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**MAILING ADDRESS:**
Chief Editor
Islamic International Medical College
274-Peshawar Road, Rawalpindi
Telephone: 111 510 510 Ext. 207
E-mail: chief.editor@riphah.edu.pk

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Correspondence Address:
Prof. Dr. Muhammad Nadim Akbar Khan
Managing Editor
Journal of Islamic International Medical College (JIIMC)
Westridge-III, Pakistan Railways Hospital
Tel: +92-51-4259795-98 Ext: 220
E mail: prh.jiimc@riphah.edu.pk

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# Journal of Islamic International Medical College

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# EDITORIAL

## Coping with Contagious Diseases: A Global Perspective

Meh Para Siddique

Historically, when compared to other ailments, contagious infectious have been feared greater in contrast to other diseases. A contagious disease is an infectious condition that spreads easily (i.e., is communicated) when a pathogen is exposed through direct or indirect contact with an infected person.[1] This infection has peculiar properties that elucidate the exaggerated level of anxiety; it spreads quickly and covertly; generally, it has been responsible for significant sickness and mortality; old forms reappear; new forms arise; and both the media and society are frequently in awe.[2] Such infection could be viral, bacterial, parasitic, fungal or any other such as, *Severe Acute Respiratory Syndrome (SARS),*[3] Middle East respiratory syndrome (MERS),[4] Ebola,[5] Tuberculosis,[6] COVID-19,[7] *Carbapenem-Resistant Enterobacter ales (*CRE),[8] Enterovirus D68,[9] Flu,[10] Human Immunodeficiency Virus Infection and Acquired Immune Deficiency Syndrome (HIV/AIDS),[11] Hepatitis (A and B),[12] Measles,[13] Hantavirus,[14] Monkeypox,[15] Pertussis,[16] Rabies,[17] Sexually Transmitted Disease,[18] Shigellosis,[19] West Nile Virus,[20] and Zika.[21,22] The occurrence, and swift spread of such contagious diseases as a pandemic provides a challenge worldwide.

Though the spread of contagious disease is undoubtedly a scientific phenomenon linked to a particular pathogen, understanding the pandemic requires a consideration of the culture-mind relationship, which is at the core of mental health. In terms of relative mortality, transmission rates, behavioral responses, official policies, compliance with authorities, and even the degree to which disease-spread beliefs have been politicized across diverse communities and cultures, startling discrepancies have been seen. Everyone may find these outbreaks upsetting, but especially those who are thought to be more sensitive to certain pandemics.[23] Additionally, cultural context has an impact on individual differences, for instance, intolerance of uncertainty, optimism, conspiratorial thinking, or collectivist orientation, which has implications for actions related to the spread and impact of contagious diseases, such as mask-wearing and social distancing.[24]

With a few justifiable exceptions, people must remain confined to their homes during such pandemic conditions. Moreover, this scenario altered people's lives profoundly and worry, stress, depression emerged as emotional, cognitive, and behavioral symptoms, which can have a wide range of psychosocial effects.[25] Thus, subsequent factors were associated to person's mental health: (1) demographics; (2) level of pandemic concern; (3) home confinement environmental conditions; (4) changes in daily life as a result of the disease outbreak; (5) contact with said communicable disease; (6) perceived and real severity of the emergency; (7) information about the disease; (8) perceived health status; and (9) participation in leisure activities.[23] Such infectious diseases might have a deleterious emotional resonance on those who are vulnerable, causing anxiety, denial, stigmatization, loss, distress, and fear that are all made worse by uncertainty, as well as depression, post-traumatic stress disorder ailments, general psychiatric morbidity, doubts about infection,[2] concerns about treatment, disruption of routines, financial and occupational worries, and upset expectations of healthcare. It was frequently noted that there was heightened awareness of non-pharmaceutical protective activities. Social support can be a protective factor for poor mental health although during an outbreak may be difficult to access.[23]

Although time is an eternal physician, but it takes time to heal the emotional scars that surfaced in patient diagnosed with infectious diseases. Intensity, and severity of these scars varies from individual to individual depending upon their level of exposure to certain contagious diseases. Primarily, there are three certain levels of exposure, *firstly*, is an infected

*Correspondence:*
*Dr. Meh Para Siddique*
*Deputy Director,*
*Research and Analysis,*
*Government of Khyber Pakhtunkhwan*
*E-mail: mehpara1612@gmail.com*

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individual being walking at double edged sword as it is possible to violate someone's privacy when attempting to manage an infection epidemic since the patient in an outbreak serves being both a victim and a transmission vector equally.[2] *Secondly,* a man becomes apprehensive after watching the news. His heartbeat raises, and his hands start to perspire. Hearing about a potential epidemic makes him feel anxious. The media bombards him with fragmented images of people running to emergencies, discussions on the necessity and prospective shortfall of antimicrobial drugs, media people reporting the death toll of prior epidemics, the hundreds of millions of expected victims worldwide, the extraordinary cost of the control of previous outbreaks, and the anticipated expense superficially required to improve preparedness. The amount of knowledge feels overwhelming to the man. Because of this, the whole public, particularly caregivers that are not infected, are not exempt from the psychological effects of such epidemics,[26-29] which may be caused by several things, such as disruptions to daily routines,[30] loss and grief, [31] considering the shame associated with such epidemics.[32,33] These psychological responses affect the well-being of the individual and community and can persist long after the outbreak.[34,35] *Thirdly*, an emergency department health care provider in a nearby hospital considers requesting a long-term leave of absence as he wants to be away when an outbreak occurs. He is worried about his family and believes he is unprepared to handle and be protected from deadly infection. Meanwhile, an infectious disease expert is flying home from an international infectious diseases congress after attending a lecture about the then evolving severe epidemic outbreak. These three clusters of people, among many others, regularly experience varying degrees of fear related to contagious diseases. In addition to having chronic stress, health care professionals who were at high risk of getting infectious patients also seem to have higher levels of sadness and anxiety.

Stress management could be helpful for front-line employees as they get ready for upcoming outbreaks. [36] They share the anxiety, the uncertainty, and the potential for irrational behavior due to fear of an unknown disease. There are self-management approaches to improve psychological well-being for the psychic symptoms of anxiety, despair, fear, and discomfort since they are common, manifest in different ways, and they are widely felt. These facts need to be known by clinicians. Health systems must put into place the short and long-term psychological support for clinicians providing COVID-19 care.[37] Additionally, the psychological responses shared by survivors, caregivers, professionals, and the public included anxiety/fears, despair, anger, guilt, grief and loss, post-traumatic stress disorder, and stigmatization, but also a greater sense of empowerment and concern for others.[23,38.]

When faced with an infectious disease, a person will typically adopt one of three coping mechanisms: avoidance, surrender, or overcompensation.[25] These coping mechanisms include problem-focused coping (looking for alternatives, protecting oneself and others), avoidance, and positive situational analysis.[39,41-45] A growing body of evidence, however, is needed to support the theory that immune system activation and infections may be responsible for the initiation, activation, and development of serious psychiatric illnesses. Additionally, attempts to combat stigmatization and prejudice through activism may have unintended consequences because these problems may also include ethical considerations. By raising health literacy, public health programmers can allay the public's apprehensions and help to lessen the negative psycho-social effects of infectious diseases.

## REFERENCES


1. WHO. Communicable diseases. World Health Organization. Available from: https://www.afro.who.int/health-topics/communicable-diseases.
2. Pappas G, Kiriaze J, Giannakis P, Falagas E. Psychosocial consequences of infectious diseases. Clinical microbiology and infection. 2009;15(8):743-747.
3. WHO. Severe acute respiratory syndrome (SARS). World Health Organization. Available from: https://www.who.int/health-topics/severe-acute-respiratory-syndrome#tab=tab_1.
4. Groot R, Baker S, Baric R, Brown C, Drosten C, Enjuanes L, Fouchier A, Galiano M, Gorbalenya A, Memish Z, Perlman S. Commentary: Middle east respiratory syndrome coronavirus (MERS-COV): announcement of the coronavirus study group. Journal of virology. 2013;87(14):7790-7792.
5. Feldmann H, Sprecher A, Geisbert T. Ebola. New England Journal of Medicine. 2020;382(19):1832-1842.
6. Getahun H, Matteelli A, Chaisson R, Raviglione M. Latent Mycobacterium tuberculosis infection. New England Journal of Medicine. 2015;372(22):2127-2135.

7. Shereen M, Khan S, Kazmi A, Bashir N, Siddique R. COVID-19 infection: Emergence, transmission, and characteristics of human coronaviruses. Journal of advanced research. 2020;24:91-98.
8. Suay-García B, Pérez-Gracia M. Present and Future of Carbapenem-Resistant Enterobacteriaceae Infections. Advances in Clinical Immunology, Medical Microbiology, COVID-19, and Big Data. 2021:435-456.
9. Holm-Hansen C, Midgley S, Fischer T. Global emergence of enterovirus D68: a systematic review. The Lancet Infectious Diseases. 2016;16(5): 64-75.
10. Gavrilova N, Gavrilov L. Patterns of mortality during pandemic: An example of Spanish flu pandemic of 1918. Population and economics. 2020;4(2):56- 64.
11. Eisinger R, Fauci A. Ending the HIV/AIDS pandemic. Emerging infectious diseases. 2018 ;24(3):413-416.
12. WHO. Global hepatitis report 2017. World Health Organization; 2017. Available from: https://www.who.int/publications/i/item/9789241565455
13. Clemmons N, Gastanaduy P, Fiebelkorn A, Redd S, Wallace G. Measles, United States, Morbidity and Mortality Weekly Report. 2015 ;64(14):373-376.
14. Vaheri A, Strandin T, Hepojoki J, Sironen T, Henttonen H, Makela S, Mustonen J. Uncovering the mysteries of hantavirus infections. Nature Reviews Microbiology. 2013;11 (8):539-550.
15. Thornhill J, Barkati S, Walmsley S, Rockstroh J, Antinori A, Harrison L, Palich R, Nori A, Reeves I, Habibi M, Apea V. Monkeypox virus infection in humans across 16 countries: April-June 2022. New England Journal of Medicine. 2022 ;387(8):679-691.
16. Kline J, Lewis W, Smith E, Tracy L, Moerschel S. Pertussis: a reemerging infection. American family physician. 2013;88(8):507-514.
17. Steele J, Fernandez P. History of rabies and global aspects: In The natural history of rabies 2017 (p. 1-24). Routledge.
18. Unemo M, Bradshaw C, Hocking J, de Vries H, Francis S, Mabey D, Marrazzo J, Sonder G, Schwebke J, Hoornenborg E, Peeling R. Sexually transmitted infections: challenges ahead. The Lancet infectious diseases. 2017;17(8):235-279.
19. Kotloff K, Riddle M, Platts-Mills J, Pavlinac P, Zaidi A. Shigellosis. The Lancet. 2018;391(10122):801-812.
20. Suthar M, Diamond M, Gale M. West Nile virus infection and immunity. Nature Reviews Microbiology. 2013;11(2):115-128.
21. Baud D, Gubler D, Schaub B, Lanteri M, Musso D. An update on Zika virus infection. The Lancet. 2017;390(10107):2099-2109.
22. Kunzler A, Stoffers-Winterling J, Stoll M, Mancini A, Lehmann S, Blessin M, Gilan D, Helmreich I, Hufert F, Lieb K. Mental health, and psychosocial support strategies in highly contagious emerging disease outbreaks of substantial public concern: A systematic scoping review. PloS one. 2021;16(2):e0244748.
23. Public Health England. No health without mental health: why this matters now more than ever. 2020. Available at: https://publichealthmatters. blog.gov.uk/2020/out-mental-health-why-this-matters-now-more-thanever/.
24. Tomes N. The making of a germ panic, then and now. Am J Public Health 2000; 90: 191–198
25. Young J, Klosko J, Weishaar M. Schema therapy: A practitioner's guide. guilford press; 2006.
26. James P, Wardle J, Steel A, Adams J. Post-Ebola psychosocial experiences and coping mechanisms among Ebola survivors: a systematic review. Tropical Medicine and International Health. 2019; 24:671-691.
27. Lee T, Chi I, Chung L, Chou K. Ageing, and psychological response during the post-SARS period. Aging and Mental Health. 2006; 10:303-311.
28. Sim K, Chan Y, Chong P, Chua H, Soon S. Psychosocial and coping responses within the community health care setting towards a national outbreak of an infectious disease. The Journal of Psychosomatic Research. 2010; 68:195-202.
29. Taha S, Matheson K, Cronin T, Anisman H. Intolerance of uncertainty, appraisals, coping, and anxiety: the case of the 2009 H1N1 pandemic. British Journal of Health Psychology. 2014; 19:592-605.
30. Chan SS, Leung D, Chui H, et al. Parental response to child's isolation during the SARS outbreak. Ambulatory Pediatrics. 2007; 7:401-404.
31. Schwerdtle P, De Clerck V, Plummer V. Experiences of Ebola survivors: causes of distress and sources of resilience. Prehospital and Disaster Medicine. 2017; 32:234-239.
32. Kamara S, Walder A, Duncan J, et al. Mental health care during the Ebola virus disease outbreak in Sierra Leone. Bulletin of the World Health Organization. 2017; 95:842-847.
33. Matua G, Wal D. Living under the constant threat of Ebola: a phenomenological study of survivors and family caregivers during an Ebola outbreak. Journal of Nursing Research. 2015; 23:217-224.
34. Lau AL, Chi I, Cummins RA, et al. The SARS (severe acute respiratory syndrome) pandemic in Hong Kong: effects on the subjective wellbeing of elderly and younger people. Aging & Mental Health. 2008; 12:746-760.
35. Zurcher S, Kerksieck P, Adamus C, Burr C, Lehmann A, Huber F, Richter D. Prevalence of mental health problems during virus epidemics in the public, health care workers and survivors: a rapid review of the evidence. Frontiers in public health. 2020;8:560389.
36. McAlonan G, Lee A, Cheung V, Cheung C, Tsang K, Sham P, Chua S, Wong J. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. The Canadian Journal of Psychiatry. 2007;52(4):241-247.
37. Fiest K, Parsons J, Krewulak K, Plotnikoff K, Kemp L, Ng-Kamstra J, Stelfox H. Experiences, and management of physician psychological symptoms during infectious disease outbreaks: a rapid review. BMC psychiatry. 2021;21(1):1-4.
38. Fardin M. COVID-19 and anxiety: A review of psychological impacts of infectious disease outbreaks. Archives of clinical infectious diseases. 2020;15.e102779.
39. Chew Q, Wei K, Vasoo S, Chua H, Sim K. Narrative synthesis of psychological and coping responses towards emerging infectious disease outbreaks in the general population: practical considerations for the COVID-19 pandemic. Singapore medical journal. 2020 ;61(7):350-356.
40. Helzer E, Pizarro D. Dirty liberals! Reminders of cleanliness

promote conservative political and moral attitudes. Psychological Science. 2011;22(4):517-522.
41. Inbar Y, Pizarro D, Bloom P. Conservatives are more easily disgusted than liberals. Cognition and emotion. 2009;23(4):714-725.
42. Jones A, Fitness J. Moral hypervigilance: the influence of disgust sensitivity in the moral domain. Emotion. 2008;8(5):613-627.
43. Murray D, Schaller M. The behavioral immune system: Implications for social cognition, social interaction, and social influence. In Advances in experimental social psychology 2016 (Vol. 53, pp. 75-129). Academic Press.
44. Wu B, Chang L. The social impact of pathogen threat: How disease salience influences conformity. Personality and Individual Differences. 2012;53(1):50-54.
45. Muller N. Infectious diseases and mental health. Comorbidity of Mental and Physical Disorders. 2014; 179, pp 99–113 (DOI: 10.1159/000365542).

ORIGINAL ARTICLE

# Non-Compliance with Universal Masking Policy by Patients During Covid-19 Pandemic: A Major Threat to Health Care Worker in Pakistan

Shamaila Burney[1], Mishaal Fazal[2], Mati Ur Rehman[3], Saerah Iffat Zafar[4], Samia Kauser[5], Kiran Fatima[6]

**ABSTRACT**

**Objective:** To determine the frequency of patient compliance with universal face mask policy during COVID-19 pandemic using simple observable criteria.

**Study Design:** Cross sectional study

**Place and Duration of Study:** Pakistan Railway Hospital, Rawalpindi during the third wave of COVID-19 pandemic over a period of one month from 15 March 2021 to 15 April 2021.

**Materials and Methods:** A total of 266 patients were recruited from the general population of patients visiting our hospital after undergoing screening for COVID-19 at the filter clinic. Face mask compliance was defined as the wearing of a disposable surgical mask while employing correct techniques as per the World Health Organization and National Institute of Health guidelines for hospital settings.

**Results:** Majority of the patients (79.9%) wore a surgical face mask as recommended for hospital settings. However, only 41% employed the correct mask wearing technique. Patients under strict supervision in outdoor clinics were more likely to wear mask as compared to their indoor counterparts (76.79% vs 51.76%). Correlation was significant at a level of 0.492. One third (34.2%) of the patients did not cover their face, nose, and chin completely. An overwhelming majority (129/183 or 70.49%) admitted reusing the mask multiple times.

**Conclusion:** The study findings indicate that while majority of the general population of patients visiting our hospital wore a face mask, compliance with correct mask wearing technique as per recommended guidelines was poor. Our results support strict implementation of universal masking policies for hospitals in Pakistan as part of a multifaceted strategy to minimize transmission of infection in health care settings.

**Key Words:** *COVID-19, Face Mask, Health Care Worker, Hospital-Acquired COVID-19 Infection, Patient Compliance.*

## Introduction

One in every five health care workers (HCW) dealing with COVID-19 patients is at risk of contracting nosocomial COVID infection during patient encounter.[1] Break through COVID 19 infection has been reported in 25% of fully vaccinated HCW during the COVID-19 delta variant surge.[2] With more and more HCW and vulnerable patients contracting hospital-acquired COVID-19 infection, hospitals are at risk of becoming a potential hub of disease spread to community.

As many as 55% of hospital-acquired COVID-19 infections are a result of direct patient to patient transmission.[3] While physical distancing is the most important way to prevent the spread of COVID-19 from person to person, there is very limited space at the hospital to do this safely. In outpatient clinics and waiting areas it may be particularly difficult to maintain social distancing. In December 2020, World Health Organization (WHO) issued interim guidelines recommending universal face masking within both outdoor and indoor health care settings.[4] A universal masking policy requires all medical and non-medical staff, patients, and visitors to always wear a face mask while in hospital. Universal face masking limits COVID-19 transmission from patient to health care provider and vice versa.[5] There is a strong correlation between universal masking in hospitals and lower rate of infectivity amongst HCW.[6,7] The model has

[1,3,5,6]*Department of Medicine*
*Islamic International Medical College,*
*Riphah International University, Islamabad*
[2]*MBBS Student*
*Fazaia Medical College,*
*Air University Islamabad*
[4]*Department of Radiology*
*Armed Forces Institute of Radiology and Imaging, Rawalpindi*
*Correspondence:*
*Dr. Shamaila Burney*
*Islamic International Medical College,*
*Riphah International University, Islamabad*
*E-mail: shamaila.burney@riphah.edu.pk*

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been implemented with proven reduction in hospital acquired COVID-19 infection.[8]

Over 40% of COVID-19 infected patients/visitors may be asymptomatic carriers.[9] Furthermore, a negative screening test at the time of admission, does not completely rule out the possibility of COVID-19 infection.[10] Such individuals may become an undetected source of hospital acquired COVID-19 infection for HCW and other patients. Safety of our health care workers thus relies heavily on face mask compliance by patients and visitors. Present study was conducted to determine the patient compliance with universal face masking in our hospital. The findings of this research could be used to improve strategic management of COVID-19 pandemic in a resource limited hospital setting.

## Materials and Methods

The study was conducted at Pakistan Railway Hospital Rawalpindi during the third wave of COVID-19 pandemic, over a period of one month from 15 March 2021 to 15 April 2021.

It was a cross-sectional study. With 51% prevalence of face mask in general community, the sample size was calculated as 165 using WHO sample size calculator with a confidence level of 95%, and a relative precision of 15.[11]The study was initiated after the approval of institutional ethical review committee. A total of 266 patients aged 18 years and above were included by random convenient sampling after taking informed consent. The study subjects were selected from various points after undergoing initial screening at the COVID filter clinic. These included patients presenting to general outpatient department (OPD) clinics and indoor patient departments (IPD)/green zone, where mask wearing was a mandatory requirement as per our hospital policy. COVID suspect patients admitted in yellow zones and those in critical areas such as emergency room (ER) and intensive care unit (ICU) were excluded from the study. Medical/allied health sciences students and hospital employees were also excluded from the study to control the confounding effect resulting from their knowledge differences with the general population.

Two trained investigators assessed the face mask compliance in patients during their physician encounter in OPD or IPD. A pilot study validated, structured observational checklist, based on WHO and NIH guidelines on face mask use, storage, and disposal in the context of health care settings was used as the survey tool.[4,12] Data was collected by visually observing face mask compliance as per given operational definition as well as asking certain direct questions. Rational use of face mask was defined as wearing of a one-time use disposable medical/surgical mask as recommended for hospital settings.[4] Correct manner of mask use was assessed as a score out of 5 and included following simple observable criteria for study purposes: (1) face mask must cover nose, mouth and chin completely; (2) it must not be worn under the chin or on the hair; (3) it should have two elastic ties that do not overlap and a metallic clip at the top (4) the face mask must not be touched or manipulated once worn; (5) it should not be lowered while talking. Each correct practice was awarded 1 mark and 0 was marked for non-compliance. For face masks to be effective in preventing infection, their storage and disposal are equally important. Surgical mask is a one-time use product that must be discarded after single use. It should be stored in a separate paper or plastic bag when not in use e.g., during eating/drinking. It is to be removed from behind and thrown away in a closed bin.

Data was analyzed using IBM SPSS version 23.0 with a

**Table I: Patients' Demographic Characteristics and Settings**

| Characteristics | Frequency (N) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 111 | 41.73 |
| Female | 155 | 58.27 |
| **Age** | | |
| Adult | 108 | 40.6 |
| Middle Aged | 113 | 42.5 |
| Aged | 45 | 16.9 |
| **Occupation** | | |
| Employees | 93 | 34.96 |
| Students | 8 | 3.00 |
| Housewives | 132 | 49.6 |
| Retired | 22 | 8.27 |
| Unemployed | 11 | 4.14 |
| **Education** | | |
| Nil | 82 | 30.8 |
| Primary | 84 | 31.6 |
| Secondary | 50 | 18.8 |
| Inter | 27 | 10.2 |
| Graduate | 23 | 8.6 |
| **Setting** | | |
| IPD | 85 | 32.0 |
| OPD | 181 | 68.0 |

margin of error of 5%. Categorical data was calculated as frequencies and percentages. Cross tabulations and correlation matrix was checked for interaction between the variables. Pearson's chi-square test was used to look for any statistically significant difference in variables and face mask compliance. *p*-value of less than 0.05 was considered significant at 95% confidence interval.

## Results

A total of 266 patients were included in our results. Table I shows the patient characteristics and settings. Majority of the patients in our study (229/266 or 86.09%) wore a face mask while 37/266 (13.90%) patients did not. Out of the 229 patients who wore a mask, 183/229 or 79.9% wore the recommended surgical mask while 43/229 (18.77%) wore a fabric mask and 3/229 (1.31%) used a N 95 mask.

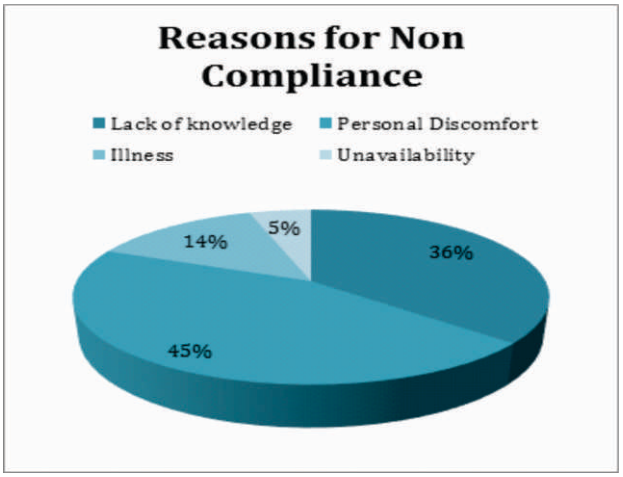


**Fig. 1 Reasons for Non-Compliance**

Mask wearing technique was assessed for the 183 patients who wore a surgical mask. A score of 5/5 was achieved by only 65/183 (41%) patients.

**Table II: Depicts the Criteria Observed and Patient Behavior**

| Question | Response | N | % |
|---|---|---|---|
| 1. Is the mask fully covering nose, face, and chin? | Yes | 139 | 75.96% |
| | No | 44 | 24.04% |
| 2. Was the colored side out and lighter side in? | Yes | 162 | 88.52% |
| | No | 21 | 11.47% |
| 3. Did the mask have 2 elastic straps and a metal strip on top? | Yes | 169 | 92.35% |
| | No | 14 | 7.65% |
| 4. Did the patient lower their mask while conversing? | Yes | 57 | 31.14% |
| | No | 126 | 68.86% |
| 5. Did the patient touch or manipulate their mask during encounter? | Yes | 76 | 41.53% |
| | No | 107 | 58.47% |

An overwhelming majority (129/183 or 70.49%) admitted reusing same mask multiple times. A sealed paper/plastic bag was used to store the mask by only 9/183 (4.92) patients. Very few patients (28/183 or 15.30%) discarded their used mask in a closed bin. Figure 2 depicts these face mask practices.


**Fig. 2: Face mask Practices**

Fewer IPD patients (44/85 or 51.76%) wore surgical mask as compared to 139/181 (76.79%) OPD patients. Correlation was significant at a level of 0.492. IPD patients were also less likely to cover their face completely as compared to their OPD counterparts (21/43 or 48.8% vs 41/138 or 29.7%). There was no significant correlation between gender and face mask compliance in terms of wearing the right type of mask and overall compliance score. However, males were more likely to touch the mask than females with p value of 0.129. Although not directly included in the study population, 148/266 (55.6%) of the patients were accompanied by attendants. Almost one-third of them (45/148 or 30.4 %) did not wear a face mask.

## Discussion

Face mask non-compliance by patients poses a significant threat to HCW and other patients. While majority of the patients (87%) in this study wore a face mask, actual compliance as per operational definition was very low. One in every five patients wore a non-surgical fabric mask or other barrier masks such as hijab/bandana/handkerchief which are not recommended for hospital settings. [13] Data suggests that face mask compliance in health care settings may be suboptimal despite a universal masking policy.[14] A hospital-based study conducted in Pakistan early in pandemic, reported that although 90.4 % of the study population was compliant with wearing a face mask only 62.1% of them used a

surgical mask.[15] The relatively good compliance with wearing of surgical face mask in our study is more likely the result of a strict internal mask policy at our hospital rather than increased community awareness. A comparison of results from various in-hospital settings further confirms this. Patients under strict supervision in OPD clinics were more likely to wear mask (139/181 or 76.79%). On the contrary, patients admitted in wards were less compliant (44/85 or 51.76%). It may be argued, that wearing of mask may be difficult for some patients due to underlying illness. However, only stable patients with no breathing difficulty were included in our study. Furthermore, the results of our study prove that only 14% patients considered underlying illness to be a barrier to face mask wearing.

Correct mask usage is as important as wearing a mask and is critical in limiting disease spread.[13] In the present study, correct mask wearing technique was employed by only 41% of the patients. Results of our study are comparable to a hospital-based study reported by Kumar et al, in which 64.7% of the study population had a suboptimal score with respect to correct mask usage.[16] According to the results of a Malaysian study, 11.2% patients/visitors did not cover their face completely with face mask.[17] In comparison, one third of our subjects (34.2%) did not cover their face, nose, and chin completely. Manipulation of face mask can increase the risk of self-contamination.[18] A significant number (40.8%) of patients in our study were found to touch their face masks while 31.14% lowered their masks during conversation. This contrasts with other regions such as China, South Korea, and Europe where face touching behaviors were negligible and observed in 1.1%, 2.2% and 6.1% respectively.[19] Face masks when not properly maintained, stored, and discarded can themselves become a potential source of disease spread.[20] An alarmingly high proportion of patients in our study (71%) did not discard their one-time surgical masks after use and admitted reusing same mask for several days. An even higher number (84.6%) of patients did not throw the used mask into a closed bin after use. This is in keeping with the results of an Italian study in which 50.3% people reused masks for extended periods and 70.5% threw used masks in general waste.[21] Earlier a local community-based survey reported by Fazal et al also concluded that 73.2% of the study population did not exercise safe mask disposal and 60% of the public discarded the used masks in general waste.[22]

Pakistan Railways Hospital is an ISO 9001-2015 certified, 350-bedded semi-government teaching hospital affiliated with Islamic International Medical College, Riphah International University. It has on an average 650 outpatient visits per day. Soon after the COVID-19 pandemic hitting Pakistan, the hospital was quick to implement necessary policies in line with national guidelines. Hospital infection control measures with reduction in the number of entry/exit points, strict hand hygiene/face mask policy & thermal detection were undertaken. The COVID-19 filter clinic screens all patients for COVID-19 symptoms and ensures only patients wearing surgical masks are allowed to proceed further. Despite these checks and balances, the results of our study reflect the general apathy of our public towards the pandemic.

Our study has some limitations. It was conducted in a single semi-government hospital hence results cannot be extrapolated to rest of Pakistan. The study was conducted over a short duration and the sample size is therefore small. Our hospital policy requires all hospital staff to wear face mask hence they were excluded. Compliance of an attendant accompanying the patient at the time of his physician encounter was however observed and reported separately. The major strength of our study is its direct observational design which is an accurate reflection of participant's actual practice. The study does not evaluate the association between facemask non-compliance and rate of hospital acquired infection amongst HCW. More studies are required to determine this important aspect as well as temporal relationship between COVID- 19 infection in HCW and larger community.

## Conclusion

The study provides preliminary data highlighting sub optimal face mask compliance by the general population of patients despite a facility-wide universal face mask policy at our hospital. Strategies to increase awareness and promote rational use of face masks in patients visiting hospitals during COVID 19 pandemic will be helpful in minimizing hospital acquired COVID-19 infection amongst health care workers and patients alike. Telehealth and home care

rather than hospital focused system are viable options to be considered in this public health crisis.

## REFERENCES

1. The Lancet. COVID-19: protecting health-care workers. Lancet. 2020;395(10228):922.
2. Milan Sharma. Breakthrough Covid-19 infections found in 25% healthcare workers during Delta surge: Study. India Today. 2021.
3. Rickman HM, Rampling T, Shaw K, Martinez-Garcia G, Hail L, Coen P, et al. Nosocomial Transmission of Coronavirus Disease 2019: A Retrospective Study of 66 Hospital-acquired Cases in a London Teaching Hospital. Clin Infect Dis. 2021;72(4):690–3.
4. Mask use in the context of COVID-19: interim guidance, 1 December 2020. World Health Organization. World Health Organization. 2020.
5. Advani SD, Smith BA, Lewis SS, Anderson DJ, Sexton DJ. Universal masking in hospitals in the COVID-19 era: Is it time to consider shielding? Infect Control Hosp Epidemiol. 2020;41(9):1066–7.
6. Klompas M, Morris CA, Sinclair J, Pearson M, Shenoy ES. Universal Masking in Hospitals in the Covid-19 Era. N Engl J Med. 2020;382(21):e63.
7. Wang X, Ferro EG, Zhou G, Hashimoto D BD. Association Between Universal Masking in a Health Care System and SARS-CoV-2 Positivity Among Health Care Workers. JAMA. 2020;324(7):703.
8. Lee JK, Jeong HW. Wearing face masks regardless of symptoms is crucial for preventing the spread of COVID-19 in hospitals. Infect Control Hosp Epidemiol. 2021;42(1):115–6.
9. Gudbjartsson DF, Helgason A, Jonsson H, Magnusson OT, Melsted P, Norddahl GL, et al. Spread of SARS-CoV-2 in the Icelandic Population. N Engl J Med. 2020;382(24):2302–15.
10. Watson J, Whiting PF, Brush JE. Interpreting a covid-19 test result. BMJ [Internet]. 2020;369(May):1–7. Available from: http://dx.doi.org/doi:10.1136/bmj.m1808
11. Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. PLoS One [Internet]. 2020;15(5):1–15. Available from: http://dx.doi.org/10.1371/journal.pone.0233668
12. Ministry of National Health Services Regulations and Coordination. Govt. of Pakistan. Guidelines for Mandatory use of Face Mask. 2020;(December):1–5.
13. J. Picard a , G. Cornec a , R. Baron a PS. Wearing of face masks by healthcare workers during COVID-19 lockdown: what did the public observe through the French media? J Hosp Infect. 2020;617–20.
14. Datta R, Glenn K, Pellegrino A, Tuan J, Linde B, Kayani J, et al. Increasing Facemask Compliance among Healthcare Personnel during the COVID-19 Pandemic. Infect Control Hosp Epidemiol. 2021;2019:1–7.
15. Sarfraz S, Raza R, Aziz K, Umar M, Noreen K, Shehryar M. Compliance on the Use of Different Types of Face Mask by Healthcare Workers, and General Public in Tertiary Care Hospital of RMU during COVID-19 Pandemic. J Rawalpindi Med Coll. 2020;24(Supp-1):71–6.
16. Kumar J, Katto MS, Siddiqui AA, Sahito B, Jamil M, Rasheed N, et al. Knowledge, Attitude, and Practices of Healthcare Workers Regarding the Use of Face Mask to Limit the Spread of the New Coronavirus Disease (COVID-19). Cureus. 2020;(April).
17. Gunasekaran GH, Gunasekaran SS, Gunasekaran SS, Hanim Bt Abdul Halim F. Prevalence and acceptance of face mask practice among individuals visiting hospital during COVID-19 pandemic: Observational study. Hilos Tensados. 2019;1:1–476.
18. Matusiak Ł, Szepietowska M, Krajewski P, Białynicki-Birula R, Szepietowski JC. Inconveniences due to the use of face masks during the COVID-19 pandemic: A survey study of 876 young people. Dermatol Ther. 2020;33(4).
19. Chen YJ, Qin G, Chen J, Xu JL, Feng DY, Wu XY, et al. Comparison of Face-Touching Behaviors before and during the Coronavirus Disease 2019 Pandemic. JAMA Netw Open. 2020;3(7):1–10.
20. Kwon JH, Burnham CAD, Reske KA, Liang SY, Hink T, Wallace MA, et al. Assessment of Healthcare Worker Protocol Deviations and Self-Contamination during Personal Protective Equipment Donning and Doffing. Infect Control Hosp Epidemiol. 2017;38(9):1077–83.
21. Scalvenzi M, Villani A, Ruggiero A. Community Knowledge About the Use, Reuse, Disinfection and Disposal of Masks and Filtering Facepiece Respirators: Results of a Study Conducted in a Dermatology Clinic at the University of Naples in Italy. J Community Health [Internet]. 2021;46(4):786–93. Available from: https://doi.org/10.1007/s10900-020-00952-3
22. Fazal M, Khawar T, Raza Z, Maryam L, Bilal A, Burney S. Compliance and Etiquettes of Using Face Masks in Public during COVID-19 Pandemic: A Community-Based Survey from Islamabad, Pakistan. Pakistan J Public Heal. 2021;11(2):79–86.

**CONFLICT OF INTEREST**

Authors declared no conflicts of Interest.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Association of Mucin-4 Expression In Anneroth Grades of Oral Squamous Cell Carcinoma

Naila Umer[1], Afifa Ehsan[2], Ali Raza[3], Rabia Masood[4], Saima Chaudhry[5]

**ABSTRACT**

**Objective**: To evaluate the expression of Mucin-4 amongst separate histological categories of oral squamous cell carcinoma patients at a tertiary care hospital in Pakistan.

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

**Place and Duration of Study:** It was carried out from July 01, 2021, to December 31, 2021, at the Department of Oral Pathology, University of Health Sciences, Lahore, Pakistan.

**Materials and Methods:** The study comprised fifty cases of oral squamous cell carcinoma randomly taken from the archives of Sheikh Zayed Hospital and Federal Postgraduate Medical Institute, Lahore as per the selection criteria agreed upon. The association of mucin-4 expression with different histological grades (based on the Anneroth grading system) was analyzed in this study. Data were entered into SPSS 20 for statistical analysis. Age was represented as mean ± standard deviation while gender distribution and tumor grades were presented as frequencies and percentages.

**Results:** Out of a total of fifty retrieved samples, thirty were analyzed (twenty were excluded based on the exclusion criteria). Of these thirty samples, 16 (53.3%) were male and 14 (46.6%) were female. Consistent with the Anneroth grading method, grade I comprised 11 (36%), grade II comprised 13 (43.3%), and grade III comprised six cases (20%) respectively. Overall positive expression of Mucin-4 was found to be 73% and a significant relation was found to exist between the intensity score and the total score of MUC-4 with Anneroth grades of Oral Squamous Cell Carcinoma with a decrease in expression and an intensification in tumor grade.

**Conclusion:** A decrease in the expression of Mucin-4 was noted with an increase in the tumor grade when the expression of Mucin-4 was evaluated amongst separate histological categories of oral squamous cell carcinoma patients.

**Key Words:** *Immunohistochemistry, MUC4, Mucin 4, Oral Squamous Cell Carcinoma, Squamous Cell Carcinoma.*

## Introduction

Mucins are high-level molecular weight multifunctional glycoproteins expressed by innumerable epithelia of oculo-rhino-otolaryngeal tracts, respiratory tracts, reproductive tracts, and gastrointestinal tracts. Being a foremost component of mucus, it aids to hydrate the epithelia, lubricates, and shields them from injurious microbes.[1-2] Distinctive silhouette of mucin expression in the epithelium of different organs is depicted and a modification in this expression is accompanied by cancer expansion promoting cell growth, differentiation, adhesion, and invasion.[3-5]

Atypical expression of mucins in numerous cancers has been accepted and numerous mucins are recognized as therapeutic agents, diagnostic and prognostic markers, and appealing therapeutic targets.[4-5] MUC4, one of the transmembrane mucins has lately emerged as an expedient biomarker. Modification in manifestation, as well as glycosylation, is documented concerning several epithelial malignancies for instance the esophagus, breast, lung, pancreas, and cervix.[6]

In cancerous cells, biochemical alterations of MUC4 in concert with changes in cell polarity permit its interaction with proteins that are otherwise cytoarchitecturally segregated.[7] MUC4 enacts its function in tumor advancement secondarily through the anti-adhesion mechanism or directly through the ErbB2 signaling pathway.[7] MUC4 is furthermore localized in the oral squamous epithelium and its

[1] *Department of Oral Pathology, Faryal Dental College, Lahore*
[2] *Department of Oral Biology, Faryal Dental College, Lahore*
[3,5] *Department of Oral Pathology, University of Health Sciences, Lahore*
[4] *Department of Oral Pathology, Islamic International Dental College, Islamabad*

*Correspondence:*
*Dr. Afifa Ehsan,*
*Associate Professor & HOD Oral Biology,*
*Faryal Dental College, Lahore.*
*E-mail: afifaehsan@gmail.com*

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character in malignant alteration is under research.[8-12] The present study aimed to assess the countenance of Mucin 4 in oral squamous cell carcinoma patients at a tertiary care hospital in Pakistan as it can be a beneficial diagnostic and prognostic marker.

## Materials and Methods

The present cross-sectional descriptive analysis was carried out at the Department of Oral Pathology, University of Health Sciences, Lahore from July 01, 2021, to December 31, 2021. Ethical endorsement of the study was acquired through the Ethical Review Board of the University of Health Sciences, Lahore (Letter#: UHS/Education/126-16/039).

A total of 50 cases of Formalin-fixed paraffin blocks from diagnosed patients of Oral Squamous Cell Carcinoma (OSCC) were recovered from the archives of Sheikh Zayed Hospital, Postgraduate Medical Institute, Lahore. Blocks with inadequate data and any sort of damage were excluded from the study. The H & E slides were prepared and graded using the Multiparameter (Anneroth's) grading system. Also, 20 cases in which the stage of invasion was not found were excluded as Anneroth grading couldn't be done on them.

For immunohistochemistry with anti MUC4 antibody, 4 µm dense tissue segments were chosen on Poly-L-lysine covered. The segments were dehydrated at $60^{0}$ Ċ for 50 minutes in warm air. Following dewaxing, in xylene sections, they were positioned in scored alcohol. Antigen repossession was done through placing slides in a Coplin jar filled with antigen retrieval solutions. Jars were then positioned inside a warm water bath at 95 °C for 30 minutes. Then the slides were set aside to lower the temperature and evaporative damages were substituted by newly prepared phosphate-buffered saline (PBS).

Afterward, the slides were incubated for 15 minutes with 1-2 drops of $H_2O_2$. Additional 1-2 drops of protein blocker were placed atop slides which were again incubated for another 10 minutes. Subsequently, they were then washed 3 times with PBS using a washer bottle. Primary Antibody incubation was done for 2 hours with anti-MUC 4 antibody (code ab52263; Abcam, USA) reduced near the strength of 5µg/ml followed with Biotinylated Secondary Antibody Incubation for 30 minutes.

Following washing with PBS, slides remained incubated for 10 minutes with Substrate Chromogenic Solution (DAB) and then counterstained with hematoxylin. Slides were then mounted employing dibutyl phthalate polystyrene xylene (DPX). Human pancreatic cancer tissue was chosen as an affirmative control whereas excluding the principal antibody stage in the peroxidase-labeled streptavidin-biotin procedure delivered the negative control for MUC4.

**Quantification:**[14]

MUC4 expression transpired to be appraised based upon the extent and intensity of immunolabelling in the tumor's cell membrane as well as cytoplasm. The complete score for every single case was determined by the accumulation of the proportion score (PS) along with the intensity score (IS) of that case. Scoring criteria are given in Table I.[14]

Data were entered into SPSS 20 for statistical analysis. Age was represented as mean ± standard deviation (SD) and the significance level remained at $P \leq 0.05$. Gender distribution and tumor grades were presented as frequencies and percentages.

**Table I: Scoring Criteria of MUC4 Expression**

| Intensity Score (IS) | Proportion Score (PS) | Total Score (TS): TS = IS + PS |
|---|---|---|
| 0 = No Staining | 0 = < 5% Immunoreactive | Score 0 = Negative |
| 1 = Mild | 1 = 6 - 32% Immunoreactive | Score 1 - 2 = Weak Positive +1 |
| 2 = Moderate | 2 = 33% - 66% Immunoreactive | Score 3 - 4 = Moderate Positive +2 |
| 3 = Intense | 3 = > 66% Immunoreactive | Score 5 - 6 = Strong Positive +3 |

## Results

Our study comprised 50 cases of OSCC out of which 20 were excluded based on the exclusion criteria and the rest were analyzed. In the 30 cases that underwent analysis, the average age range of the patients was found to be 53 ± 3.77 years with the majority of them being male (53.3%) while only 46.6% were observed to be females. The most common site of involvement in this study was found to be the tongue and buccal mucosa while gingiva, lower lip, palate, and tonsil were less common. Grade 2 comprised a total of 43.3% cases which were recorded to be the maximum followed by grade 1

(36%) and grade 3 (20%) (Table II).

Out of the total, 73% of cases were found to be positive for MUC-4 expression while the rest were negative (Figure 1). Most of the tumors showed moderate intensity highlighting 33 - 66% of tumors. A significant relation ($p \leq 0.05$) was established between intensity and total score of MUC-4 with Anneroth grades of OSCC with a decrease in expression and an intensification in tumor grade (Table III).

**Table II: Demographic Data & Anneroth Tumor Grades of OSCC**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Age** | **21 - 40 years** | | **41 - 60 years** | | **61 - 80 years** | | **Total** |
| | 06 (20%) | | 18 (60%) | | 06 (20%) | | N = 30 |
| **Gender** | **Male** | | | **Female** | | | |
| | 16 (53.3%) | | | 14 (46.6%) | | | |
| **Site** | **Tongue** | **Buccal mucosa** | **Gingiva** | **Lower lip** | **Palate** | **Tonsil** | |
| | 11 | 11 | 3 | 2 | 2 | 1 | |
| **Anneroth Grade** | **Grade 1 ( ≥ 15)** | | **Grade 2 (16 - 18)** | | **Grade 3 ( ≥ 19)** | | |
| | 11 (36%) | | 13 (43.3%) | | 6 (20%) | | |

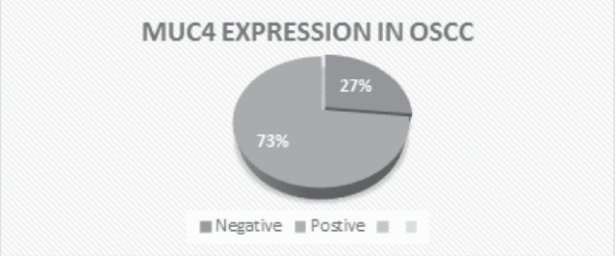


**Fig. 1: Mucin-4 Expression in Oral Squamous Cell Carcinoma (OSCC)**

**Table III- Intensity, Proportion & Total Score of Mucin-4**

| **MUCIN-4 STAINING** | **Anneroth's Histological Grades of OSCC** | | | | |
|---|---|---|---|---|---|
| | **Grade 1** | **Grade 2** | **Grade 3** | **Total** | ***P* - value** |
| **Intensity Score (IS)** | | | | | |
| No staining | 1 | 3 | 3 | 7 | $p = 0.004$ df = 1 |
| Mild | 1 | 4 | 3 | 8 | |
| Moderate | 5 | 6 | 0 | 11 | |
| Severe | 4 | 0 | 0 | 4 | |
| **Proportion Score (PS)** | | | | | |
| < 5% | 1 | 3 | 3 | 7 | $p = 0.072$ df = 1 |
| < 33% | 1 | 2 | 3 | 6 | |
| 33 - 66% | 6 | 4 | 0 | 10 | |
| > 66% | 3 | 4 | 0 | 7 | |
| **Total Score (IS + PS)** | | | | | |
| Negative | 1 | 3 | 3 | 7 | $p = 0.02$ df = 1 |
| Weak Positive | 0 | 1 | 3 | 4 | |
| Moderate Positive | 4 | 7 | 0 | 11 | |
| Strong Positive | 6 | 2 | 0 | 8 | |

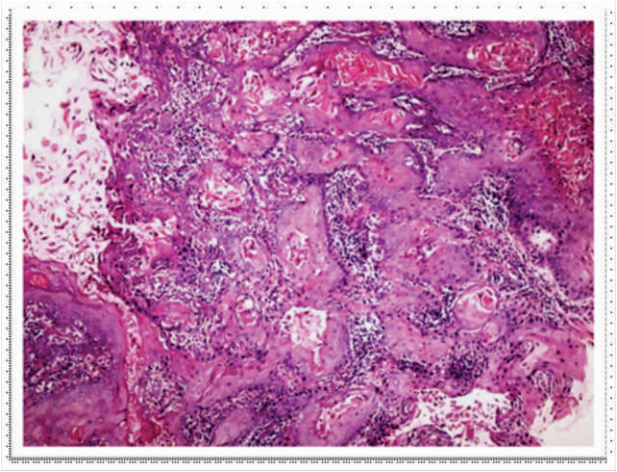

**Fig. 2: Well Differentiated Oral Squamous Cell Carcinoma (Grade1) (H&E; 10x10 X)**

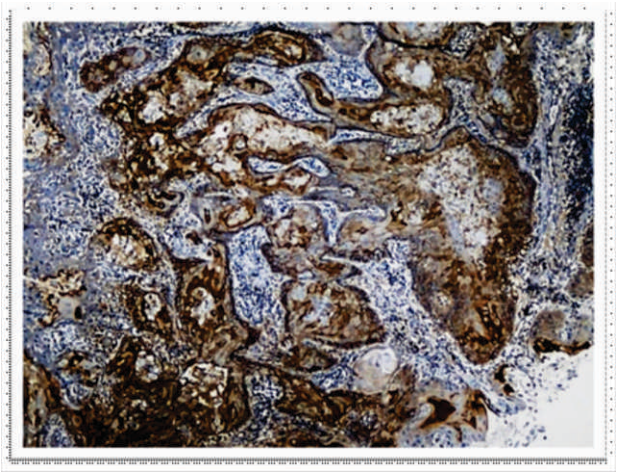

**Fig. 3: Strong Cytoplasmic Expression In Well-Differentiated OSCC (Grade 1) (MUC4 IHC; 10 X 10 X)**

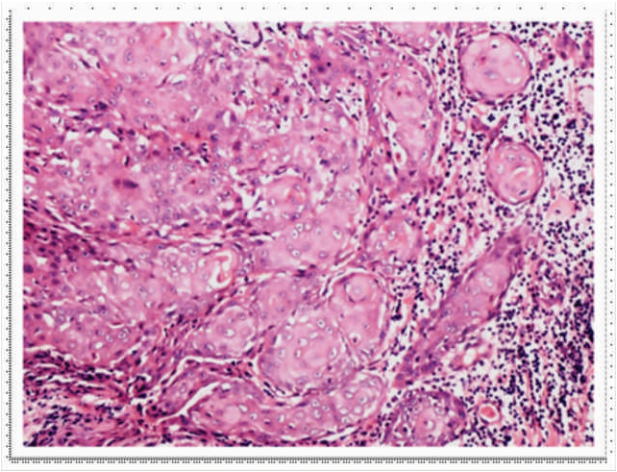

**Fig. 4: Moderately Differentiated OSCC (Grade 2) (H&E; 10 x 10 X)**

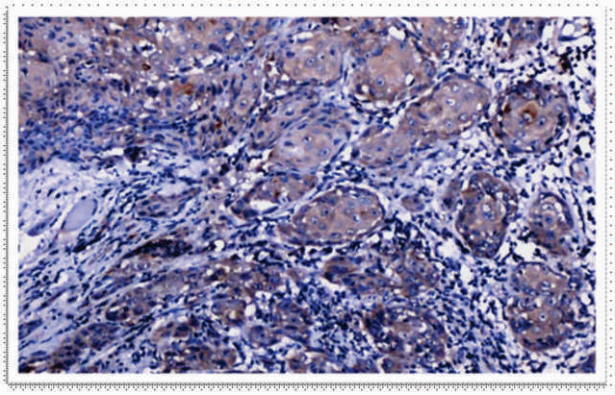

**Fig. 5: Moderately Strong Cytoplasmic Expression In Moderately Differentiated OSCC (Grade 2) (MUC4 IHC; 10 x 10 X)**

## Discussion

Oral Squamous cell carcinoma remains nevertheless one of the greatest widespread tumors globally and the second most common tumor in Pakistan.[15-19] It is of immense significance to be a consistent diagnostic and prognostic biomarker for cancer patients to be able to make available indispensable information for attaining a clinical conclusion. Lately, mucins have been contemplated as prospective biomarkers in cancer diagnosis attributable to their distinctive representation in cancer patients as contrasted to the normal one. Among them, MUC4 is considered a promising one.[15-18]

In the current study expression of MUC-4 was observed in 73% of oral squamous cell carcinoma cases with the majority of tumors presenting a moderate intensity of the marker staining 33 - 66% of tumor cells. This positive ratio was analogous to the investigations carried out by Narashiman et al. and Kohli et al. while variance was found in one study performed in the population of Japan where the proportion of positive expression was found to be 40 %.[10-11] This variance can be attributed to dissimilarities in the population targeted where the incidence of OSCC is low. The rest of the studies have targeted the South Asian population with an elevated incidence rate of oral squamous cell carcinoma.[12-14]

Studies conducted by Hamada et al, Narashiman et al., and Kohli et al. have categorized OSCC only based on the degree of tumor differentiation/ keratinization and did not take into consideration any other parameters contemplated in Anneroth's grading systems.[8,10-11] No study has so far compared Anneroth's tumor grading system for OSCC regarding MUC4 expression. In the current study, the Anneroth grade of OSCC when associated with MUC4 expression revealed statistically significant results. A reduction in expression in conjunction with an intensification in tumor ranking was observed.

Allred scoring system was utilized in our study encompassing both intensity (IS) and proposition score (PS) as contrasted to the rest of the studies which only considered PS. When the association of MUC4 expression was equated with a grade of tumors a strong to moderate expression was observed in grade 1 tumors, mild to moderate in grade 2 while grade 3 tumors revealed weak/mild expression only. A noteworthy relationship was established concerning the expression of MUC4 and intensity in addition to total score (IS + PS). When tumor grade correlation in conjunction with positive and negative expression of MUC 4 was assessed, no substantial relation was obtained. This finding was analogous to the results of studies carried out by Hamada et al. They correlated various grades of SCC with positive and negative MUC4 expression instead of a difference in the positivity that is from weak to strongly positive, while our findings were significant as regards this aspect.[8]

A lessening in MUC 4 expression in moderately as well as poorly differentiated SCC could possibly be accredited to the deficit of differentiation of squamous cells as contrasted to well-differentiated SCC. Formerly many investigations carried out upon the function of MUC4 in SCC have revealed the aforementioned's association in conjunction with tumor differentiation. Philipe Guillem in 2000 reported the association of MUC4 gene expression with squamous differentiation, as he discerned the strongest hybridization signals in well-differentiated esophageal SCC.[20] Correspondingly, a study done by Kathpalia to determine cellular pathways in cutaneous SCC found MUC 4 m RNA upregulation nearly threefold in well-differentiated SCC.[20-23]

## Conclusion

In conclusion, a decrease in the expression of Mucin-4 was seen with an increase in the tumor grade when the expression of Mucin-4 was assessed amongst separate histological categories of oral squamous cell carcinoma patients. The findings of our study also reveal upregulation (73%) of MUC4 appearing in

tumor tissue alongside negative expression in the regular epithelium. Loss of MUC4 expression along with an intensification in tumor scoring is observed. Given that the differential expression of MUC4 is observed with higher expression in grade 1 tumors in contrast to grade 3, so it provides supportive evidence to incorporate it as a marker for tumor cell differentiation.

**Strength of Study**

Given the differential expression of MUC4, it provides supportive evidence to incorporate it as a marker for tumor cell differentiation.

**Limitations of Study**

The study was conducted on a smaller scale with less sample size. Further studies should be conducted with larger sample sizes including a larger number and a wider spectrum of participants from different hospitals in various areas of the country.

**Future Recommendations**

MUC4 can demonstrate to be a beneficial diagnostic and prognostic marker. Furthermore, additional epidemiological studies should be carried out in the future on a greater scale to extend these discoveries and find a correlation between MUC4 expression with tumor stage, treatment modalities, and patient outcome.

## REFERENCES

1. Bansil R, Turner BS. Mucin structure, aggregation, physiological functions and biomedical applications. Current opinion in colloid & interface science. 2006 Jun 1;11(2-3):164-70.
2. Pinzón Martín S, Seeberger PH, Varón Silva D. Mucins and pathogenic mucin-like molecules are immunomodulators during infection and targets for diagnostics and vaccines. Frontiers in chemistry. 2019 Oct 22;7:710.
3. Krishn SR. 2016.Secretory mucin MUC5AC in gastrointestinal malignancies.*Doctoral Dissertations*.University Of Nebraska Medical Center.Digtal Commons database.
4. Kufe DW. Mucins in cancer: function, prognosis and therapy. Nature Reviews Cancer. 2009 Dec;9(12):874-85.
5. Hollingsworth MA, Swanson BJ. Mucins in cancer: protection and control of the cell surface. Nature Reviews Cancer. 2004 Jan;4(1):45-60.
6. Chakraborty S, Jain M, Sasson AR, Batra SK. MUC4 as a diagnostic marker in cancer. Expert opinion on medical diagnostics. 2008 Aug 1;2(8):891-910.
7. Singh AP, Chaturvedi P, Batra SK. Emerging roles of MUC4 in cancer: a novel target for diagnosis and therapy. Cancer research. 2007 Jan 15;67(2):433-6.
8. Hamada T, Wakamatsu T, Miyahara M, Nagata S, Nomura M, Kamikawa Y, Yamada N, Batra SK, Yonezawa S, Sugihara K. MUC4: a novel prognostic factor of oral squamous cell carcinoma. International journal of cancer. 2012 Apr 15;130(8):1768-76.
9. Macha MA, Rachagani S, Pai P, Gupta S, Lydiatt WM, Smith RB, Johansson SL, Lele SM, Kakar SS, Lee JH, Meza J. MUC4 regulates cellular senescence in head and neck squamous cell carcinoma through p16/Rb pathway. Oncogene. 2015 Mar;34(13):1698-708.
10. Narashiman S, Narasimhan M, Venkatraman G. Expression of Mucin 4 in leukoplakia and oral squamous cell carcinoma: An immunohistochemical study. Journal of oral and maxillofacial pathology: JOMFP. 2014 Jan;18(1):25.
11. Kohli M, Shivam AK, Ahuja P, Dutta J. Mucin-4: A novel marker for oral cancer. Journal of Oral and Maxillofacial Pathology: JOMFP. 2019 Jan;23(1):49.
12. Rathee R, Devi A, Narwal A, Kamboj M, Singh S. Immunohistochemical Coexpression of MUC1 and MUC4 in Oral Leukoplakia and Oral Squamous Cell Carcinoma. Head and Neck Pathology. 2021 Sep;15(3):831-42.
13. Almangush A, Mäkitie AA, Triantafyllou A, de Bree R, Strojan P, Rinaldo A, Hernandez-Prera JC, Suárez C, Kowalski LP, Ferlito A, Leivo I. Staging and grading of oral squamous cell carcinoma: An update. Oral oncology. 2020 Aug 1;107:104799.
14. Kwon KY, Ro JY, Singhal N, Killen DE, Sienko A, Allen TC, Zander DS, Barrios R, Haque A, Cagle PT. MUC4 Expression in Non–Small Cell Lung Carcinomas: Relationship to Tumor Histology and Patient Survival. Archives of pathology & laboratory medicine. 2007 Apr;131(4):593-8.
15. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a cancer journal for clinicians. 2018 Nov;68(6):394-424.
16. Anwar N, Pervez S, Chundriger Q, Awan S, Moatter T, Ali TS. Oral cancer: Clinicopathological features and associated risk factors in a high risk population presenting to a major tertiary care center in Pakistan. Plos one. 2020 Aug 6;15(8):e0236359.
17. Qureshi MA, Syed SA, Sharafat S. Lip and oral cavity cancers (C00-C06) from a mega city of Pakistan: Ten-year data from the Dow Cancer Registry. Journal of Taibah University Medical Sciences. 2021 Aug 1;16(4):624-7.
18. Malkani N, Kazmi S, Rashid MU. Epidemiological Assessment of Oral Cancer Burden in Pakistan. Cancer Investigation. 2021 Nov 26;39(10):842-53.
19. Khaleel ME, Raza A, Ehsan A, Masood R, Javed M. Clinicopathological spectrum of oral squamous cell carcinoma at a public sector health facility. Biomedica. 2015;31(1):21-6.
20. Guillem P, Billeret V, Buisine MP, Flejou JF, Lecomte-Houcke M, Degand P, Aubert JP, Triboulet JP, Porchet N. Mucin gene expression and cell differentiation in human normal, premalignant and malignant esophagus. International journal of cancer. 2000 Dec 15;88(6):856-61.
21. Kaur S, Momi N, Chakraborty S, Wagner DG, Horn AJ, Lele SM, Theodorescu D, Batra SK. Altered expression of transmembrane mucins, MUC1 and MUC4, in bladder cancer: pathological implications in diagnosis. PloS one.

2014 Mar 26;9(3):e92742.

22. Kathpalia VP, Mussak EN, Chow SS, Lam PH, Skelley N, Time M, Markelewicz Jr RJ, Kanduc D, Lomas L, Xiang Z, Sinha AA. Genome-wide transcriptional profiling in human squamous cell carcinoma of the skin identifies unique tumor-associated signatures. The Journal of dermatology. 2006 May;33(5):309-18.
23. Macha MA, Rachagani S, Pai P, Gupta S, Lydiatt WM, Smith RB, Johansson SL, Lele SM, Kakar SS, Lee JH, Meza J. MUC4 regulates cellular senescence in head and neck squamous cell carcinoma through p16/Rb pathway. Oncogene. 2015 Mar;34(13):1698-708.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Hereditary Resemblances of Lip Prints Among the Members of Biological Families

Aftab Alam Tanoli[1], Ijaz Aziz[2], Khalil Ur Rehman[3], Nayella Nijat Bangesh[4], Qurrat Ul Ain[5], Farrukh Iqbal[6]

**ABSTRACT**

**Objective:** To assess the resemblance of lip prints among the members of biological families, involving identical twins.

**Study Design:** Descriptive study.

**Place and Duration of Study:** Department of forensic medicine & toxicology, post-graduate medical institute/university of health sciences Lahore December 22, 2014, to December 22, 2016.

**Materials and Methods:** A total of 216 individuals (father, mother and both the children), who underwent observational study of lip impression collection without any anesthesia or drug, were enrolled into the present study. Father, mother and both identical twins of each family were selected. Lip prints of Father, mother and both twins of each family were recorded. Each lip of 54 twin offspring was compared with the corresponding lip of his/her father, mother, and other identical twin in the same family twin.

**Results:** Out of 54-total families, monozygotic twins of 19(35.18%) families observed resemblance with father, whereas monozygotic twins of 35(64.81%) families observed resemblance with mother. There was no definite identical lip print pattern observed in any of the children. Furthermore, the prevalence of Type II lip prints was higher type present in males and in females.

**Conclusion:** Lip prints of study participants do not match with each other. They are not identical with other twin baby or either parents but have some resemblance features. Like fingerprints, lip print patterns are unique, and it is considered feasible to apply lip prints features in personal identification.

**Key Words:** *Cheiloscopy; Lip Prints; Monozygotic Twins Family, Personal Identification.*

## Introduction

Personal identification is necessary for unknown deceased person in homicide, suicide, accident, mass disaster etc. Identification of a missing individual can aid immensely in the process of grief resolution by family and friends. In universal declaration human rights, article 06 states that "before the law, it is the right of every person to be identified as individual person.[1] On human lips amongst the inner labial mucosa and external skin there is zone of transition on which lip patterns are present in the form of wrinkle and grooves in the form of normal lines and fissures. Like fingerprints, the pattern of wrinkles on the lips has individual characteristics. The wrinkles and grooves on the labial mucosa (called sulci labiorum) form a characteristic pattern called lip prints, the study of which is referred to as Cheiloscopy.[2]

Lip patterns can be identified as early as the sixth week of intra uterine life. After 6th week of fetal intra uterine life, lip prints are well developed and can be recognized. [3] The duration of lip print's reliability on paper may be up to 12 weeks even if exposed to ambient conditions, but duration of reliability on glass may be up to 9th week if kept in closed container in temperature adjusted around 25 °C, but if exposed to ambient conditions it may be up to 6th week. Clear and identifiable lip prints can be obtained if taken less than 24 hrs. after death[4].

A study was conducted on two matching twins in 1972 which stated that twins are indistinguishable by every other means, but their lip prints were diverse. Lip print analysis of family members suggest that

[1,4]*Department of Forensic Medicine*
*Women Medical College, Abbottabad*
[2]*Department of Forensic Medicine*
*Makran Medical College, Turbat*
[3]*Department of Forensic Medicine*
*Rehman Medical College, Peshawar*
[5]Department of Gynae/Obs Unit-2,
Holy Family Hospital Unit 2, Rawalpindi
[6]Department of Medicine,
Federal Polyclinic Hospital, Islamabad

*Correspondence:*
*Dr. Aftab Alam Tanoli,*
*Department of Forensic Medicine*
*Women Medical College, Abbottabad*
*E-mail: drtanoli403@gmail.com*

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offspring do receive similar type of lip prints features as of their mother / father, but location of these lines are different, and no two prints are the same even in twins.[5]

Development of modern techniques of crime detection has cautioned the criminals for taking sufficient precautions like the use of gloves. In such circumstances, accurate methods like fingerprint analysis fails to establish a positive identity. Any method that owns the probability of supporting the forensic field in identifying a dubious should be chased and if revealed applicable then it should be utilized for criminal investigations and legal proceedings. Crime detectors mostly don't utilize the benefits of using lip prints for the purpose of identifying the suspects. Detailed anti-mortem records of both lips can be used for matching the details of post-mortem lip prints for personal identification. A lip print established at the scene of crime can be a source for inferences as to the character of the cosmetics used, number of people involved, sex, habits, occupational traits and the diseased changes in lips themselves.[6]

Lip prints were recorded among 54 biological families with siblings involving identical twin, to ascertain inheritance resemblance of lip prints, and to analyze the characteristics of lip prints for positive identification, so that to make it an investigatory tool of identification in forensic sciences. The findings of these studies can be utilized to motivate crime scene investigators to analyze the characteristics of lip prints for positive identification as fingerprints in crime scenes, so that to make it an investigatory tool of identification in forensic sciences.

## Materials and Methods

A descriptive study was conducted in the Department of forensic medicine & toxicology, post-graduate medical institute/university of health sciences Lahore from December 22, 2014, to December 22, 2016. A total of 216 individuals (father, mother, both children's), who underwent Non-Probability / Convenience Sampling of lip impression collection without any anesthesia or drug, were enrolled into the present study. Before starting the research work, I presented my proposal in institutional ethical review committee and advance studies and research board. Ethical review committee approved on 02-07-2014 and advance studies and research board approved on 05-07-2014. Only individuals having lips with normal transition zone of mucosa and skin were included in the study. Individuals having inflammation of lips, malformation, deformity, surgical scars, active lesions, and hypersensitive to impression material were not included in the study. No drugs or chemical was used in study subjects.

The subjects were residents of Abbottabad & Mansehra (KPK), Rawalpindi (Punjab) & Islamabad surrounding villages. Written informed consent was obtained. All participants were given brief details of our objectives and answered the questions relating to procedure.

A thin layer of lipstick was applied in a single motion evenly on the lips of everyone. After two minutes, the individuals were advised to maintain a relaxed lip position. Negligible pressure was sustained on lips touching cellophane tape the while making the lip impression and subsequently the glued portion of the cellophane tape fixed on to the white bond paper to retain the lip impression. The impressions were afterward visualized with the magnifying lens.

To minimize the chances of error, which could most likely occur with manual magnifying lens, a digital method (indirect method) was used to analyze the lip marking. The lip impressions were scanned and exported on adobe photoshop-7 software at 256 gray scales configuration. A 300-dpi resolution was used to enhance the imagining quality of lip prints.

Collected data values were recorded and analyzed using SPSS 20.0. P-value was taken as $< 0.05$. Confidence level was taken as 95%. Mean, standard deviation, minimum and maximum values were calculated for continuous variables in all quadrants of individual lips. Frequency and percentages were calculated for resemblance among biological families and for gender. Two-way Anova test applied for substantial variance in type of lip prints. Z-test was applied to test the resemblance of lip prints to mother and father separately in the family. Microsoft word and excel have been used to form tables and figures.

## Results

The available data was used to generate the profile of resemblance of lip prints among various family members. The percentage of resemblance of lip prints of father and mother with their identical twins

and resemblance of 1st identical twin with 2nd identical twin with their father and mother in all of 54 families (216 individuals) are described in graph.


**Fig. 1: Percent Resemblance of 54 Families**

The X-axis shows family coded number.
The Y-axis shows resemblance among the families.
A-C corresponds to father verses first twin
A-D corresponds to father verses second twin
B-C corresponds to mother verses first twin
B-D corresponds to mother verses second twin
C-D corresponds to first twin verses second twin

Lip print pattern of all identical twin babies along with their parents were analyzed. Lip print type-1 was 116 (4.44%), Lip print type-2 was 1870 (71.6%), Lip print type-3 was 52 (1.99%), Lip print type-4 was 567 (21.7%) and Lip print type-5 was 05(0.19%) in all the quadrants of lips.

The mean resemblance between father and both twin was found to be 58.335 while between mother and first twin was as 58.335 and between mother and second twin was as 70.835. The mean

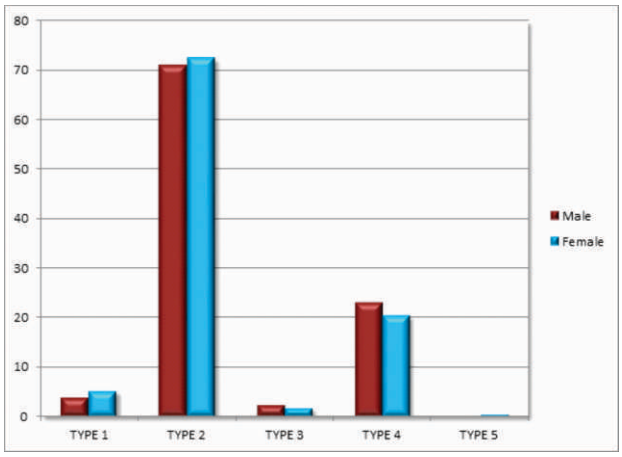


**Fig. 2: Percent Distribution of Types of Lip Prints in Male and Female**

**Table I: Lip Prints Quadrant wise in Male Gender**

| Lip print types | Quadrant 1 | Quadrant 2 | Quadrant 3 | Quadrant 4 | total |
|---|---|---|---|---|---|
| Lip print type 1 | 12 (24.48 %) | 10 (20.40 %) | 11 (22.44 %) | 16 (32.65 %) | 49 (3.80 %) |
| Lip print type 2 | 205 (22.45 %) | 220 (24.09 %) | 259 28.36 %) | 229 (25.08 %) | 913 (70.88 %) |
| Lip print type 3 | 11 (36.66 %) | 7 (23.33 %) | 4 (13.33 %) | 8 (26.66 %) | 30 (2.32 %) |
| Lip print type 4 | 93 (31.41 %) | 83 (28.04 %) | 52 (17.56 %) | 68 (22.97 %) | 296 (22.98 %) |
| Lip print type 5 | 00 | 00 | 00 | 00 | 00 |

**Table II: Lip Prints Quadrant Wise in Female Gender**

| Lip print types | Quadrant 1 | Quadrant 2 | Quadrant 3 | Quadrant 4 | total |
|---|---|---|---|---|---|
| Lip print type1 | 19 (28.35 %) | 16 (23.88 %) | 20 (29.85 %) | 12 (17.91 %) | 67 (5.08%) |
| Lip print type 2 | 202 (21.10%) | 231 (24.13 %) | 259 (27.06%) | 265 (27.69%) | 957 (72.66%) |
| lip print type 3 | 7 (31.81%) | 7 (31.81 %) | 4 (18.18%) | 4 (18.18%) | 22 (20.57%) |
| lip print type 4 | 102 (37.63%) | 78 (28.78 %) | 45 (16.60%) | 46 (16.97 %) | 271 (20.57%) |
| lip print type 5 | 00 | 00 | 2 (40 %) | 3 (60 %) | 5 (0.37 %) |

resemblance between first twin and second twin was found to be 58.335. Maximum Resemblance of twin babies with father and mother was87.51% & 91.67% respectively, whereas minimum Resemblance of twin babies with father and mother 25% & 33% respectively

In 54 families, father resemblance with 1st and 2nd twin baby was calculated, and then mother resemblance with 1st and 2nd twin baby was calculated. In 19 families, off-springs found to be having higher resemblance with father 35.18% ($z$=0.4978, $p$<0.05), whereas in 35 families, children's lip impressions showed higher resembling with

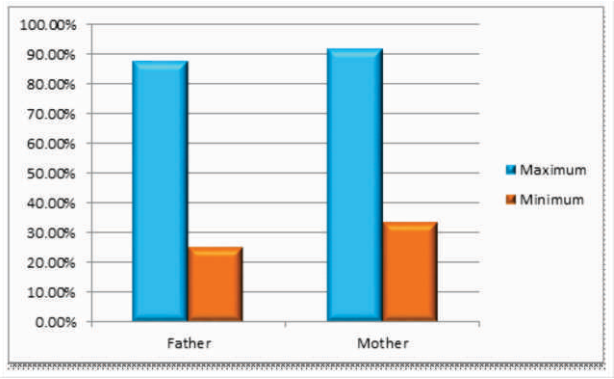


**Fig. 3: Parents Maximum and Minimum Resemblance with Twins**

mothers 64.81% ($z$=0.49917, $p$<0.05). Lip prints showed a strong positive and statistically significant correlation between parents and their offspring.

We observed that mother resemblance towards twin babies was at higher level as compared with father resemblance. Father to mother resemblance ratio is 1:1.8. No lip print pattern was found specific to any lip quadrant and mostly mix types of lip print pattern were present in all the 04- quadrants of lips. None of the gender had any specific lip print pattern in any specific lip quadrant.

## Discussion

Our research study with 54-pairs of identical twin babies along with their mother and father in a family is unique and valuable addition on chelioscopic data. Lip prints are not identical in case of identical twins but similarities of lip prints between parents and children were found accounting for the hereditary to play a major role. Study on18-pairs of monozygotic twins and 22-pairs of monozygotic twins found that families with identical twin babies pointed to have a considerable genetic factor. Uni-ovular twins share same proteins, same genetic information so lip can be used as a primary biometric modality for successful identification purpose.[7]

Lip print pattern type II was the commonest finding in the study. In male and female gender participants lip print type II was 70.88% and 72.3%, lip print type IV was 22.9% and 20.4%, lip print type I was 3.8% and 5.06%, lip print type III was 2.32% and 1.66%, and lip print type V was 0.0% and 0.37%, respectively. In our study lip print type II was most common pattern in all the quadrants of lip in both males and females. The predominance of type II lip print is in accordance of the findings of a researcher, who studied 208 individuals and found type II (47.6%) as predominant lip print type.[8] The result finding of other research articles are also consistent with our data.[9,10,11] The findings of another study has also shown type II lip print pattern of both sexes in all of the 04-quadrents.[12] In female study subjects, lip print type II was most common dominant finding, which is consistent with the results of other findings.[13] Studies conducted by other organizers found that lip print type I was highest percentage in male and females subjects.[14,15] Lip prints show differences according to race and ethnic origins of persons. In contrast to our observation previous work demonstrated that lip print type II with (26%) was second most studied type in both sex.[16] Studies regarding prevalence of lip print pattern in different races or ethnic origin have been reported to show variations of pattern not only in population but also in male and female subjects.[17] Similarly the second most common type observed was lip print type IV which is in accordance to the previous studies.[18,19,20] but in contrast to the other studies where lip print type IV was most common type of lip prints.[6,5] Other lip print pattern observed in our research were lip print type IV, I, III and V respectively in prevalence which is in contrast to findings of other research where they found the succession of lip print as type III , IV, I and V.[21]

These findings are consistent with the study on 496 subjects and twins with families. No two identical lip prints were found in their study.[22] These findings are also like the study performed on 20-pairs of Monozygotic twins and 20-pairs of non-twin siblings.[23]

Overall, the results of the study are found to be consistent with the previous studies. Current study shares several features common with other published data in literature, where parents and monozygotic twins were studied, and it was found that they shared some similarity in the grooves, but the detail features of lip prints were not same. They found that neither between the twins nor the twins with their parents had the similarity.[24,25] Also lip prints were not identical in case of identical twins but the similarities of lip prints between parents and children were found accounting for the hereditary to play a major role. Identical twin babies had shown more percentage of similarities with each other in comparison to non-identical twins. Also, inheritance

pattern was significant for twin babies in case of their lip prints.[11] However, the findings of the study are inconsistent with the findings where they found no significant correlation with parents and twin offspring.[16] The most important feature of the current study is that the level of resemblance of parents with the offspring is studied. When individuals were compared for resemblance among biological family, there was no significant difference in parents and off springs as revealed by Z-test ($z$=0.4978 and $z$=0.499[17] for father and mother respectively) showing positive association with both parents. The finding is important as it could be used in forensic identification of missing persons in a family as phenotypic marker especially in cases of mass disaster.

## Conclusion

Comparison of lip print pattern of identical twin babies shows that they are unique to each individual(father, mother, each twin baby) and among identical twin lip print patterns have some similarities with each other. They are not identical with other twin baby or either parents but have some resemblance features. There is no definite identical lip print pattern observation in any of the children. The prevalence of type-2 lip print is higher type, present in male and females of studied population. It concludes that lip print pattern is nonspecific indicator of gender determination.

## Operational Definition

### Resemblance

When off springs will receive at-least one same types of lip prints characteristic as their parents (either father or mother) in each quadrant of lip, but placement of lip prints characteristics may or may not be in the exact location as their either parents will be labeled as Resemblance.

### Study Limitations

When the subjects press his or her lips, there is a possibility that only the central area of lip come in contact while the rest relaxed portion stay away of cellophane tape, which leads to distortion of the prints. Identifying the biological family tree with identical twins is really hard work and time consuming. Family members especially fathers are mostly out of house due to business or job earning reasons and we must wait a lot and sometime travel a lot. Families are reluctant to participate voluntarily and concerned of giving their personal details and samples.

### Ethical Approval

The ethical approval from Ethical Committee of post-graduate medical institute, Lahore was obtained prior to initiation of the research work.

### Participants' Consent

The informed consents have been obtained from Volunteer individuals or guardians to publish the data concerning this case.

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### Conflict of Interest

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## REFERENCES

1. Singh H, Chhikara P, Singroha R. Lip prints as evidence. Journal of Punjab Academy of Forensic Medicine and Toxicology.2011; 11: 23-25.
2. Kaur I, Cheema JK. Assessment of Pattern of Lip Prints in Patients with Oral Pre-malignant lesions. J Adv Med Dent Scie Res. 2018; 6(7):8-11.
3. Loganadan S, Dardjan M, Murniati N, Oscandar F, Malinda Y, Zakiawati D. Preliminary Research: Description of Lip Print Patterns in Children and Their Parents among Deutero-Malay Population in Indonesia. Int J of Dentistry. 2018; 2-7.
4. El Domiaty M A, Al-Gaidi SA, Elayat AA, Safwat MD, Galal SA. 2010. Morphological patterns of lip prints in saudi arabia at almadinah almonawarah province. Forensic Sci Int. 2010;200: 179.e1-9.
5. Pawar SR, Anjaneya S, Pandey R, Patel T. Cheiloscopic comparison of female sex workers with sexually inactive females as control, a prospective study. International Journal of Medicine and Allied Health Sciences.2014; 2(1): 184-188.
6. Obik H, Asomugha A, Ezejindu A. Morphological patterns of lip print in otolo nnewi community, anambra state, Nigeria. Online Journal of Medicine and Medical Science Research. 2014; 3(3): 24-32.
7. Thakur B, Ghosh B, Puri N, Bansal R, Yadav S, Sharma RK. A comparative study of lip print patterns in monozygotic and dizygotic twins. Int J Res Med Sci. 2017;5(5):2144-2149 .
8. Verma P, Sachdeva SK, Verma KG, Saharan S, Sachdeva K. 2013. Correlation of lip prints with gender, ABO blood groups and intercommissural distance. North American journal of medical sciences. 2013;5(7):427-31.
9. Harsha L, Jeyaraj G. Correlation of Lip Print, Fingerprint and Blood Groups in a Tamil Nadu Based Population. J.Pharm. Sci. & Res. 2015; 7(9):795-799.
10. Durbakula K, Kulkarni S, Prabhu V, Jose M, Prabhu RV. Study, and comparison of lip print patterns among Indian and Malaysian dental students. J Cranio Max Dis. 2015;4:5-11.
11. Debta FM, Debta P, Bhuyan R, Swain SK, Sahu MC, Siddhartha S. Heritability and correlation of lip print, palm print, fingerprint pattern and blood group in twin

population. J Oral Maxillofac Pathol. 2018; 22(3): 451-466.
12. Timsinha S, Kar MS. A study on distribution and gender wise predilection of lip print pattern. Asian Journal of Medical Sciences. 2019;10( 4) :61-65
13. Mohan M, Uma Maheswari TN. Prevalence of different subtypes of type II lip prints among students of saveetha dental college. Int J Forensic Odontol. 2017;2: 9-12.
14. Sunday OG, Stephen AA, Wokpeogu PC, Nmereni AP, Nwolim PJ, Owabhel RF. Cheiloscopy among the Igbo Students in Madonna University Elele, Rivers State, Nigeria. Saudi J. Biomed Res. 2018; 3(3): 129-135.
15. Nadeem S, Manzoor G, Pervez S. Lip forensics; cheiloscopic patterns among population of Punjab, Pakistan. Professional Med J. 2019; 26(7):1177-1182.
16. Patel S, Paul I, Astekar MS, Ramesh G, Sowmya G. A study of lip prints in relation to gender, family and blood group. International journal of oral and maxillofacial pathology. 2010; 1(1): 4-7.
17. Selvamani M, Priya MP, Nandini DB, Basandi PS,Madhushankari GS. Study of lip print patterns in Kerala sample population. International Journal of Current Research. 2016; 8(11):41279-41282.
18. Remya S, Priyadarshini T, Umadethan B, Gopalan M, Jeyaseelan N . Cheiloscopy – A Study of Lip Prints for Personal Identification. IOSR-JDMS. 2016; 15 (2) :101-103. p-ISSN: 2279-0861.
19. Udin NHM, Rahman NSSA, Gabriel GB, Hamzah NH. Digital Approach for Lip Prints Analysis in Malaysian Malay Population (Klang Valley): Photograph on Lipstick-Cellophane Tape Technique. Jurnal Sains Kesihatan Malaysia. 2019; 17(2): 43-49.
20. Ahmed SA, Salem HE, Fawzy MM. Forensic dissection of lip prints as an investigative tool in a mixed Egyptian population. Alexandria Journal of Medicine. 2018; 54: 235–239
21. Rastogi P, Parida A. 2011. Lip prints–an aid in identification. Australian Journal of Forensic Sciences. 2011; 1-8.
22. Borase AP, Shaikh S, Mohatta A. A study of lip prints among North Maharashtrian population. J Adv Oral Res. 2016;7(3): 20-25.
23. Fernandes LCC, Oliveira JDA, Santiago BM, Rabello PM, Carvalho MVDD, Campello RIC, Soriano EP. Cheiloscopic Study among Monozygotic Twins, Non-Twin Brothers and Non-Relative Individuals. Braz. Dent. J. 2017; 28(4)
24. Maheswari TU, Gnanasundaram, N. Role of Lip prints in PersonalIdentification and criminalization. Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology. 2011;12(1): 21.
25. Venkatesh R, David MP. Cheiloscopy: An aid for personal identification. J Forensic Dent Sci. 2011; 3(2): 67-70.

**CONFLICT OF INTEREST**

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Diagnostic Utility of Calretinin Immunohistochemistry for the Diagnosis of Hirschsprung's Disease

Maryam Qaiser[1], Saira Javeed[2], Rabiya Fawad[3], Ayesha Sarwar[4], Iram Kehkashan Khurshid[5], Abrar Ul Haq Satti[6]

**ABSTRACT**

**Objective:** The aim of this study was to evaluate the diagnostic utility of calretinin immunostaining in colonic biopsy specimens in patients having a clinical suspicion of Hirschsprung's disease.

**Study Design:** This study was a Cross sectional validation study.

**Place and Duration of Study:** The study was conducted at Pakistan institute of medical sciences, Shaheed Zulfiqar Ali Bhutto Medical University (SZABMU), Islamabad, for a period of 11 months (December 2018 to November 2019).

**Materials and Methods:** Sixty specimens from patients including multiple colonic biopsies and biopsies from rectum for doubted Hirschsprung's disease were evaluated. The biopsies were processed in Histopathology lab and Hematoxylin and eosin slides were examined. 30 ganglionic segments and 30 aganglionic segments along with control specimens were further stained with calretinin immunohistochemical marker and evaluated.

**Results:** On Hematoxylin and eosin staining, 30 biopsies showed ganglion cells and 30 biopsies showed absence of ganglion cells. Calretinin immunohistochemistry was then evaluated on these ganglionic and aganglionic segments. In this study, sensitivity was found to be 91.4 % and a 100% of specificity was established. The positive predictive value and negative predictive value was found to be 100% and 89.2% respectively.

**Conclusion:** Calretinin immunohistochemical marker can be applied on colonic and rectal biopsy specimens as a dependable and adjunctive tool for diagnosing Hirschsprung's disease, as it is easy and reliable to be used in daily practice.

**Key Words:** *Calretinin, Hirschsprung's Disease, Immunohistochemistry.*

## Introduction

Obstruction of large gut in infants is commonly caused by Hirschsprung's disease (HD). The disease occurrence is about 1 per 5000 live births, with a predicted disease frequency of 1.4 per 5000 live births in Asian populations.[1]

The etiology of HD is explained by the disruption of migration of neural crest cells, resulting in congenital absence of ganglion cells in the colon, along with their disrupted proliferation and differentiation. Two types of HD are identified: Type 1 or short-segment disease that is identified in 60% to 85% of patients with HD. It is characterized by aganglionosis which is limited to the rectum, reaching up to the large gut distal to the splenic flexure. Type 2 is labeled as long-segment disease, that is found in 15% to 25% of the patients having widespread aganglionosis of the rectum and colon. Aganglionosis in the gastrointestinal tract is demonstrated by the lack of the ganglion cells in the two plexuses of gut wall, the submucosal and myenteric plexuses.[2,3]

A combination of clinical symptoms help in diagnosing the HD including, contrast enema, anorectal manometry and histologic findings.[1] Histopathological absence of ganglion cells and nerve plexus of submucosa and muscularis propria showing hypertrophy and hyperplasia constitute the diagnostic criteria for HD. Hematoxylin and eosin (H & E) staining is conventionally used for the diagnosis of Hirschsprung's disease but it requires serial sectioning and also depends on observer's capability

[1,4]*Department of Histopathology,*
*HBS Medical and Dental College, Islamabad*
[2]*Department of Histopathology,*
*Islam Medical and Dental College, Sialkot*
[3]*Department of Histopathology,*
*Quetta Institute of Medical Sciences, Quetta*
[5]*Department of Histopathology,*
*CMH Medical College, Khariyan Cantt*
[6]*Department of Pediatrics*
*Rawal Institute of Health Sciences, Islamabad*
*Correspondence:*
*Dr. Maryam Qaiser*
*Assistant Professor Histopathology*
*Department of Pathology,*
*HBS Medical and Dental College, Islamabad*
*E-mail: maryamsherazi110@gmail.com*

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to evaluate the biopsy specimen.[3] Immunohistochemistry (IHC) in the recent years has been proven to be an additional tool in the diagnosis of HD, with increased diagnostic yield. [4] Calretinin is one of the many markers used for diagnosing HD. It is a calcium binding protein which is vitamin D dependent and richly expressed in neurons, steroid producing cells, testicular cells, and neuroendocrine cells etc. [4, 5] Ganglion cells in submucosal and myenteric plexus of a normal gut show a positive calretinin expression whereas aganglionic regions of diseased gut show absence of calretinin expression.[6,7]

In contrast to routine H & E, calretinin IHC staining has become frequently applied immune-marker to identify ganglion cells in colonic biopsies with suspicion of Hirschsprung's disease.

Calretinin carries several advantages in this regard. It is easily performed on paraffin-embedded sections, staining pattern is simple, pattern of interpretation is easy, and it is cost effective.

Many studies in literature demonstrated a high sensitivity (96%) and specificity (100%) for Calretinin.[8] Calretinin highlights ganglion cells which are not very apparent on H & E-stained sections, thereby preventing unnecessary surgeries. It is found to be a cost effective and valuable diagnostic support in HD.[9]

The study was carried out to determine the diagnostic utility of calretinin immunohistochemical marker for the diagnosis of Hirschsprung's disease in order to benefit the clinicians for the management of the patients.

## Materials and Methods

The place of study was Pathology department, conducted at the Pakistan institute of medical sciences, Shaheed Zulfiqar Ali Bhutto Medical University (SZABMU), Islamabad, Pakistan. Duration of the study was 11 months, from December 2018 to November 2019. It was a cross sectional validation study. Multiple colonic and rectal biopsies from 60 suspected patients of Hirschsprung's disease were evaluated. The biopsies were processed in Histopathology lab and Hematoxylin and eosin slides were examined. Biopsies including 30 ganglionic segments, 30 aganglionic segments and control specimens were stained with calretinin immunohistochemical marker. Calretinin showed a granulated staining of neuronal fibers in lamina propria and submucosal layer of ganglionic segments, whereas ganglion cells showed a dark nuclear and cytoplasmic staining which was seen in the ganglionic segments in both Meissner and myenteric plexuses. Negative staining shown by neuronal fibers and ganglion cells in all the gut layers was considered as negative for calretinin immunohistochemical maker.

Inclusion criteria: All colonic biopsies with full thickness sections with suspicion of Hirschsprung's disease were included.

Exclusion criteria: Inadequate biopsies which showed only the superficial mucosa without submucosa and muscularis propria were exempted from the study.

Statistical package for social sciences (SPSS16) Software was applied for performing the statistical analysis. Different variables including sex, H&E staining patterns and immunohistochemical results were calculated as frequency and percentages. Sensitivity, Specificity, Positive and Negative Predictive values were considered by means of 2x2 tables.

- Sensitivity = True Positives / True Positives + False Negatives X 100
- Specificity = True Negatives / True Negatives + FP X 100
- Positive Predictive Value = True Positives / True Positives + FP X 100
- Negative Predictive Value = True Negatives / True Negatives + FN X 100

## Results

Colonic biopsies were taken from 60 patients showing an age range from two months to 10 years. Male to female ratio was 3.2 to 1. Most common presenting complaint was constipation (93%) while some of them presented with abdominal distention and delayed passage of meconium.

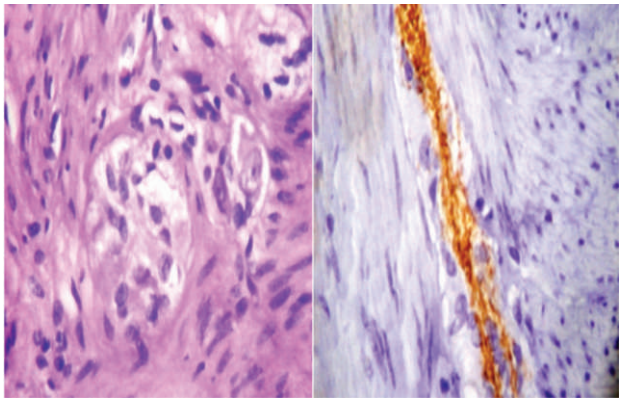
Out of total 60 biopsies (n=60), fifteen biopsies (25%) were from rectosigmoid junction and fourteen (23%) were rectal wall biopsies. On H & E, 30 biopsies showed ganglion cells and the other 30 biopsies showed that ganglion cells were absent. In 16 cases (26.7%), ganglion cells were present in myenteric plexus and 14 (23.3%) cases showed the presence of ganglion cells in both messeiner's and myenteric plexus. Out of 30 aganglionic segments, 13 cases

(21.7%) showed nerve bundle hyperplasia. Calretinin IHC was then applied on all ganglionic and aganglionic biopsies. Out of the 30 ganglionic segments, calretinin immunoexpression was seen in 27 segments but 3 ganglionic segments were negative for calretinin despite the existence of ganglion cells on routine H&E staining (10%). Out of 30 aganglionic segments calretinin immunoexpression was seen in five cases (16.6%). All the other 25 cases were negative for calretinin. (Photomicrograph showing Calretinin Immunostaining)

Therefore 32 cases {27 cases (90%) having ganglion cells on both H & E and calretinin and 5 (16.6 %) cases which showed ganglion cells positive based on calretinin, but H & E declared it negative} were true positives. 25 (83.3%) cases were true negatives showing no ganglion cells on H & E and calretinin. 3 (10%) cases are false negatives which are negative on calretinin but having ganglion cells on H & E. So, this method showed a sensitivity of 91.4 % and specificity was found to be 100%. The positive predictive value was found to be 100% and negative predictive value was 89.2 %. (Table I)

**Table I: Utility of Calretinin Compared to H & E**

| | | H&E | | Total |
|---|---|---|---|---|
| | | Ganglion Cells Seen | Ganglion Cells Not Seen | |
| Calretinin | Positive | 27(90%) | 5(16.6%) | 32 |
| | Negative | 3(10%) | 25(83.3%) | 28 |
| Total | | 30 | 30 | 60 |



**Photomicrograph:**

**A: H & E Showing Ganglion Cells in Myenteric Plexus (400x) arrow points ganglion cell**

**B: Calretinin iImmunopositivity of Ganglionic Segment. (400X)**

## Discussion

As diagnosis of HD depends upon the demonstration of the aganglionosis in the colonic biopsy specimens, sometimes it becomes very difficult and tiresome; necessitating furthermore serial cut sections on H&E.[10] To overcome these problems calretinin IHC is now widely used in the diagnosis of HD.[5]

The age range of the patients in the current study (n=60) was 2 months to 10 years. Rakhshani et al in their study showed that age range of patients with HD was, one day to 12 yr.[11] Similarly Anbardar et al demonstrated that age of patients suffering from the disease was ranging from 2 days to 10 years.[5] The current study showed a male predominance (75%). Collins et al in their study showed that 82% of the patients were male.[12] The study conducted by Rakhshani et al also pointed male predominance (67.1%).[11] Joseph et al in his study showed that constipation was the most common complaint (94.5%).[13] This was comparable to the current study in which constipation (93%) was most common presenting symptom. In present study out of the total 30 ganglionic segments (which showed ganglion cells on H&E), 27 cases (90%) showed staining of ganglion cells by calretinin. Out of the 30 aganglionic segments calretinin IHC was able to pick 5 (16.6 %) cases which were negative on H & E. This study indicated a sensitivity of 91.4 % and specificity was found to be 100%. The results were comparable to the study conducted by Mukhopadhyay et al (n=80) and it was shown that Calretinin IHC marker had sensitivity equals to 96% and a specificity of value 100%. The positive predictive value was found to be 100% and negative predictive value was 92.59%.[14] Musa et al and Kazemi et al in their studies concluded that calretinin immunostaining, is a very sensitive (100%) and specific (100%) diagnostic tool to the histopathological analysis in the suspected cases of HD.[15,16] In adequate biopsy specimens calretinin IHC is confirmatory, but in case of inadequate biopsies it is decisive, and diagnostic as compared to H&E.[17] In present study, out of 13 cases of nerve bundle hyperplasia, not a single case showed positivity of calretinin. Similar was the finding observed by Gabal et al in their study that the nerve fibers showing calretinin positivity alone was not sufficient to consider the colonic biopsies as positive for innervation to exclude Hirschsprung's disease.[18]

3(10%) cases in the current study were classified as false negative which were positive for ganglion cells on H & E but did not show immunoreactivity with calretinin. Many studies conducted describe the reasons for false negative results of IHC in the laboratories.[19]

Human inaccuracy leading to false negative results comprise “wrong on slide control,” “no on-slide control,” and “wrong protocol run,”. It is predicted that the explanations for unsuccessful IHC staining, and their incidences are inconstant among variable laboratories based on test list, platforms, regularity of use, conservation, and obviously the value of the control materials in place.[19,20]

Many researchers applied calretinin along with other markers as ancillary techniques on rectal biopsies to rule out aganglionosis. Study conducted by Takawira et al has demonstrated that calretinin is superior to acetylcholinesterase (AChE) as an ancillary technique because it is readily available, can be utilized on paraffin embedded tissue and helpful in improving the diagnostic accuracy.[3] Zani et al observed in the survey study that as the loss of calretinin staining is a marker of ganglion cell absence in the colon of HD patients and can be easily utilized on paraffin embedded tissue, it has widely replaced AChE staining which is applied on frozen sections.[21] Similar observation was made by Kovach et al showing more significance of calretinin to AChE.[22] Chisholm KM et al also reported that calretinin is easier to accomplish and understand and increases the investigative accurateness in patients of HD.[23] There are few limitations in the study including: small sample size, anatomical subtyping of the lesion into short or long segment or total colonic aganglionosis was not done and the data regarding clinical follow-up was lacking. Further studies with large sample size are suggested. Research should be directed to describe the calretinin immunostaining configurations of the variable gut portions including transitional zone, rare types of Hirschsprung's disease, total hypoganglionosis patients, and the anorectal junction. Genetic studies for mutational analysis in cases of HD should also be carried out.

## Conclusion

Calretinin immunohistochemistry is an important and reliable diagnostic tool showing high sensitivity and specificity that aids histopathological examination in suspected HD. Hence based on sensitivity and specificity we strongly recommend the use of calretinin stain especially in cases where ganglion cells are not seen on routine Hematoxylin and Eosin staining.

**REFERENCES:**

1 Ali A, Haider F, Alhindi S. The Prevalence and Clinical Profile of Hirschsprung's Disease at a Tertiary Hospital in Bahrain. Cureus.2021;13:(1): e12480. doi:10.7759/cureus.12480

2 Anderson JE, Vanover MA, Saadai P. Epidemiology of Hirschsprung disease in California from 1995 to 2013. Pediatr Surg Int. 2018, 34:1299-1303. 10.1007/s00383-018-4363-9

3 Bradnock TJ, Knight M, Kenny S. Hirschsprung's disease in the UK and Ireland: incidence and anomalies. Arch Dis Child. 2017; 102:722-27. 10.1136/archdischild-2016-311872

4 Yan BL, Bi LW, Yang QY. Transanal endorectal pull-through procedure versus transabdominal surgery for Hirschsprung disease: a systematic review and meta-analysis. Medicine Baltimore. 2019, 98: e16777. 10.1097/MD.0000000000016777

5 Musa ZA, Qasim BJ, Ghazi HF. Diagnostic roles of calretinin in hirschsprung disease: A comparison to neuron-specific enolase. Saudi J Gastroenterol. 2017; 23:60-6

6 Mukhopadhyay B, Sengupta M, Das C, Mukhopadhyay M, Barman S, Mukhopadhyay B. Immunohistochemistry-based comparative study in detection of Hirschsprung's disease in infants in a Tertiary Care Center. Journal of laboratory physicians. 2017;9(2):76.

7 Jiang M, Li K, Li S, Yang L, Yang D, Zhang X, et al. Calretinin, S100 and protein gene product 9.5 immunostaining of rectal suction biopsies in the diagnosis of Hirschsprung'disease. American journal of translational research. 2016;8(7):3159

8 Jeong J, Kim SP, Jung E, Choi SO. The Usefulness of Calretinin Immunohistochemistry for Rectal Suction Biopsy to Diagnose Hirschsprung's Disease. Journal of the Korean Association of Pediatric Surgeons. 2016;22(2):23-8

9 Sikandar M, Nagi AH, Sikandar K, Naseem N, Qureshi I. Calretinin Expression in Hirschsprung's Disease–A Potential Marker of Ganglion Cells. Annals of Punjab Medical College. 2017;11(3):181-6.

10 Najjar S, Ahn S, Kasago I, Zuo C, Umrau K, Ainechi S, et al. Image Processing and Analysis of Mucosal Calretinin Staining to Define the Transition Zone in Hirschsprung Disease: A Pilot Study. European Journal of Pediatric Surgery. 2019 ;29(02):179-87.

11 Rakhshani N, Araste M, Imanzade F, Panahi M, Tameshkel FS, Sohrabi MR, et al. Hirschsprung disease diagnosis: Calretinin marker role in determining the presence or absence of ganglion cells. Iranian journal of pathology. 2016;11(4):409.

12 Collins L, Collis B, Trajanovska M, Khanal R, Hutson JM, Teague WJ, et al. Quality of life outcomes in children with Hirschsprung disease. Journal of pediatric surgery. 2017;52(12):2006-10.

13 Joseph B M, Neema M, Mange M, Alphonce B C, Peter F R,

Phillipo L C Hirschsprung's disease in children: a five-year experience at a university teaching hospital in northwestern Tanzania. BMC Res Notes. 2014; 7: 410

14 Mukhopadhyay M, Das C, Kumari M, Mukhopadhyay B, Saha AK. Evaluation of calretinin expression in diagnosis of hirschsprung's disease: as an adjunct to histopathological diagnosis. International Journal of Scientific Research. 2019;8(3).

15 Musa ZA, Qasim BJ, Ghazi HF, Al Shaikhly AW. Diagnostic roles of calretinin in hirschsprung disease: A comparison to neuron-specific enolase. Saudi journal of gastroenterology: official journal of the Saudi Gastroenterology Association. 2017;23(1):60

16 Kazemi Aghdam M, Khoddami M, Mollasharifi T, Almasi-Hashiani A. Diagnostic Value of Calretinin and S100 Immunohistochemistry in Hirschsprung's Disease. International Journal of Pediatrics. 2019;7(6):9577-89.

17 Sheir M, Samaka RM, Fakhry T, Albatanony AA. Comparative study between use of calretinin and synaptophysin immunostaining in diagnosis of Hirschsprung disease. International Surgery Journal. 2019;6(3):658-63.

18 Gabal HH, Osman WM, El Atti RM. Effectiveness of calretinin immunohistochemistry with digital morphometry in mapping of different segments of Hirschsprung disease. Egyptian Journal of Pathology. 2016;36(1):9-18.

19 Cheung CC, Taylor CR, Torlakovic EE. An audit of failed immunohistochemical slides in a clinical laboratory: the role of on-slide controls. Applied Immunohistochemistry & Molecular Morphology. 2017;25(5):308-12.

20 Cates JM, Troutman KA. Quality management of the immunohistochemistry laboratory: a practical guide. Applied immunohistochemistry & molecular morphology. 2015;23(7):471-80.

21 Zani A, Eaton S, Morini F, Puri P, Rintala R, Van Heurn E, et al. European Paediatric Surgeons' Association survey on the management of Hirschsprung disease. European Journal of Pediatric Surgery. 2017;27(01):096-101.

22 Kovach AE, Pacheco MC. Ganglion Cells Are Frequently Present in Pediatric Mucosal Colorectal Biopsies: H&E Sections and Calretinin Immunohistochemistry in the Evaluation of Children With Chronic Constipation. Pediatric and Developmental Pathology. 2018;21(1):48-53.

23 Chisholm KM, Longacre TA. Utility of peripherin versus MAP-2 and calretinin in the evaluation of Hirschsprung disease. Applied Immunohistochemistry & Molecular Morphology. 2016;24(9):627-32.

**CONFLICT OF INTEREST**

Authors declared no conflicts of Interest.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Incidental Findings Observed on Magnetic Resonance Imaging of Sacroiliac Joints

Aasma Nudrat Zafar[1], Saqib Qayyum Ahmad[2]

**ABSTRACT**

**Objectives:** To investigate the frequency and nature of various incidental findings and their relationship with presence or absence of sacroiliitis, observed on magnetic resonance imaging (MRI) of sacroiliac joints (SIJ).

**Study Design:** Observational study.

**Place and Duration of Study:** Fauji Foundation Hospital, Rawalpindi, from January 2018 to March 2021.

**Materials and Methods:** All patients undergoing MRI of SIJ were included except those who could not lie down supine in MR gantry. Data regarding age, gender, MRI findings related to SIJ and other incidental findings were recorded. Frequencies of findings in various groups were compared using chi-square test considering p value of <0.05 as significant.

**Results:** Out of 302 patients, 126 (41.7%) showed incidental findings. Among 201 females, 87 (43.3%), while among 101 males, 39 (38.6%) showed incidental findings (p=0.437, not significant). Sacroiliitis (SI) was seen in 58.7% and 45.5% of females and males respectively (p=0.030, significant). One hundred and sixty-four (54.3%) of 302 patients were grouped as having SI on the basis of MRI while 138 (45.7%) had normal SIJ. In the former group 64 (20.5%) showed at least one incidental finding. Among the latter group, 62 (20.5%) had incidental findings (p= 0.300, not significant). Most common incidental finding was lower lumbar disc degenerative disease (LLDDD), seen in 65 (21.5%) patients.

**Conclusion:** Incidental findings are commonly observed on MRI of SIJ. They were seen overall, in two-fifth of our patients. Incidental findings must be reported, as these can have important clinical implications. There was no significant difference between patients with and without SI with respect to prevalence of incidental findings.

**Key Words:** *Ankylosing Spondylitis, Bone Marrow Oedema, Lumbar Disc Degenerative Disease, Sacroiliac Joint, Sacroiliitis.*

## Introduction

Inflammation of sacroiliac joints (SIJ) is usually a diagnosis of exclusion.[1] Magnetic resonance imaging (MRI) has emerged as an important technique for diagnosis and follow-up of patients with sacroiliitis (SI).[2] It can detect acute inflammatory changes across the joints even when plain radiographs are normal. Initial changes of sub-chondral oedema are picked up easily.[3] There are multiple pathologies that can clinically mimic this disease, for example genitourinary, hip, muscle, and lower back pathologies and elicit request for MRI of SIJ due to clinical suspicion of SI.[4] Some of them can have important clinical significance in patients' management.

The aim of this study was to identify the nature and analyze the frequencies of various incidental findings that were observed during the MRI of SIJ in both the genders, and to compare their frequencies in different groups.

## Materials and Methods

This observational study was carried out at Radiology department of a tertiary care hospital in Rawalpindi, Pakistan, from January 2018 to March 2021, after approval from hospital's ethics review committee. All patients undergoing MRI of SIJ were included, regardless of age or gender, employing consecutive, non-probability sampling technique. Those patients were excluded who could not lie down supine in MR gantry to complete the examination. Data regarding age, gender, MRI findings related to SIJ and other tissues were recorded.

SI on plain MRI was defined as sub-articular bone marrow oedema in at least two consecutive images, or more than one lesion in a single slice.[5,6] Incidental findings were defined as all abnormal findings that

[1]*Department of Radiology*
*Fauji Foundation Hospital & Foundation University School of Health Sciences, Islamabad, Pakistan*
[2]*Department of Pathology*
*Bahria International Hospital, Rawalpindi*

*Correspondence:*
*Dr. Aasma Nudrat Zafar*
*Assistant Professor*
*Department of Radiology*
*Fauji Foundation Hospital & Foundation University School of Health Sciences, Islamabad, Pakistan*
*E-mail: aasmarad@gmail.com*

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were seen other than or in addition to SI, including clinically significant normal anatomical variants.

Scans were performed on 1.5 Tesla MRI unit (Toshiba Vintage Titan), using body flexed array coil in supine position. The sequences included coronal STIR (short-tau inversion recovery) along long axis of sacrum and perpendicular to second sacral vertebral body, axial T2-weighted (fat saturated), coronal obliques (T1 and T2-weighted) and sagittal T2 weighted. MRI scans of patients were studied for presence or absence of SI by radiologist having more than five years' experience of reporting.

Demographic data of all the patients was recorded. In addition to documenting presence or absence of SI, data was also collected regarding the presence of any incidental finding. This included scrutiny of visualized lumbo-sacral spine, genitourinary organs, hip joints, muscles, and soft tissues.

Patients were arbitrarily divided, decade-wise into seven age groups, viz. group 1 (11-20 years), group 2 (21-30 years), group 3 (31-40 years), group 4 (41-50 years), group 5 (51-60 years), group 6 (61-70 years), and group 7 (71-80 years). The frequency of incidental findings was recorded for each age group. The data was entered into statistical package for social sciences version (version 21.0) for analysis. Mean and standard deviation were calculated for quantitative variables. Frequency and percentage were calculated for qualitative variables. Frequencies of SI and incidental findings were compared in males and females using chi-square test considering *p*-value $\leq$ 0.05 as significant. Patients were also divided into those with, and those without SI. Frequencies of incidental findings were compared in both groups employing chi-square test, considering *p*-value $\leq$ 0.05 as significant.

## Results

A total of 302 subjects were included in the study. Patients' age ranged from 12 to 80 years with mean and median ages as 33.6 (SD$\pm$10.7) and 33 years respectively. Most of the patients, i.e. 114 (37.7%) out of 302, were in 4$^{th}$ decade of life. Age distribution of patients and frequency of patients showing incidental finding on MRI of SIJs in different age groups are shown in the Fig 1, and Table I.

Female to male ratio was 1.9. Mean ages for female and male were 35.3 (SD$\pm$ 10.52) and 30.2 (SD$\pm$ 10.51) respectively. SI was seen in 118 (58.4%) of 202 females as compared 46 (45.5%) of 101 males. Difference was significant with p-value 0.030 (Table II). Among the females, 87 (43.3%) of 202, and among the males 39 (38.6%) of 101 showed incidental findings. Difference was not significant with p-value 0.437 (Table II).

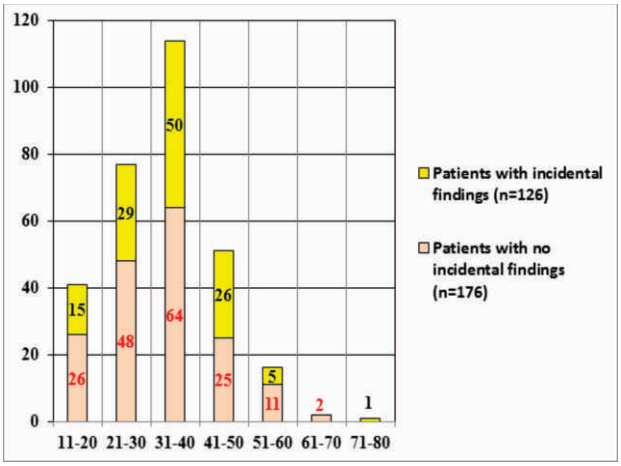


**Fig 1: The Frequency Distribution of Patients (Shown Along Y-Axis), Subjected to Magnetic Resonance Imaging of Sacroiliac Joints, According to Decade-Wise Age Groups (Shown Along X-Axis).**

**Table I: Frequency of Patients Showing Incidental Finding on Magnetic Resonance Imaging of Sacroiliac Joints in Different Age Groups (N=302)**

| Age Groups in Years | Frequency and Percentage of Patients | Patients with no Incidental Findings | Patients with Incidental Findings |
|---|---|---|---|
| 11-20 | 41(13.6%) | 26 (8.6%) | 15 (4.9%) |
| 21-30 | 77 (25.5%) | 48 (15.9%) | 29 (9.6%) |
| 31-40 | 114 (37.7%) | 64 (21.2%) | 50 (16.5%) |
| 41-50 | 51 (16.8%) | 25 (8.3%) | 26 (8.6%) |
| 51-60 | 16 (5.3%) | 11 (3.6%) | 5 (1.6%) |
| 61-70 | 2(0.6%) | 2(0.6%) | 0 (%) |
| 71-80 | 1 (0.3%) | 0 (0%) | 1 (0.3%) |
| TOTAL | 302 | 176 (58.3%) | 126 (41.7%) |

**Table II: Distribution of Sacroiliitis and Incidental Findings in Male and Female Patients**

| | Female (n=202) | Male (n=101) | p-value. Significant if < 0.05 |
|---|---|---|---|
| Sacroiliitis | 118 (58.4%) | 46 (45.5%) | chi square statistics 4.693, p-value 0.030 (significant) |
| Incidental findings | 87 (43.3%) | 39 (38.6%) | chi square statistic 0.603, p-value 0.437 (not significant) |

Out of 302 patients, 164 (54.3%) were diagnosed as having SI, according to MRI criteria. In this group of patients, 64 (21.2%) showed at least one incidental finding. The second group of 138 (45.7%) patients revealed no MRI evidence of SI. Among the latter group, 62 (20.5%) had incidental findings. No significant difference (*p*-value 0.300) was observed between the patients in two groups with respect to prevalence of incidental findings (Table III).

**Table III: Frequency of Incidental Findings in Patients with and without Sacroiliitis (SI) on Magnetic Resonance Imaging (MRI) of Sacroiliac Joint (N=302)**

| | Incidental Findings Detected on MRI | No Incidental Findings on MRI | Total |
|---|---|---|---|
| MRI showing SI | 64 (21.2%) | 100 (33.1%) | 164 (54.3%) |
| No SI on MRI | 62 (20.5%) | 76 (25.2%) | 138 (45.7%) |
| Total | 126 (41.7%) | 176 (58.3%) | Grand Total= 302 |
| The chi square statistic is 1.074 and the p-value is 0.300, not significant. | | | |

Most common incidental finding was lower lumbar disc degenerative disease (LLDDD) that was present in 66 (21.5%) of 302 patients. It was seen in 37 (21.2%) patients with SI and 29 (9.6%) patients without SI (p=0.746, not significant). Distribution of various incidental findings on MRI, in groups of patients with and without evidence of SI is shown in Table IV.

**Table IV: Distribution of Various Incidental Findings on Magnetic Resonance Imaging (MRI), In Groups of Patients With and without Evidence of Sacroiliitis (SI). Total Number of Patients=302**

| Incidental Findings with Frequency and Percentage | Frequency and % of Patients with SI on MRI | Frequency and % of Patients with No SI on MRI |
|---|---|---|
| Lumbar disc degenerative disease n= 66 (21.8%) | 37 (12.2%) | 29 (9.6%) |
| Genitourinary pathologies n=25 (8.3%) | 10 (3.3%) | 15 (5.0%) |
| Hip joint abnormalities n=10 (3.3%) | 5 (1.65%) | 5 (1.65%) |
| Soft tissue lesions, n=9 (2.9%) | 3 (0.9%) | 6 (1.9%) |
| Transitional vertebra , n=7 (2.3%) | 5 (1.6%) | 2 (0.7%) |
| Sacral pathologies,n=4 (1.3%) | 1 (0.3%) | 3 (0.9%) |
| Other abnormal osseous findings n=4 (1.3%) | 3 (0.9%) | 1 (0.3%) |
| Ascites, n=1 (0.3%) | 0 (0%) | 1 (0.3%) |
| No incidental findings, n=176 (58.3%) | 100 (33.1%) | 76 (25.2%) |

## Discussion

SIJ can be imaged using plain radiographs, fluoroscopy, computerized tomography, nuclear imaging, positron emission tomography, sonography and MRI. MRI has revolutionized the diagnosis of SI.[7] It is superior to the rest of imaging modalities due to excellent depiction of bone marrow and soft tissue contrast; hence it enables detailed evaluation of tissues in addition to SIJ. Moreover, it is radiation-free and can be safely used in younger patients and those of reproductive age. Earliest changes of sub-chondral marrow oedema are well identified on MRI. However, the imaging time is relatively longer than the rest of the modalities, rendering it difficult for the patients with severe pain to lie supine for the examination. On the other hand, radiographic manifestations of SI occur much later in the course of the disease and the procedure is attended with risk of irradiating pelvic organs.[2]

SI can be due to multiple causes, e.g., infection, inflammation, neoplasia, or trauma.[8] Early diagnosis of this entity is crucial in the management to prevent complications like chronic backache, hip pain and muscle wasting. Due to complex pelvic anatomy, there is significant overlap of symptoms of bones, joints, soft tissues, genitourinary and gastrointestinal system diseases. A good clinical history and examination remains the mainstay of management and must be obtained by the radiologist.[9]

Differential diagnoses of sacroiliitis include ankylosing spondylitis, fractures around hip joint, tendinitis, piriformis syndrome, pyogenic infections, tuberculosis, and trochanteric bursitis.[4] The joints can show inflammatory changes in pregnancy and other hyper- and hypomobile states. Obesity is also a risk factor. Malignant causes e.g. multiple myeloma and non-malignant etiologies such as osteitis-condensens-ilii can also be a cause of painful SIJ. We diagnosed one patient with latter condition during

this study. Functional causes like scoliosis and leg-length discrepancy can cause inflammatory changes at SIJ. Hip degenerative and inflammatory arthritis should also be looked for while interpreting SIJ.[10]

Acute SI manifests as bone marrow edema in sub-chondral location; this is the most important criterion for defining active disease on MRI.[11] Acute disease can show as joint fluid, sub-chondral or soft tissue edema. Edema is manifested as hypo-intense signal on T1-weighted imaging and high signal intensity on T2 and STIR sequences. Earliest signs of cartilage and bone destruction can be picked up by MRI.[12] Active or acute SI is best seen on fluid-sensitive sequences like STIR sequence; post contrast imaging is not essential.[13] Features of chronic disease include structural changes such as new bone formation or sclerosis, fat deposition, erosions, joint space narrowing and ultimately, ankylosis.[14] Erosions and ankylosis are best seen on T1-weighted images. A newer technique, MRI-based synthetic computed tomography (sCT) is reported to depict better details of erosions, sclerosis and ankylosis in comparison to T1 weighted MR imaging.[15]

A multi-centric study was carried out in Belgium, Canada and Poland to determine common incidental findings on MRI of SIJ in children.[16] Out of 540 children, 106 (20%) had SI and 228 (42%) patients showed one or more incidental finding on MRI. Our study, though not limited to children only, shows a similar frequency (41.7%; n=302) of incidental findings. Commonest incidental finding in both the studies was lumbar disc degenerative changes.

A study was conducted in Turkey, which included only the female subjects, mainly to see the frequency of pelvic congestion syndrome in patients who underwent MRI of SIJ for clinically suspected SI.[17] The study revealed that 285 (37%) of 774 patients had incidental findings which included pelvic congestion, various other genitourinary system disorders, and musculoskeletal system disorders. The percentage of patients showing incidental findings is not much different from the percentage of such patients seen in our study. This Turkish study showed that in the group of patients without SI, incidental findings were seen in 182 (24%) patients. On the other hand, in the group of patients with SI, the incidental findings were less common and were seen in 103 (13%) patients. These findings are also concordant with the findings of our study. Moreover, in both the studies the frequency of incidentally discovered musculoskeletal diseases was more in the group with SI than the other group.

During literature search, we found a case-report of Paget's disease with sacroiliitis.[18] Our study did not find this entity in any of our patients. Jans et al showed in their six-year retrospective analysis that non-inflammatory disease entities were more common than SI on MRI in patients with inflammatory type back pain.[19] They found that out of 691 subjects, 249 (36%)showed SI on MRI, whereas more than half (54.3%) of our patients were diagnosed as suffering from SI.

A UK-based study investigated the incidence of transitional vertebrae and numerical variants of the spine using MRI. They found transitional vertebrae in 14 (3.3%) of 418 subjects.[20] We came across lumbo-sacral transitional vertebrae in 7 (2.3%) of 302 patients.

The limitation of our study is that the size of the sample is relatively small. Secondly, it has been carried out in a single centre; therefore the results cannot be generalized. Thirdly, we did not receive any patient less than 10 years of age, with a request for MRI of SIJ. More research is needed to diagnose incidental findings in this age group. In case of children it is important to keep a low threshold for selection with regards to imaging, for detecting pelvic and skeletal pathologies. This is because the underlying conditions can have long-term implications if not diagnosed early.

## Conclusion

Incidental features on MRI of SIJ are common and were seen in approximately two-fifth of our patients. These must be reported, as these can have important clinical implications. Commonest incidental finding in our study was lumbar degenerative disc disease. No significant difference was observed between the patients with SI as compared to those without SI with respect to prevalence of incidental findings. In suspected cases of sacroiliitis with negative MRI findings, some other possible cause of symptoms should be looked for. These incidental findings may help in explaining the cause of symptoms and aid in management.

## REFERENCES

1. Buchanan BK, Varacallo M. Sacroiliitis. [Updated 2021 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK448141/
2. Braga MV, de Oliveira SC, Vasconcelos AHC, Lopes JR, de Macedo-Filho CL, Ramos LMA et al. Prevalence of sacroiliitis and acute and structural changes on MRI in patients with psoriatic arthritis. Sci Rep2020; 10:11580. doi: https://doi.org/10.1038/s41598-020-68456-7
3. Tsoi C, Griffith JF, Lee RKL, Wong PCH, Tam LS. Imaging of sacroiliitis: current status, limitations and pitfalls. Quant Imaging Med Surg 2019; 9(2):318-35. doi:10.21037/qims.2018.11.10.
4. Lin C, MacKenzie JD, Courtier JL, Gu JT, Milojevic D. Magnetic resonance imaging findings in juvenile spondyloarthropathy and effects of treatment observed on subsequent imaging. Paediatric Rheumatology 2014; 12:25. doi: 10.1186/1546-0096-12-25. eCollection 2014.
5. Herregods N, Dehoorne J, Van den Bosch F, Jaremco JL, Vlaenderen JV, Joos R et al. ASAS definition for sacroiliitis on MRI in SpA: applicable to children?. Pediatr Rheumatol Online J 2017;15(1):24. doi:10.1186/s12969-017-0159-z
6. Maksymowych WP, Lambert RG, Østergaard M, Pedersen SJ, Machado PM, Weber U et al. MRI lesions in the sacroiliac joints of patients with spondyloarthritis: an update of definitions and validation by the ASAS MRI working group. Ann Rheum Dis 2019;78(11):1550-1558. doi: 10.1136/annrheumdis-2019-215589.
7. Slobodin G, Hussein H, Rosner I, Eshed I. Sacroiliitis – early diagnosis is key. J. Inflamm. Res 2018; 11:339-44. doi: 10.2147/JIR.S149494. eCollection 2018.
8. Kok HK, Mumtaz A, O'Brien C, Kane D, Torreggiani WC, Delaney H. Imaging the patient with sacroiliac pain. Can AssocRadiol J. 2016;67(1):41-51. doi: 10.1016/j.carj. 2015.08.001.
9. Casiano VE, DydykAM, Varacallo M. Back Pain. [Updated 2021 May 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538173/
10. soi C, Griffith JF, Lee RKL, Wong PCH, Tam LS. Imaging of sacroiliitis: Current status, limitations and pitfalls. Quant Imaging Med Surg. 2019;9(2):318-335. doi:10.21037/qims.2018.11.10
11. Rudwaleit M, Jurik AG, Hermann KG, Landewé R, van der Heijde D, Baraliakos X et al. Defining active sacroiliitis on magnetic resonance imaging (MRI) for classification of axial spondyloarthritis: a consensual approach by the ASAS/OMERACT MRI group. Ann Rheum Dis 2009;68(10):1520-7. doi: 10.1136/ard.2009.110767.
12. Hermann KG, Bollow M. Magnetic resonance imaging of sacroiliitis in patients with spondyloarthritis: correlation with anatomy and histology. Rofo. 2014;186(3):230-7. doi: 10.1055/s-0033-1350411.
13. de Hooge M, van den Berg R, Navarro-Compán V, van Gaalen F, van der Heijde D, Huizinga T et al. Magnetic resonance imaging of the sacroiliac joints in the early detection of spondyloarthritis: no added value of gadolinium compared with short tau inversion recovery sequence. Rheumatology (Oxford). 2013 Jul;52(7):1220-4. doi: 10.1093/rheumatology/ket012.
14. Tezcan ME, Temizkan S, Ozal ST, Gul D, Aydin K, Ozderya A et al. Evaluation of acute and chronic MRI features of sacroiliitis in asymptomatic primary hyperparathyroid patients. Clin Rheumatol 2016;35(11):2777-2782. doi: 10.1007/s10067-016-3172-6.
15. Jans L.B.O, Chen M, Elewaut D, Bosch F.V.D, Carron P, Ozderya A et al. MRI-based synthetic CT in the detection of structural lesions in patients with suspected sacroiliitis: comparison with MRI. Radiology 2021; 298:343–9. doi: https://doi.org/10.1148/radiol.2020201537
16. Schiettecatte E, Jaremko JL, Sudoł-Szopińska I, Znajdek M, Mandegaran R, Swami V et al. Common incidental findings on sacroiliac joint MRI in children clinically suspected of juvenile spondyloarthritis. Eur. J. Radiol Open. 2020; 7:100225. doi: https://doi.org/10.1016/j.ejro.2020.100225
17. Cimsit C, Yoldemir T, Tureli D, Aribal ME. Evaluation of sacroiliac joint MRI for pelvic venous congestion signs in women clinically suspected of sacroiliitis. Acta Radiologica. 2017;58(7):849-855. doi:10.1177/0284185116675656
18. Antonelli MJ, Magrey M. Sacroiliitis mimics: a case report and review of the literature. BMC MusculoskeletDisord 2017;18(1):170. doi: 10.1186/s12891-017-1525-1.
19. Jans L, Van Praet L, Elewaut D, Van den Bosch F, Carron P, Jaremko JL et al. MRI of the SI joints commonly shows non-inflammatory disease in patients clinically suspected of sacroiliitis. Eur J Radiol 2014;83(1):179-84. doi: 10.1016/j.ejrad.2013.10.001.
20. Tins BJ, Balain B. Incidence of numerical variants and transitional lumbosacral vertebrae on whole-spine MRI. Insights Imaging 2016; 7(2):199–203. doi: https://doi.org/10.1007/s13244-016-0468-7.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Comparison of Nebivolol with Metoprolol in controlling heart rate and improving left ventricular ejection fraction in patients with congestive cardiac failure

Amjad Ali Shah[1], Asma Rauf[2], Siyab Ahmad[3], Mahboob Ur Rehman[4], Niaz Ali[5], Bilal Ahmad[6]

**ABSTRACT**

**Objective:** To compare nebivolol versus metoprolol therapy in controlling heart rate and improvement in left ventricular ejection fraction in patients with congestive cardiac failure.

**Study Design:** Randomized controlled trial.

**Place and Duration of Study:** Out-patient department of Cardiology, Pakistan Institute of Medical Sciences (PIMS), Islamabad from 1st March 2016 to 28th February 2017.

**Materials and Methods:** A total of 262 cases were included. A detailed clinical examination, electrocardiography and echocardiography were done by blinded operators. Randomization of patients into group A and group B via random number table was done. Group A received nebivolol and group B received metoprolol tartrate for six months. Patients of all age groups, of either gender or all socioeconomic strata, with the clinical diagnosis of cardiac failure were included in this study. Decompensation of heart failure requiring hospitalization and bradycardia or atrioventricular blocks developing during the study was taken as a criterion for drop out. History of diabetes, hypertension, and smoking was recorded. Left ventricular ejection fraction and heart rate were documented and compared amongst the two groups. Chi square test was applied for comparison between qualitative variables while the independent samples *t*-test was used to compare quantitative variables between groups. Analysis of data was done using SPSS version 21. A *p*-value of ≤ 0.05 was considered significant.

**Results:** Our study population was 262 patients with a mean age of 49.25 ± 31.74 years, range between 18 and 80 years. Patients in group A, on nebivolol demonstrated a significant improvement in left ventricular ejection fraction ($p$=0.00031) and heart rate ($p$=0.00163) when compared to patients in group B, on metoprolol.

**Conclusion:** Nebivolol was found to more effective in improving left ventricular ejection fraction and heart rate in patients with congestive cardiac failure.

**Key Words:** *Congestive Cardiac Failure, Heart Rate, Left Ventricular Ejection Fraction, Metoprolol, Nebivolol.*

## Introduction

Congestive Cardiac Failure (CCF) is a disease in which patients have breathlessness at rest or during exercise, easy fatiguability, or signs of fluid accumulation, which are associated with an objective dysfunction of the heart due to a structural or functional abnormality.[1,2] In diastolic cardiac failure, more than 50% of the ejection fraction is preserved despite signs and symptoms of failure. Diminished left ventricular ejection fraction (LVEF) with clinical features is usually associated with systolic cardiac dysfunction.[3,4]

Tachycardia associated with cardiac failure carries a grim prognosis. An elevated heart rate serves as a trigger for the development of cardiac complications in various ailments including cardiac failure, myocardial infarction, and hypertension. Patients with poorly controlled tachycardia have increased cardiovascular morbidity and mortality.[5,6] The risk of cardiac failure development in the general population is 1 in 5 at the age of 40 years.[7] Data regarding the pattern and outcome of heart failure from developing countries is sparse. Cardiac failure affected approximately 6.6 million population in America in 2010 with a total expenditure in

[1,6]*Department of Cardiology/Surgical*[5]
*Saidu Group of Teaching Hospital, Swat*
[2]*Department of Cardiology*
*Bilal Hospital, Rawalpindi*
[3]*Department of Pathology*
*Swat Medical College, Swat*
[4]*Department of Cardiology*
*Pakistan Institute of Medical Sciences, Islamabad*
*Correspondence:*
*Dr. Siyab Ahmad*
*Assistant Professor*
*Department of Pathology*
*Swat Medical College, Swat*
*E-mail: siyabamc@gmail.com*

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healthcare services on the disorder of 34.4 billion dollars.[8]

There are three types of receptors controlling cardiac functions: $\beta_1$ & $\beta_2$ adrenergic receptors produce a positive chronotropic and inotropic effect as opposed to $\beta_3$ adrenergic receptor producing a negative inotropic effect via nitric oxide synthesis pathway.[9,10] In cardiac failure, β blockers have been recommended as the main treatment modality as it has both prognostic and symptomatic benefits. β blockers have been proven to be effective in decreasing the number of death and improving morbidity.[11] Moreover, the β blockers which cause vasodilatation may be better in treating cardiac failure because it results in a decrease in after-load when compared to drugs of the same class that do not have this function.[12] Nebivolol is on the latest β blockers developed and has a significant arteriolar dilatory effect. It lacks sympathomimetic activity and is a highly selective $\beta_1$-adrenergic blocker as compared to other drugs in this class.[13]This study was conducted to compare nebivolol versus metoprolol therapy in controlling heart rate and improvement in left ventricular ejection fraction in patients with congestive cardiac failure

## Materials and Methods

This randomized controlled trial was conducted from 1 March 2016 to 28th February 2017 at the Out-Patient Cardiology Department of Pakistan Institute of Medical Sciences (PIMS), Islamabad. The sample size was calculated using the World Health Organization (WHO) sample size calculator using the formulae for hypothesis test for two population proportions (one-sided), keeping a level of significance of 22.1%, a power of the test of 80.5%, a population portion 1 of 26.4%, and a population proportion 2 of 35.7%, giving us a sample size of 131 patients in each group or 262 total patients.[14] Approval from the ethical committee of the hospital was obtained (letter no HEC 2240, 05/05/2014). The study population included those patients who had congestive cardiac failure based on the clinical history and confirmed on echocardiography as having either systolic or diastolic dysfunction, having sinus rhythm. Adults of 18 years or above and of both genders were included. The patients with co-morbidities like asthma, chronic obstructive airway disease (COPD), peripheral arterial disease, heart blocks, and acute decompensated cardiac failure were not included in the study.

A detailed history was taken. History of diabetes, hypertension, and smoking were recorded. The New York Heart Association classification was used to stratify patients according to the severity of dyspnoea at the index visit and subsequently thereafter. Clinical examination was done after five minutes of rest to record heart rate, and blood pressure was recorded using mercury sphygmomanometers.

Detailed echocardiography was done by a blinded operator. Other medications being taken according to guideline-directed medical treatment (including Angiotensin converting enzyme (ACE) inhibitors, Angiotensin receptor blockers, diuretics, digoxin, nitrates) by the patients were noted. Left Ventricular end-diastolic and end-systolic dimensions, volumes and ejection fraction were recorded with the M-Mode and Simpson's method and a mean of three values was taken on echocardiography. Diastolic function was recorded with echocardiography by measuring E and A mitral inflow waves with pulsed wave Doppler. E prime was recorded with Tissue Doppler from the lateral mitral annulus. Isovolumic relaxation time (IVRT) and deceleration times were recorded with Doppler echocardiography.

Randomization was done, with the patients being sorted into two groups to get either metoprolol tartrate (Group B) or nebivolol (Group A) according to a random number table. The procedures were reconducted at one-, three- and six-months after drug administration by blinded operators. At each visit, an electrocardiogram (ECG) was performed to note the PR interval and history and physical examination was done. Dose titration of β blockers was done at two weekly intervals keeping in view the symptoms, heart rate and PR interval with a target of 60 to 70 bpm.

After entering data, analysis was done with SPSS software version 21.0. The categorical variables like gender, diabetes, hypertension, smoking, and efficacy were analysed as frequencies and percentages. The mean baseline LVEF and heart rate values were compared with post-intervention values after 6 months using the independent samples *t*-test. Independent sample *t*-test was also used to compare mean change in heart rate and LVEF between two

groups. A *p*-value≤ .05 was considered significant.

## Results

A total of 262 patients were included in the study. The mean age of the patients was 49.25 ± 31.74 years that ranged from 18 to 80 years. Most of the patients in group A i.e., 46 (35.2%) were aged between 61-70 years, while in group B, 35 (26.7%) were also in the same age group. A total of 78 (60%) of patients in Group A were male, while this number was 73 (56%) in Group B. Patient distribution according to age group and the presence of risk factors is exhibited in Table I.

In group A, the mean and standard deviation of pre-treatment LVEF in our study was 45.23 ± 24.77% with a range of 20-70%. The mean and standard deviation of pre-treatment heart rate in our study was 50.13 ± 34.86 bpm with a range of 50-120 bpm, while in group B, the mean and standard deviation of pre-treatment LVEF in our study was 43.13 ±17.07% with a range of 24-62%. The mean and standard deviation of pre-treatment heart rate in our study was 85.10± 25.16 bpm with a range of 60-110 bpm.

**Table I: Distribution of Patients According to age and Risk Factors**

| Age (years) | Group A n= 131 | %Age of Patients | Group B n= 131 | %Age of Patients |
|---|---|---|---|---|
| 18 to 20 | 0 | 0% | 0 | 0% |
| 21 to 30 | 02 | 1.5% | 04 | 3% |
| 31 to 40 | 07 | 5.3% | 18 | 13.7% |
| 41 to 50 | 23 | 17.6% | 22 | 16.8% |
| 51 to 60 | 37 | 28.2% | 35 | 26.7% |
| 61 to 70 | 46 | 35.2% | 31 | 23.7% |
| 71 to 80 | 16 | 12.2% | 21 | 16% |
| **Risk Factors** | **Group A n= 131** | **% Age of patients** | **Group B n= 131** | **% Age of patients** |
| DM | 51 | 45.8% | 66 | 50.4% |
| HTN | 44 | 32% | 39 | 29.8% |
| SMOKING | 36 | 22.1% | 26 | 19.9% |
| DM + HTN | 64 | 48% | 61 | 46.6% |
| DM + HTN + SMOKING | 57 | 43.5% | 47 | 36% |

In group A, LVEF increased after the 6 months nebivolol therapy in patients up to the age of 60 years while it decreased after the age of 60 years while in group B, LVEF increased after 6 months metoprolol therapy in patients up to the age of 60 years while it is decreased after the age of 60 years. LVEF increase was increased to a greater degree in the nebivolol group as compared to metoprolol group. In group A, heart rate deceleration was more after the 6 months of nebivolol therapy than when compared with the metoprolol group with the same duration of therapy. Heart rate deceleration was more in patients having ages less than 60 years in both groups. Data for this variable is displayed in Table II.

In Group A, the average deceleration of heart rate was more in patients having diabetes, hypertension, and smokers, while in group B, the average deceleration of heart rate was more in smokers and those who had diabetes and hypertension. The data for these variables is displayed in Table III.

**Table II: Age-wise Distribution of Patients having According to LVEF and Heart Rate**

| Age (years) | Group A (Nebivolol) n= 131 | %Age Improvement After Nebivolol Therapy | Group B (Metoprolol) n= 131 | %Age of LVEF Improvement After Metoprolol Therapy | *p*-value |
|---|---|---|---|---|---|
| 18 to 20 | 0 | 0 % | 0 | 0% | 0.00031 |
| 21 to 30 | 02 | 7% | 04 | 06% | |
| 31 to 40 | 07 | 11% | 18 | 04% | |
| 41 to 50 | 23 | 11% | 22 | 07% | |
| 51 to 60 | 37 | 10% | 35 | 05% | |
| 61 to 70 | 46 | -05% | 31 | -09% | |
| 71 to 80 | 16 | - 09% | 21 | -06% | |
| **Age (years)** | **Group A n= 131** | **Average HR Deceleration after Nebivolol therapy** | **Group B n= 131** | **Average HR Deceleration After Metoprolol therapy** | ***p*-value** |
| 18 to 20 | 0 | 16 | 0 | 12 | 0.00163 |
| 21 to 30 | 02 | 26 | 04 | 13 | |
| 31 to 40 | 07 | 20 | 18 | 20 | |
| 41 to 50 | 23 | 18 | 22 | 17 | |
| 51 to60 | 37 | 23 | 35 | 12 | |
| 61 to 70 | 46 | 19 | 31 | 16 | |
| 71 to 80 | 16 | 16 | 21 | 19 | |
| 18 to 20 | 0 | 16 | 0 | 12 | |

In group A, the average improvement in LVEF was more in hypertensive and diabetics, while in group B the average improvement in LVEF was 9% in hypertensive. The average improvement of LVEF was higher with nebivolol in each age group when

**Table III: Average Heart Rate Improvement in Patients having CCF in According to different Risk Factors.**

| | Group A (Nebivolol) n= 131 | Average HR Deceleration after Nebivolol therapy | Group B (Metoprolol) n= 131 | Average HR Deceleration after Metoprolol therapy | *p*-value |
|---|---|---|---|---|---|
| DM | 51 | 09 | 66 | 02 | 0.000351 |
| HTN | 44 | 16 | 39 | 06 | |
| Smoking | 36 | 11 | 26 | 10 | |
| HTN + DM | 64 | 08 | 61 | 12 | |
| HTN + DM Smoking | 57 | 09 | 47 | 07 | |

compared to metoprolol. This data is displayed in Table IV.

**Table IV: Average LVEF (%) of patients having CCF in different Risk Factors.**

| | Group A (Nebivolol) n= 131 | Average LVEF (%) Improvement after Nebivolol therapy | Group B (Metoprolol) n= 131 | Average LVEF (%) Improvement after Metoprolol therapy | *p*-value |
|---|---|---|---|---|---|
| DM | 51 | 11% | 66 | 08% | 0.001132 |
| HTN | 44 | 13% | 39 | 09% | |
| Smoking | 36 | 06% | 26 | 05% | |
| DM + HTN | 64 | 07% | 61 | 05% | |
| DM + HTN + SMOKING | 57 | 03% | 47 | 02% | |

## Discussion

In our study, **t**he mean and standard deviation of LVEF was 45.23 ± 24.77% with a range of 20-70%. The mean and standard deviation of heart rate in our study was 50.13 ± 34.86 bpm with a range of 50-120 bpm. There were 2 (0.8%) patients of the age range of 18-20 year, in whom the LVEF decreased to 3% after the 6 months nebivolol therapy. A total of 9 (3.5%) patients belonged to the age range of 21-30 years and LVEF increased in them to 06% after the 6 months nebivolol therapy. 19 (7.2%) patients of the age range of 31-40 years had an LVEF increased to 04% after the 6 months nebivolol therapy, 42 (16%) patients of the age range of 41-50 years had an increase in LVEF of 7% after the 6 months nebivolol therapy, while 72 (27.5%) patients of the age range of 51-60 years saw LVEF increased to 5% after the 6 months nebivolol therapy. Lastly, 64 (24.4%) patients of the age range of 61-70 years developed an LVEF decrease of 9% after the 6 months nebivolol therapy.

In a study Brehm et al, the average improvement of cardiac rate was noted in 63% study population having EF of 13-39% in a double-blinded randomized controlled trial. Exertion time, cardiac rate, LVEF and tolerability were noted at initiation and after 3 months of administration of nebivolol (2.5 and 5 mg, n = 6) or placebo (n = 6).[15] In 4 patients nebivolol was better tolerated resulting in improvement of dyspnoea. Heart rate decreased while the maximum exercise duration and performance remained stable. LVEF increased (ejection fraction 31.5 ± 10.11 to 42.0 ± 10.99%, $p \leq 0.01$) after treatment with nebivolol.[15] The left ventricular end-systolic diameter decreased in the nebivolol-group from 56.5 ± 9.40 to 50.2 ± 9.43 mm ($p \leq 0.02$). This show that with nebivolol treatment LVEF may improve.[15]

The ENECA (efficacy of nebivolol in the treatment of elderly patients with chronic heart failure as add-on therapy to ACE inhibitors or angiotensin II receptor blockers, diuretics, and/or digitalis) study showed that nebivolol treatment had markedly increased LVEF in comparison to placebo in all subgroups of population under study.[14] In a double blinded randomized control study by Shibata et al wherein they studied the benefits of nebivolol and compared it with placebo. It was inferred that the nebivolol group demonstrated a greater improvement despite the poor conditions like age, gender, ejection fraction, diabetes, or prior ischemic cardiac insult. Moreover, it was shown that to prevent death and hospital admission, nebivolol should be continued for 2 years.[16]

There are very few comparative studies in treating cardiac failure with β-adrenergic blockers.[17] In two small clinical trial where in nebivolol was compared with carvedilol in terms of exercise tolerance, both the drugs had beneficial effect in improving exercise tolerance after twelve months of treatment. Conversely, in a trial by Patrianakos et al, there was no difference in improvement in LVEF and left ventricular end systolic volume.[17] Both carvedilol and nebivolol had beneficial effect on exercise tolerance and neither drug had declined exercise tolerance at earlier assessment. The drawback of this study was its low power, more over Patrianakos and colleagues conducted their study in patients with non-ischemic dilated cardiomyopathy so extrapolating it to other cardiac failure patient due ischemic disease is inappropriate.[18] In order to establish the benefit of one β blocker over the other in treatment of cardiac failure more head-to-head comparative studies should be done. Moreover, these should be high

power studies before jumping to any concrete conclusions. Furthermore, Sim et al have noted that Nebivolol is beneficial even in low doses, providing benefits at the roughly the same degree as higher doses without the added risk of side effects.[19] Lastly, Seleme et al noted that Nebivolol was of great use in the management of hypertension that was comparable in its effectiveness to more established drug classes such as ACE inhibitors and calcium channel blockers.[20]

## Limitations

Our study was limited by the duration of follow-up i.e., up to six months: heart failure is a chronic condition and, the effects of nebivolol need to be observed for a longer duration against standard treatment, to determine whether short-term benefits translate into long-term ones. Secondly, our study did not look at the side-effects of both study-arms in detail, which is another aspect that should be adequately reviewed before changing established clinical practices. Lastly, this was a single-center study, with patients being drawn from ethnic groups, so the results may not be generalizable to the rest of the country.

## Conclusion

Nebivolol was found to improve LVEF and cardiac rate in this cohort of patients presenting with heart failure and further collective studies at a larger scale are required to establish its non-inferiority and subsequently, its superiority over other beta-blockers so that such prescribing may be inculcated into local and international practice guidelines.

## REFERENCES

1. Malik A, Brito D, Vaqar S, Chahbra L. Congestive Heart Failure. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430873/.
2. Hajouli S, Ludhwani D. Heart Failure and Ejection Fraction. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022. Available from: https://www.ncbi.nlm.nih.gov/books/NBK553115/.
3. Sarwar M, Majeed SM, Khan MA. Types and frequency of cardiac arrhythmias in patients with heart failure. J Pak Armed Forces Med J 2014;1(1):S109-13.
4. Sanhoury M, Mohamed F, Sadaka M, Abdel-Hay MA, Sobhy M, Elwany M. The impact of asymptomatic ventricular arrhythmias on the outcome of heart failure patients with reduced ejection fraction. Egypt Heart J. 2022 16;74(1):11.
5. Khan MA, Majeed SM, Sarwar M. Screening of High Risk Patients with Mitral Valve Prolapse – Role of Heart Rate Variability. J Islam Int Med Coll. 2013;9(3):59-62.
6. Zhao W, Zhao J, Rong J. Pharmacological Modulation of Cardiac Remodeling after Myocardial Infarction. Oxid Med Cell Longev. 2020 ;2020(1):8815349.
7. Savarese G, Lund LH. Global Public Health Burden of Heart Failure. Card Fail Rev. 2017 Apr;3(1):7-11
8. Seemi S, Iffat S, Ahmed Sana JS. Diagnostic Accuracy of Electrocardiography in Diagnosis of Left Ventricular Hypertrophy. J Islam Int Med Coll. 2014;9(3):63–8.
9. Ali DC, Naveed M, Gordon A, Majeed F, Saeed M, Ogbuke MI, et al. β-Adrenergic receptor, an essential target in cardiovascular diseases. Heart Fail Rev. 2020 ;25(2):343-354.
10. Raja GS, Khan HF, Siddiqui A. Cardiac Autonomic Modulation in Psychologically Stressed Subjects as Reflected by Heart Rate Variability. J Islam Int Med Coll. 2015;10(3):199–203.
11. Silverman DN, de Lavallaz JD, Plante TB, Infeld MM, Goyal P, Juraschek SP, et al. Beta-Blocker Use in Hypertension and Heart Failure (A Secondary Analysis of the Systolic Blood Pressure Intervention Trial). Am J Cardiol. 2022 ;165(1):58-64.
12. Alvi AA, Khan MA, Ali W. Control of Oral Anticoagulant Therapy using INR in Patients with Artificial Heart Valves. J Islam Int Med Coll. 2014;9(2):3–6.
13. Priyadarshni S, Curry BH. Nebivolol. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022. Available from: https://www.ncbi.nlm.nih.gov/books/NBK551582/.
14. Edes I, Gasior Z, Wita K. Effects of nebivolol on left ventricular function in elderly patients with chronic heart failure: results of the ENECA study. Eur J Heart Fail [Internet]. 2005;7(4):631–9.
15. Brehm BR, Wolf SC, Gorner S, Buck-muller N. Effect of nebivolol on left ventricular function in patients with chronic heart failure : a pilot study. 2002;4(5):757–763.
16. Shibata MC, Flather MD, Wang D. Systematic review of the impact of beta blockers on mortality and hospital admissions in heart failure. Eur J Heart Fail [Internet]. 2011;3(3):351–7.
17. Veverka A. Nebivolol in the treatment of chronic heart failure. 2017;3(5):647–54.
18. Patrianakos AP, Parthenakis FI, Mavrakis HE, Diakakis GF, Chlouverakis GI, Vardas PE. Comparative efficacy of nebivolol versus carvedilol on left ventricular function and exercise capacity in patients with nonischemic dilated cardiomyopathy. A 12-month study. Am Heart J. 2015;150(5):985-985.
19. Sim DS, Hyun DY, Jeong MH, Kim HS, Chang K, Choi DJ, et al. Effect of Low-Dose Nebivolol in Patients with Acute Myocardial Infarction: A Multi-Center Observational Study. Chonnam Med J. 2020 ;56(1):55-61.
20. Seleme VB, Marques GL, Mendes AE, Rotta I, Pereira M, Júnior EL, et al. Nebivolol for the Treatment of Essential Systemic Arterial Hypertension: A Systematic Review and Meta-Analysis. Am J Cardiovasc Drugs. 2021;21(2):165-180.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Comparison of Stretching Alone Versus Combination of Muscle Energy Technique and Stretching on Pain and Disability among Patients with Trigger Points in Cervical Region

Muhammad Tariq Shafi[1], Shahzad Ahmad[2], Shoaib Waqas[3], Muhammad Faheem Afzal[4,] Ubaid Ullah Akbar[5], Shahzada Iftikhar Hussain[6]

**ABSTRACT**

**Objective:** To compare effect of stretching combined with muscle energy technique on disability and pain in patients with trigger points in cervical region.

**Study Design:** Comparative clinical trial.

**Place and Duration of Study:** Intervention and assessment was done in Physical Therapy department of Shalamar Hospital, Lahore, Pakistan from 13 September 2018 to 29 March 2019.

**Materials and Methods:** It was a single blinded parallel arm study. Seventy-two patients recruited in the study by using probability simple random sampling. Patients with non-specific neck pain, trigger points in trapezius muscle, aged between 18 to 45 years were included in the study. Patients with history of road traffic accident, torticollis or complaint of spinal cord compression were excluded. Patients were divided in two equal groups by random number table. Group A received combination of stretching and muscle energy technique while group B received only stretching. Intervention repeated for 3 to 5 days, number of sessions was 3 days a week for 4 weeks. Assessment was taken baseline and after 4 weeks of intervention. Data was entered and analysed through SPSS version 21.

**Results:** The demographics of result showed that 54.2% male and 45.8% female participated in the study with 52.8% sedentary and 47.2% were active subjects. The results of the study showed statistically significant improvement on neck disability and pain (P value<0.05).

**Conclusion:** It is concluded that muscle energy technique with stretching is more effective for patients with trigger points in cervical region.

**Key Words:** *Muscle Energy Technique,Neck Disability Index, Stretching, Trigger point.*

## Introduction

From last decade, neck pain is the fourth leading cause of disability according to the global burden of disease.[1]Neck pain is considered second most common cause of pain.[2]Almost half of the population suffers from neck painat least once in a life.[3]As per evidence, the prevalence of neck pain varies from 15 to 50% annually.[3-4] Neck pain is more common in females as compared to males and middle-aged population is commonly effected. [5-6]More often, it is idiopathic, and nature of pain is non-specific. [7]. Most of the neck pain is also linked with the different complications such as headache, back pain, arthralgia, and depression.[6] In regard to direct or indirect costs, neck pain is usually considered insensitive to different interventions and costly.[8]Chronic neck pain also causes usual absentees of office worker due to severity of pain.[9]

Myofascial Pain Syndrome is non-articular, nonspecific musculoskeletal pain, associated with regional pain and muscle tenderness characterized by trigger points, also known as trigger. Trigger points are associated with sensory, motor, and autonomic findings.[10]Trigger points are assessed on physical examination and by two palpation methods one is pincer grip method other is flat palpation method.[11]Most common clinical sign and symptoms of MPS having trigger points are aches and pain, muscle tightness or spasm, restricted ROM, and generalized muscle fatigue. Patients show local

[1,3,4,5,6]*Department of Physical Therapy*
*Lahore Medical and Dental College, Lahore*
[2]*Department of Physical Therapy*
*National Hospital and Medical Center, Lahore*
*Correspondence:*
*Dr. Muhammad Tariq Shafi*
*Assistant Professor*
*Department of Physical Therapy*
*Lahore Medical and Dental College, Lahore*
*E-mail:muhammad.tariq@lmdc.edu.pk*

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twitch response and positive jump sign. There exist wide variety in pain perception and intensity of pain ranges from mild ache to an excruciating burning pain, or both.[12] Patients also show sensory, motor, and autonomic symptoms.[13]

Patient education is very important component in treatment of myofascial pain syndrome. Patient is instructed about the home exercise program about the stretching strengthening and relaxation exercise, and postural awareness is also improved.[14]By improving diet and minimizing the modifiable risk factors can reduces the chances of trigger point development and can assist in synchronize the effect of treatment.[15].In cervical radiculopathy, for treating the pain and inflammation the first line of medication usually used are non-steroidal anti-inflammatory drugs (NSAIDs).[16]

In the non-surgical intervention of cervical radiculopathy electrotherapy may be used as an associated treatment, with numerous advantages.[17]About cervical radiculopathy treatment with massage, it is shown that very less information is found in exhaustive literature search specifically.[18]Muscle energy technique is new form of manipulative diagnosis and intervention in which activation of muscle done through command in specific direction and against resistance.[19]

As per evidence, neck pain leads to different pathologies and stretching helps in the management of neck pain. There is very little evidence that compare two interventions on trigger points release and adjustment of pain. The purpose of this study was to compare effect of stretching combined with muscle energy technique on disability and pain in patients with trigger points in cervical region.

## Materials and Methods

The comparative clinical trial conducted by using single blinded. A sample of 72 patients recruited in the study that is calculated by using Open Epi online calculator with 95% confidence interval and 5% margin of error. The data was collected at Shalamar Hospital, Lahore, Pakistan from 13 September 2018 to 29 March 2019.Probability simple random sampling technique was used to recruit participants in the study. Study was completed in six months after the approval of synopsis from the Institutional Review Board of Lahore Medical and Dental College, Lahore. (LMDC/LCPT/ERB/PGS/0891) Diagnosed patients with trigger points on cervical region were included in the study. The diagnostic criteria for the trigger points were physical examination and positive Jump sign. Patients had trigger points in trapezius muscles with complaint of non-specific neck pain, both gender with age 18 to 45 years were included in the study. Patients with history of road traffic accident, complaint of torticollis, spinal cord compression, articular or any systematic disorder were excluded from the study. The recruited patients (n=72) were divided equally in to two groups by using simple random number table.

Group A patients received Stretching alone that comprised of 5 repetitions. The duration of single bout of stretch was 30 seconds. Group B received Muscle Energy Technique using post isometric relaxation, followed by passive stretching. Duration of stretching was 30 seconds while each maneuver homogenously repeated 5 times per treatment for 3 days in a week up to 4 weeks. Permission was sought from the institute and consent was taken from patient in English/Urdu according to understanding of patients. Patient's interaction with each other avoided so that they do not know the intervention of other group. Numeric Pain Rating Scale (NPRS) was used to check the pain intensity and Neck Disability Index (NDI) was used to check functional ability.

Patient's assessment was done on baseline and after fourth week of intervention. Both groups received conventional treatments as well that includes Ultrasound therapy (ITO US-100) for seven minutes in continuous mode, stretching and isometrics. All demographic information and outcome tool data were entered by SPSS version 21.

The demographic information was presented in the form of frequencies and percentages. Test of normality applied to check normal distribution of data and Independent T-test was used to determine the difference between the groups and quantitative data was presented by Mean and Standard Deviation

## Results

The results of the study showed mean age and standard deviation was 36.32±1.46 and 54.2% male and 45.8% female participated in the study. The mean and standard deviation of Numeric Pain Rating Scale (NPRS) was 6.36±2.344 and 6.28±2.187 in group A and B respectively and 1.53±2.223 and 2.78±2.94 after 4 week of intervention that showed

significant difference between groups (P-value=0.012). The mean and standard deviation of NDI was 18.92±9.915 and 19.86±10.137 in group A and group B at baseline, 3.53±6.036 and 7.56±10.252 after 4 week of intervention that showed significant difference. (P-value=0.001)

**Table I : Shows Demographics Information of the Participants (n=72)**

| Variables | Frequency | Percentage |
|---|---|---|
| **Gender** | | |
| • Male | 39 | 54.2% |
| • Female | 33 | 45.8% |
| **Life-style** | | |
| • Active | 34 | 47.2% |
| • Sedentary | 38 | 52.8% |
| **Hypertension** | | |
| • Yes | 24 | 33.3% |
| • No | 48 | 66.7% |
| **Headache** | | |
| • Yes | 17 | 23.6% |
| • No | 55 | 76.4% |
| **Computer Usage** | | |
| • Yes | 28 | 38.9% |
| • No | 44 | 61.1% |
| **Tension** | | |
| • Yes | 47 | 65.3% |
| • No | 25 | 34.7% |
| **History of Trauma** | | |
| • Yes | 22 | 30.6% |
| • No | 50 | 69.4% |

**Table II : Shows Mean± Standard Deviation of Numeric Pain Rating Scale and Neck Disability Index in both groups. (n=72)**

| Variables | | Group | Mean value | SD | P value |
|---|---|---|---|---|---|
| **NPRS** | **PRE** | **Group A** | 6.36 | 2.344 | 0.660 |
| | | **Group B** | 6.28 | 2.187 | |
| | **POST** | **Group A** | 1.53 | 2.223 | 0.012 |
| | | **Group B** | 2.78 | 2.948 | |
| **NDI** | **PRE** | **Group A** | 18.92 | 9.915 | 0.856 |
| | | **Group B** | 19.86 | 10.137 | |
| | **POST** | **Group A** | 3.53 | 6.036 | 0.001 |
| | | **Group B** | 7.56 | 10.252 | |

## Discussion

In this study, pain occurrence due to trigger points was assessed through Numeric Pain Rating Scale. In initial assessment, mean and standard deviation of pain was 6.36±2.344 and 6.28±2.187in group A and B respectively. Mean and standard deviation of group A was 1.53±2.223 and 2.78±2.948 in group B after 4 week of intervention that showed statistically significant P value=0.012. A study conducted in 2010 by Athanasios Trampas that showed significant effect of stretching on trigger points.[20]. Another study conducted by Kostopoulos that also compare the effects of passive stretching alone with passive stretching and intermittent compression and concluded that there is significant effect occur in both groups.[21]. A study conducted in India by the Chitra Kataria in 2012 that compare the effects of muscle energy technique with stretching along with conventional treatment and concluded that both groups showed statistically significant in reduction of pain with mechanical neck pain.[22].A study conducted by Gulnazsadria to compare the effect of muscle energy technique with the active release technique and concluded that both the groups show significant improvement in range of motion of neck.[23] A clinical trial conducted on patients to see the effects of muscle energy technique alone and in combination with the stretching technique in reducing the symptoms occur due to trigger points. The results of the study showed that combination of muscle energy technique and stretching is considered effective in reduction of pain.[24]

The result of study showed significant difference in disability of neck in group comparison while previous study also showed statistically significant improvement in neck disability index in patients with non-specific neck pain.[24] Another study showed conducted by Phadke A et al that concluded that muscle energy technique is more effective than stretching on functional disability in patients suffering from neck pain.[25] A systematic review recently published that also support that muscle energy technique play more effective role with conventional physical therapy treatment in patients with neck pain.[26]

Current study also reveals some other factors related to trigger point.30-40 year's age group was most effected by trigger points. One important factor was

that 38.9% patient had computer usage history. The benefit of the combined approach over stretching may be due to Muscle Energy Technique in combination facilitating causes reduction of tone in the involved tissues. The reduction in involved tissue tone results in change of neural command and increase circulation of the involved tissue. The change in the local environment of tissue leads to reboot neural command and results in reversing normal length, increased circulation, reduction in pain and improved neck mobility and functioning.[25]

## Conclusion

In patients with trigger point neck pain, combined approach using both Muscle Energy Technique and stretching for the treatment of Trigger point release is effective in relieving pain and improving neck disability index as compared to stretching in isolation.

### REFERENCES

1. Mokdad AH, Ballestros K, Echko M, Glenn S, Olsen HE, Mullany E, Lee A, Khan AR, Ahmadi A, Ferrari AJ, Kasaeian A. The state of US health, 1990-2016: burden of diseases, injuries, and risk factors among US states. Jama. 2018 Apr 10;319(14):1444-72.
2. Blanpied PR, Gross AR, Elliott JM, Devaney LL, Clewley D, Walton DM, Sparks C, Robertson EK, Altman RD, Beattie P, Boeglin E. Neck pain: revision 2017: clinical practice guidelines linked to the international classification of functioning, disability, and health from the orthopaedic section of the American Physical Therapy Association. Journal of Orthopaedic& Sports Physical Therapy. 2017 Jul;47(7):A1-83.
3. Safiri S, Kolahi AA, Hoy D, Buchbinder R, Mansournia MA, Bettampadi D, Ashrafi-Asgarabad A, Almasi-Hashiani A, Smith E, Sepidarkish M, Cross M. Global, regional, and national burden of neck pain in the general population, 1990-2017: systematic analysis of the global burden of disease study 2017. Bmj. 2020 Mar 26;368.
4. Xie Y, Szeto G, Dai J. Prevalence, and risk factors associated with musculoskeletal complaints among users of mobile handheld devices: A systematic review. Applied ergonomics. 2017 Mar 1;59:132-42.
5. Beltran-Alacreu H, López-de-Uralde-Villanueva I, Calvo-Lobo C, Fernández-Carnero J, La Touche R. Clinical features of patients with chronic non-specific neck pain per disability level: A novel observational study. Revista da AssociaçãoMédica Brasileira. 2018;64:700-9.
6. Fernández-de-las-Peñas C, Hernández-Barrera V, Alonso-Blanco C, Palacios-Ceña D, Carrasco-Garrido P, Jiménez-Sánchez S, Jiménez-García R. Prevalence of neck and low back pain in community-dwelling adults in Spain: a population-based national study. Spine. 2011 Feb 1;36(3):E213-9.
7. Borghoutus JA, Koes BW, LMB. The clinical course and prognostic factors of non-specific neck pain :a systematic review. Pain. 1998;77:1-13.
8. Haldeman S, Carroll LJ, Cassidy JD. The empowerment of people with neck pain: introduction: the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. Journal of Manipulative & Physiological Therapeutics. 2009 Feb 1;32(2):S10-6.
9. Okuyucu K, Gyi D, Hignett S, Doshani A. Midwives are getting hurt: UK survey of the prevalence and risk factors for developing musculoskeletal symptoms. Midwifery. 2019 Dec 1;79:102546.
10. Barbero M, Schneebeli A, Koetsier E, Maino P. Myofascial pain syndrome and trigger points: evaluation and treatment in patients with musculoskeletal pain. Current opinion in supportive and palliative care. 2019 Sep 1;13(3):270-6.
11. Nagrale AV, Glynn P, Joshi A, Ramteke G. The efficacy of an integrated neuromuscular inhibition technique on upper trapezius trigger points in subjects with non-specific neck pain: a randomized controlled trial. Journal of Manual & Manipulative Therapy. 2010;18(1):37-43.
12. Kumar S, Khuba S, Gautam S, Agarwal A, Vittobaraju M, Aggarwal A, Awal S, Mishra P. Association of Myofascial Pain in Patients with Thoracolumbar Scoliosis, Kyphoscoliosis or Spinal Deformity Attending a Tertiary Care Hospital in Uttar Pradesh, India.
13. Lucas N, Macaskill P, Irwig L, Moran R, Bogduk N. Reliability of physical examination for diagnosis of myofascial trigger points: a systematic review of the literature. The Clinical journal of pain. 2009 Jan 1;25(1):80-9.
14. Bronfort G, Evans R, Anderson AV, Svendsen KH, Bracha Y, Grimm RH. Spinal Manipulation, Medication, or Home Exercise With Advice for Acute and Subacute Neck PainA Randomized Trial. Annals of internal medicine. 2012;156(1_Part_1):1-10.
15. Lagattuta F FF. Assessment and treatment of cervical spine disorders. 2000;2:50-60.
16. Scheiman J, Isenberg J. Agents used in the prevention and treatment of nonsteroidal anti-inflammatory drug-associated symptoms and ulcers. The American journal of medicine. 1998 Nov 2;105(5):32S-8S.
17. Kroeling P, Gross A, Graham N, Burnie SJ, Szeto G, Goldsmith CH, Haines T, Forget M. Electrotherapy for neck pain. Cochrane database of systematic reviews. 2013(8).
18. Myers TW. Anatomy trains: myofascial meridians for manual and movement therapists: Elsevier Health Sciences; 2009.
19. Phadke A, Bedekar N, Shyam A, Sancheti P. Effect of muscle energy technique and static stretching on pain and functional disability in patients with mechanical neck pain: A randomized controlled trial. Hong Kong Physiotherapy Journal. 2016 Dec 1;35:5-11.
20. Trampas A, Kitsios A, Sykaras E, Symeonidis S, Lazarou L. Clinical massage and modified Proprioceptive Neuromuscular Facilitation stretching in males with latent myofascial trigger points. Physical therapy in sport. 2010 Aug 1;11(3):91-8.
21. Kostopoulos D, Nelson Jr AJ, Ingber RS, Larkin RW. Reduction of spontaneous electrical activity and pain perception of trigger points in the upper trapezius muscle through trigger

point compression and passive stretching. Journal of musculoskeletal pain. 2008 Jan 1;16(4):266-78.

22. Mahajan R, Kataria C, Bansal K. Comparative effectiveness of muscle energy technique and static stretching for treatment of subacute mechanical neck pain. Int J Health Rehabil Sci. 2012 Jul;1(1):16-21.
23. Sadria G, Hosseini M, Rezasoltani A, Bagheban AA, Davari A, Seifolahi A. A comparison of the effect of the active release and muscle energy techniques on the latent trigger points of the upper trapezius. Journal of bodywork and movement therapies. 2017 Oct 1;21(4):920-5.
24. Noor R, Afzal B. Comparative study of treatment of trigger points pain with two techniques. 1 Muscle Energy Technique Alone 2. Combined Approach. Int J Sci Res. 2016;5:1825-9.
25. Phadke A, Bedekar N, Shyam A, Sancheti P. Effect of muscle energy technique and static stretching on pain and functional disability in patients with mechanical neck pain: A randomized controlled trial. Hong Kong Physiotherapy Journal. 2016 Dec 1;35:5-11.
26. Sbardella S, La Russa C, Bernetti A, Mangone M, Guarnera A, Pezzi L, Paoloni M, Agostini F, Santilli V, Saggini R, Paolucci T. Muscle energy technique in the rehabilitative treatment for acute and chronic non-specific neck pain: a systematic review. In Healthcare 2021 Jun 17 (Vol. 9, No. 6, p. 746). MDPI.

**CONFLICT OF INTEREST**

Authors declared no conflicts of Interest.

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Authors have declared no specific grant for this research from any funding agency in public, commercial or nonprofit sector.

**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Paediatric Residents' Perception of Breastfeeding amidst Covid 19

Ammara Ayub, Saba Afzal Shaikh, Fahim Ahmed Subhani, Bilal Ahmad, Ghania Sehar Cheema, Huma Afzal

**ABSTRACT**

**Objective**: This study was conducted to determine paediatric residents' perception, beliefs, and attitudes towards breastfeeding particularly by COVID positive mothers and to assess the need for a breastfeeding teaching program.

**Study Design**: A descriptive cross-sectional study

**Place and Duration of Study**: This study was conducted over 1 months (15 October 2021-15 November 2021) among the paediatric residents from different hospitals in Rawalpindi/ Islamabad.

**Materials and Methods**: A total of 70 paediatric residents were included in the study. A self-administered online questionnaire was sent via email, comprising 19 items related to breastfeeding and its implications during the COVID 19 pandemic. Results were analysed on SPSS 20.

**Results**: Out of 70 residents, 63 (90%) responses were obtained. Most of the residents were supportive of breastfeeding and had a good perception as 100% of participants supported that breast milk is an ideal food for babies. However, huge uncertainty was noted in the answers to questions regarding breastfeeding in mothers with COVID-19 infection as only a few (12.7%) residents believed that mothers with active COVID 19 infection can breastfeed their baby. There was no difference among first and second year residents and third and fourth year residents (<0.5)

**Conclusion**: The participants' perception, beliefs, and overall knowledge about breast feeding is satisfactory but regarding breastfeeding in mothers who had COVID-19 infection is inadequate. The authors' recommendation is to have more emphasis on support & promotion of breastfeeding in paediatric residency programs across Pakistan.

**Key Words:** *Breastfeeding, COVID-19, Pandemic , Pediatric Resident, Perception.*

## Introduction

Breastfeeding has a pivotal role in infant nutrition, survival, and mother-infant bonding as breast milk is a wholesome source of nutrition for new-borns and infants.[1] Exclusive breastfeeding for the first six months of life is recommended by the World Health Organization, American Academy of Paediatrics (AAP) and Pakistan Paediatric Association (PPA), followed by sustained breastfeeding along with suitable supplemental foods for up to two years.[2,3] Non-exclusive breastfeeding will double the risk of death from diarrhoea and pneumonia in infants aged 0–5 months, [4] which are still the leading causes of infant mortality in Pakistan with a rate of 56/1000 live births.[5] Educating healthcare providers to be lactation advocates could be a useful strategy for promoting breastfeeding in underserved communities. The paediatricians with their leading role in provision of healthcare to children are responsible for recognising the value of breastfeeding, campaigning for it, and motivating & helping mothers for breastfeeding.[6] Women who were encouraged by their perinatal care provider to breastfeed more frequently initiated breastfeeding.[7] According to WHO, breastfeeding should be encouraged for mothers with suspected or confirmed COVID-19.[2] Mothers should be reassured that the beneficial effects of breastfeeding greatly outweigh the dangers of transmission. None of the studies on the breast milk of women infected with Covid-19 to date has found the virus in the breast milk.[8,9] Whether they or their infants have suspected or confirmed COVID-19, WHO, UNICEF, RCPCH and PPA recommend rooming in with the practice of

*Department of Pediatric*
*Islamic International Medical College,*
*Riphah International University, Islamabad*

*Correspondence:*
*Dr. Saba Afzal Shaikh*
*Assistant Professor*
*Department of Pediatric*
*Islamic International Medical College,*
*Riphah International University, Islamabad*
*E-mail: saba.afzal@riphah.edu.pk*

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hygienic measures unless the mother is too unwell or the neonatal condition mandates intensive care.[10,11] Despite a thorough literature search, authors were unable to find any local studies on the knowledge of health care professionals on breastfeeding during COVID-19. In this study, in addition to paediatric residents' perception about basic concepts of breastfeeding, the authors also intended to find out their knowledge on breastfeeding recommendations in COVID-19 positive mothers.

## Materials and Methods

This cross-sectional, online survey was conducted at department of paediatrics, Islamic International Medical College/Riphah International University. Paediatric resident doctors were recruited from different training programs from teaching hospitals of twin cities of Islamabad/Rawalpindi over a period of 1 month. An online close-ended questionnaire comprising of 19 items related to perception, beliefs and knowledge about breastfeeding was designed & sent via email to the residents who agreed to participate in study. The questionnaire was validated by piloting. Study was approved by institutional review board of Riphah International University.

## Results

Out of 70, 63 participants responded with a 90% response rate. Majority (50%) of the participants belonged to the FCPS residency programme, 40% from MCPS and 10% from MD, as depicted in table-1. Most (38%) of them were from 2nd year of residency. All of the participants are of the view that breastfeeding is the ideal food for the baby & is cheaper with 87% agreeing that breastfed babies are healthier than formula-fed babies. 84% of the residents agreed to the fact that breastfeeding is more convenient than formula feeding and 36.5 % of residents believed that working mothers should bottle-feed their babies. There is no significant relationship between the year of residency to the knowledge of breastfeeding (p-value insignificant). Responses to questions linked to knowledge & perception of breastfeeding and formula feeding of Paediatric Residents are mentioned in Table-II and table-III. Knowledge and perception of the participants on breastfeeding amidst COVID 19 is shown in Table-IV.

**Table I: Distribution of Degree Program and Year of Residency (n=63)**

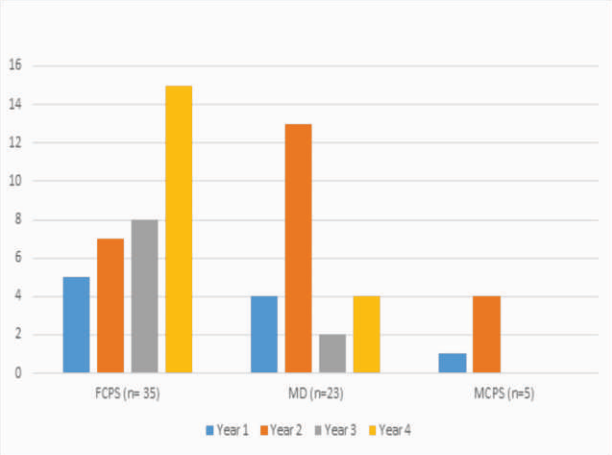


**Table II: Knowledge and Perception of Breastfeeding of Paediatric Residents (Total Responses=63)**

| S. No | Question | Agree | Neutral | Disagree |
|---|---|---|---|---|
| 1. | Exclusive breastfeeding should be extended for 6 months | 18 (28.6%) | 43 (68.3%`) | 2 (3.2%) |
| 2. | Breastfeeding increases mother-infant bonding. | 63 (100%) | --- | --- |
| 3. | Breast milk lacks iron. | 19 (30.2%) | 8 (12.7%) | 36 (57.1%) |
| 4. | The benefits of breastfeeding last only as long as the baby is breastfed. | 22 (34.9%) | 4 (6.3%) | 37 (58.7%) |
| 5. | Breastfed babies are more likely to be overfed than formula-fed babies. | 50 (7.4%) | 8 (12.7%) | 5 (7.9%) |
| 6. | Breast milk is more easily digested than formula milk. | 61 (96.8%) | 2 (3.2%) | 3 (4.8%) |
| 7. | Breastfeeding is more convenient than formula | 53 (84.1%) | 4 (6.3%) | 6 (9.5%) |
| 8. | Breast milk is cheaper than formula. | 63 (100%) | --- | ---- |

**Table III: Knowledge and Perception of formula feeding of Paediatric Residents (Total Responses=63)**

| S. No. | Questions | Agree | Neutral | Disagree |
|---|---|---|---|---|
| 1. | Formula feeding is more convenient than breastfeeding. | 10 (10%) | 6 (9.5%) | 47(76.6%) |
| 2. | Formula feeding is a better choice if the mother plans to go back to work. | 23 (36.5%) | 10(15.9%) | 30 (47.6%) |
| 3. | Mothers who formula feed their babies miss the great joys of motherhood. | 45 (71.4%) | 11 (17.5%) | 7 (11.1 %) |
| 4. | Formula milk is as healthy for an infant as breast milk. | 3 (4.8%) | 11 (17.5%) | 49 (77.8%) |

**Table IV: Knowledge and Perception of the Participants on Breastfeeding Amidst COVID 19 (Total Responses = 63)**

| S. No. | Questions | Agree | Neutral | Disagree |
|---|---|---|---|---|
| 1. | There is a risk if a baby is breastfed by a mother suffering from COVID-19. | 8 (12.7%) | 12 (19%) | 43 (68.3%) |
| 2. | Formula feeding is a safer option if a mother is confirmed to have COVID-19 | 14 (22.2%) | 15 (23.8%) | 34 (54%) |
| 3. | If a mother is symptomatic for COVID-19 she can continue breastfeeding her baby | 39 (61.9%) | 11 (17.5%) | 13 (20.6%) |
| 4. | If a mother is suspected case of COVID-19 she must continue breastfeeding her baby | 49 (77.8%) | 7 (11.1%) | 7 (11.1%) |
| 5. | If a mother is confirmed case of COVID-19 she must continue breastfeeding her baby | 43 (68.3%) | 11 (17.5%) | 9 (14.3%) |
| 6. | If a mother is confirmed case of COVID-19 she can continue breastfeeding her baby while observing SOPs | 55 (87.3%) | 5(7.9%) | 3 (4.8%) |
| 7. | If a mother is a confirmed case of COVID-19 she should isolate herself and give EBM (expressed breast milk) to the baby through a bottle | 37(58.7%) | 14(22.2%) | 12(19%) |
| 8. | If a mother is confirmed case of COVID-19, she should stop breastfeeding for at least 2 weeks | 7 (11.1%) | 10 (15.9%) | 46 (73%) |

Among all participants, 87.3 % were of the view that the mother can continue breastfeeding during active COVID-19 infection if she takes proper precautions and medications, while 7.9% were unsure of what to do in such a situation and 11 % had the opinion that breastfeeding is contraindicated in such mothers. Even though 58.7 % were of the view that such mothers can give expressed breast milk (EBM) to the baby, only 55% of the residents had the knowledge that breast milk protects against COVID 19.

## Discussion

This study explored paediatric resident's perception & attitudes about breastfeeding amidst pandemic Covid-19. Response rate in present study was greater (90%) as compared to 60%[12] & 75%[13] in international studies. The residents showed average knowledge about breastfeeding as is the case in the study on Spanish residents[12], although questions in both studies were different. ~~While~~ Studies conducted on Canadian Paediatric residents showed opposite results with most residents lacking knowledge about breastfeeding.[14,15]

All of the participants agreed that breast milk is an ideal and healthy food for a baby, with 75% of residents disagreeing that formula feeding is more convenient and cheaper than breastfeeding. This is in contrast to the study conducted by Al-Nassaj HH et al, in which only 57 % of the residents agreed that breast milk is an ideal and healthy food for a baby. [13]

50% of the residents agreed that working mothers should continue breastfeeding, which is similar to the results by Al-Nassaj HH et al.[13] Majority (68% )agreed that exclusive breastfeeding should be extended for 4-6 months.

In the present study, most of the residents agreed that breastfeeding should be given for the first 6 months, these results are similar to the results (92%) of a study conducted in Brazil on 89 healthcare professionals.[16] 57.2% of residents agreed that breast milk contains sufficient iron which is similar to the perception of the doctors in a study conducted by Shaw et al. [17]

Residents' responses to questions about COVID-19 infection and breastfeeding revealed significant discrepancies, indicating a lack of adequate knowledge. Similar results were obtained from a study conducted in India where only 54% of the participants have adequate knowledge amidst the pandemic.[18]In the present study, half of the residents agreed that breastfeeding is protective against COVID -19. 12.7 % agreed that there is a risk of infection to the baby if breastfed by a mother suffering from COVID-19, which is in contrast to the perception of doctors (85%) in a study carried out in India[18]. 87.3 % said that the mother can continue breastfeeding during active COVID-19 infection if she takes proper precautions and medications, a response far better than the response of the participants (47%) in the above-mentioned study.[18] Another study carried out in Nepal on healthcare professionals about knowledge regarding COVID 19 infection revealed that only 53.6% knew that infected mothers can breastfeed.[19] 58.7% of residents agreed that if a mother is confirmed case of COVID-19 she should isolate herself and give EBM (expressed breast milk) to the baby. 22.2% agreed that formula feeding is a safer option in such cases, while 74.6% of Indian doctors endorsed EBM & 12% formula milk for such infants.[18] There is no significant difference in the knowledge among various years of

residency.

This study showed that knowledge & perception of paediatric residents about breastfeeding during COVID 19 infection is average but there is still room for improvement. SARS-CoV-2 is a rapidly evolving infection and residents should have adequate knowledge about it so that they can manage and guide the parents accordingly.

The limitations of the study are a small sample size and the fact that only paediatric residents were included. Further studies with questions targetting technique & skills of breastfeeding as well as the inclusion of residents of Obstetrics/gynaecology need to be done to identify the gaps in Paediatric as well as obstetric residency to improve the training of future consultants, which will subsequently result in the promotion of breastfeeding.

## Conclusion

The participants' perceptions, beliefs, and breastfeeding knowledge are above average and acceptable but knowledge concerning breastfeeding in mothers who had COVID-19 infection is inadequate. The authors' recommendation is to have more emphasis on support & promotion of breastfeeding amidst Covid-19 in paediatric residency programs across Pakistan. Dedicated workshops and mandatory courses on breastfeeding during pandemic COVID-19 should be offered to the residents to address this inadequacy.

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### REFERENCES

1. Victora CG, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. Lancet. 2016;387:475–90.
2. World Health Organization. GUIDELINE Protecting, promoting and supporting BREASTFEEDING IN FACILITIES providing maternity and newborn services. Geneva; 2017 [cited 2021 Jul 12].
3. Breastfeeding and the Use of Human Milk. Pediatrics. 2012;129(3):e827–41.
4. Lee MK, Binns C. Breastfeeding and the Risk of Infant Illness in Asia: A Review. Int J Environ Res Public Health. 2020;17(1): 2-10
5. UNICEF. Pakistan (PAK) - Demographics, Health & Infant Mortality - UNICEF DATA [Internet]. [cited 2021 Jul 12]. Available from: https://data.unicef.org/country/pak/
6. Handa D, Schanler RJ. Role of the Pediatrician in Breastfeeding Management. Pediatr Clin North Am. 2013;60(1):1–10.
7. Lu MC, Lange L, Slusser W, Hamilton J, Halfon N. Provider encouragement of breast-feeding: Evidence from a national survey. Obstet Gynecol. 2001;97(2):290–5.
8. Zhu H, Wang L, Fang C, Peng S, Zhang L, Chang G, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. Transl Pediatr. 2020;9(1):51–60.
9. Chen Y, Peng H, Wang L, Zhao Y, Zeng L, Gao H, et al. Infants Born to Mothers With a New Coronavirus (COVID-19). Front Pediatr. 2020; 16: 8.
10. WHO EMRO | Breastfeeding advice during the COVID-19 outbreak | COVID-19 | Nutrition site [Internet]. Available from: http://www.emro.who.int/nutrition/covid-19/breastfeeding-advice-during-the-covid-19-outbreak.html
11. Wyckoff AS. Rooming-in, with precautions, now OK in revised AAP newborn guidance. AAP News. 2021 Jul 3.
12. Survey N, Breastfeeding ON, Amongst K. ORIGINAL NATIONAL SURVEY ON BREASTFEEDING KNOWLEDGE AMONGST Breastmilk supplies newborn infants with the specific compounds they need to grow and centres and among different health workers . The BFHI strategy ( Baby-friendly Hospitals Initiative ) promote. 2019;93:1–11.
13. Al-Nassaj HH, Al-Ward NJA, Al-Awqati NA. Knowledge, attitudes and sources of information on breastfeeding among medical professionals in Baghdad. East Mediterr Heal Journal. 2004;10(6):871–8.
14. Esselmont E, Moreau K, Aglipay M, Pound CM. Residents' breastfeeding knowledge, comfort, practices, and perceptions: Results of the Breastfeeding Resident Education Study (BRESt). BMC Pediatr. 2018;18(1):1–7.
15. Pound CM, Williams K, Grenon R, Aglipay M, Plint AC. Breastfeeding knowledge, confidence, beliefs, and attitudes of canadian physicians. J Hum Lact. 2014;30(3):298–309.
16. Silvestre P, Carvalhaes M. Breastfeeding knowledge and practice of health professionals in public health care services. SciELO Bras [Internet]. [cited 2021 Jul 12]; Available from: https://www.scielo.br/j/rlae/a/vTwKK5cX55Ddy3cQh3cNvfD/?format=pdf&lang=en
17. Shaw SC, Devgan A. Knowledge of breastfeeding practices in doctors and nurses: A questionnaire-based survey. Med Journal, Armed Forces India. 2018;74(3):217.
18. Malik S, Joshi P, Gupta PK, Sharma S. Assessment of knowledge and opinion regarding breastfeeding practices during COVID-19 pandemic among paediatricians and obstetricians in India: an online survey. Sudan J Paediatr. 2021;21(1):30.
19. Neupane HC, Shrestha N, Adhikari S, Angadi S, Shrestha BK, Gauli B. Knowledge of Health Care Professionals and Medical Students Regarding Covid-19 in a Tertiary Care Hospital in Nepal. J Nepal Med Assoc. 2020;58(227):480.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Bone Mineral Density and Its Relationship with Physical Activity, Dietary Behavior and Body Mass Index Among Rehabilitation Students

Sidra Ali Naqvi, Fouzia Batool, Hania Farheen, Faisal Saeed, Muhammad Ali, Sheikh Majid Hussain

**ABSTRACT**

**Objective:** To find out the relationship of Body Mass Index (BMI), dietary behavior and Physical Activity (PA) with Bone Mineral Density (BMD) in students of rehabilitation sciences.

**Study Design:** An analytical cross-sectional study.

**Place and Duration of Study:** It was conducted at Department of Rehabilitation Sciences, Shifa Tameer-e-Millat University, Islamabad, Pakistan within the duration of 4 months, from November 2019 to February 2020.

**Materials and Methods:** This study included a sample size of 157 participants recruited through non-probability convenient sampling. The students of rehabilitation sciences (males and females) of 18-25 years, who were independent in their activities of daily lives, were included, while those with any current or diagnosed medical condition, major surgery and students having any fracture or trauma were excluded. The physical activity was assessed using International Physical Activity Questionnaire-short form (IPAQ-SF), dietary behavior by Eating Attitude Test (EAT-26) and BMD by calcaneal ultrasound. Data analysis was done on SPSS version 21.

**Results:** The mean age of the participants was 21.22 ±1.80 years, including 27(17.20%) males and 130(82.80%) females. According to the outcome measures, most of the participants had normal BMI 92(58.6%), normal eating behavior 122(77.7%), moderate activity level 84(53.5%) and were osteopenic 95(60.5%). The spearman's correlation showed that there is a weak negative but significant relationship between BMI and BMD (r = -0.238, p= 0.003), also weak negative relationship between dietary behavior and BMD (r=-0.002, p= 0.978). The physical activity level and BMD levels have weak positive relationship, (r= 0.002, p= 0.984).

**Conclusion:** The result of this study suggest that the BMI has significant relationship with the bone mineral status, whereas the physical activity and eating attitudes do not contribute directly to bone mineral status.

**Key Words:** *Bone Mineral Density, Dietary Behaviour, Osteopenia, Osteoporosis, Physical Activity.*

## Introduction

In the childhood and at puberty, the bone density and the maximum bone strength and density has already been achieved by the age of 18-20 years when the peak bone mass (PBM) has been maximally accumulated, followed by reduction in bone mass with the passing time.[1]

It was generally believed that osteoporosis was a disease of older adults, but many former studies have pointed towards the relationship of low bone mineral density (BMD) in young age with the failure to achieve ideal peak mineral density (PMD) during childhood and pre-puberty age.[2] In Pakistan the Asian Audit (2009) revealed that about 40 million people were estimated to have osteopenia and number for osteoporosis being predicted to be ten million.[3] Current statistics has shown that Asians and Caucasians getting osteoporosis are at advanced risk.[4]

In relation to bone mineral density, body mass index is the one which is directly related to a person's physical fitness and is commonly associated with BMD in different anatomical regions, due to increased bone marrow adipocity.[5, 6] Second major factor in maintaining bone mass is the dietary behavior, in that regards, calcium and vitamin D play a very vital role along with magnesium, vitamin C & K also contribute to bone health.[7,8,9] The world statistics depict that there is an increased proportion of young adults that rely on unbalanced, low energy and nutritionally-deficient diet that lead to decrease in

*Department of Rehabilitation Sciences*
*Shifa Tameer-e-Millat University, Islamabad*
*Correspondence:*
*Dr. Sidra Ali Naqvi*
*Research Assistant*
*Department of Rehabilitation Sciences*
*Shifa Tameer-e-Millat University, Islamabad*
*E-mail: sidifa94@gmail.com*

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bone mass.[10] Lastly, the lack of physical activity in a person's life may lead to compromise in their physical fitness.[2] The strength of muscles and aerobic capacity are directly proportional to healthier bone mass. As stated by Wolf's Law; loading stress causes a modeling response, increasing bone mass and strengthening of bones.[11] From the above discussions and past literature, it has been depicted that the modifiable factors affecting bone health include body mass composition, physical activity and eating behavior.[1] Due to the prevailing sedentary lifestyle and decrease physical activity in the young adults, the bone mineral density may be affected. There have been numerous studies conducted on the bone health in the old adult population, but limited data is available on young adults. As rehabilitation students must treat the patient physically in future, so they must have good body mass index, balanced diet and physical activity. Therefore, a study was planned with an objective to find out the relationship of body mass index, dietary behaviour, and physical activity with bone mineral density in students of rehabilitation sciences.

## Materials and Methods

It was a cross sectional analytical study conducted at Department of Rehabilitation Sciences, Shifa Tameer-e-Millat University Islamabad, Pakistan from November 2019 to February 2020. Rao software calculator was used to the calculate the sample size with confidence interval level 95%, margin of error 5% and while assuming the students of rehabilitation sciences to be 3000 in the twin cities of Pakistan, which came to be 341. While in this study data was collected from 157 participants using nonprobability convenient sampling due to low response rate. The approval was taken from Institutional Review Board and Ethics Committee (IRB & EC) Shifa International Hospital & Shifa Tameer-e-Millat University Islamabad, Pakistan (Ref: IRB#073-563-2019 received on 13th November 2019). Students (males and females) of 18-25 years, who were independent in their activities of daily lives, were included, while students with any current or diagnosed medical condition, major surgery and those having any fracture or trauma were excluded. The data collection was done by manual distribution of self-administered questionnaire in booklet form among the students. The questions were structured in English language. In addition, informed consent was attached with each questionnaire. The participants who were a part of the study had right to withdraw at any time during the study. The participants were informed that their confidentiality would be preserved, and no physical, psychological, and emotional harm is intended.

Demographic information was collected using self-constructed questionnaire which included age, gender, marital status, BMI (height in $m^2$ and weight in kg). International physical activity questionnaire-short-form was used to record the level of physical activity in students which is a reliable and valid tool.[12,13] Eating Attitude Test-26 questionnaire was used to assess the eating pattern in the undergraduate students.[14] EAT-26 has reliable internal consistency (cronbach's alpha = 0.822–0.922), test–retest reliability (interclass correlation coefficient = 0.817) and convergent validity (r = 0.450–0.750).[14] Sonsot-3000 machine was used to check the BMD at the level of calcaneus. It is used previously in various studies and has been proven to be very reliable.[1,15] T-scores were noted for each participant. T-values had three categories where T> -1.0 was considered normal, between 2.5 to -1.0 was considered osteopenia and T =< -2.5 was osteoporotic.[1,15]

Data was entered and analyzed using SPSS 21. The descriptive analysis was reported as frequency, percentage and mean for age, dietary behavior, physical activity level and BMD. Shapiro-wilk test showed $p<0.05$ representing that data was not normally distributed, therefore spearmen correlation test was used to find the relationship of BMI with BMD, PA and dietary behavior. The level of significance was taken as $P<0.05$

## Results

Out of 157 participants, 27(17.20%) were males and 130(82.80%) were females. The mean age of the participants was 21.22 ± 1.80years. Majority of the participants were in the normal category of BMI 92 (58.6%), followed by underweight 33(21%), overweight 26(16.6%) and obese 6(3.8%). According to EAT-26, 122(77.7%) participants showed normal eating behaviour while 35(22.3%) showed abnormal eating pattern. As stated by IPAQ-SF results, 24(15.3%) showed vigorous activity levels, 84(53.5%) showed moderate activity level and 49(31.2%)

showed low activity levels. Whereas, on the BMD scan 56(35.7%) participants were found to have normal bone mineral density, 95(60.5%) were osteopenic and 6(3.8%) were osteoporotic. Mean and Standard Deviation of age, BMI, dietary behaviour, PA, and BMD. (Table I)

BMI showed a significant ($p<0.05$) relationship with BMD, while dietary behaviour and physical activity showed a non-significant ($p<0.05$) relationship with BMD respectively. (Table II)

**Table I: Mean and Standard Deviation of Age, Body Mass Index, Dietary Behavior, Physical Activity and Bone Mineral Density**

| Variables | Mean ± S. D |
|---|---|
| Age (years) | 21.22 ± 1.80 |
| BMI ($Kg/m^2$) | 21.92 ± 3.89 |
| Dietary Behaviour | 13.24 ± 9.15 |
| Physical Activity Level (METs) | 1661.60 ± 1867.74 |
| BMD Level ($g/cm^2$) | -1.28 ± 0.75 |

**Table II: Correlation of Body Mass Index, Dietary Behaviour and Physical Activity on Bone Mineral Density**

| | | BMD Level |
|---|---|---|
| BMI | r-value | -0.238 |
| | p value | 0.003 |
| Dietary Behaviour (EAT-26) | r-value | -0.002 |
| | p value | 0.978 |
| Physical Activity (IPAQ-SF) | r- value | +0.002 |
| | p value | 0.984 |

## Discussion

Analysis of the study showed that BMI had a negative, weak, and significant relationship with BMD, proving that body mass of an individual is an important predictor of bone mineral which is consistent with previous study of Hee-Sook Lim et al. that concluded body fat and consumption of fats had a negative correlation with bone mineral status.[16]

According to the studies conducted by Hervàs et al. and Ho-Pham et al. showed that lean bone mass had greater effect on BMD than higher BMI and also that lean bone mass was related with greater BMD in adults due to the combined effect of mechanical loading and biochemical actions.[1, 17] The study of Iwaniec and his colleague Turner, also concluded that higher body weight can increase mechanical loading on bone, altering its microarchitecture but it also has the potential to increase the amount of atypical loading on the bone, which in turn can increase the risk of fracture.[18] Hence, the findings of these three studies are in par with the results of this present study, supporting the fact that lower BMI has beneficial effects on bone mineral density of young adults.

There was a negative and insignificant relationship between the eating attitude and BMD inferred that the higher score of the EAT-26 (eating disorder attitude), the lower will be the BMD. Although most of the respondents i.e., 122(77.7%) in this study were classified as normal, asymptomatic, or free of problem, while 35(22.3%) had a risk of developing eating disorders. Work of Bennell et al. indicated that the abnormal dietary behaviours can cause amenorrhea, low BMD, or maximised risk of stress fracture. Thereby, this was in line with the past studies that examined eating attitude disorders with the bone mineral density and concluded that the bad eating behaviour is basically the reason for low BMD and is closely related to an increase in endogenous cortisol production and decrease in BMD.[15]

On the other hand, the results of this study showed that the physical activity had a weak positive relationship with BMD. Kopiczko et al. concluded that physical activity has the most significant effect on bone status especially.[19] This statement is consistent with the study findings proving that physical activity does have impact on bone mineral density. The lack of significant relationship between PA and BMD in the present study might be due to the difference in the level, duration and type of activity performed by the participants and that the sample size was not large. Furthermore, majority of the participants who had moderate level of activity, reported walking being the most common activity of their daily life and that it was not habitual (not performed regularly) and non-continuous (consisted of large rest bouts). Furthermore, such activity did not challenge the body's skeletal system to initiate an adaptive response in the bones to enhance BMD. Evidence suggests that the resistance exercises which produce forces on bone tissue led to its proper development. High-intensity power training has shown to provide significant improvement for the hip, trochanter, and lumbar spine BMD.[19] This has been supported by the

study of Kim et al. which showed no association between moderate intensity PA and BMD in women.[20]

## Limitations and Recommendations of Study

In this study, we were unable to reach the estimated sample size due to low response rate so future studies should be conducted with a larger sample size. Further, the objective way of assessing the physical activity of the participants should be considered. The study will help the clinicians to plan programs that can help in primary preventions for bone disorders for the university students. This study recommends that BMI is important for students of rehabilitation sciences, to prevent Osteopenia and Osteoporosis, therefore, students should be guided through lectures/ seminars about its importance in their well-being.

## Conclusion

It is concluded that the BMI has significant relationship with the bone mineral status, whereas the physical activity and eating attitudes do not contribute directly to bone mineral status among students of rehabilitation sciences.

### REFERENCES

1. Hervás G, Ruiz-Litago F, Irazusta J, Fernández-Atutxa A, Fraile-Bermúdez AB, Zarrazquin I. Physical activity, physical fitness, body composition, and nutrition are associated with bone status in university students. Nutrients. 2018;10(1): 61.
2. Lim H-S, Ji S-I, Hwang H, Kang J, Park Y-H, Lee H-H, et al. Relationship between bone density, eating habit, and nutritional intake in college students. Journal of bone metabolism. 2018;25(3):181-6.
3. Jalal S, Younis MZ. Aging and elderly in Pakistan. Ageing International. 2014;39(1):4-12.
4. Kruger MC, Todd JM, Schollum LM, Kuhn-Sherlock B, McLean DW, Wylie K. Bone health comparison in seven Asian countries using calcaneal ultrasound. BMC musculoskeletal disorders. 2013;14(1):81.
5. Hars M, Trombetti A. Body composition assessment in the prediction of osteoporotic fractures. Current Opinion in Rheumatology. 2017;29(4):394-401.
6. Moradi S, Mirzaei K, Abdurahman A, Keshavarz S. Adipokines may mediate the relationship between resting metabolic rates and bone mineral densities in obese women. Osteoporosis International. 2017;28(5):1619-29.
7. Karpiński M, Popko J, Maresz K, Badmaev V, Stohs SJ. Roles of vitamins D and K, nutrition, and lifestyle in low-energy bone fractures in children and young adults. Journal of the American College of Nutrition. 2017;36(5):399-412.
8. Kunutsor SK, Whitehouse MR, Blom AW, Laukkanen JA. Low serum magnesium levels are associated with increased risk of fractures: a long-term prospective cohort study. European journal of epidemiology. 2017;32(7):593-603.
9. Wang C, Cao X, Zhang Y. A novel bioactive osteogenesis scaffold delivers ascorbic acid, β-glycerophosphate, and dexamethasone in vivo to promote bone regeneration. Oncotarget. 2017;8(19):31612-25.
10. Moreno LA, Gottrand F, Huybrechts I, Ruiz JR, González-Gross M, DeHenauw S, et al. Nutrition and lifestyle in european adolescents: the HELENA (Healthy Lifestyle in Europe by Nutrition in Adolescence) study. Advances in Nutrition. 2014;5(5):615S-23S.
11. Chen J-H, Liu C, You L, Simmons CA. Boning up on Wolff's Law: mechanical regulation of the cells that make and maintain bone. Journal of biomechanics. 2010;43(1):108-18.
12. Murphy JJ, Murphy MH, MacDonncha C, Murphy N, Nevill AM, Woods CB. Validity and reliability of three self-report instruments for assessing attainment of physical activity guidelines in university students. Measurement in Physical Education and Exercise Science. 2017;21(3):134-41.
13. Tran VD, Do VV, Pham NM, Nguyen CT, Xuong NT, Jancey J, et al. Validity of the international physical activity questionnaire–short form for application in Asian countries: a study in Vietnam. Evaluation & the health professions. 2020;43(2):105-9.
14. Gómez-Bruton A, Matute-Llorente A, González-Agüero A, Casajús JA, Vicente-Rodríguez G. Plyometric exercise and bone health in children and adolescents: a systematic review. World Journal of Pediatrics. 2017;13(2):112-21.
15. Dev RO, Henry E. Effects of body mass index (BMI), eating attitude and physical activity on bone health among undergraduate students in Malaysia. International E-Journal of Advances in Social Sciences. 2016;2(5):591-7.
16. Lim J-H, Bae H-S, Lee S-M, Ahn H-S. Dietary and non-dietary factors related to bone mineral density in female college students. Korean Journal of Community Nutrition. 2008;13(3):418-25.p
17. Ho-Pham LT, Nguyen UD, Nguyen TV. Association between lean mass, fat mass, and bone mineral density: a meta-analysis. The Journal of Clinical Endocrinology & Metabolism. 2014;99(1):30-8.
18. Iwaniec UT, Turner RT. Influence of body weight on bone mass, architecture and turnover. Journal of Endocrinology. 2016;230(3):R115-R30.
19. Kopiczko A, Łopuszańska-Dawid M, Gryko K. Bone mineral density in young adults: the influence of vitamin D status, biochemical indicators, physical activity and body composition. Archives of osteoporosis. 2020;15(1):1-9.
20. Kim YA, Lee Y, Lee JH, Seo JH. Effects of physical activity on bone mineral density in older adults: Korea National Health and Nutrition Examination Survey, 2008–2011. Archives of osteoporosis. 2019;14(1):1-10.

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The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Frequency of Temporomandibular Joint Disorders (TMDS) Among University Students from Islamabad, Pakistan

Mohsin Fazal, Nimrah Umair, Fahad Masud, Syeda Ayesha Absar Hussain, Muhammad Talha Ashfaq, Usman Khan

**ABSTRACT**

**Objective**: To determine the frequency of temporomandibular disorders (TMDs) among 18- to 24-year-old university students of Islamabad.

**Study Design:** Descriptive cross-sectional study.

**Place and Duration of Study**: Sample was chosen from Quaid e Azam University, Bahria University and Riphah International University. Duration of the study was from January to March 2020.

**Materials and Methods**: The study comprised of 160 candidates from various universities in Islamabad including both males and females aged 18 to 24 years. Data was collected using a self-reported questionnaire and clinical examination. Age, gender, socio-economic status, and history of symptoms of TMDs were assessed. Clinical examination of the Temporomandibular Joint was carried out by the investigator to assess any clicking sounds, tenderness in the myofascial muscles and any evidence of osteoarthritis. The data was analyzed by using IBM SPSS 23. The results and frequencies were calculated using the Chi-Squared test. With a p value of <0.05, a significant relationship of TMD with gender and its clinical conditions, was determined.

**Results**: Out of the 160 examined, 88 were males and 72 were females. TMDs were more prevalent amongst candidates aged 22 years, with a percentage of 31.3%. Prevalence of TMDs among the participants was calculated at 61.3%. Out of those 61.3%, 58.1% had internal derangements 15% had myofascial pain and 2.5% had osteoarthritis.

**Conclusion**: Our study shows a high prevalence of TMDs in 18- to 24-year-old individuals. There was an overall prevalence of 61.3% among the total participants. It was found to be most prevalent among 22-year-old individuals with a percentage of 31.3%.

**Key Words:** *Internal Derangement, Myofascial Pain, Osteoarthritis, Temporomandibular Joint Disorders.*

## Introduction

Temporomandibular disorders (TMD) are disorders of the jaw muscles, temporomandibular joint (TMJ) and the nerves associated with chronic facial pain. Anything that prevents the complex system of muscles, bones and joints from working together in harmony may result in disharmony and temporomandibular disorder (TMD).[1] Etiology and pathogenesis of TMD is poorly understood, therefore treatment of temporomandibular joint diseases is sometimes difficult but it is thought to be multifactorial.[2] Different etiological factors of TMD documented in the literature are psychological factors such as personality and behavior, occlusal discrepancies, improper dental treatment, joint laxity, continuous micro trauma to joint, overloading/overusing joint structures, and parafunctional habits. Stress, behavioral, social, and emotional conditions are also considered[3]. Common symptoms include jaw tenderness, headaches, earaches and facial pain[4]. The symptoms vary greatly with the classification of TMDs. The classification of TMDs by Okeson P. Jeffrey, which is based on the management and diagnosis of TMJ disorders, is divided into three clinical conditions i.e., 1. Degenerative Joint disease, 2. Myofascial pain.[3] Internal derangement.[5] One or more of these conditions can prevail at the same time in an individual. The investigators of our research had a set of symptoms documented on the questionnaire with respect to each condition. The degenerative joint disease included osteoarthritis and rheumatoid arthritis in the temporomandibular joint (TMJ). Myofascial pain included pain in the fascia covering

*Department of Oral and Maxillofacial Surgery*
*Islamic International Dental College, Islamabad*
*Correspondence:*
*Dr. Syeda Ayesha Absar Hussain*
*Demonstrator,*
*Department of Oral and Maxillofacial Surgery*
*Islamic International Dental College, Islamabad*
*E-mail: ayesha.absar@gmail.com*
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the muscles that control the normal functions of jaw, neck, and shoulders. Internal derangement included a dislocated jaw, disk displacement or an injured condyle.[1]

TMDs are commonly found among individuals from 20 to 40 years of age but it is also reported in the younger population as well.[6] A systematic review has investigated the prevalence of TMDs among the general population, using the diagnostic criteria 'DC/TMD', which is recognized worldwide.[7, 8] Emerging studies regarding genetics and hormones have shown evidence of TMDs more prevalent in women than in men.[6] TMDs are prevalent in around 31% of adults/elderly people and 11% of children/adolescents. Furthermore, most common TMD is disc displacement with reduction, accounting for roughly 26% of adults/elders and 7.5 percent of children/adolescents.[9, 10] In recent years, a lot of youngsters are presenting with the complaint of headache and jaw pains in dental hospitals. These are mostly found to be associated with TMD which often times gets overlooked. Since TMDs are a degenerative condition that exacerbates over time, early detection and management are extremely important.[1,2,11,12]

In a survey of university students, temporomandibular joint disorders were shown to be widespread among university going students.[13] These students usually fall under the age range of 18 to 24 years old in most undergraduate universities. During the course of their undergraduate studies, students face all sorts of academic stresses and social pressures that lead to the development of certain parafunctional habits like bruxism, clenching etc. resulting in one of the three clinical conditions of TMDs.[8] In this cross-sectional study, the authors investigated the prevalence of TMDs among university going individuals aged 18 to 24. Prevalence of the most common condition of TMD was also assessed among those individuals. Incidence of the most common signs and symptoms was also assessed based on respective conditions of TMDs.

Most health care professionals receive minimal or no training in diagnosis of TMDs and have difficulty in distinguishing the pain associated with TMD and pain originating from surrounding structures, due to which it goes undetected in most individuals. Several researches have reported the misdiagnosis of severe pain due to TMDs with migraines, neck-ache, musculoskeletal pain due to other reasons[14]. The aim of this study was to take TMDs into account as a public health issue since it was an under-reported condition among students. Our objective was to highlight Orofacial pain disorder as a disease for its early detection and management as it effects the quality of an individual's life.

## Materials and Methods

A descriptive cross-sectional study was conducted in three institutions of Islamabad, namely 'Quaid e Azam University', 'Bahria University' and 'Riphah International University'. Students from these three institutions were sampled for our study. Duration of the study was from January to March 2020.

A total of 160 participants were examined and given self-reported questionnaires to fill out. The sample size was calculated using the WHO calculator, confidence level=95%, confidence interval 5%, population=infinite and population proportion=10%. This generated a sample size of 130.[15] The data collection was carried out from 1st January 2020 to 14th March 2020. During the survey, the students were explained the terminologies and an informed consent was taken with the assurance that the privacy of their information would be maintained. The study was permitted by the institution's ethical review committee (Ref. No. IIDC/IRC/2 0211007 1008).

Inclusion criteria for our study was university students from age 18 to 24 years. Their age was verified through university identity cards. Our study included university students aged 18 to 24. Data was collected using a self-reported questionnaires and physical examination of the temporomandibular joints was carried out. The physical examination by the investigators comprised of palpation of the TMJ on mouth closing and opening, to assess the presence of any crepitation or clicking. Furthermore, the muscles of mastication were palpated to assess any tenderness that might be present due to undiagnosed TMDs. The participants were then interviewed and asked about their symptoms relating to temporomandibular disorders.

Our self-reported questionnaire was adapted from the 'DC/TMD' criteria[7,8] It consisted of five parts. The first part comprised history of the participant

including demographic details and socio-economic status. The second part consisted of causative factors such as depression, anxiety, arthritis, stress plus symptoms such as headaches and earaches. Any significant previous dental treatment linked to the TMJ, was also recorded for example prior orthodontic treatment or third molar extractions. Presence of osteoarthritis was assessed in the third part of the questionnaire. Symptoms like pain in the jaw, pre-auricular area, jaw lock, limited mouth opening and headaches in the temple areas were evaluated. For those presenting with any of the above symptoms, were to identify the aggravating factors such as chewing hard food and parafunctional habits such as clenching and grinding of teeth. In the fourth part, internal derangements within the TMJ, which presents as opening and closing jaw clicking in both TMJs and crepitation, was mentioned. This was assessed through palpation and auscultation of the joints by the investigator. The fifth and final part of the form was to evaluate myofascial pain through palpation of the muscles of mastication and muscles of the neck.

SPSS 23 software was used to analyze the data. For each variable, the frequency and percentages were determined. Chi-square test was used to compare factors such as TMD signs and symptoms among age groups, genders, and clinical situations. *P* value less than 0.05 was taken statistically significant.

## Results

A total of 160 participants were included in the study who filled questionnaires. They were interviewed and examined. These 160 participants were between the age ranges of 18 to 24. Individuals younger than 18 and older than 24 were not included in the study. All the participants were healthy, and their socioeconomic status was assessed based on the level of income as chosen by participants in the questionnaire. Individuals were informed that the questionnaires would be kept confidential, to avoid any bias in their selection of income level.

Out of 160 participants, 88(55%) were males and 72(45%) were females. 98 participants out of 160 were found to be positive for having one of the TMDs. Among the TMD positive 98 participants, 45(46%) were males and 53(54%) were females. Thus, an overall 61.3% prevalence rate was found.

We found a statistically significant relationship between gender and the presence of TMDs with a p-value of 0.005.

**Table I: Prevalence of TMDS Amongst Different Genders**

| Gender | Yes | No | Total |
|---|---|---|---|
| **Females** | 53 | 19 | 72 |
| **Males** | 45 | 43 | 88 |
| **Total** | 98 | 62 | 160 |

A generalized prevalence of TMDs was assessed in a manner of present or absent status in the participants.

Our participants were also assessed for the type of TMDs present via manual examination by the researchers and the signs and symptoms marked by the participants in the questionnaires.

**Table II: Prevalence of The Various Types of TMDS Amongst Participants**

| TMJ Disorder | Frequency | Percentage |
|---|---|---|
| Internal Derangement | 70 | 71.4% |
| TMPDS | 5 | 5.1% |
| Osteoarthritis | 0 | 0 % |
| ID and OA | 3 | 3% |
| ID and TMPDS | 19 | 19% |
| All | 1 | 1.02 % |

Table II shows that out of the three clinical conditions of TMDs, 70(71.4%) individuals had internal derangement only, 5(5.1%) had TMPDS only and 3(3.06%) individuals had both internal derangement and osteoarthritis. 19(19.3%) individuals had both internal derangement and TMPDS and only 1(1.02%) individual had all three conditions.

Furthermore, about 48.9% of people who had TMD were found to have a click on mouth opening after examination. 78.5% of TMD positive subjects showed a click on closing. And 25% of these subjects manifested crepitation.

Assessment of other variables was also conducted via questionnaire like depression, arthritis, periodontal disease, headaches, migraines, neck ache, earache, stressful work environment, marital problems, trouble sleeping and shoulder pain etc. Despite depression being the most frequent variable found in our study population and marital problems being the closest (0.6) to statistically significant value (0.005), the results did not show a statistically significant relationship with any of these variables. Other variables related to oral and maxillofacial aspect included orthodontic treatment, jaw trauma, parafunctional habits, wisdom tooth extraction,

previous treatment for TMPDS and dental treatment. Dental treatment was found to be the most frequent variable among the oral and maxillofacial factors, giving a percentage of 30% among TMD positive individuals, yet not statistically significant.

Examination and history of TMPDS included pain in (jaw, temple, in the ear, in front of ear), limitation in function (jaw closing, ability to eat), jaw lock, jaw stiffness, clicking sounds, headache in temple areas, pain on chewing hard or tough food, side to side pain, pain on opening of mouth, on parafunctional jaw habits (clenching, grinding, pen chewing, chewing gum) and pain on yawning or while talking. None of these had a statistically significant relationship with TMPDS either.

Lastly, investigators examined the muscles of mastication and neck manually. Among all the muscles examined (masseter, temporalis, medial pterygoid, lateral pterygoid, anterior neck, posterior neck, and sternocleidomastoid), temporalis was the most common muscle found tender on palpation i.e. 14.4%.

Since our research focused on a specific range of age of individuals, a prevalence of TMDs was also found with respect to age. Table III shows that the mean age of the participants was 21 years in the age group of 18- to 24-year-olds. TMD was found to be most prevalent in 22-year-olds followed by 21-year-olds and then 20 year old.

**Table III: Prevalence of TMDS Amongst 18- To 24-Year-Old Participants**

| Age | TMD | | Total |
|---|---|---|---|
| | Yes | No | |
| 18 | 5 | 2 | 7 |
| 19 | 8 | 4 | 12 |
| 20 | 14 | 7 | 21 |
| 21 | 23 | 17 | 40 |
| 22 | 37 | 13 | 50 |
| 23 | 7 | 12 | 19 |
| 24 | 4 | 7 | 11 |
| Total | 98 | 62 | 160 |

## Discussion

Our study revealed that more than half of the total participants had TMD symptoms. This is in line with findings from the College of Medicine and Medical Sciences at Holy Spirit University of Kaslik (USEK) in Jounieh, Lebanon, which revealed that a similar number of patients in a clinic sample had TMDs[8].

In order of prevalence, headache, temporal pain, and clicking were observed to be the most common symptoms. A previous study conducted at Abdul Wali Khan University in Mardan observed headache to be the most common symptom as these findings were found to be in line with our study[15]. However, a study by Okeson et al. revealed clicking to be the most common symptom[5, 15]. It is likely that students mix up ear issues and TMD symptoms since it is easier to say "earache" compared to "joint discomfort." This is further supported by the fact that otolaryngologists examined 50% of TMD patients from the Lebanese and Italian subpopulations[16], which is the reason why our study also aimed at its awareness so that its findings can guide in the diagnosis, prevention, and treatment of TMDs by respective specialists. Our study further revealed that the female subgroup showed a higher prevalence of TMPDS than their male counterparts. This is supported by similar results observed in a study at Qassim University[17]. The findings of the present study also showed similar results in the presence of TMD symptoms between the two genders. Furthermore, the subgroup of students who had previous dental treatments showed the highest prevalence of TMPDS. The most common sign on examination was the clicking sound on the closing of the jaw followed by a clicking sound on opening and crepitation. Almost half of the people who had TMD were found to have a click upon mouth opening during the examination. More than half of TMD-positive subjects revealed clicking upon mouth closing, and a quarter of these subjects experienced crepitation. Our study observed that out of seven muscles that we examined, the temporalis muscle was the most affected muscle in TMDs patients, with the masseter being the second most common. According to research, TMD affects the jaw elevator muscles, such as the temporalis and masseter muscles.[18] Another correlation derived from our study was depression and stress as aggravating and risk factors for TMDs. Out of the 46 individuals who claimed to be subject to stress and depression, more than half of them exhibited signs and symptoms of TMDs. This result was in line with a study conducted at the Mayo Hospital, Pakistan, that investigated the correlation between depression and TMDs.[19] Finally, a study conducted in China investigated the frequency of TMDs amongst medical students and

the psychological risk factors associated with it. Their study found a high frequency of TMDs (31.7%) amongst the participants, this result is in line with our findings as our study also demonstrated a high prevalence of TMDs with psychological influences as possible risk factors.[20]

Despite positive findings there were some limitations to our study. Firstly, our study only included 18- to 24-year-old individuals, hence leaving out a big portion of the younger generation. Secondly, we could not examine the subjects in a clinical setting with radiographic aids, which would have proved to be far more accurate and reliable. To accurately assess the correlation between stress and depression with TMDs, subjects diagnosed with stress and depression could be added to the study. Furthermore, our study does not reveal the future implications of TMDs since the study was cross-sectional. Future longitudinal studies should be conducted to include a wider range of youth, to reveal the true impact of undiagnosed TMDs. Moreover, if ignored at an early age, TMDs aggravate and can consequently affect the quality of life of an individual. Our study hopes to aid and encourage further research on this topic, to diagnose, prevent, and treat these disorders timely and to spread awareness regarding these conditions. Moreover, future studies should be conducted with a proportionate number of male and female participants to maximize the accuracy of the results.

In conclusion, among all the variables assessed i.e type of TMD, gender, age, environmental and dental factors, the only statistically significant relationship found between a variable and its effect on presence or absence of TMDs, was gender. It is accepted that TMD symptoms are more common in females.[21,22]

## Conclusion

Our study shows a high prevalence of TMDs in 18 to 24 year old individuals. There was an overall prevalence of 61.3% among the total participants. It was found to be most prevalent among 22-year-old individuals with a percentage of 31.3%.

## REFERENCES

1. Ferneini EM. Temporomandibular Joint Disorders (TMD). Journal of Oral and Maxillofacial Surgery. 2021;79(10):2171-2.
2. Chisnoiu AM, Picos AM, Popa S, Chisnoiu PD, Lascu L, Picos A, et al. Factors involved in the etiology of temporomandibular disorders-a literature review. Clujul medical. 2015;88(4):473.
3. Ahuja V, Ranjan V, Passi D, Jaiswal R. Study of stress-induced temporomandibular disorders among dental students: An institutional study. National journal of maxillofacial surgery. 2018;9(2):147.
4. Research NIoDaC. Health Info , TMD (Temporomandibular Disorders). 2022.
5. Okeson JP. Management of temporomandibular disorders and occlusion-E-book: Elsevier Health Sciences; 2019.
6. Harrison AL, Thorp JN, Ritzline PD. A proposed diagnostic classification of patients with temporomandibular disorders: implications for physical therapists. journal of orthopaedic & sports physical therapy. 2014;44(3):182-97.
7. Srivastava KC, Shrivastava D, Khan ZA, Nagarajappa AK, Mousa MA, Hamza MO, et al. Evaluation of temporomandibular disorders among dental students of Saudi Arabia using Diagnostic Criteria for Temporomandibular Disorders (DC/TMD): a cross-sectional study. BMC Oral Health. 2021;21(1):1-11.
8. Kmeid E, Nacouzi M, Hallit S, Rohayem Z. Prevalence of temporomandibular joint disorder in the Lebanese population, and its association with depression, anxiety, and stress. Head & face medicine. 2020;16(1):1-11.
9. Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet J-P, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. Journal of oral & facial pain and headache. 2014;28(1):6.
10. Rongo R, Ekberg E, Nilsson IM, Al-Khotani A, Alstergren P, Conti PCR, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for children and adolescents: An international Delphi study—Part 1-Development of Axis I. Journal of Oral Rehabilitation. 2021;48(7):836-45.
11. Habib SR, Al Rifaiy MQ, Awan KH, Alsaif A, Alshalan A, Altokais Y. Prevalence and severity of temporomandibular disorders among university students in Riyadh. The Saudi dental journal. 2015;27(3):125-30.
12. Chandak RM, Pandhripande RM, Sonule SS, Chandak MG, Rawlani SS. To assess the prevalence of signs and symptoms of temporomandibular disorders in Vidarbha population by Fonseca's questionnaire. Journal of Oral Research and Review. 2017;9(2):62.
13. Karthik R, Hafila MF, Saravanan C, Vivek N, Priyadarsini P, Ashwath B. Assessing prevalence of temporomandibular disorders among university students: a questionnaire study. Journal of International Society of Preventive & Community Dentistry. 2017;7(Suppl 1):S24.
14. Ashraf J, Zaproudina N, Suominen AL, Sipilä K, Närhi M, Saxlin T. Association between temporomandibular disorders pain and migraine: results of the health 2000 Survey. J Oral Facial Pain Headache. 2019;33(4):399-407.
15. Khan M, Khan A, Hussain U. PREVALENCE OF TEMPOROMANDIBULAR DYSFUNCTION (TMD) AMONG UNIVERSITY STUDENTS. Pakistan Oral & Dental Journal. 2015;35(3).
16. Abou-Atme YS, Zawawi KH, Melis M. Prevalence, intensity,

and correlation of different TMJ symptoms in Lebanese and Italian subpopulations. J Contemp Dent Pract. 2006;7(4):71-8.
17. Alfawzan AA. An assessment of the prevalence and severity of temporomandibular disorders among undergraduate dental students at Qassim University. World J Dent. 2020;11(2):134-8.
18. Garip H, Tufekcioglu S, Kaya E. Changes in the temporomandibular joint disc and temporal and masseter muscles secondary to bruxism in Turkish patients. Saudi medical journal. 2018;39(1):81.
19. Riaz N. Level of depression in temporomandibular disorder patients. JPDA. 2018;27(03):100.
20. Wu J, Huang Z, Chen Y, Chen Y, Pan Z, Gu Y. Temporomandibular disorders among medical students in China: prevalence, biological and psychological risk factors. BMC oral health. 2021;21(1):1-8.
21. Conti PCA, Ferreira PM, Pegoraro LF, Conti JV, Salvador MC. A cross-sectional study of prevalence and etiology of signs and symptoms of temporomandibular disorders in high school and university students. Journal of orofacial pain. 1996;10(3).
22. Poveda Roda R, Bagán JV, Díaz Fernández JM, Hernández Bazán S, Jiménez Soriano Y. Review of temporomandibular joint pathology: Part I: Classification, epidemiology and risk factors. Medicina Oral, Patología Oral y Cirugía Bucal (Internet). 2007;12(4):292-8.

**CONFLICT OF INTEREST**

Authors declared no conflicts of Interest.

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Authors have declared no specific grant for this research from any funding agency in public, commercial or nonprofit sector.

**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Patient Satisfaction and Difficulties Encountered with Telemedicine During COVID-19 Pandemic

Muhammad Ashraf[1], Faryal Shoaib[2], Hashaam Ghafoor[3], Alishba Ashraf Khan[4]

**ABSTRACT**

**Objective**: To assess patient satisfaction with telemedicine services. To find out the difficulties encountered by patients with telemedicine. To assess whether telemedicine services can be continued in future.

**Study Design**: Cross sectional survey.

**Place and Duration of Study:** The study was conducted at Shifa International Hospital, Islamabad from July 1, 2020, to September 30, 2020.

**Materials and Methods**: It was a cross-sectional survey in which two hundred patients were interviewed at the end of tele-consultation according to a proforma after taking informed consent and using non-probability consecutive sampling technique. Data was analyzed using SPSS version 22.

**Results**: Among 200 patients, 61.5% were males and 38.5% were females and the mean age was 43.45 $\pm$ 11.964 years. 73.5% patients used telemedicine for the first time and 52.0% patients used this service for consultation regarding fever and COVID-19 suspected symptoms. Among these patients, only 6.5% could not clearly hear the voice of doctor during consultation, 6.5% could not clearly see the picture of doctor on screen. 56.5% patients agreed and 42.0% strongly agreed that telemedicine saves their time, expenditure and prevents the discomfort of travelling to hospital**.** Most patients (60.5%) were satisfied with the telemedicine services offered. Majority of patients (81.0%) reported that they will recommend telemedicine to others and will use it even after the COVID-19 pandemic.

**Conclusion**: Study concluded that overall satisfaction level of patients with telemedicine was high. Audio visual connection problems were found in a small percentage of patients. Participants were willing to use this service even after the COVID-19 pandemic and they would recommend others to use telemedicine.

**Key Words:** *COVID-19, Patient Satisfaction, Pandemic, Telemedicine.*

## Introduction

In response to difficult time of COVID-19, health care systems need paradigm shift, otherwise technology was still advanced few years back, but nobody went for telemedicine especially in country like Pakistan.[1] Telemedicine has been described by World Health Organization (WHO) as "the delivery of healthcare services by all healthcare professionals utilizing technology for exchange of valid information regarding diagnosis, treatment, and prevention of disease and injuries." [2]

The trend of telemedicine is exponentially increasing worldwide.[3] The COVID-19 pandemic made telehealth services a significant tool for providing the health care.[4] The use of telehealth services was limited worldwide until March 2020.[5] Telehealth, which includes asynchronous e-visits and synchronous audio-only or video visits, has been used by over 9 million Medicare beneficiaries between 17 March and 13 June, 2020.[6]

In Pakistan, current surge in telemedicine took place due to fear of contracting the COVID-19 and to maintain the social distancing. During last several months, social distancing has caused this technology to become even more significant as a support system and in increasing utilization of the telemedicine.[7] Moreover, telemedicine centers were made and practiced in the government and private sector in Pakistan at a vast level for the first time with good experience in offering support to the health care personnel and medical advice to the patients utilizing technology.[8, 9] During current pandemic telemedicine may be helpful for protection of health care workers, triage of suspected COVID-19 patients before arrival in hospital and for patients with

[1,2]*Department of Medicine,*
*Shifa International Hospital, Islamabad*
[3]*Department of Anaesthesia*
*Hamad Medical Corporation Doha, Qatar*
[4]*MBBS Student*
*Rawalpindi Medical University, Rawalpindi*

*Correspondence:*
*Dr. Muhammad Ashraf*
*Consultant Medical Specialist*
*Shifa International Hospital, Islamabad*
*E-mail: drmashraf2@gmail.com*

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chronic medical illnesses who cannot come to hospital.

The patient satisfaction is a growing concern in all aspects of healthcare.[10] As with traditional modalities of health care delivery, telemedicine also relies on reports of patient satisfaction because the patients are the only source of information about how they are treated and the therapy met their expectations, if the patients are not satisfied, the service is rendered obsolete.[11] As the telemedicine services are being provided to patients in private hospitals in these days, it is important to improve the services according to patient's satisfaction. The objectives of the study are to know the patient satisfaction, to find the difficulties encountered by patients with a view to improve these services and to assess whether telemedicine services can be continued in future.

## Materials and Methods

It was a descriptive cross-sectional study in which 200 patients were included and non-probability consecutive sampling technique was used. The study was conducted at Shifa International Hospital, Islamabad. The duration of study was three months (from July 1, 2020, to September 30, 2020). All patients who fulfilled the inclusion criteria and availing telemedicine services in internal medicine clinics were enrolled. The patients were interviewed at the end of tele-consultation to answer the questions according to the proforma after taking informed consent. The study was approved by Institutional Review Board and Ethics Committee.

Data was analyzed using SPSS version 22. Basic descriptive statistical analysis was done including frequencies, means, standard deviation and proportions. Chi's square test was also applied on categorical variables. *P*-value of less than 0.05 was considered significant.

## Results

Among 200 patients, 66 (33.0%) were up to 40 years old and 134 (67.0%) were more than 40 years. The mean age of the patients was 43.45 ± 11.964 years.

Among these patients, 123 (61.5%) were male and 77 (38.5%) were females.

Out of 200 patients, more than half 104 (52.0%) used tele-consultation for fever or suspected COVID-19 symptoms while 96 (48.0%) patients used it for other medical problems.

Out of 200 patients, 147 (73.5%) used telemedicine for the first time, 45 (22.5%) used 1-3 times and only 8 (4.0%) patients used it >3 times (Figure I).

Table I shows the details of the questions asked

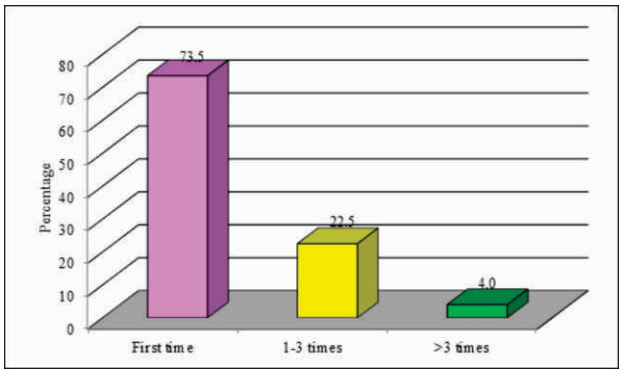


**Fig. 1: Frequency Distribution of Patients According to Number of Telemedicine Visits**

mainly to schedule an appointment, audio visual quality and overall satisfaction and response of patients according to proforma. Overall, 193 (96.5%) out of 200 patients were satisfied with telemedicine services.

**Table I: Frequency Distribution of Patients according to Satisfaction and Difficulties Encountered with Telemedicine**

| | Strongly Disagree | | Disagree | | Neutral | | Agree | | Strongly Agree | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| It was easy to schedule the appointments | – | – | – | – | – | – | 71 | 35.5 | 129 | 64.5 |
| There was no problem to pay consultation fee | 11 | 5.5 | 29 | 14.5 | 10 | 5.0 | 58 | 29.0 | 92 | 46.0 |
| I can clearly hear the voice of doctor during consultation | 13 | 6.5 | 37 | 18.5 | – | – | 67 | 33.5 | 83 | 41.5 |
| I can clearly see the picture of doctor on screen | 13 | 6.5 | 8 | 4.0 | 29 | 14.5 | 65 | 32.5 | 85 | 42.5 |
| It was simple to use the system | 11 | 5.5 | 9 | 4.5 | 9 | 4.5 | 80 | 40.0 | 91 | 45.5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| I have no fear to face camera | 9 | 4.5 | – | – | 6 | 3.0 | 92 | 46.0 | 93 | 46.5 |
| Waiting time of tele-consultation less as compared to face-to-face consultation | 12 | 6.0 | 16 | 8.0 | 20 | 10.0 | 65 | 32.5 | 87 | 43.5 |
| Telemedicine saves my time, expenditure, and discomfort of travelling to hospital | 3 | 1.5 | – | – | – | – | 113 | 56.5 | 84 | 42.0 |
| Telemedicine staff was cooperative | 5 | 2.5 | – | – | 12 | 6.0 | 55 | 27.5 | 128 | 64.0 |

Among 200 patients, 162 (81.0%) reported that they will recommend telemedicine to others and will use it even after the COVID-19 pandemic is over.

Table II shows significant association ($p$=0.000) between age and overall patients' satisfaction with telemedicine while insignificant association ($p$=0.082) between age and use of telemedicine by patients even after the COVID-19 pandemic is over.

**Table II: Association Between Age and Satisfaction**

| | Age | | Total | P-value |
|---|---|---|---|---|
| | <40 yrs | >40 yrs | | |
| **Overall, I am satisfied with Telemedicine** | | | | |
| Disagree | 1 (0.5%) | 6 (3.0%) | 7 (3.5%) | 0.000 |
| Agree | 37 (18.5%) | 35 (17.5%) | 72 (36.0%) | |
| Strongly agree | 28 (14.0%) | 93 (46.5%) | 121 (60.5%) | |
| Total | 66 (33.0%) | 134 (67.0%) | 200 (100.0%) | |
| **I shall use Telemedicine even after the COVID -19 Pandemic is over** | | | | |
| Yes | 58 (29.0%) | 104 (52.0%) | 162 (81.0%) | 0.082 |
| No | 8 (4.0%) | 30 (15.0%) | 38 (19.0%) | |
| Total | 66 (33.0%) | 134 (67.0%) | 200 (100.0%) | |

Table III indicates significant association ($p$=0.035) between gender and overall patients' satisfaction with telemedicine and significant association ($p$=0.005) between gender and use of telemedicine by patients even after the COVID-19 pandemic is over.

**Table III: Association Between Gender and Satisfaction**

| | Gender | | Total | P-value |
|---|---|---|---|---|
| | Male | Female | | |
| **Overall, I am satisfied with Telemedicine** | | | | |
| Disagree | 3 (1.5%) | 4 (2.0%) | 7 (3.5%) | 0.035 |
| Agree | 37 (18.5%) | 35 (17.5%) | 72 (36.0%) | |
| Strongly agree | 83 (41.5%) | 38 (19.0%) | 121 (60.5%) | |
| Total | 123 (61.5%) | 77 (38.5%) | 200 (100.0%) | |
| **I shall use Telemedicine even after the COVID -19 Pandemic is over** | | | | |
| Yes | 92 (46.0%) | 70 (35.0%) | 162 (81.0%) | 0.005 |
| No | 31 (15.5%) | 7 (3.5%) | 38 (19.0%) | |
| Total | 123 (61.5%) | 77 (38.5%) | 200 (100.0%) | |

## Discussion

During COVID-19 pandemic, a rapid increase in the telemedicine trend is being observed not only among developed countries but also among developing countries including Pakistan. Most of the patients in our study (67.0%) were more than 40 years old and 33.0% patients were upto 40 years of age while the mean age of the patients was 43.45±11.964 years. The findings of a recent study carried out by Richards AE and coworkers (2021) indicated that mean age of the patients was 63.1 ± 14.6 years.[17] Another study conducted by Orrange S and associates (2021) also confirmed that most of the respondents were elderly as the mean age of the patients was 55.8±16.0 years.[13]

In our study male patients were in majority (61.5%) while remaining proportion (38.5%) was of females. The findings of our study are comparable with a study performed by Ahsan MF and collaborators (2020) who also asserted that majority (75.6%) of the patients were male and only 24.4% were female.[12] However, a study undertaken by Ramaswamy A and teammates (2020) exhibited different results that most of the patients (61.3%) were females and 38.7% were male patients.[18]

As the trend of telemedicine is increasing during

COVID-19 pandemic, study disclosed that more than half (52.0%) of the patients used this service for fever or suspected Covid-19 while 48.0% patients used this service for other medical problems. This indicates that although telemedicine was used mainly by suspected COVID -19 patients, a significant percentage of patients with other chronic illnesses have also utilized telemedicine services. This may also be due to limited access to outpatient clinics and face to face consultations during peak of this pandemic. The results of this study are different to the results of study done by Magadmi MM and fellows (2020) who highlighted that only 18.1% patients used telemedicine for COVID-19 and majority (81.9%) used this service for other medical problems.[2] The findings of our study further indicated that majority (73.5%) of patients used telemedicine service for the first time and 26.5% patients used this service more than one time. Almost similar results were reported in a study by Adams L and comrades (2021) who showed that 71.9% patients had their first experience with telemedicine while 28.1% patients used telemedicine for more than one time.[19] So our study indicates that telemedicine services were new to these patients and those using this service for the second or third time were more likely to follow up again.

Our study revealed that a significant majority of patients was satisfied with appointments and paying consultation fee online. Among these patients, 75.0% reported that they can clearly hear the voice of doctor during consultation and 75.0% also said they can clearly see the picture of doctor on screen while audio visual communication was not satisfactory for just 25% of patients.

So, the main difficulties encountered were technical in the form of poor audio-visual signals perhaps due to internet connection problems. The difficulties with audio visual connections during telemedicine consultations may be more than that reported in our study especially in rural areas of the country where mobile phone signals and internet quality is not well established. Our study, however, did not differentiate between patients from rural and urban areas. Similar results were reported in a study performed by Orrange S and associates (2021) who elucidated that 88.2% patients were satisfied with sound and 65.5% with video quality.[13] The findings of another study carried out by Hentati F and companions showed better results than our study and that only 17.8% patients faced technical difficulties.[20] The study done in India by Acharya RV and Rai JJ indicated that problems encountered were 47 % in technical issues.[15]

Study further highlighted that majority of patients confirmed that they can use the system easily and have no fear to face camera. Among the patients, 76.0 % reported that waiting time of tele-consultation is less as compared to face-to-face consultations. The results of this study are comparatively different from a study undertaken by Magadmi MM and fellows (2020) who stated that 70.0% patients were unsatisfied with waiting time of tele-consultations.[2] In our study majority (98.5%) of telemedicine users believed that telemedicine saves their time, expenditure, and discomfort of travelling to the hospital. This indicates that telemedicine can be useful especially for remote and rural areas of country which have poor health facilities and difficult road access to the cities. In our study 91.5% patients affirmed that telemedicine staff was cooperative. Similarly, Haxhihamza K and colleagues also reported in their study that majority of the patients (89.3%) were satisfied with telemedicine staff.[4]

When the overall satisfaction level among patients regarding telemedicine was evaluated, study showed very encouraging results that significant majority (96.5%) was satisfied with telemedicine during COVID-19 pandemic. The findings of our study are much better than the study conducted by Alharbi KG and colleagues (2021) who reported that overall patients' satisfaction level with telemedicine was 68.1%.[21] The results of our study are also consistent with the study done by Khalid T et al which showed that 99.4% patients were overall satisfied with telemedicine.[22]

The results of our study showed significant association ($p$<0.05) between age and overall satisfaction level of patients with telemedicine. Patients more than 40 years of age were more satisfied. The study carried by Magadmi MM and fellows also showed significant association between age and overall satisfaction level of patients with telemedicine.[2] However, our study showed insignificant association ($p$>0.05) between age and

use of telemedicine after COVID-19 pandemic .

Patients' satisfaction plays a vital role and boosts the utilization of health care services. Majority (83.5%) of the patients said that they will recommend telemedicine to others due to its usefulness. These findings are like a study done by Parker K and Chia M who stated that more than 90.0% patients confirmed to recommend others to use telemedicine.[23] The study further highlighted that 81.0% patients wished to use telemedicine even after the COVID-19 pandemic. Almost similar results were reported in a study done by Sathiyaraj A and colleagues who stated that 80.0% patients wanted to use telemedicine in future.[6] Similar results were observed in studies by Lopez C et al and Aashima et al, in which patients showed strong preference for continued usage of telemedicine even after the pandemic.[14,16] This indicates that telemedicine services can be utilized in future by the patients even after the pandemic and telemedicine can be incorporated in regular health services.

## Conclusion

Study concluded that overall patients were satisfied with telemedicine during COVID-19 pandemic. Audio visual connection problems were the main difficulties encountered by a small percentage of patients. Majority of patients were willing to use telemedicine after the pandemic and were desirous to recommend others to use telemedicine. The study has limitations that it did not include the opinion of provider and consultants. The benefits of telemedicine during COVID-19 period are enormous; hence, further studies are needed on large scale to assess the patient satisfaction and difficulties encountered with telemedicine to get further benefits from this service and incorporate telemedicine in regular health care.

### REFERENCES

1. Abdel Nasser A, Mohammed Alzahrani R, Aziz Fellah C, Jreash DM, Almuwallad NTA, Bakulka DSA, et al. Measuring the patients' satisfaction about telemedicine used in Saudi Arabia during COVID-19 pandemic. Cureus 2021; 13(2): e13382.
2. Magadmi MM, Kamel FO, Magadmi RM. Patients' perceptions and satisfaction regarding teleconsultations during the COVID-19 pandemic in Jeddah, Saudi Arabia. Res Square 2020; 1: 1-19.
3. Khan ZA, Zahoor AW, Afzal I, Butt U, Siddiqui AM, Khan Z, et al. Evaluation of patient perception and satisfaction toward the use of telemedicine during pandemic of novel coronavirus in Pakistan. Telemed J E-Health 2021 Jan 15. doi: 10.1089/tmj.2020.0343. Online ahead of print.
4. Haxhihamza K, Arsova S, Bajraktarov S, Kalpak G, Stefanovski B, Novotni A, et al. Patient satisfaction with use of telemedicine in university clinic of psychiatry: Skopje, North Macedonia during COVID-19 pandemic. Telemed E-Health 2021; 27(4): 464-7.
5. Hawrysz L, Gierszewska G, Bitkowska A. The research on patient satisfaction with remote healthcare prior to and during the COVID-19 pandemic. Int J Environ Res Public Health 2021; 18: 5338.
6. Sathiyaraj A, Lopez H, Surapaneni R. Patient satisfaction with telemedicine for prechemotherapy evaluation during the COVID-19 pandemic. Future Oncol 2021; 17(13): 1593-1600.
7. Khan UZ. Telemedicine in the COVID-19 era: a chance to make a better tomorrow. Pak J Med Sci 2020; 36(6): 1405-7.
8. Humayun A, Shahabuddin S, Afzal S, Malik AA, Atique S, Iqbal U. Healthcare strategies and initiatives about COVID19 in Pakistan: telemedicine a way to look forward. Comp Methods Prog Biomed Update 2021; 1: 100008.
9. Nagra MH, Ehsan S, Ahmad U, Ali M, Hussain HA, Bakar A. Implementation of a telemedicine service during COVID-19 pandemic in Pakistan. J Clin Practice 2021; 75(8): e14310.
10. Cleary PD. A hospitalization from hell: a patient's perspective on quality. Ann Intern Med 2003; 138: 33-9.
11. LaBarberas PA, Mazursky D. A longitudinal assessment of consumer satisfaction/dissatisfaction: the dynamic aspect of the cognitive process. J Marketing Res 1983; 20: 393-404.
12. Ahsan MF, Irshad A, Malik K, Rashid I, Shahzad A, Waqar SH, et al. Patient satisfaction at telemedicine center in COVID-19 pandemic – Shaheed Zulfiqar Ali Bhutto Medical University, (SZABMU) Islamabad. Pak Armed Forces Med J 2020; 19(2): S578-83.
13. Orrange S, Patel A, Mack WJ, Cassetta J. Patient satisfaction and trust in telemedicine during the COVID-19 pandemic: retrospective observational study. JMIR Hum Factors 2021; 8(2): e28589.
14. López C,Valenzuela JI, Calderón JE, Velasco AF, Fajardo R. A telephone survey of patient satisfaction with realtime telemedicine in a rural community in Colombia. J Telemed Telecare 2011; 17(2): 83-7.
15. Acharya RV, Rai JJ. Evaluation of patient and doctor perception toward the use of telemedicine in Apollo Tele Health Services, India. J Fami Med Prim Care 2016; 5: 798-803.
16. Aashima, Nanda M, Sharma R. A review of patient satisfaction and experience with telemedicine: a virtual solution during and beyond COVID-19 pandemic. Telemed E-Health 2021 Mar 12. doi: 10.1089/tmj.2020.0570. Online ahead of print.
17. Richards AE, Curley K, Christel L, Zhang N, Kouloumberis P, Kalani MA, et al. Patient satisfaction with telehealth in neurosurgery outpatient clinic during COVID-19 pandemic. Interdisciplinary Neurosurg 2021; 23: 101017.
18. Ramaswamy A, Drangsholt S, Ng E, Culligan PJ, Schlegel PN, Hu JC. Patient satisfaction with telemedicine during the COVID-19 pandemic: retrospective cohort study. J Med

Internet Res 2020; 22(9): e20786.

19. Adams L, Lester S, Hoon E, van der Haak H, Proudman C, Hall C, et al. Patient satisfaction, and acceptability with telehealth at specialist medical outpatient clinics during the COVID-19 pandemic i Australia. Intern Med J 2021; 51(7): 1028-37.
20. Hentati F, Cabrera CI, D'Anza B, Rodriguez K. Patient satisfaction with telemedicine in rhinology during the COVID-19 pandemic. Am J Otolaryngol 2021; 42(3): 102921.
21. Alharbi KG, Aldosari MN, Alhassan AM, Alshallal KA, Altamimi AM, Altulaihi BA. Patient satisfaction with virtual clinic during Coronavirus disease (COVID-19) pandemic in primary healthcare, Riyadh, Saudi Arabia. J Fam Community Med 2021; 28: 48-54.
22. Khalid T, Tariq R, Alia S, Athar R. Teledermatology using WhatsApp messenger during COVID 19 pandemic; our experience of a cost-effective solution to reach out patients in limited resource. J Health Infor Dev Countr 2021; 15(1): 1-8.
23. Parker K., Chia M. Patient, and clinician satisfaction with video consultations in dentistry - part one: patient satisfaction. Br Dent J 2021; 1-6.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Challenges Faced by Senior Faculty in the Implementation of Integrated Curriculum in Developing Countries

Madeeha Rehan[1], Neelofar Shaheen[2], Noushaba Sadiq[3]

**ABSTRACT**

**Objective**: To identify the key challenges faced by senior faculty members in the implementation of an integrated curriculum in developing countries

**Study Design:** Quantitative descriptive cross-sectional

**Place and Duration of Study:** Foundation University Medical College Islamabad and Women Medical College Abbottabad. Four months duration (Jun 2017-Sep 2017)

**Materials and Methods:** The study was conducted in two private medical colleges. The sampling technique employed was a purposeful non-probability sampling technique. A total of 60 senior faculty members (Associate Professors and Professors) participated in the study. Data collection was carried out using a self-developed, validated questionnaire (closed-ended), consisting of 20 items based on the Likert scale format of Strongly Agree (SA) =4 points, Agree (A) = 3 points, Neutral, 0 Disagree (D) = 2 points, and Strongly Disagree (SD) = 1 point.

**Results**: Descriptive analytics were run on SPSS version 21. The common challenges confronted by senior faculty members in the implementation of an integrated curriculum consisted of; Lack of sequential planning of the integrated curriculum (66.5%), insufficient continuous medical education (CME) activities for faculty (56.5%) along with ineffective communication among faculty members (53.5%), lack of effective teamwork (42.6%) and lastly, deteriorating quality of students in medical colleges (48.6%).

**Conclusion:** Senior faculty members faced diverse challenges while their institutes decided to implement the modular integrated curriculum**.** The lack of a collaborative approach in curriculum planning adversely affected curriculum organization and sequencing. Lack of interdepartmental communication and collaboration and deficient faculty development programmes together with the deteriorating quality of medical students were the major challenges faced by senior faculty members in implementing an integrated curriculum.

**Key Words:** *Challenges in Integrated Curriculum, Curriculum Implementation, Faculty Development, Integrated Curriculum, Medical Education.*

## Introduction

Curriculum development is a dynamic process. The medical curriculum has gone through many reforms. These reforms are never easy, but they are inevitable.[1] The problems arising at different levels of the educational system do not lie in the curriculum formulation, but rather in its implementation. According to Ivowi (2004) curriculum implementation implies putting "theory into practice" or "proposal into action". Even after investing enormous proportions of money and effort into implementing an integrated curriculum, its successful accomplishment remains a dream yet to be realized in most medical colleges at the national level.[2] The students who have experienced an integrated curriculum perceive it as a strength in terms of enhancing problem-solving skills, and student-centred teaching and learning,[3] therefore, there is a dire need for designing effective policies for successful curriculum implementation. Hence, it is imperative that methods of curriculum implementation are addressed and focused upon.[4] According to Muller et al (2008) and Shaheen et al (2021), curriculum integration is a complex process understood and implemented differently at different

[1]*Department of Pathology*
*Foundation University Medical College, Islamabad*
[2]*Department of Health Professions Education & Research*
*Peshawar Medical College, Riphah International University*
[3]*Department of Medical Education*
*National University of Medical Sciences, Rawalpindi*
*Correspondence:*
*Dr. Madeeha Rehan*
*Associate professor*
*Department of Pathology*
*Foundation University Medical College, Islamabad*
*Received: March 30, 2021; Revised: August 06, 2022*
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rates in different contexts.[5,6]

It is an undeniable fact that no educational policy can be successfully implemented unless teachers' problems are taken into consideration before initiating decision-making and planning of curriculum.[7] The teacher is the most qualified resource person and is the best candidate to be consulted in all stages of curriculum development. Nevertheless, it has been observed that when it comes to decision-making in education, teachers' opinions are not given their due weightage, which in turn negatively impacts curriculum implementation. This issue, therefore, calls for careful consideration by the stakeholders involved in designing and implementing the integrated curriculum.[8]

As per the literature review, relatively younger faculty members are more willing, open, and adaptive to change as compared to their senior counterparts. Undoubtedly, senior faculty members are integral to the success of any academic institution. They are consistently growing professionally and contributing to their discipline, and they also serve as mentors to the junior faculty.[9] Vital features of an organization such as leadership, maintenance of cohesive culture and a positive climate depend upon the senior members of the faculty. It takes determination, will and participation to lead the change of curricular reforms.[10] Faculty face diverse challenges everywhere in the world and literature reports even the challenges related to infrastructure, space, and administrative issues.[11] Thus, it is of utmost importance to identify first and then try to resolve the problems and the needs of senior faculty to nurture their desired characteristics over the career continuum.[12]

This study aimed to identify the major challenges encountered by senior faculty members during the implementation of the integrated curriculum in their institutes.

## Materials and Methods

This quantitative study of the cross-sectional design was carried out in two private medical colleges in different provinces where an integrated curriculum was already implemented. Ethical approval was acquired from the ethical review committee of the respective institution. The sampling technique employed was the purposeful sampling technique. It included the Associate Professors and Professors as their participants. The 60 senior faculty members were all those who had been part of the transition from traditional to integrated curriculum. All Assistant Professors and the faculty of the medical education department were not included in the study. Written informed consent was taken from all the participants.

Data collection was done via the use of a self-developed descriptive questionnaire. The main questions were related to intrinsic motivation, mindsets, interdepartmental and intradepartmental issues, CME activities, lack of teamwork and curriculum organization. It was validated by 4 medical educationists. It consisted of 20 items in total, based on the Likert scale format of Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Neutral, 0 Disagree (D) = 2 points, and Strongly Disagree (SD) =1 point. Data were analysed using SPSS version 21.

## Results

A total of sixty senior faculty members including Associate Professors (63.3%) and Professors (36.6%) were included in the study. Out of the sixty participants', forty were females and twenty were males (Table I).

**Table I: Demographics of the Participants**

| Variables | Frequency (%) |
|---|---|
| **Age (years)** | |
| 40-55 | 28 (46.66) |
| 56-70 | 32 (53.33) |
| **Designation** | |
| Professor | 22 (36.66) |
| Associate professor | 38 (63.33) |
| **Gender** | |
| Male | 20 (33.33) |
| Female | 40 (66.66) |
| **Teaching experience (years)** | |
| 10-19 | 29 (48.33) |
| $\geq$ 20 | 31 (51.66) |

Amongst various major challenges identified, most common were lack of sequential planning of integrated curriculum, insufficient continuous medical education (CME) activities for faculty, lack of effective teamwork, lack of interdepartmental communication, lack of collaborative approach in designing the table of specifications, deteriorating quality of students in medical colleges and lastly inadequate infrastructure (Table II).

50% of the faculty members believed an integrated curriculum is associated with a reduction in rote learning as compared to a discipline-based curriculum, and 17.9% strongly agreed that integrated curriculum results in the production of more competent doctors as compared to the discipline-based curriculum. Similarly, 23.2% of the participants agreed that after having practised traditional teaching and learning methodologies for a long period of time, they did not feel motivated to adopt new teaching and learning strategies in an integrated curriculum. On the flip side, 32% agreed that a student-centred approach in an integrated curriculum limits a teacher's authority over students.

**Table II: Major Challenges Faced by Senior Faculty in Transition from Traditional to an Integrated Curriculum**

| | Challenges | Frequency (Strongly agree) |
|---|---|---|
| 1 | Lack of sequential planning of integrated curriculum | 66.5% |
| 2 | Insufficient CME activities for faculty | 56.5% |
| 3 | Lack of effective teamwork | 48.6% |
| 4 | Deteriorating quality of students in medical colleges | 42.6% |
| 5 | Lack of interdepartmental communication | 53.5% |
| 6 | Lack of collaborative approach in designing Table of Specifications | 57.1% |
| 7 | Inadequate infrastructure | 44.6% |

## Discussion

According to Asebiomo (2009), not only a well-formulated curriculum is important but its effective implementation is necessary to achieve the desired goals of education.[13] A study conducted at the national level,[2] concluded that the design and implementation of an integrated curriculum in public sector institutions with established curricula is a difficult process, and resistance by faculty was the most common issue in this context where changing the mindset of faculty members at senior level is mandatory.[14] This is in contrast to our findings because most of the senior faculty members were more than willing to adapt to the change and strongly agreed that an integrated curriculum enhances problem-solving and critical-thinking skills as compared to a traditional disciplined-based curriculum. However, most of the faculty members are of the opinion that there is a lack of faculty development approaches to polish their skills which could allow them to adopt advanced teaching strategies. In a systematic review, it is recommended that various formal and informal faculty development approaches including workshops, seminars, experiential learning, timely feedback and effective peer coaching should be incorporated into faculty development programmes.[15] In a study conducted in Nigeria, inadequate faculty training and interdepartmental issues were found to be the most common causes which are consistent with our study findings.[16] While in contrast to our study, time constraints and temporal restrictions were the main issues faced by the faculty in curriculum implementation.

Most of the senior faculty members believed that there is a dearth of coordination and communication at the interdepartmental and intradepartmental levels about curriculum designing and changes done in the curriculum later. It is a matter of urgency to formulate a well-structured curriculum committee consisting of senior faculty members and a qualified medical educationist. Though caution needs to be exercised and overambitious attempts must be avoided. It is best, to begin with, modular integration under the supervision of Modular Integration Committees followed by a module coordinator for every committee. Representatives from different departments including clinical teachers and a medical educationist should be members of committees.[14]

Also, for the successful implementation of an integrated curriculum monthly and fortnightly meetings of the faculty should be arranged to finalize the teaching-learning schedule. The reason for transitioning to an integrated system, including its advantages and disadvantages should be explained to the faculty.[15]

In our study, most of the faculty members believed there were no incentives or rewards for competent and hardworking faculty members. In one study, it has been mentioned that there should be incentives and rewards for the faculty members involved in curriculum development through a collaborative approach and skilful conflict resolution. This strategy of improving extrinsic motivation can boost the

curricular change process.[17] While extrinsic motivation is important, intrinsic motivation has also an important role to play. According to literature intrinsic motivations of faculty and their professional and ethical values are often ignored while using different faculty development approaches. Therefore, it is essential to re-design faculty development approaches not only for skill enhancement but also as an opportunity for the renewal of personal and professional growth.[14] In most western countries medical education is a characterized trend toward student-centred learning, however in most eastern and developing countries medical education remains a more traditional teacher-centred process.[18] This trend is changing now and many developing countries are adopting integrated curricula where faculty have multiple roles to play.[19]

A vast majority of the faculty members were of the view that there is an inadequate infrastructure which is a huge obstacle to the implementation of the integrated curriculum. This is in accordance with a study conducted at a national level in which it was concluded that good infrastructure is required for successful curriculum implementation.[1] In fact the infrastructure, serves as the necessity to be considered before implementing the integrated curriculum.[20]

In our study, most of the faculty members agreed that selection criteria for admission of medical students in medical colleges need reviewing. This is consistent with another study in which it was reported that awareness should be provided to medical teachers and students regarding integrated curriculum.[2] The integrated curriculum necessitates the involvement of students in the curriculum implementation, review, and assessments to make sure that the students take responsibility for their own learning and provide valuable input to the faculty and administrators.[21]

## Limitations of the study

1. Sample size was small but we had only senior faculty as our target population and there were only two institutions so the results can be considered applicable to other similar settings.
2. A close-ended questionnaire was designed therefore opinions of faculty members could not be taken.

## Conclusion

In conclusion, curriculum implementation is the lifeblood of an educational institution and is critical to the success of any medical college. There is a dire need to design an innovative and creative faculty policy to simplify integration, enhance faculty development approaches and collaborate at the political, institutional, and administrative levels to resolve the issues related to curriculum implementation effectively.

### References

1. Ali SK, Baig LA. Problems and issues in implementing innovative curriculum in the developing countries: the Pakistani experience. BMC Med Educ .2012;12(1):31.
2. Kayani ZA, Mahboob U, Gilani I, Wajid G. Perceptions of Medical Teachers About Integrated Curriculum : a Systematic Review. 2015;1(2):19–26.
3. Yasmeen R, Anwar M. Measuring and comparing educational environment of two education systems (Integrated and traditional medical curriculum) running simultaneously at Islamic International medical college with (DREEM) inventory. Journal of Islamic International Medical College (JIIMC). 2013;8(1):60-3.
4. Ali A. Ahmadi AL. Issues and Prospects of Effetive Implementation of New Secondary School Curriculum in Nigeria. J Educ Pract. 2015;6(34):29–39.
5. Muller JH, Jain S, Loeser H, Irby DM. curriculum : opinions and progression Lessons learned about integrating a medical school curriculum : perceptions of students , faculty and curriculum leaders. 2008;778–85.
6. N. Shaheen, R.A. Khan, R. Yasmeen, et al. Probing in the complexities of the integrated undergraduate medical curriculum: A qualitative exploratory study. J Pak Med Assoc. 2021;452–6.
7. Bilge U, Unluoglu I. A Historical Perspective of Medical Education. Journal of Education in Science Environment and Health 1(2):1112015; September
8. Ogar OE, Awhen F. Teachers perceived problems of curriculum implementation in tertiary institutions in cross river state of Nigeria . 2015;6(19):145–52.
9. Shukr I, Qamar K, Hassan AU. Faculty's Perception of Level of Teacher'S Motivation. Motiv Demotivation Teach Pak Armed Forces Med J . 2016;66(6):784–9.
10. Naveed A, Sadiq S, Rehman IR, Siddiq A, Kamran R. Leadership Styles of Change Leaders Steering Curriculum Reforms in Pakistan. Journal of Islamic International Medical College (JIIMC). 2022 Jun 26;17(2):124-8
11. Kiral E. Challenges Faced by Prospective Teachers in Universities and Solution Proposals. International Journal of Environmental and Science Education. 2016;11(5):839-50.
12. Shankar PR. Challenges in shifting to an integrated curriculum in a Caribbean medical school. J Educ Eval Health Prof. 2015;12:9.
13. Mba JM, Ed MA, Hons BA, Ed C. Curriculum design and development. 2007;

14. Steinert Y, Mann K, Anderson B, BB-M, 2016 undefined. A systematic review of faculty development initiatives designed to enhance teaching effectiveness: A 10-year update: BEME Guide No. 40.
15. Malik AS, Malik RH. Twelve tips for developing an integrated curriculum. Medical Teacher.2014; 33(2):99-1042.
16. Sundberg K, Josephson A, Reeves S, Nordquist J. Power and resistance: leading change in medical education. Stud High Educ. 2015;5079:1–18.
17. Alabi FO. Implementing the new senior secondary school curriculum for the realization of the objective of entrepreneurship education in Ondo state, Nigeria. 2014;1:264
18. Findyartini A, Hawthorne L, Mccoll G, Chiavaroli N. How clinical reasoning is taught and learned : Cultural perspectives from the University of Melbourne and Universitas Indonesia. BMC Med Educ. 2016;1–10.
19. Nawabi S, Shaikh SS, Javed MQ, Riaz A. Faculty's perception of their role as a medical teacher at Qassim University, Saudi Arabia. Cureus. 2020 Jul 9;12(7).
20. Owolabi R. Adoption of integrated curriculum development as a tool to promote information profession, Nigeria. Library Philosophy and Practice. 2021 Jan 14:1-
21. Khan RA, Sajjad M. Student Empowerment in Medical Education. Journal of Islamic International Medical College (JIIMC). 2017 Dec 1;12(4):166-7.

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**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.

ORIGINAL ARTICLE

# Effect of online Teaching on Academic Performance of 4thYear MBBS Students During Covid-19 Lock-Down

Afia Matloob, Mustafa Ismail, Fatima Sidra Tanweer

**ABSTRACT**

**Objective:** To determine the frequency of academic performance of fourth year MBBS students and to evaluate the perceptions of students regarding online teaching methods

**Study Design:** Cross sectional.

**Place and Duration of Study:** Study was conducted at department of Ophthalmology, HBS medical and Dental College, Islamabad from January 2020 to April 2020.

**Materials and Methods:**125 student's 4th year MBBS were selected through nonprobability consecutive sampling. We used structured questionnaire with three main sections: 1) demographics characteristics, 2) perceived stress and academic performance using Likert scale , 3) perceptions of students regarding online learning. Data was analyzed using SPSS version 24. Chi-square test was applied. P value ≤ 0.05 was considered significant.

**Results:** There were 59(47.2%) male and 66(52.8%) female students. Mean age of students was 21.3±4.3SD years. Academic performance was improved in 71(56.8%) students. Perceived stress was mild in 53(42.4%), moderate in 47(37.6%) and severe in 25(20%). Common perceptions affecting academic performance were future learning preferences, low impact, satisfactory quality of online learning, high level of isolation and better than traditional method ($p<0.05$).

**Conclusion:** Online learning is an effective teaching modality resulting in moderately high academic performance of HBS medical students. Low perceived stress leads to better academic results. We suggest faculty training and students' orientation regarding online learning tools. This will help in improving online learning outcomes.

**Key Words:** *Coronavirus Disease, Online learning, Perceptions, Teaching Methods.*

## Introduction

COVID-19 (Novel Coronavirus disease) is declared a global public health challenge. It is caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus-2).[1] 1st cases of COVID-19 were reported in Wuhan, China (December 2019), later on the disease rapidly disseminate around the world and World Health Organization (WHO) declared it as pandemic on 11thMarch 2020. An estimated 223 countries are affected with COVID-19 with 138 million cases and 2.9 million mortalities reported globally.[2] In United Stated, COVID-19 is 3rd leading cause of mortality following cardiovascular disease and cancer. However, WHO reported global case fatality rate 2.2% for COVID-19 as current estimate.[3] WHO reported 873,220 confirmed cases of COVID-19 and 19,384 confirmed deaths in Pakistan on 10th May, 2021.[4]

COVID-19 affected all areas of life including medical education. The global lockdown leads to worsen the medical education level. In this stressful condition, several countries initiated as E- learning system to continue the education process in safe and secure manner. A sudden transition of education system from traditional learning to online learning changed the institutional educational methods of delivering courses. Medical students were exposed to online modules, textbooks, video lectures and computer-based programs. The process resulted in Flipped classroom model for learning in several countries of world.[5]

Literature divided online learning into two main classifications: 1) synchronous and asynchronous. Synchronous technology is associated with live interaction (between student and teacher) using

*Department of Ophthalmology,*
*HBS Medical and Dental College, Islamabad*
*Correspondence:*
*Department of Ophthalmology,*
*HBS medical and Dental College, Islamabad*
*E-mail:afiamatloob@outlook.com*
*Received: January 22, 2022; Revised: August 20, 2022*
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web chats, audio-conferencing and videoconferencing etc. Asynchronous technology is associated with a significant delay in time for interaction between receipt and instructor using E-mail, Discussion forum, earlier video recording etc.[6]

Online learning system had several reasons for acceptability including ease of use, better control over the environment and flexibility of method. However, it had some limitations including social isolation, connectivity issues and lack of teacher student interaction. Desi et al. reported psychological impact of E-learning on medical students. They reported that delay in online lectures (58.9%) is statistically correlated with depressive symptoms of students. Loss of confidence to be competent doctor among students due to E-learning system is also mentioned specially in male gender (p=0.001).[7]

So, it is very important to understand Effect of online learning on medical student to monitor their academic and moral progress. Our study was conducted to determine frequency of academic performance and perceived stress of fourth year medical students and to evaluate the perceptions of students regarding online teaching methods.

## Materials and Methods

We conducted a cross sectional study at department of Ophthalmology, Hazarat Bari Imam Sarakar (HBS) medical and Dental College, Islamabad. Our study duration was 4 months (January 2020-April 2020). We took ethical approval from internal review board (Appl# EC, 03/01/02/2021). All participating students signed written consent before participation into study. Sample size of 125 students was calculated using 20% students using online software for classes[8], 95% confidence interval, 5% absolute precision. Students were selected through nonprobability consecutive sampling. Inclusion criteria was based upon age >18 years, both gender and students enrolled in 4$^{th}$ year of M.B.B.S. Exclusion criteria was based upon special students (students with any disability), students other than 4$^{th}$ years, students on long leave, female students who are married and pregnant. We used structured questionnaire with three main sections; 1) demographics characteristics, 2) perceived stress and academic performance using likert scale, 3) perceptions of students regarding online learning using Abbasi et al. guidelines[9]. Perceived stress was categorized as mild, moderate, and severe. Academic performance was categorized as improved and not improved. Students were interviewed using questioner. Data analysis was done with the help of SPSS version 24. We reported percentages and frequencies for numerical and categorical data while Mean and standard deviations were reported for quantitative data. Universal confounder's age and gender were controlled by stratification. Post stratification Pearson's chi-square test was applied. P value ≤0.05 was reported as significant finding.

## Results

Total 125 students were included in study. There were 59(47.2%) male and 66(52.8%) female. Mean age of students was 21.3±4.3SD years. Out of all, 51(40.8%) were using mobiles, 22(17.6%) computer, 47(37.6%) laptops and 5(4.0%) were using other gadgets. Annual academicGrades were ≤50% in 33(26.4%) and >50% in 92(73.6%) students. Academic performance was improved in 71(56.8%) and not improved in 54(43.2%). Perceived stress was mild in 53(42.4%), moderate in 47(37.6%) and severe in 25(20%). Overall perceptions regarding online learning response was positive 67(53.6%) and negative 58(46.4%).

Students with mild stress showed improved academic performance as compared to moderate and severe perceived stress (p=0.000). Among all the students with overall positive perceptions response showed improved academic performance as compared to students with negative perceptions response as shown in table I.

Majority of students who agreed with “Online learning is helpful in understanding basic sciences” showed better academic performance as compared to others (p=0.000). Among all those students who were strongly agreed with “online learning is not suitable for clinical skills 31(24.8%) showed not improved academic performance while 11(11.2%) showed improved academic performance (p=0.001). Academic performance was significantly associated with quick time management (p=0.001), online learning as serious communication gap (p=0.000) and low connectivity and internet issues (p=0.000) as shown in table II.

Perceived stress questions including social isolation, lack of self-discipline, lack of interaction with

patients for learning and lack of interaction with students and other class members showed significant impact on academic performance (p=0.000, p= 0.000, p=0.01 and p=0.000 respectively) as shown in table III.

Majority of students with positive perceptions regarding "future learning preference of online learning system" showed improved academic performance as compared to those with negative response (48% vs 8.8%, p=0.000). Majority of students with positive response regarding "satisfactory quality of online learning" showed improved academic performance as compared to those with negative response (38.4% vs 18.4%, p=0.001). Perceptions such as low impact of online learning, increased isolation positive response showed significant association with improved academic performance (p=0.03) as shown in table

**Table I: Association Between Academic Performance, Perceived Stress, and Overall Perceptions Response**

| Perceived stress | Academic performance | | Total | P value |
|---|---|---|---|---|
| | Not improved | Improved | | |
| Mild | 10(8%) | 50(35%) | 53(43%) | 0.000 |
| Moderate | 36(28.8%) | 14(13.2%) | 47(42%) | |
| Severe | 8(6.4%) | 7(8.8%) | 25(15%) | |
| Total | 54(43.2%) | 71(56.8%) | 125(100%) | |
| **Overall Perceptions Response** | | | | |
| Negative | 39(31.2%) | 19(15.2%) | 58(46.4%) | 0.000 |
| Positive | 15(12%) | 52(41.6%) | 67(53.6%) | |
| Total | 54(43.2%) | 71(56.8%) | 125(100%) | |

**Table II: Academic Performance with Respect to Performance Questions**

| | Performance Questions | | Academic Performance | | P value |
|---|---|---|---|---|---|
| | | | Not improved | Improved | |
| 1 | Online learning helped me in understanding better basic sciences | Agree | 3(2.4%) | 28(22.4%) | 0.000 |
| | | Strongly agree | 38(2.4%) | 12(9.6%) | |
| | | Neutral | 11(8.8%) | 10(8%) | |
| | | Strongly disagree | 0(0%) | 15(12%) | |
| | | Disagree | 2(1.6%) | 6(4.8%) | |
| 2 | Online learning is not suitable for clinical skills learning | Agree | 10(8%) | 15(12%) | 0.001 |
| | | Strongly agree | 31(24.8%) | 11(11.2%) | |
| | | Neutral | 13(10.4%) | 9(7.2%) | |
| | | Strongly disagree | 14(11.2%) | 3(2.4%) | |
| | | Disagree | 3(2.4%) | 13(10.4%) | |
| 3 | Time is easily managed in studies through online system | Agree | 21(16.8%) | 20(16%) | 0.001 |
| | | Strongly agree | 26(20.8%) | 36(28.8%) | |
| | | Neutral | 7(5.6%) | 1(0.8%) | |
| | | Strongly disagree | 0(0%) | 9(7.2%) | |
| | | Disagree | 0(0%) | 5(4%) | |
| 4 | A serious communication gap was found between student and instructor | Agree | 13(10.4%) | 17(13.6%) | 0.000 |
| | | Strongly agree | 7(5.6%) | 33(26.4%) | |
| | | Neutral | 17(13.6%) | 18(14.4%) | |
| | | Strongly disagree | 11(8.8%) | 3(2.4%) | |
| | | Disagree | 6(4.8%) | 0(0%) | |
| 5 | Internet and low connectivity affect understanding of lectures | Agree | 16(12.8%) | 6(4.8%) | 0.000 |
| | | Strongly agree | 24(19.2%) | 38(30.4%) | |
| | | Neutral | 1(0.8%) | 16(12.8%) | |
| | | Strongly disagree | 5(4%) | 8(6.4%) | |
| | | Disagree | 8(6.4%) | 3(2.4%) | |

**Table III: Association Between Perceived Stress Questions and Academic Performance of Students**

| | Perceived Stress Questions | | Academic Performance | | P Value |
|---|---|---|---|---|---|
| | | | Not improved | Improved | |
| 1 | Students had a feeling of social isolation in online learning system | Agree | 0(0%) | 19(15.2%) | 0.000 |
| | | Strongly agree | 15(12%) | 23(18.4%) | |
| | | Neutral | 21(16.8%) | 4(3.2%) | |
| | | Strongly disagree | 0(0%) | 24(19.2%) | |
| | | Disagree | 18(14.4%) | 1(0.8%) | |
| 2 | Students are more likely to have lack of self-discipline with online system | Agree | 9(7.2%) | 37(29.6%) | 0.000 |
| | | Strongly agree | 0(0%) | 20(16%) | |
| | | Neutral | 3(2.4%) | 7(5.6%) | |
| | | Strongly disagree | 10(8%) | 0(0%) | |
| | | Disagree | 3(2.4%) | 13(10.4%) | |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Students lack interaction with patients in online learning system | Agree | 15(12%) | 28(22.4%) | 0.01 |
| | | Strongly agree | 20(16%) | 24(19.2%) | |
| | | Neutral | 7(5.6%) | 6(4.8%) | |
| | | Strongly disagree | 12(9.6%) | 5(4%) | |
| | | Disagree | 0(0%) | 8(6.4%) | |
| 4 | Reduced interaction and class discussion with other class members | Agree | 1(0.8%) | 35(28%) | 0.000 |
| | | Strongly agree | 26(20.8%) | 14(11.2%) | |
| | | Neutral | 8(6.4%) | 11(8.8%) | |
| | | Strongly disagree | 15(12%) | 7(5.6%) | |
| | | Disagree | 4(3.2%) | 4(3.2%) | |

**Table IV: Association Between Perceptions Response and Academic Performance**

| | Perceptions | Response | Academic performance | | P value |
|---|---|---|---|---|---|
| | | | Not improved | Improved | |
| 1 | Future learning preference | Negative | 45(36%) | 11(8.8%) | 0.000 |
| | | Positive | 9(7.2%) | 60(48%) | |
| 2 | Quality of online learning is satisfactory | Negative | 35(28%) | 23(18.4%) | 0.001 |
| | | Positive | 19(15.2%) | 48(38.4%) | |
| 3 | Low impact of online learning | Negative | 36(28.8%) | 23(18.4%) | 0.000 |
| | | Positive | 18(14.4%) | 48(38.4%) | |
| 4 | Student teacher interaction isolation has increased | Negative | 32(25.6%) | 39(31.2%) | 0.03 |
| | | Positive | 22(17.6%) | 32(25.6%) | |
| 5 | Online learning is better than traditional learning | Negative | 25(20%) | 58(46.4%) | 0.000 |
| | | Positive | 29(23.2%) | 13(10.4%) | |
| | | Total | 1(0.8%) | 16(12.8%) | |

## Discussion

Online learning is an active medical education tool that offers effective alternative for traditional educational system. it also helps to solve health care providers and educators' shortage issue.[10] Literature reported that online learning is as effective in enhancing knowledge and information as traditional lecture-based learning. Some studies labeled it as cost effective strategy in health education system.[11] Pandemic COVID-19 has forced medical schools to suspend their on-ground lectures and shift it to online system for safety of students and teachers.[12]

In present study, online learning Help in basic sciences, unsuitability for clinical skills understanding, quick time management, serious communication gap and low internet activity were important factors effecting academic performance ($p<0.001$). Hugenholtz et al. reported that online learning is an effective learning system as compared to traditional methods. However, secure internet capacity, staff experience performing online lectures, poor access to communication technologies and poor infrastructure are common problems faced in online learning system.[13]Kogan et al. reported that lack of computer and technical skills are significant barriers towards delivery of online learning system.[14]Keshverziet al. reported that good quality internet and affordable bandwidth are too expensive to afford by students. Similarly, these barriers contribute to slow downloading speed and low visual quality outputs.[15] Another similar study reported that in remote areas telecommunication signal contribute to poor connectivity issue in low-income countries.[16] Agrawal et al. reported that online learning sessions were stopped due to 80% unavailability of presenter and 20% technical reasons.[17]

In present study, common perceptions regarding online learning include future learning, satisfaction, low impact, isolation and better than traditional learning system. Rose reported that online learning reported that common perceptions of students are flexibility, better platform for sharing information, improve access to medical information, learner convenience and repeatability.[18]Jawaid et al. reported that common perception regarding online learning system is that it required digitalization of medical education using innovative technology.[19]Iqbal et al. from Pakistan reported that 86% of students felt online learning had little impact on their learning while 77.4% students showed negative perceptions.[20]

## Limitations

Study was conducted in medical college so its findings cannot be generalized on all learning schools.

## Conclusion

Online learning is an effective teaching modality

resulting in moderately high academic performance of HBS medical students. Low perceived stress leads to better academic results. Future learning preference and low impact of online learning are most common students' perceptions associated with lack of improvement in academic performance. We suggest faculty training and students' orientation regarding online learning tools. This will help in improving online learning outcomes.

## REFERENCES

1. Rabi F.A., Al Zoubi M.S., Kasasbeh G.A., Salameh D.M., Al-Nasser A.D. SARS-CoV-2 and coronavirus disease 2019: what we know so far. *Pathogens.* 2020;9:E231.
2. Cui J., Li F., Shi Z.L. Origin, and evolution of pathogenic coronaviruses. *Nat Rev Microbiol.* 2019;17:181–192.
3. Xie M., Chen Q. Insight into 2019 novel coronavirus - an updated interim review and lessons from SARS-CoV and MERS-CoV. *Int J Infect Dis.* 2020;94:119–124
4. Akhtar H, Afridi M, Akhtar S, Ahmad H, Ali S, Khalid S et al. Pakistan's Response to COVID-19: Overcoming National and International Hypes to Fight the Pandemic. JMIR Public Health Surveill. 2021 May 19;7(5):e28517.doi: 10.2196/28517.
5. Kumar SC. Awareness, benefits, and challenges of e-learning among the students of Kurukshetra University Kurukshetra: A study. *Int J Inf Dissemination Tech.* 2019;8(4):227–230. doi:10.5958/2249-5576.2018.00048.1
6. O'Doherty, D., Dromey, M., Lougheed, J. *et al.* Barriers and solutions to online learning in medical education – an integrative review. *BMC Med Educ* 18, 130 (2018). https://doi.org/10.1186/s12909-018-1240-0
7. Desai D, Sen S, Desai S, Desai R, Dash S. Assessment of online teaching as an adjunct to medical education in the backdrop of COVID-19 lockdown in a developing country - An online survey. *Indian J Ophthalmol*. 2020;68(11):2399-2403. doi:10.4103/ijo.IJO_2049_20
8. Wynter L., Burgess A., Kalman E., Heron J.E., Bleasel J. Medical students: what educational resources are they using? *BMC Med Educ.* 2019;19(1):36
9. Abbasi S., Ayoob T., Malik A., Memon S.I. Perceptions of students regarding E-learning during Covid-19 at a private medical college. *Pak J Med Sci.* 2020;36 (COVID19-S4).
10. Kim KJ, Jang HW. Changes in medical students 'motivation and self-regulated learning:a preliminary study. *Int J Med Educ.* 2015;6:213. doi:10.5116/ijme.565e.0f87
11. Bradbury NA. Attention span during lectures:8 seconds, 10 minutes, or more? *Adv Physiol Educ.* 2016;40:509–513. doi:10.1152/advan.00109.2016.
12. Kim K.J., Kang Y., Kim G. The gap between medical faculty's perceptions and use of e-learning resources. *Med Educ Online.* 2017;22(1):1338504
13. Hugenholtz NI, de Croon EM, Smits PB, van Dijk FJ, Nieuwenhuijsen K. Effectiveness of e-learning in continuing medical education for occupational physicians. Occup Med. 2008;58(5):370–2
14. Kogan M., Klein S.E., Hannon C.P., Nolte M.T. Orthopedic education during the COVID-19 pandemic. *J Am AcadOrthop Surg.* 2020;28(11):e456–e464
15. Keshavarzi M.H., SoltaniArabshahi S.K., Gharrahee B., Sohrabi Z., Mardani-Hamooleh M. Exploration of faculty members' perceptions about virtual education challenges in medical sciences: a qualitative study. *J Adv Med Educ Prof.* 2019;7(1):27–34
16. Ayittey FK, Ayittey MK, Chiwero NB, Kamasah JS, Dzuvor C. Economic impacts of Wuhan 2019-nCoV in China and the world. J Med Virol. 2020;92(5):473–5
17. Agrawal S, Maurya AK, Shrivastava K, Kumar S, Pant M, Mishra SK. Training the trainees in radiation oncology with telemedicine as a tool in a developing country: a two-year audit. Int J Telemed Appl. 2011;2011:23–8.
18. Rose S. Medical Student Education in the Time of COVID-19. JAMA. 2020;323(21):2131–2.
19. Jawaid M, Ashraf J. Initial experience of eLearning research module in undergraduate medical curriculum of Dow University of Health Sciences: Development and students' perceptions. *Pak J Med Sci.* 2012;28(4):591–596.
20. Iqbal S, Shafiq A, Iqbal N. Perceptions of undergraduate dental students towards e-Learning in Lahore Medical and Dental College. *Pak J Med Heal Sci.* 2016;10(4):1191–1193.

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Authors declared no conflicts of Interest.

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The data that support the findings of this study are available from the corresponding author upon request.

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