors in shaping aggression among youth but in the context of Wah Cantt it can be postulated that the significant associations could be due to strong bonding and increased level of interaction between parents and their children, leading to close surveillance of the activities of children which controls any addiction to media exposure. Another limitation was the students themselves answering the questions for aggression which might not provide the authentic results because aggression is predominantly determined by observation and the reported media exposure could have been confirmed by the parents & teachers. Behavior is a complex combination of physical, psychological, and physiological dimensions in human beings. It is defined as "the internally coordinated responses (actions or inactions) of whole living organisms (individuals or groups) to internal and/or external stimuli, excluding responses more easily understood as developmental changes".[23, 24] It is important therefore to conduct physical, neurophysiologic, behavioral, cognitive, and environmental studies to understand the inter relationship between students' behaviours and contextual factors. Among other non-negotiable risk factors like poverty was not the case in our sample[(25)].

There is a deep and subtle relationship between aggression and its social & genetic predictors. All these factors open new research areas in our unique educational culture. It would be interesting to see the role of these factors in media and aggression equation in a community with such low levels of aggression.

Conclusion

The levels of aggression and media exposure are both low in our society. There is a positive correlation between the two variables. The role of the cultural and societal values of indulgence in sports and scholarship by the citizens of this area on youth behaviors should be studied in a longitudinal study to confirm the association. The primary prevention model in vogue at Wah Cantonment i.e., may contain some positive lessons which could be implemented to lessen the evil of media exposure and hence aggression levels in youth in extended societies.

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ORIGINAL ARTICLE

Why Stress? A Comparative Descriptive Study of Perceived Stress Levels Among Working and Non-Working Female Medical Doctors

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ABSTRACT

Objective: To identify different levels of stress and determine significant risk factors among working and non-working female medical doctors in Islamabad/Rawalpindi city

Study Design: A Comparative cross-sectional study.

Place and Duration of Study: Rawalpindi/Islamabad from September to December 2019

Materials and Methods: 240 respondents were selected by simple random and snowball sampling. Study subjects included working and nonworking female doctors. Scoring was done on the basis PhoenX Tool Kit for Chronic Stress.

Results: Among the total respondents 17.1% were found to be highly stressed however remaining 75.8% were moderately stressed. Significant difference in stress scores was observed between working (9.2% highly stressed) and nonworking (25% highly stressed) female doctors (p=0.003). Mean optimal score was 28.15 for doctors working in public hospitals as compared to 22.1 for those working in private hospitals (p<0.001). Medical officers were found to be stressed to a greater extent (54.5%) as compared to registrars (45.5%) and consultants. Number of dependent family members, years since graduation, stressful financial situation and cooperation of husband/in-laws were found to be significant stressors among both groups. However, among non-working female doctors, their financial situation, non-cooperation of husband/family, more dependent family members, low self-esteem and self-confidence were significant stressors.

Conclusion: It is concluded that medicine is inherently a stressful profession for both working and non-working females. Working female doctors have high rates of anxiety, depression, and marital problems, while non-working females have social environment, less appreciation by the society and monotonous lifestyle.

Key Words: *Female Medical Doctors, Stress, Stressors, Stress Management, Working and Non-Working Women.*

Introduction

Stress is defined as any action that results in special psychological and physical demands on a person that unbalances an individual's equilibrium. Job-related stress is the leading source of stress among both working and non-working adult population. Workplace has become a source of extreme stress because of technological changes, mass retrenchments, mergers and acquisitions, information overload, demand for more productivity, fierce competition, and uncertain future. On the other hand, well-educated young professionals who fail to pursue their profession also suffer from stress due to internal guilt, low self-esteem, and dissatisfaction.[1]

Medicine is inherently a stressful profession and job stress is a well-recognized problem among health care professionals. Medical doctors are a high-risk group for mental health problems due to job-stress. The specific factors which make doctor's profession so stressful include their responsibility for “people” rather than “objects”, and the fact that their actions or omissions can cost life or death and that they have a profound impact on a human's life. Moreover, doctors' competence is under continual evaluation by both patients and colleagues.[2] Their mistakes are highly visible with potentially devastating results for patients as well as the doctors themselves. Two potential additional sources of stress for health professionals include their face-to-face relationships with patients, relatives, other staff and hospital's

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management and exposure to increased risk of disease or injury.[3]

Around one third population of medical doctors suffer from severe stress and mental health illnesses as compared to general population one fifth of which suffer from such conditions.[4] High stress levels lead to anxiety and depression, and it is reported that one third of the medical doctors had anxiety disorders while 20% had depression.[5] Unfortunately, these symptoms are more commonly encountered by female medical doctors. Female doctors working in hospitals experience higher levels of professional burnout than males, and around 40% of the female doctors abandon their careers right after graduating.[6] Long working hours usually disturbs the early-marriage and family life, leading to conflicts with partners, which is one of the main reasons for high burnout rate.[7]

Potential sources of stress among female medical professionals generally include five factors which were qualitatively labeled as career development, job demands, organizational climate, working hours and other external factors.[8-10] A survey conducted by the Department of Community Health Sciences, Agha Khan University, concluded that Majority (68%) of the doctors were not satisfied with their jobs, and females more commonly than males (72% vs 65%, $p<0.001$).[11]

As doctors are generally more stressed out due to nature and demand of their work, at the same it is not less stressful for well-educated doctors to quit their profession and get confined at homes. It is important to identify the level of stress among both working and non-working female doctors so that appropriate measures could be taken to normalize the stressors. Therefore, this comparative study was designed with an aim to identify and compare stress levels among working and non-working female medical doctors in Islamabad/Rawalpindi city and also to determine significant risk factors causing stress among the study population.

Materials and Methods

This comparative cross-sectional study was conducted from September to December 2019, in four tertiary care hospitals of Islamabad/Rawalpindi city, selected randomly from a list of all tertiary care hospitals functioning in twin cities. The minimum required sample size was calculated to be 240 (120 each for working and non-working female doctors group), using WHO online sample size calculator where prevalence of stress among female healthcare professionals was considered to be 88%,[12] with a 95% level of confidence, 80% study power and 10% adjustment for attrition. The inclusion criteria for working female doctors included at least MBBS qualification, PMDC registered doctors from public and private hospitals practicing medicine for past 5 years while for non-working female doctors all those who were not practicing medicine from the beginning of their career were included in the study. Female doctors who had recently left the job or at least within last 5 years or practicing privately as General Practitioners at private clinics were excluded from the study because the reason for their stress level might confuse because of recently quitting the job. The study was approved from Institutional Review Board (IRB)

A two-staged cluster-random sampling technique was employed in this study. At the first stage, sampling frame was developed by listing public and private tertiary care hospitals in Rawalpindi/ Islamabad, one public and one private hospital was selected randomly for each city. In the second stage, lists of all the employed doctors were obtained from randomly selected hospitals. A sampling frame was created by including and excluding the individuals as per the set criteria mentioned above. A list of 200 random numbers was generated using computer software Microsoft Excel 2003, with the help of which 120 working female doctors were randomly selected, thirty from each hospital list. Each participant was approached, and a formal written consent was obtained after having adequately explained the objectives and the rationale for the study. Upon refusal to participate in the study, next participant from the list, according to random number sequence, was approached till completion of required sample size. The non-working doctors were contacted on telephone and through their e-mail Ids. Keeping in view the limited access "snowball sampling" technique was employed for accessing non-practicing doctors and information was gathered via interviews.

A validated questionnaire was used to collect data for this study that is the "PhenX Tool Kit for Chronic Stress",[13] consisting of two sections. First section

comprised of the socio-demographic details while the second section consisted of variables / stressors based on protocol used for assessment of chronic stress. This section included a list of 31 items about common life conditions and situations (e.g., financial issues, work, marital relationship, family and children, social life). The 32-item scale was broken down into 11 subscales (General, money and finance, work, non-working, marital relations, parental, family, isolation/depression, social life, residence and recommendations). For each item the scoring was done as: a response of not true = 0, somewhat true = 1, and very true = 2. The total score from each individual subscale was then calculated. A low score indicated good mental health while higher score showed increased degree of stress.

Data analysis was done using statistical package for social sciences software (IBM SPSS version 23.0). Descriptive statistics of categorical variables was presented as frequency/percentages, while mean and standard deviation was reported for continuous variables. The outcome variable, stress level score, was calculated for each responder. 31-items were scored as 0, 1 or 2 depending on participant's response, while the last item related to recommendations was not scored. Total maximum score was 62. A score 18 points or less was labelled as "not stressed", score of 19 to 43 was labelled as "stressed to some extent", while score between 44 to maximum of 62 was labelled as "stressed to great extent". Pearson's chi square test was applied to compare the stress levels among working and non-working female doctor groups. Multivariate analysis was done to find any significant associations between working status of doctors and financial issues, work, marital relationship, family and children and social life. The p-value of ≤0.05 was considered to be significant.

Results

There were 240 female doctors participated in the study, where 120 were working doctors while 120 were non-working doctors. Overall, 177 (73.8%) respondents were of age less than 40 years, whereas 63 (26.3%) were of more than 40 years. Around 15% (36) of the doctors had graduated for more than 20 years ago, 43.3% (104) had graduated between 10 to 20 years ago, and 41.7% (100) had graduated less than 10 years ago. Among working doctors, majority 45 (37.5%) were working as medical officers, and majority 44.2% (53) reported to be working for 10 hours daily. Post-graduation was completed by 89 (37.1%) working doctors, whereas among non-working doctors only 11 (9.1%) pursued post-graduation as shown in table 1.

Table I: Demographic Characteristics of Study Participants (n=240)

Demographics	Working Status n(%)	
	Working (n=120)	Non-working (n=120)
Age (n=240)		
• Less than 40 years	84 (70.0%)	93 (77.5%)
• 40 years and above	36 (30.0%)	27 (22.5%)
Graduation year (n=240)		
• 1-10 years ago	17 (14.2%)	19 (15.8%)
• 11-20 years ago	56 (46.6%)	48 (40.0%)
• 21 years and above	47 (39.1%)	53 (44.1%)
Post-graduation (n=240)		
• Yes	11 (9.1%)	89 (74.1%)
• No	109 (90.8%)	31 (25.8%)
Designation (n=120)		
• Medical officer	-	45 (37.5%)
• Registrar		36 (30.0%)
• Consultant		39 (32.5%)
Gross income (PRK) (n=240)		
• <75k	34 (28.3%)	30 (25.0%)
• 76-150k	68 (56.6%)	61 (50.8%)
• 151-250k	13 (10.8%)	17 (14.2)
• >250k	5 (4.2%)	12 (10.0%)
Dependent family members (n=240)		
• Less than 4	88 (73.3%)	81 (67.5%)
• 4 or more	32 (26.6%)	39 (32.5%)

Among the working group, 94 (78.3%) agreed that they had no time to fully take care of own needs as compared to 16 (13.3%) of non-working group (p<0.001). Stressor of less appreciation from family/employer was reported by 16 (13.3%) working while 56 (46.6%) non-working doctors (p<0.001), 61 (50.8%) of working females reported to unwillingly say yes to commitments as compared to 15 (12.5%) non-working doctors (p<0.001), stressful financial situation was faced by 19 (15.8%) working while 63 (52.5%) non-working doctors (p<0.001). Regarding marital relationship, 14 (11.6%) working and 22 (18.33%) non-working doctors reported to encounter frequent arguments with the husband (p=0.082), 20 (16.6%) working and 16 (13.3%) non-working doctors reported less involvement of

husband in domestic duties (p<0.001), 19 (15.8%) working and 20 (16.6%) non-working doctors admitted that they could have worked or exceled in carrier if husband had supported them (p<0.001), 13 (10.8%) working as compare to 43 (35.8%) nonworking women admitted that their family relations (husband/ in-laws) are not supportive and this factor causes significant stress (p<0.001). Summary of other stressors is given in table 2.

Table II: Summary of Various Stressors among Working and Non-working Female Doctor Groups

Stressors	Study Groups		P-value
	Working (n=120)	Non-working (n=120)	
A. General			
1.You don't have time to fully take care of your own needs because you are doing so much to take care of others.			
• True	94 (78.3%)	16 (13.3%)	< 0.001
• Somewhat true	19 (15.8%)	96 (80.0%)	
• Not true	7 (5.8%)	8 (6.6%)	
2.You feel as though you are always working and yet getting nothing done			
• True	6 (5.0%)	55 (45.8%)	< 0.001
• Somewhat true	58 (48.3%)	64 (53.3%)	
• Not true	56 (46.6%)	1 (0.8%)	
3.Too much is expected from you by others.			
• True	32 (26.6%)	21 (17.5%)	0.208
• Somewhat true	64 (53.3%)	69 (57.5%)	
• Not true	24 (20.0%)	30 (25.0%)	
4.You seldom get any feedback /word of appreciation from your employer /family /spouse.			
• True	16 (13.3%)	56 (46.6%)	< 0.001
• Somewhat true	27 (22.5%)	63 (52.5%)	
• Not true	77 (64.1%)	1 (0.8%)	
5.You sometimes find yourself saying "yes" to commitment, you wouldn't normally volunteer to do, because it is easier than saying "no".			
• True	61 (50.8%)	15 (12.5%)	< 0.001
• Somewhat true	53 (44.1%)	89 (74.1%)	
• Not true	6 (5.0%)	16 (13.3%)	
B. Money and Finance			
6.Your financial situation is pretty uncomfortable and you stress about it regularly			
• True	19 (15.8%)	63 (52.5%)	< 0.001
• Somewhat true	44 (36.6%)	46 (38.3%)	
• Not true	57 (47.5%)	11 (9.2%)	
7.You feel it is good to be intellectually stimulated and financially independent.			
• True	96 (80.0%)	111 (92.5%)	0.008
• Somewhat true	19 (15.8%)	9 (7.5%)	
• Not true	5 (4.2%)	-	
C. Work			
8. You don't feel motivated /excited about your job.			
• True	3 (2.5%)	-	-
• Somewhat true	36 (30.0%)		
• Not true	81 (67.5%)		
9. Your work schedule (hours /days /weekends /nights) do not fit in your personal life.			
• True	42 (35.0%)	-	-
• Somewhat true	61 (50.8%)		
• Not true	17 (14.1%)		

10. You don't get paid enough for what you do. • True • Somewhat true • Not true	33 (27.5%) 52 (43.3%) 35 (29.0%)	-	-
D. Non-working			
11. You are looking for a job and cannot find the one you want. • True • Somewhat true • Not true	-	57 (47.5%) 60 (50.0%) 3 (2.5%)	-
12. You feel like being a housewife is not appreciated. • True • Somewhat true • Not true	-	110 (91.6%) 9 (7.5%) 1 (0.8%)	-
13. Your decision to stay at home is enforced because the current situation doesn't give choice for employment. • True • Somewhat true • Not true	-	110 (91.6%) 5 (4.2%) 5 (4.2%)	-
E. Marital relations			
14. You have frequent arguments/disagreements with your husband. • True • Somewhat true • Not true	29 (24.1%) 77 (64.1%) 14 (11.7%)	17 (14.6%) 81 (67.5%) 22 (18.3%)	0.082
15. Your husband's share in domestic duties is very less. • True • Somewhat true • Not true	56 (46.6%) 44 (36.6%) 20 (16.6%)	9 (7.5%) 95 (79.1%) 16 (13.3%)	< 0.001
16. You feel that you could excel in your job /carry on your profession if your husband had cooperated. • True • Somewhat true • Not true	51 (42.5%) 50 (41.6%) 19 (15.8%)	16 (13.3%) 84 (70.0%) 20 (16.6%)	<0.001
17. Your relationship restricts your freedom. • True • Somewhat true • Not true	67 (55.8%) 37 (30.8%) 16 (13.3%)	39 (32.5%) 61 (50.8%) 20 (16.7%)	0.001
18. You do not get much time to spend /communicate with your husband • True • Somewhat true • Not true	22 (18.3%) 80 (66.6%) 18 (15.0%)	28 (23.3%) 92 (81.6%) -	<0.001
19. Your family relations (husband/ in-laws) are not supportive and cause significant stress. • True • Somewhat true • Not true	73 (60.8%) 34 (28.3%) 13 (10.8%)	3 (2.5%) 74 (61.6%) 43 (35.8%)	< 0.001
F. Parental Aspects			
20. Your family size makes thing difficult for you to manage. • True • Somewhat true • Not true	75 (62.5%) 42 (35.0%) 3 (2.5%)	46 (38.3%) 41 (34.1%) 33 (27.5%)	<0.001
21. You feel guilty about the childcare arrangements when your child is sick. • True • Somewhat true • Not true	59 (49.2%) 44 (36.6%) 17 (14.1%)	0 (0%) 41 (34.1%) 79 (65.8%)	< 0.001

22. You feel there is no workplace facility/flexible working hours for working mothers. • True • Somewhat true • Not true	 100 (83.3%) 20 (16.7%) 0 (0%)	 84 (70.0%) 35 (29.1%) 1 (0.8%)	0.039
G. Family			
23. You have a parent, child or a spouse who is in a very bad health. • True • Somewhat true • Not true	 0 (0%) 31 (25.8%) 89 (74.0%)	 16 (13.3%) 40 (33.3%) 64 (53.0%)	<0.001
H. Isolation and Depression			
24. You find your mind is still consumed with worry even when you are relaxing or spending quiet times with your family. • True • Somewhat true • Not true	 4 (3.3%) 35 (29.1%) 81 (67.5%)	 7 (5.8%) 78 (65.0%) 35 (29.1%)	<0.001
25. You have emotional out bursts where you cry/ become angered easily • True • Somewhat true • Not true	 23 (19.1%) 76 (63.3%) 21 (17.5%)	 54 (45.0%) 61 (50.8%) 5 (4.1%)	< 0.001
26. You often have trouble in sleeping. • True • Somewhat true • Not true	 8 (6.6%) 27 (22.5%) 85 (70.8%)	 18 (15.0%) 67 (55.8%) 35 (29.1%)	< 0.001
27. On the whole you are not satisfied with yourself and you often feel less self confident. • True • Somewhat true • Not true	 19 (15.8%) 26 (21.6%) 75 (62.5%)	 78 (65.0%) 40 (33.3%) 2 (1.6%)	< 0.001
I. Social Life			
28. You often have to go to social events alone & you don't want to. • True • Somewhat true • Not true	 16 (13.3%) 84 (70.0%) 20 (16.6%)	 17 (14.1%) 80 (66.6%) 23 (19.1%)	0.845
29. You are unable to count on friends /family to help you through problems. • True • Somewhat true • Not true	 0 (0%) 38 (31.6%) 82 (68.3%)	 3 (2.5%) 104 (86.6%) 13 (10.8%)	<0.001
J. Residence			
30. You live farther away from the rest of your family/love ones. • True • Somewhat true • Not true	 26 (21.6%) 66 (55.0%) 28 (13.3%)	 0 (0%) 52 (43.3%) 68 (56.6%)	<0.001
31. You would like to move away from a joint family system but you cannot. • True • Somewhat true • Not true	 7 (8.5%) 69 (57.5%) 44 (33.0%)	 57 (47.5%) 54 (45.0%) 9 (7.5%)	<0.001
K. Recommendations			
32. What is the best parameter which may be adopted to reduce stress among working/ nonworking female doctors? • Flexible working hours/ day care centers • Better support from family/spouse • Salaries equitable to male colleagues • Adequate autonomy and respect at home/workplace	 27 (22.5%) 37 (30.8%) 12 (10.0%) 44 (36.6%)	 65 (54.1%) 49 (40.8%) 0 (0%) 6 (5.0%)	<0.001

Stress score was calculated for both study groups, the mean score among working group was 23.6±7.4 while 32.6±10.5 for non-working group (p<0.001). It was revealed that 17.1% of the respondents reported to be stressed to great extent, 75.8% were stressed to some extent and 7.1% were not stressed. Among the working group 9.2% were stressed to great extent as compare to 25% of non-working females, 81.6% were stressed to some extent as compare to 70% of non-working respondents while 9.2% were not stressed as compare to 5% of non-working females (P<0.003) as shown in figure 1. Female doctors working in public sector hospitals had significantly higher stress score as compared to those working in private hospitals (28.15 vs 22.1, p=0.003). Comparison of time since graduation with stress score revealed significant difference in the stress score for participants who had graduated within last 10 years (P value<0.005) and those with graduation time between 10-20 years (P value<0.001) with group with graduation time more than 21 years respectively while there was no significant difference between group less than 10 year and 10-20 years. This showed that there was significant difference in optimal stress scores of those who graduated 1-10 years and 10-20 years back with those of more than 21 years. With reference to increasing income levels, it was found that it had significant negative correlation with stress scores i.e. with growing income levels the stress scores were decreasing. (P<0.01). This means that financial situation was a significantly important factor in producing stress among people.

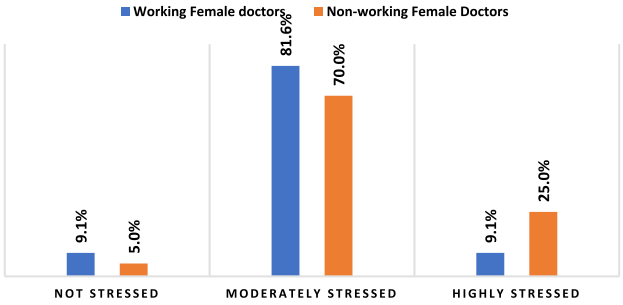

Fig 1: Comparison of Stress Levels Among Working and Non-Working Female Doctors.

Stress scores were calculated based on responses to the stressor questionnaire. It was found that 41 (17.1%) participants were experiencing high stress, 182 (75.8%) were moderately stressed while 17 (7.1%) were found to be under no stress. Significantly a greater number of non-working doctors were found to be experiencing high level of stress as compared to working female doctors (73.1% vs 26.8%, p<0.001). Around 26.8% doctors working in public sector hospitals were experiencing high stress while no employee of private sector hospital was under high stress (p=0.002). Similarly, high stress levels were positively associated with years of graduation, designation, gross income, and number of dependent family members. Significantly a greater number of participants who graduated within past 10 years experienced high stress (p=0.002), medical officers of junior designation were at higher level of stress (0.04), participants with gross income less than 150,000 (p<0.001) and participants with more than 4 dependent family members were also found to be at higher stress level (p<0.001) as shown in table 3.

Table III: Comparison of Stress Score and Demographic Variables between Study Groups

Characteristics	Stress level			P-value
	Not stressed (n=17)	Moderately stressed (n=182)	Highly stressed (n=41)	
Age • Less than 40 years • 40 years and above	11 (64.7%) 6 (35.3%)	139 (76.3%) 43 (23.6%)	27 (65.8%) 14 (34.1%)	0.261
Type of institution • Public sector • Private sector	6 (35.3%) 5 (29.4%)	43 (23.6%) 55 (30.2%)	11 (26.8%) -	0.002
Graduation year • 1-10 years ago • 11-20 years ago • 21 years and above	9 (52.9%) 2 (11.7%) 6 (35.3%)	70 (38.4%) 82 (45.0%) 30 (16.4%)	21 (51.2%) 20 (48.7%) -	0.002
Designation • Medical officer • Registrar • Consultant	5 (29.4%) 5 (29.4%) 1 (5.8%)	34 (18.6%) 26 (4.2%) 38 (20.8%)	6 (14.6%) 5 (12.1%) -	0.040
Gross income (PRK) • <75k • 76-150k • 151-250k • >250k	- 10 (58.8%) 7 (41.1%) -	44 (24.1%) 98 (53.8%) 23 (12.6%) 17 (9.3%)	20 (48.7%) 21 (51.2%) - -	<0.001
Work profile • Non-working • Working	6 (35.3%) 11 (64.7%)	84 (46.1%) 98 (53.8%)	30 (73.1%) 11 (26.8%)	0.003
Dependent family members • Less than 4 • 4 or more	12 (70.5%) 5 (29.4%)	141 (77.4%) 41 (22.5%)	16 (39.0%) 25 (60.9%)	<0.001

Discussion

Stress is a well-recognized problem within the medical profession. Work related stress can affect doctor's health and result in low morale and motivation while female physicians who are unable to pursue their profession also experience low self-esteem and self-confidence leading to greater degree of stress. This study was an effort to find out difference in stress levels in working and non-working female doctors, their comparison with each other and various stress factors associated with high levels of stress in female doctors.

Among the working group 9.2% were stressed to great extent as compared to 25% of non-working females. Performing several roles may increase individual's privileges and resources in their social environment, assist in establishing social and economic status and security, act as a buffer for problems or families in any single life domain, and enhance feelings of self-worth. Recent studies of the risk and benefits of having multiple roles indicate that people who had more social roles experience less psychological distress and mental illness. [14]

The results show that the respondents who graduated 1-10 years back were far more stressed than those who graduated more than 21 years ago. Initial few years after graduation are more critical, as that is the time for career development and maintaining a balance between career, family and raising children is necessary. Thus this could be the reason for high stress levels which eventually decreases with time as family life and financial situations gets stable. [15]

Majority of non-working doctors were dissatisfied, low self-esteemed and less confident as compared to working female doctors ($p<0.001$). These results are highly supported by another study carried out in Iran regarding self-efficacy and self-esteem in employed and unemployed women. The reason of higher self-esteem level among professional working women could be that these women are considered to have somewhat higher status and economic independence related to employment, which lacks in non-working women. [16] A feeling of contributing to the welfare of their families as well as society might also contribute in enhancing their self-esteem. Work provides a woman with more self-esteem and to some extent satisfies her need for recognition freedom, power, independence, and the need for social contacts. [17]

It was found that working women have bigger social circle and enjoy better social life as compared to the non-working group, thus they count on friends or family to help them through problems and difficult times. Similar results were concluded in a study that at sometimes job might operate as a safety valve through which frustrations which could potentially be expressed in the family are often diverted. [18]

Significantly higher number of working women reported to have supportive and cooperative families specially husbands and in-law's relatives. On the contrary most of non-working doctors admitted that their marital relationship restricts their freedom and family does not support their professional career growth. These findings were found to be in agreement with results of studies conducted by Dhote S et al, Ahmed A et al, and SS Nathawat, et al.[19-21] Results indicated significantly better marital adjustment and subjective well-being for the working women than for the house-wives. Specifically, working women reported higher scores on general health, life satisfaction, and self-esteem measures and lower scores on hopelessness, insecurity, and anxiety, compared with the housewives. [21]

Stressful financial situation was another factor found to be more common in the non-working female doctors group, who despite of being professionally competent were unable to pursue their career and earn due to unavoidable family circumstances. Stress was found to be negatively associated with financial independence. [20]

Non-working females were found to be emotionally unstable as compared to working females ($p<0.001$), and these results were supported by studies conducted by Arif S et al [22] and Akram MA et al.[23] Arif S et al stated that non-practicing doctors showed lack of the ability in stress management related to occupational stress and also find it difficult to manage personal stress and managing new relationships in their lives, such as with husband and/or in-laws.[22]

A significant difference in stress levels was observed among doctors working in public and private hospitals. The main factor observed was the difference in pay scale. Doctors working at private

hospitals were found to be well paid with less workload as compared to the ones working in public sector hospitals. These findings were consistent with study conducted by Malik AA et al [24] where it is stated that in public setups long duty hours, less personal safety and heavy workload to be significant de-motivators.

Conclusion

It is concluded that both working and non-working female doctors have high rates of anxiety, depression and marital problems, but non-working females are significantly more stressed. This study highlights significance of stress management so the individuals can develop skills to cope stress and associated problems.

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ORIGINAL ARTICLE

Exploring the Journey of Students in an Online CHPE Program of a Pakistani University: An Exploratory Qualitative Study

Khaulah Jawed[1], Syeda Sanaa Fatima[2]

ABSTRACT

Objective: To explore the factors affecting the learning of students of certificate in health professionals education (CHPE) in an online learning environment, and the strategies to improve their learning environment.

Study Design: An exploratory qualitative study.

Place and Duration of Study: CHPE program Riphah International University. The study was conducted from 15th August to 15th September 2020.

Materials and Methods: An exploratory qualitative study was conducted, eight students from the CHPE program Riphah International University volunteered to participate in the study. Eight Semi-structured open-ended individual interviews were carried out. Data were transcribed and thematically analyzed manually.

Results: Thematic analysis of data identified 26 codes, 12 subthemes, and 6 themes. Themes were learning enhancing factors, best about online learning, biggest challenges, learning hampering factors, satisfaction with online sessions, and suggestions for improvement.

Conclusion: The current study showed overall satisfaction with the online learning environment of the CHPE (certificate in health profession education) program, despite this satisfaction few hampering factors were identified, addressing these factors can improve the online learning environment. Strategies suggested for improvement were faculty training, students training, planning of the session, and fewer participants for online learning.

Key Words:*Hampering Factors, Improvement Suggestion, Learning Environment, Online, Promoting Factors.*

Introduction

The year 2020 began with a pandemic COVID -19, humans were not immune to this new disease they changed their lifestyles to prevent further infections and control of spread. The institutes were closed immediately. For maintaining social distance, in this era of crisis, advancement in technology was the only hope to prevent disruption of learning. This sudden closure of institutes posed a challenge in the educational field and the need for the development of an online learning environment in the world. [1] Despite COVID 19 being a crisis for the world, it has laid the foundation of a new era of development of the online learning environment. According to Maslow's hierarchy of needs, a learning environment must fulfill certain requirements for efficient learning of the students. Achieving the objective requires defining needs, gaps and problems. Hence for corrective measures for a conducive learning environment, institutes are striving for improving teaching and assessment strategies in an online learning environment [2]

"Online learning is an education that takes place over the Internet. It is often referred to as "e-learning" among other terms. However, online learning is just one type of "distance learning" -the umbrella term for any learning that takes place across distance and not in a traditional classroom." [3] "Online learning systems are web-based software for distributing, tracking, and managing courses over the Internet."[2]

According to the literature, many universities in Pakistan have shifted their on-campus learning to an online learning environment abruptly. Riphah International University has also shifted all of its programs including undergraduate and postgraduate masters and certificate programs to an online learning environment in line with HEC guidelines [4,5] This sudden transition of the learning environment to an online learning environment lead

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to a few challenges faced by the students during online learning.[6] To improve the online learning environment according to their resources and context many universities have evaluated their learning environment and got perceptions of the students. Every institute needs to improve its learning environment according to the perception of the students. [2,7] Among different universities in Pakistan, Riphah International University is conducting a CHPE course of six months duration. According to Maslow's hierarchy of needs, a learning environment plays a crucial role in the learning of students. If the basic needs are fulfilled in and learning environment only then one can be shifted to the level of self-actualization. [8] For improvement of the online learning environment, it is important to understand the experiences and challenges faced by students as major stakeholders. [9] The current study is focused to address, the following research are the factors affecting the learning of students of certificate in health Professionals education (CHPE) in an online learning environment, and the strategies to improve their learning environment.

The objectives of the study were; To explore the factors affecting the learning of students of certificate in health Professionals education (CHPE) in an online learning environment, and the strategies to improve their learning environment

Theoretical Framework

Maslow's hierarchy of needs can be used for evaluation of Learning environments since the online learning environment is new but it can be evaluated using Maslow's hierarchy of motivation. [10] Through students' perceptions about the online learning environment, the student's satisfaction and motivation can be assessed using this Hierarchy of needs. [10] For improvement, one must identify the strengths and problems in their online learning environments and find out ways to address these issues to improve the learning of students. [11]

Materials and Methods

An Exploratory Qualitative study was conducted at Riphah University of Pakistan from 15th August to 15th September 2020. The study was carried out on students of CHPE Riphah International University, purposive homogenous sampling was carried out. Ethical approval for the study was taken from the ethical committee of Riphah International University. The feasibility of the participants was ensured and the informed consent was taken on what's app and text message. The anonymity, confidentiality of data was assured on call just before the interviews. [12] Eight students from the CHPE program who volunteered were included in interviews. There were four females and four male students. The Researchers were MHPE students, and they were not knowing the CHPE students before the research. The study was conducted during the period of COVID- 19, so all the interviews were conducted online (WhatsApp and Phone calls).

Participants underwent one-to-one interviews, that were conducted on mobile phones and zoom. Both researchers conducted interviews with participants. Semi-structured questions were asked; the interviews were recorded. Informed consent was taken before the start of the interviews. The questionnaire used for the interview is attached as Appendix 1.

For quality assurance, the strategies followed were triangulation, member checking, peer debriefing, data analysis was rooted in participants' responses which removed the researcher bias. Two types of triangulation were used, i) Data triangulation to strengthen the conclusion of finding and prevention of false interpretations. ii) Investigator triangulation to minimize the bias in gathering, analyzing, and reporting the data. For this two authors were involved in data collection and analysis. [13] The transcripts of the participants were sent to the participants for validation. The participants in peer debriefing were told about the title, aim and process. According to the guidelines in AMEE guide no. 87, semi-structured open-ended questions were designed to conduct individual interviews.[13] The questions were designed to address the research question. This Questionnaire was sent to three Medical educationists for validity and credibility.

A pilot interview lasting 20 minutes was conducted with two participants of CHPE 2020 to ensure the quality and the logical sequence of the Questions.

The interviews were transcribed, coded and thematic analysis was done manually.[14] The use of software was limiting the researcher's critical thinking ability, so the manual analysis was preferred by the researcher. The data was sifted, refined, and

categorized for creating distinct thematic categories.[15]

Results

After manual thematic analysis, 26 codes were identified, which were merged into 12 subthemes and 6 themes were identified. That exhibits Learning enhancing factors, learning hampering factors, best about online learning, the biggest challenge, satisfaction with online sessions and the suggestions for improvement of the online learning environment, which adequately answers the Research Question. Table 1 provides an overview of the findings of this study.

Table No: I Overview of Findings of the Study

Themes	Subthemes	Codes	Participants Quotations
Learning enhancing factors	Student engagement	Motivation, Relevance,	*"Motivation, Relevance, Sessions were according to International Standards"* ***P2***
		Use of different apps, group activities,	*"Use of different apps, breakout rooms, online learning activities"* ***P3***
		Student engagement, Cooperative staff	*"Teacher's motivation, every student was involved, Cooperative staff"* ***P6***
Best about online learning	Convenient and Conducive environment	Comfortable	*"No need to look presentable" P4* *"The learning environment was more comfortable I mean we can ask questions without any fear" P7*
	audiovisual aids	PPT quality	*"Yes, good quality ppt"* ***P7***
Biggest Challenge	Technology effects on Health and Learning	Lacks face to face interaction	*"Missing face to face interaction b/w peers and teachers"* ***P1***
		Monotony, Long screen time	***"****Monotony, Long screen time, no physical movement and missing psychomotor teaching"* ***P2***
		Net issue	***"****Internet connection was not very fast"* ***P4***
		Lacks teaching of skills	*"Mendeley could have been better face to face" P6*
Learning Hampering factors	• Large groups and Technology	Large group	*"There was a large group of students and Internet issue. We have to sit for long hours in front of computers" P1*
	• Net etiquettes	Rules ignored	*"Net etiquettes and Ground rules were not followed" P1*
	• Time limitations	Time management	*"the reading material was too much, and we had less time to read them".* ***P6***

	• Distractors.	Distraction	*"Distractors, like chatbox on zoom and WhatsApp chat"* ***P8***
Satisfaction with online sessions	Very satisfied	A new experience but a good one	*"I am very satisfied with the online sessions. It was a new experience at the start of the covid era but overall a good experience"* ***P7***
Suggestions for improvement	Planning of sessions	Time management	*"reduction of teaching hours per day, Gap in contact sessions "****P2***
		Sequencing of topics,	*"Sequence of topics need to be improved"* ***P6***
		Customized e-learning activities for CHPE,	*"Interactive videos, online apps, Strong IT experience, Student Support System.P1* *"….. customized e-learning activities for CHPE"* ***P8***
	Students support	Less number of participants	*"Less number of participants, some teachers should be trained more"* ***P3***
		Teacher availability	*Teacher availability after contact session"* ***P1***
		The mock session, teaching net etiquettes,	*"Mock session must be planned, net etiquettes should be taught to students and better student support for technology"* ***P2***
	Faculty training	The online learning environment and challenges for faculty	*"Few facilitators need to be trained more on the transition from face to face to online teaching, Planning of online activities should be improved* ***P8***

Discussion

The study aims to explore promoting and hampering factors in an online learning environment. Also, identification of strategies for improvement of the online learning environment of the CHPE program. *The learning-enhancing factor* was student engagement. Students were motivated and they kept engaged with relevant online group activities. Different apps were used. The staff of the CHPE course was very cooperative throughout the course. *The best things students* experienced were a conducive learning environment and audio-visual aids. Students were comfortable since there was no need to look presentable and good-quality power points were used during the lecture. *Learning Hampering factors* were a large number of students, internet connectivity issues, violation of ground rules, limited time to read study material, and distractors like the use of Whats app during class. The biggest challenge faced by students were lack of face-to-face interaction, monotony, long screen time, internet connectivity issues, and lack of learning skills. *Students were satisfied* overall with this new experience. *Suggestions for improvement* given by the students were student support, faculty training, and proper planning of sessions.

The findings of this study are in line with the literature, and the participants identify that the learning enhancing factors are good student engagement, quality PowerPoint presentations and the best thing was the conducive and environment. Findings of a survey-based article on student engagement in an online learning environment state that students engagement promotes and motivates learners to learn and reduce their feeling of loneliness. [16] Andrew W cole states that engaging students in an online environment are much more difficult than the regular face-to-face sessions. [17] To engage students collaborative group tasks can play major roles. [18] Moreover, a healthy interaction among students and faculty improves the learning experience of students by maintaining a conducive environment. Furthermore, clarity regarding goals to achieve is another way for student engagement. [19] The new finding in this study is the role of cooperative staff in enhancing learning.

In this study, the biggest challenges identified are lack of face-to-face interaction and internet unavailability or poor signals, and teaching skills is not an easy task in an online learning environment. However, in literature, the limited attention span, inability to teach skills, lengthy course, and ill-disciplined students are the key limitations. [2] In an article addressing challenges faced by preclinical faculty, the key limitation is poor computer skills and lack of hands-on activities. [19] In another article, the author explains whats app and different chat groups can be used to interact with students. However, in this study, these are taken as distractors. [20]

The literature shows that student satisfaction is the main criteria for a successful learning experience of students in an online learning environment. [21] In this study, the students are generally found satisfied with their online learning environment when they state that, “yes I am satisfied because I have learned various apps to use in my undergrad classes”.

As far as suggestions for improvement in an online learning environment are concerned, the literature shows various strategies aligned with this study. In an opinion piece by Xin Xie and Keng Siau the author says that the biggest opportunity in an online learning environment is that a bigger group of learners can learn at the same time but in this study, participants suggested incorporating the small number of students at a time in an online session to improve learning. [22] An article on blended learning states that content organization plays a major role inadequate learning of students. [23] This supports the suggestion given in this study when the participants suggested reducing the teaching hours and improving the sequencing of topics. An article states that interaction with faculty is better in an online learning environment, however, the participants of this study suggested improving this interaction by making the faculty available after the online sessions. [24,25] The communication and faculty fluency over the use of technology can impact learners positively as described in an article by Dimitros Valachopoulos. [25] In this study, the participants stressed upon both faculty and student training for using online learning modalities. An article suggests various strategies to improve the online experience of students but two major strategies are timely feedbacks and prompt student support. [26] The suggestion of this study is in line with the findings of literature where the participants advocate good

student support as a suggestion for improvement.

Limitations

The limitations of the study were, the study was qualitative and the sample was also small. This study was conducted on one program of CHPE in a single private university in Pakistan, therefore the findings are applicable in similar contexts. A survey-based on this study should be conducted across other universities for generalizability.

Future research

Future research can be done to explore the experiences of undergraduate medical students and post-graduate medical students.

Conclusion

The current study showed overall satisfaction with the online learning environment of the CHPE program. Despite this satisfaction few hampering factors, were identified, addressing these factors can improve the online learning environment. The strategies suggested for improvement were faculty training, students training, planning of the session, and fewer participants for online learning.

Implications of the study

The current study will help in improving online learning in post-graduate certificate courses like CHPE.

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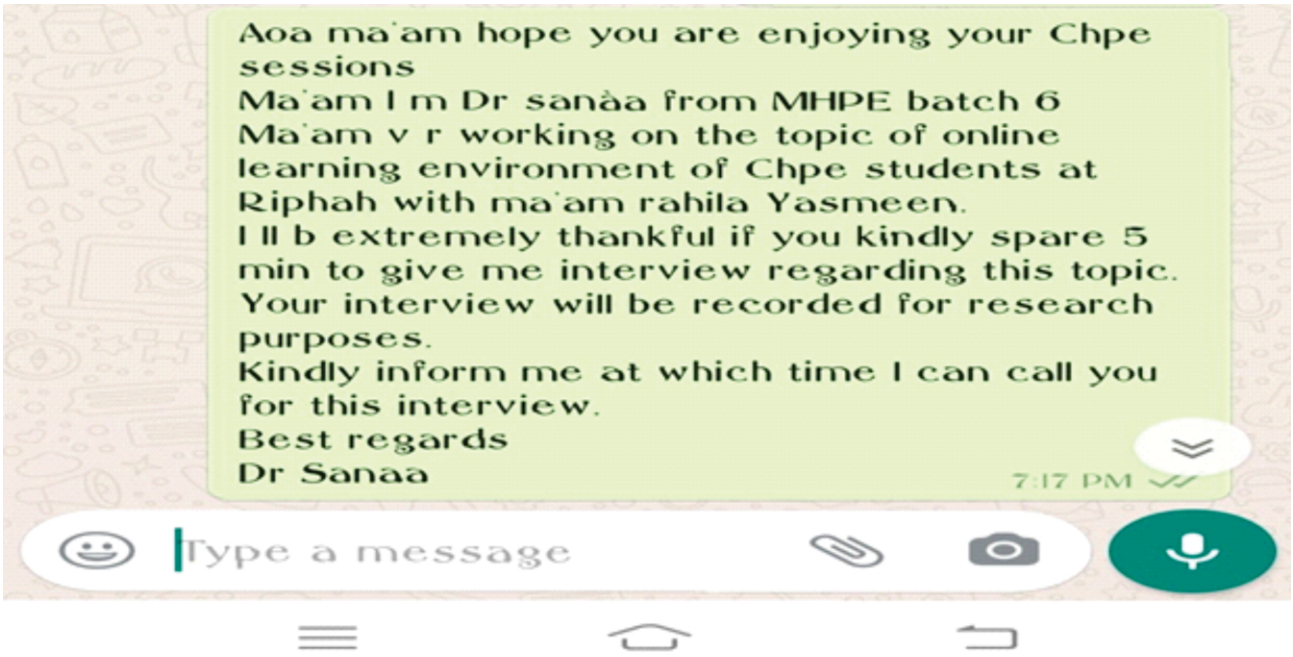
APPENDIX 1: Screenshot Of Consent Taken on Whatsapp from Participants of CHPE for Interviews



Appendix 2 : Showing Questions for Interview

Questionnaire	
Q1	What is the best and the worst thing about online learning environment of online contact session of CHPE?
Q2	Which biggest challenge do you perceive in online learning environment of CHPE?
Q3	Does online contact session enhance my knowledge, skills and attitude?
Q4	How variation in teachers and teaching styles enhanced my learning?
Q5	What are the hampering factors in online learning environment of CHPE?
Q6	What were the enhancing factors in online learning environment of CHPE?
Q7	Are you satisfied with the online learning session of CHPE?
Q8	What are the future suggestions for improving online learning environment?

CASE REPORT

Metaplastic Squamous Cell Carcinoma of Breast-An Uncommon Tumor with an Unusual Presentation A Case Report

Javeria Faridi[1], Saeed Alam[2]

ABSTRACT

Metaplastic breast carcinoma is uncommon. Pure Metaplastic squamous cell carcinoma is rare. Usually there is mixed type (adenosquamous) in which few areas show squamous metaplasia. The incidence has reported only 0.1 to 2%.[1] It is a case report of primary metaplastic squamous cell carcinoma. Tumor had no connection with the skin.

Key Words: *Metaplastic, Squamous Cell Carcinoma, Adenosquamous*

CASE REPORT

A 50 year old lady presented with breast lump for 1 year. On palpation the large lump was protruded beneath skin in right breast, it adhered to skin and above skin showed mild ulcerated changes. No lump was palpable in axilla. A biopsy was performed in which it was diagnosed as invasive carcinoma NST (No special type) and prognostic marker status were triple negative mean ER, PR and HER2 negative. Patient modified radical mastectomy with level-II axillary dissection was performed. Grossly mastectomy specimen was 24x14x12cm with ellipse of skin having areola and nipple. There was nodular protruded lump (Figure-1). Cut surface shows a large solid 7cm mass with necrotic and hemorrhagic areas (Figure-2). On Gross examination tumor was not reaching up to any peripheral margin. Sampling according to guidelines were done. Axillary fatty tissue dissection revealed 11 lymph nodes. The largest was 1. 5cm.All lymph nodes submitted for microscopic examination. Histological examination revealed malignant neoplasm composed of nest and islets of polygonal squamous cells. The cells had intercellular bridges and markedly pleomorphic nuclei. Mitotic figures were frequently present. Abundant keratinization was also present. (Figure-3) No tumor area show invasive ductal carcinoma pattern. Even after extensive sampling there was no direct connection of tumor with skin. (Figure-4) No pagetoid spread was seen. Tumor was infiltrating the parenchyma but not reaching up to margins. All lymph nodes were negative for metastatic tumor. It was diagnosed as Metaplastic squamous cell carcinoma. Nottingham score was given 9, Grade III, poorly differentiated carcinoma. Pathological TN staging was pT4, pNX.

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Introduction

Pure metaplastic squamous cell carcinoma of breast is rare neoplasm. It arises from glandular component which shows metaplasia to squamous cell carcinoma. It can be differentiated with adenosquamous carcinoma by absence of glandular component. Metaplastic carcinomas are high grade carcinoma, pure squamous cell carcinoma is one of its aggressive forms.

Discussion

Metaplastic carcinoma of breast is rare entity which show variable morphological features of metaplasia in which glandular component is absent or minimal. Metaplastic carcinoma usually exhibit squamous, spindle or mesenchymal differentiation. The current World Health Organization (WHO) classification system for these tumor includes low and high grade adenosquamous carcinoma, fibromatosis like metaplastic carcinoma, squamous cell carcinoma, spindle cell carcinoma and carcinoma with mesenchymal differentiation.[2] Metaplastic carcinomas are triple negative carcinoma. Squamous cell carcinoma is an aggressive form of metaplastic carcinoma. Exact etiology for metaplastic squamous cell carcinoma is unknown but few studies suggest that it arise from metaplastic squamous epithelium.[2] It usually presents clinically as large palpable mass of 3-5cm which is larger as compared to conventional invasive ductal carcinoma.[3] Grossly it show cystic and necrotic areas.[3] Histologically, predominantly exhibit

squamous differentiation with varying degree of keratinization and pleomorphism.

The diagnosis of metaplastic squamous cell carcinoma can be established by evaluating these parameter: i-Origin of tumor from skin, adnexa or nipple should be excluded, ii-More than 90% area must show squamous differentiation, iii- Area other than squamous cells as spindle, ductal or mesenchymal must be excluded by extensive sampling, iv-Metastasis from other site e.g. lung, oral cavity, and cervix should be excluded.

Metaplastic squamous cell carcinoma show poor prognosis with rapid enlargement though lymphatic spread and lymph node involvement is less common as in invasive ductal carcinoma.[4]

Due to rarity of breast metaplastic squamous cell carcinoma the exact management strategy is still not clear.[5,6]

Conclusion

Pure metaplastic squamous cell carcinoma of breast should consider in differential when triple negative carcinoma diagnosed on FNAC or biopsy. Before establishing the final diagnosis of pure metaplastic squamous cell carcinoma of breast rule out metastasis from other sides and primary skin squamous cell carcinoma.

Fig 1-Gross Appearance of Mastectomy Specimen with Large, Protruded Lump.

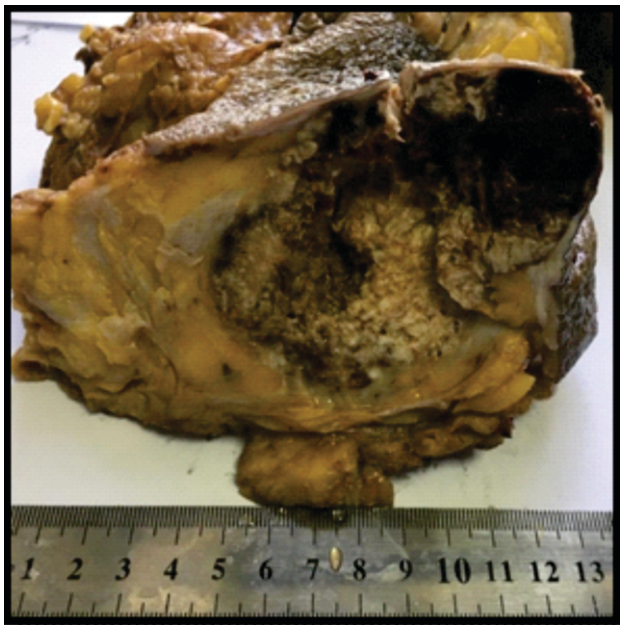

Fig 2: Cut Surface Show Large Necrotic Mass.

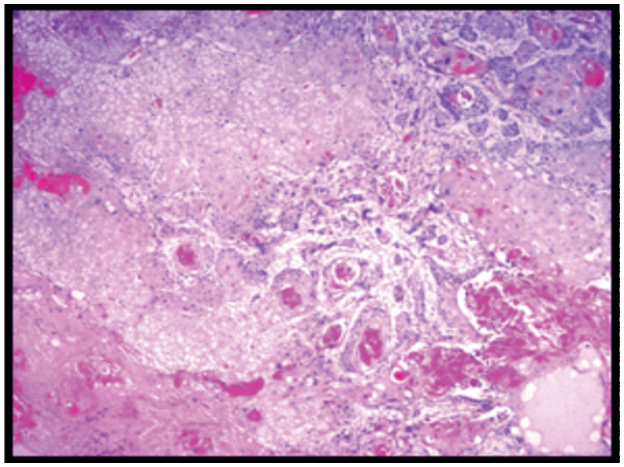

Fig 3: Microscopic Section of Tumor Shows Nest of Squamous Cells with Abundant Keratinization (H&E100 x).

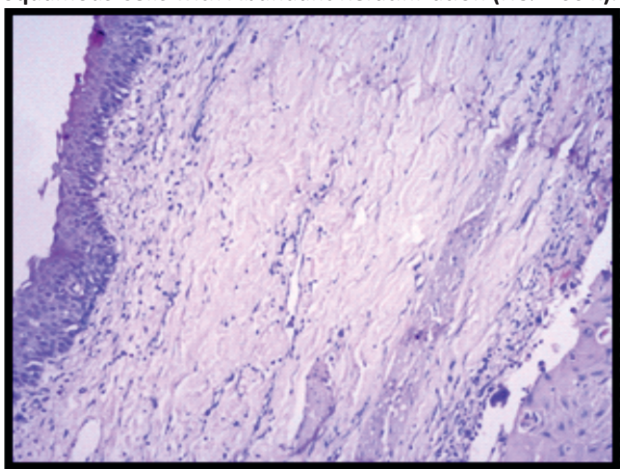

Fig 4: Microscopic section of tumor has no connection with skin (H&E100X).

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JOURNAL OF ISLAMIC INTERNATIONAL MEDICAL COLLEGE (JIIMC)

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b. Describe what is known (in the literature) and what is not clear about the subject with reference to relevant literature thus identifying the literature gap.
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- Sample size
- Sampling technique
- Mention about permission of ethical review board and other ethical issues addressed.
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EDITORIAL

Recently Discovered Omicron: Fifth Wave of Pandemic in Pakistan What Strategies Can be adopted to Control its Spread? — Prof. Mulazim Hussain Bukhari — **212**

ORIGINAL ARTICLES

Rifaximin: An Option for The Treatment of Irritable Bowel Syndrome — Muhammad Abdul Quddus, Arslan Shahzad, Rukhsana Munawar, Khawaja Tahir Maqbool, Amna Mansoor, Naveed Gani, Sheikh Muhammad Taqqi Anwer — **215**

Diagnostic Accuracy of Umbilical Artery and Middle Cereberal Artery Doppler in Detection of Intrauterine Growth Restriction — Asia Raza, Azra Saeed Awan, Seema Gul, Nadia Ahmed Bokhari, Hina Tabassum, Samina Irshaad — **219**

Susceptibility Pattern of Bacterial Isolates from Surgical Site Infections in a Tertiary Care Hospital at Rawalpindi — Sundas Ishtiaq, Ishtiaq Ahmed — **224**

Head Injuries in Pediatric Population at DHQ Teaching Hospital Haripur — Javed Iqbal Khan, Hassan Nasir, Tahir Iqbal Khan, Noreen Sultan, Tahir Angez Khan, Mehwish Naz — **232**

Potentiation Effects of Acetylcholine at Neuromuscular Junction by Ranitidine — Abdul Azeem, Akbar Waheed, Sidra Mumal, Salman Bakhtiar, Jawaria Iftikhar, Talal Zafar — **237**

Prevalence and Extent of Anterior Loop of the Mandibular Canal Using Cone Beam Computerized Tomography — Shoaib Rahim, Nighat Haroon Khan, Saira Bilal, Nadia Hanif, Uzma Habib, Fahad Haroon — **243**

Comparison between KPG Index and OPG Measurements: Predicting Orthodontic Treatment Duration and Difficulty Level in Impacted Canines — Ayesha Iftikhar, Tayyaba Jahanzeb — **248**

Parenting Styles and Attention Deficits Hyperactive Disorder Symptoms: Mediating Role of Temperament Traits in Young Adults — Rehana Mushtaq, Sadia Saleem — **255**

Primary Prevention of Aggression Induced by Media Exposure: A Cross Sectional Study — Ambreen Ansar, Sadia Nadeem, Amna Sajjad, Aleena Sohail, Aisha Bukhari, Aima Akhtar — **260**

Why Stress? A Comparative Descriptive Study of Perceived Stress Levels among Working and Non-Working Female Medical Doctors — Shaista Zeeshan, Rukhsana Roshan, Rehama Ahsan Gilani, Maham Zahid — **265**

MEDICAL EDUCATION

Exploring The Journey of Students in an Online CHPE Program of a Pakistani University: An Exploratory Qualitative Study — Khaulah Jawed, Syeda Sanaa Fatima — **274**

CASE REPORT

Metaplastic Squamous Cell Carcinoma of Breast-An Uncommon Tumor with an Unusual Presentation A Case Report — Javeria Faridi, Saeed Alam — **281**

ABOUT JIIMC — **284**

INSTRUCTIONS FOR AUTHORS — **288**