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A J S M U

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A J S M U

Volume 11, Issue 2 **July - December 2025**

EDITORIAL		Page No.
Team Based Teaching: Strategy to Learn Anatomy in Large Group	Surriyya Sarwat	38
ORIGINAL ARTICLE		
Knowledge and Attitudes Towards Clinical Use of E-Cigarettes Among Medical Students in A Public Sector University of Karachi	Mehreen Fatima, Mahnoor Najib, Qarsam Arsha, Nargis Ali, Saba Zulfiqar, Muhammad Abdullah Mashriqi, Adil Shah, Yumna Khan	40
Thyroid Profile in Type 2 Diabetes Mellitus and their Correlation	Noor ul Ain, Shazia Shakoor, Afsheen Zehra, Muhammad Saeed, Zakia Aamir	46
Impostor Syndrome Among Medical Students: A Comparative Study of Public and Private Medical Institutions in Pakistan	Momina Jilani, Minal Akbar, Thoraya Salah Murtada Sidahmed	51
Epidemiological Analysis of Elbow Fractures in Children of Urban Populations of the Third World Country	Ghazanfar Ali Shah, Mukesh Kumar, M. Sabir Memon, Affan Tayyab, Syed Muhammad Sibtain, Imran Khan Mangi	57
Impact of PF Ratio and Oxygenation on Non-Invasive Ventilation Failure during Acute Exacerbations of COPD Instructions to Authors	Syed Ali Abbas, Yusra Arshad, Kulsum Ghous, Nimra Akhtar, Ayesha Shahnawaz, Hudaibya Ayub	62
CASE REPORT		
Premaxillary Osteotomy and Fixation in Bilateral Cleft Lip and Palate: A Case Report	Summera Kanwal, Tahera Ayub, Muhammad Ashraf Ganatra, Naid Rashid Qureshi	67
Instructions To Authors		iv

EDITORIAL

Team Based Teaching: Strategy to Learn Anatomy in Large Group

Surriyya Sarwat

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Teaching Anatomy is fundamental for pre-clinical years in medical institutes. Many medical schools deliver anatomy content through cadaveric dissection, prosected bodies, plastic models, web-based classrooms, Anatomy studios or even 3D visualization in small as well as large group sessions[1,2]. Mostly theoretical content is delivered through large group teaching due to a large number of students with a limited number of cadaveric bodies, high number of contact sessions, shortage of trained anatomists, overcrowding, and teacher-centered formats[3,4]. This issue is especially prevalent in public sector institutes. In public-sector medical colleges, additional constraints such as limited resources, budgets, infrastructure for small group sessions, limited access to cadavers and models, heavy teaching loads, and competing administrative responsibilities further exacerbate this issue. Large lecture halls become the default method of delivery, not because it is educationally ideal, but because it is administratively feasible. Yet these environments frequently encourage surface learning, passive note-taking, and short-term memorization behaviors misaligned with the demands of clinical practice. Every physical assessment, surgical procedure, and diagnostic evaluation performed within the context of healthcare, relies upon a sound understanding of anatomy and physiology. Consequently, when students are enrolled into overpopulated public school classrooms, many of these students will not be able to effectively convert structural relationships to functional. When students face difficulties relating concepts of anatomy/physiology to their future roles as healthcare providers, these deficits not only affect their immediate academic performance but also have long-term implications for patient safety[5].

It is therefore increasingly difficult to justify the pedagogies that primarily transmit only information rather than cultivate active, accountable, and clinically relevant learning. Although advanced learning tool modifications such as multimedia or learning management systems are helpful, they do not resolve the deeper learning and problem-solving competency-based expectations from the medical professionals. The purpose of anatomy education is to prepare safe and reflective medical personnel; pedagogical approaches must explicitly foster application of knowledge, peer collaboration, and readiness for clinical reasoning[6].

Team-based learning (TBL)—with its structured sequence of guided preparation, readiness assurance testing, and collaborative application exercises—offers a powerful response to the entrenched challenges of large-group teaching, particularly in resource-constrained public institutions[7]. In the last two decades, multiple research exploration in context with TBL in health professions education has revealed enhancement of student learning, engagement, and teamwork. Systematic reviews have consistently reported improvements in students' academic performances, problem-solving skills, and professional attitude with TBL implemented in high fidelity. Crucially, TBL is designed for large cohorts. A single skilled facilitator can guide multiple teams working simultaneously, making it highly compatible with public-sector realities where expanding faculty numbers is rarely feasible[7].

Research has shown that, in large cohort studies, teaching anatomy through traditional lectures supplemented with team-based learning (TBL) improves examination outcomes and fosters positive learner perceptions. Students frequently report that TBL increases accountability for preparation, deepens clinical reasoning, and encourages articulation of anatomical relationships. These benefits arise not from additional teaching hours, but from restructuring how existing time is used[8].

The process of TBL based on individual readiness-assurance (IRAT) for every learner, is particularly valuable in large public classrooms. It ensures early identification of misconceptions, provides immediate feedback, and promotes disciplined study habits so individuals take the responsibility for self-exploration of the concepts. Team application exercises (tRAT) provide students with opportunities to integrate conceptual knowledge with clinical reasoning, transforming learning from passive reception into collaborative problem-solving. TBL is mainly aligned with the patient-centered and outcomes-based curricula of medical education[1]. Logistics for TBL directly address the persistent constraints of large group interactive sessions in the public sector environment. Application problems can be facilitated in large lecture halls using simple tools such as response cards or structured reporting. Faculty time is re-directed towards guiding discussion rather than repeating content. This model simultaneously enhances learning quality and preserves scalability[1].

Correspondence: Dr. Surriyya Sarwat, Associate Professor, Department of Anatomy, Jinnah Sindh Medical University, Karachi, Pakistan

Email: surriyya.sarwat@jsmu.edu.pk

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The literature demonstrates that during COVID-19 related disruptions to face-to-face instruction, blended models integrating traditional lectures with online TBL maintained continuity of structured interaction.

In order for a medical education programme to successfully adopt TBL, it is necessary for the institution to commit to the process, along with commitment from faculty to develop effective materials and procedures for preparing students to use TBL[9]. Faculty development is critical in developing, engaging, and facilitating authentic application exercises for the students. The structure of the assessment should encourage student preparation and teamwork, as well as reasoning skills, rather than just passive attendance. In addition, students who have only participated in a teacher-centered learning environment, may be apprehensive about using TBL for peer assessment and evaluation, particularly in a public-sector institution, where academic competition and anxiety levels tend to be elevated. However, with an appropriate orientation to this method of learning and implementation of TBL supported by the institution, research shows that student acceptance of peer assessment and evaluation increases significantly[10].

Although TBL does not supersede traditional educational methods, such as cadaveric dissection, prosection, or simulation, it offers the educational framework to enhance the development and use of these methods. Incorporating radiological and three-dimensional (3D) virtual anatomy technologies into TBL application exercises enhances opportunities for greater vertical and horizontal integration of anatomical education throughout the medical education curriculum[10].

The available literature clearly documents that TBL allows for enhanced knowledge retention, increased learner engagement, development of teamwork and shared skills, and application of the knowledge of anatomy to clinical practice by medical students, especially at public-sector educational institutions where there has been extensive growth in student enrolment and limited resources, thus, rendering reliance on traditional lecture-based methods of teaching less effective than the TBL approach (with its continuous feedback mechanism creating a better educational environment for students, and allowing for in-depth development of concepts). Therefore, the real question becomes whether all medical schools are prepared to support the implementation of TBL with appropriate planning and preparation. Implementing TBL in any instructional setting relies primarily upon the leadership of an institution, allocation of resources, and the involvement and training of students, faculty and staff, as well as the reform of the assessment process. Even more basic philosophical changes are necessary: recognizing that the students are not merely passive recipients of an expert's teaching but rather active participants (partners) who construct their own understanding of clinically relevant anatomy[11,12].

In order to ensure that we are truly preparing graduates who are capable of utilizing their anatomical knowledge to reason clinically, collaborate effectively, and continue their learning independently, we must adapt the way we approach anatomy education. Team-Based Learning (TBL) is a structured approach that is supported by research and can provide a better framework for producing successful students in larger classroom environments. Its adoption is not simply an instructional option; it is an ethical response to the realities of contemporary medical education and the responsibilities we hold towards future patients.

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ORIGINAL ARTICLE

Knowledge and Attitudes Towards Clinical Use of E-Cigarettes Among Medical Students in A Public Sector University of Karachi

Mehreen Fatima[1], Mahnoor Najib[2], Qarsam Arsha[2], Nargis Ali[2], Saba Zulfiqar[2], Muhammad Abdullah Mashriqi[2], Adil Shah[2], and Yumna Khan[2]

ABSTRACT

Objective: This study aimed to evaluate the knowledge and attitudes of medical students at a public university in Karachi regarding the clinical use of e-cigarettes.
Methodology: A cross-sectional observational study was conducted among the undergraduate MBBS students from first year to final year including both the genders through convenient sampling technique. A self-administered structured questionnaire comprising four sections was administered to the participants.
Results: Total 301 participants were included in the study with a mean age of 22.88±3.951 years. Most of the study participants were females (58.5%) and majority of the participants were studying in their final year (43.2%). It was found that majority of the participants were not smoking any cigarettes (77.7%). Most of the participants (73.4%) had heard about e-cigarettes, but the majority of them denied smoking (n=251, 83.3%). However, of those who smoked e-cigarettes, 52% smoked daily. Further, significantly more female than male participants believed that e-cigarettes are less harmful than conventional cigarettes (P-value = 0.002 Vs. 0.597).
Conclusion: Participants had adequate knowledge about e-cigarettes and slightly positive attitude towards their use. Further, males were found to be more knowledgeable than females in most of the aspects.

Keywords: Attitudes, clinical usage, e-cigarettes, knowledge, medical students

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INTRODUCTION

Electronic cigarette (E-cigarette) also referred to as electronic nicotine delivery systems (ENDS) is a portable device, powered with a battery that delivers nicotine via vaporized, flavourful liquid made from propylene glycol, glycerine, and nicotine[1]. In the last two decades, e cigarette has become increasingly popular as evidenced by a significant increase in its global usage[2]. Its use is more commonly seen in young, high-income city dwellers around the world[3]. Technology innovations, some attractive taste options, and heavy marketing of e-cigarettes as a cheaper and safer alternative of smoking or as a smoking-cessation product, are some of the reasons for its increased use. According to a 2013 report by CDC (Center for Disease Control and Prevention), between 2011 and 2012, e-cigarettes usage in middle and high school students increased from 3.3% to 6.8%[4].

According to Brozek et al., the use of e-cigarettes among medical students is 1.3% with majority of users being male[5]. In a study conducted among medical college students in Saudi Arabia, the results showed that the prevalence rate of e-cigarette use is 11.5%[6]. Although it is perceived beneficial for smoking cessation, there is still inconclusive evidence in support of e-cigarettes' effectiveness in smoking cessation[3]. Moreover, some studies indicated that use of e-cigarettes in student population is not always associated with intention to quit smoking[3, 6].

This growing popularity of e-cigarettes generates increased interest among researchers all over the globe.

1. Department of Forensic Medicine, DIMC, Dow University of Health Sciences, Karachi, Pakistan

2. Final Year Student, DIMC, Dow University of Health Sciences, Karachi, Pakistan

Correspondence: Dr. Mehreen Fatima, Associate Professor, Department of Forensic Medicine, DIMC, Dow University of Health Sciences, Karachi, Pakistan

Email: mehreen.fatima@duhs.edu.pk

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However, little data is available from developing countries and considerable gaps exist in knowledge with regard to the risks and benefits of e-cigarette use, which need to be addressed. It is vital to improve level of awareness and to promote education with regard to e-cigarette use. This could be accomplished at level of college and university students, especially medical students as they are future doctors who would be responsible for imparting adequate knowledge to their patients and encouraging them to develop healthy habits. So, it is vital to know their perspectives on e-cigarettes especially their perspective of clinical use of e-cigarettes as a method to cease smoking.

Thus, this study aimed to assess the knowledge, attitude and perceptions of medical students towards e-smoking, with a special focus on their inclination to recommend the clinical use of e-cigarettes as a method to cease smoking.

METHODOLOGY

IRB/ERC Approval:

This was a cross-sectional observational study conducted at two public sector medical colleges under Dow University of Health Sciences. Before start of the study, the primary researcher obtained ethical approval from University review board via the reference number IRB- 2422/DUHS/approval/2022/748 dated 18th March 2022.

The study was conducted from April 2022 to Dec 2022. Sampling was done through convenient sampling technique from undergraduate MBBS students studying from the first year to the final year including both the genders. However, students not willing to give written informed consent, students of BDS and Allied health sciences, and pass out students and students appearing in exams were excluded from the study.

The sample size was determined using Open Epi version 3.01. In a study from Sindh Pakistan, the perception calculated was 65%[3]. Hence, taking 95% confidence level and 5% margin of error the computed sample size was 298. By adding, 10% for expected non-response rate, a total of 328 was suggested as sample size.

A self-administered structured questionnaire was given to the participants after taking an informed consent. Each participant took approximately 10 minutes to complete the questionnaire. The questionnaire comprised four sections. First section was a brief socio-demographic section including questions like participant's gender, age and study year. Section 2 included questions regarding participants' self-reported smoking status. Section 3 evaluated the knowledge and attitude related to the clinical use of e-cigarettes and e-smoking, and section 4 assessed perception with questions like whether e-cigarettes help in quitting smoking, or are less addictive than regular cigarettes etc.

A pilot project was conducted on 10% of the sample size that is 32 participants to test the questionnaires' clarity, the time required to fill the forms, its organization and applicability. This helped identify and correct any errors or oversights. Based on the feedback, the questionnaire was revised to address the identified deficiencies.

Data was tabulated on Microsoft Excel and analyzed on SPSS (version 22). The categorical variables were shown as frequency and percentages while quantitative variables were presented as means and standard deviation. Further, knowledge and attitude of the participants towards e-cigarettes was assessed using cross tabulation and chi-square test. P-value below 0.05 was considered significant.

RESULTS

Total 301 participants were included in the study with a mean age of 22.88±3.951 years. Most of the study participants were females (58.5%) while the majority of the participants were studying in their final year (43.2%), were Pakistani (93.7%), and studying in a private sector university (70.8%). Most of the participants were not smoking conventional cigarettes (77.7%), even in the past (73.4%). Further, when participants who smoked cigarettes were asked about the number of cigarettes they smoked daily, 8.3% said two packs of cigarettes. Moreover, when they were asked if they wanted to quit smoking, 22.6% said yes (Table 1).

Most of the participants (73.4%) agreed that they have heard about e-cigarettes. Additionally, when they were asked about their source of information, almost half of them reported having heard about e-cigarettes from their family and friends (50.5%) (Figure 1).

When participants were asked if they smoked e-cigarettes, majority of them denied it (n=251, 83.3%), however, of those who admitted smoking e-cigarettes, 52% smoked daily, 12 did it occasionally (24%), while all others reported smoking rarely (n=12, 24%). Additionally, most of those who smoked, cited fashion or trend as their reason of starting using e-cigarettes (n=21, 42%) (Figure 2).

Additionally, when knowledge and attitude of the participants was assessed towards the clinical use of e-cigarettes, significantly more female participants than males claimed that e-cigarettes were less harmful than conventional cigarettes (P-value = 0.002 Vs. 0.597).

Table 1: General characteristics of the participants (n=301)

General Characteristics		N	%
Age (Years)	Mean ± SD	22.88±3.951	
Gender	Male	125	41.5
	Female	176	58.5
Study Year	First	24	8.0
	Second	18	6.0
	Third	38	12.6
	Fourth	91	30.2
	Final	130	43.2
University Sector	Private	213	70.8
	Public	88	29.2
Nationality	Pakistani	282	93.7
	Others (USA, America, Canada, Iran, etc.)	19	6.3
Do you currently smoke regular cigarettes?	Daily	24	8.3
	less than daily	42	14.0
	not at all	234	77.7
In the past, have you ever smoked regular cigarettes?	daily	31	10.3
	less than daily	49	16.3
	not at all	221	73.4
Packs of cigarette smoked daily (n=99)	0	52	52.5
	1	19	19.1
	2	25	25.2
	3	3	3.03
Have you ever thought about quitting smoking? (n=99)	yes	68	68.6
	no	31	31.4

Table 2: Knowledge and attitude of the participants towards the clinical use of e- cigarettes

Knowledge and Attitude		N	%	P-value
E-cigarettes are less dangerous and a safer option than traditional cigarettes? (n=235)	Yes	101	33.6	**0.000**
	No	63	20.9	
	Not sure	71	23.6	
	Yes	42	14.0	
E-cigarettes are not at all harmful? (n=238)	No	129	42.9	**0.000**
	Not sure	67	22.3	
E-cigarettes help in quitting smoking? (n=236)	Yes	86	28.6	**0.000**
	No	75	24.9	
	Not sure	75	24.9	
When compared to regular cigarettes, e-cigarettes reduce the risk of cancer for users? (n=235)	Yes	82	27.2	**0.000**
	No	78	25.9	
	Not sure	75	24.9	
E-cigarettes are addictive? (n=236)	Yes	179	59.5	**0.030**
	No	14	4.7	
	Not sure	43	14.3	
FDA approval of e-cigarettes for smoking cessation? (n=236)	Yes	yes	44	**0.000**
	No	no	60	
	Not sure	Not sure	132	
Are students adequately educated regarding e-cigarettes in medical school? (n=236)	Yes	68	22.6	**0.001**
	No	168	55.8	
Is it essential for doctors to be educated about e-cigarettes? (n=236)	Yes	200	66.4	**0.000**
	No	14	4.7	
	Not sure	22	7.3	
Would you suggest e-cigarettes as a method of smoking cessation to a patient who smokes cigarettes? (n=235)	Yes	88	29.2	**0.000**
	No	82	27.2	
	Not sure	65	21.6	

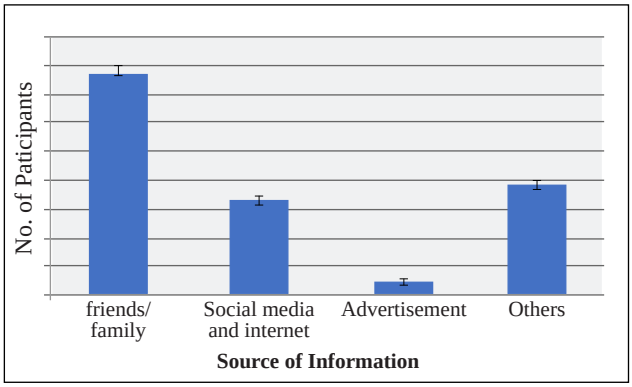

Figure 1: Source of Information of the Participants about E-cigarettes

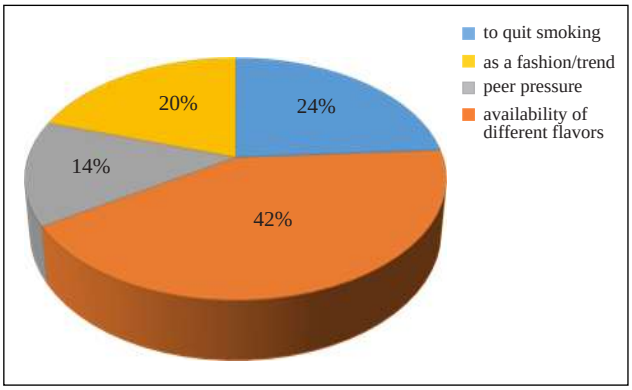

Figure 2: Reported Reasons of Starting Electronic Cigarettes

Furthermore, 27.2% participants believed that e-cigarettes reduce the risk of cancer for individuals who use them as an alternative to smoking conventional cigarettes. More than half of the participants (59.5%) agreed that e-cigarettes are addictive. When participants were asked whether they would recommend e-cigarettes as a method to quit smoking, 29.2% participants said that they would. (Table 2).

DISCUSSION

Healthcare practitioners consider e-cigarettes as a measure of harm reduction and discuss about the efficacy and safety of these e-cigarettes in cessation of smoking. Previously published research regarding the use of e-cigarettes for smoking cessation have shown significant variation and ranged from 3.7 to 46% in clinical practice[7,8]. Whereas another study reported that healthcare professionals have highlighted less harmful effects of vaporized and e-cigarettes as compared to conventional cigarettes and have favorable attitudes towards the use of e-cigarettes[9]. Therefore, it is really crucial to highlight the long-term health related consequences of e-cigarettes usage.

In the current study, the majority of participants denied smoking (n=251, 83.3%). Similarly, a study conducted in Jordan revealed that out of total 679 participants, only 38 were e-cigarette users[10].

Further, the current study reported that males were commonly using e-cigarettes and their source of information regarding e-cigarettes was family or friends followed by social media. Likewise, e-cigarette use was very high among males in another study however, the primary source of their information was social media[10].

Most smokers in our study had taken up e-smoking as a fashion or trend (n=21, 42%), followed by as a smoking cessation method (24%), and due to the availability of different flavors (20%). This availability of different appealing flavors has led to calls for flavor ban from all ENDS by the American Academy of Pediatrics (AAP) and the American College of Physicians (ACP)[8].

Current study agreed with another study conducted in Jordan in 2022 which also concluded that majority of the participants had adequate knowledge overall and positive attitude towards the use of e-cigarettes[11].

Most of the participants in our study believed that e-cigarettes were significantly less dangerous than conventional cigarettes (55.4%), and females were found to be more knowledgeable as compared to males (P-value = 0.002 Vs. 0.597). However, males were found to be more active users of e-cigarettes than females. Another study reported significant gender differences, where females were found more prone to the idea than males[12]. These findings suggest increasing popularity of e-cigarettes among the youth especially the medical students, urging towards the need of strict regulations and more educational and awareness campaigns to provide knowledge about the harmful effects and addiction of nicotine.

Another study assessed participants' perceptions of nicotine pouches and e-cigarettes. Most participants viewed nicotine pouches as the most effective method for quitting smoking, while e-cigarettes were perceived as less harmful than nicotine pouches[13]. Further, a Chinese study showed that male gender, low education level, and lifestyle habits, all contribute towards the use of smoking including both conventional and electronic cigarettes[14,15].

Another study conducted in Italy showed contrasting results where the use of e-cigarettes was found to be rare among the nursing students and it was found that use of e-cigarette was not associated with smoking cessation[16]. Similarly, another study conducted in Jordan showed less popularity of e-cigarettes as compared to other countries. Further, medical students showed better knowledge regarding e-cigarettes compared to non-medical students (OR = 1.710, 95CI% =1.326–2.204, p-value <0.001)[17].

In contrast, another study conducted in Jordan showed that more than one fifth of adults were engaged in e-cigarette smoking[18]. Whereas, a study conducted at a medical university in the United States showed lack of knowledge among medical students regarding tobacco products and increased number of students consuming these products[19]. Additionally, a study conducted in Thailand showed misconceptions of medical students in several aspects regarding the use of e-cigarettes, where lack of information in the curriculum concerning the smoking cessation method, addiction, and health impacts was not sufficient[20].

Another study conducted in Karachi reported findings that contrasted with the present study, as participants demonstrated a negative attitude toward the use of e-cigarettes. This may be attributed to social and cultural stigmatization, as well as limited exposure to e-cigarette advertising on social media[21]. Furthermore, another study indicates that although the use of e-cigarettes among adolescents is increasing, their knowledge regarding these products remains inadequate[22].

In conclusion, the present study found that participants had adequate knowledge of e-cigarettes and a slightly positive attitude toward their clinical use. However, the lack of robust evidence regarding the safety and efficacy of e-cigarettes in comparison with conventional cigarettes, as well as their long-term health consequences, remains debatable. Therefore, standardized survey methods, along with continuous monitoring at both national and international levels, are required to track the evolving patterns of e-cigarette utilization. Furthermore, head-to-head randomized controlled trials are needed to compare the effectiveness of e-cigarettes for smoking cessation with standard therapies. Such evidence would be instrumental in informing public health policies and guiding patient counseling and advocacy.

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ORIGINAL ARTICLE

Thyroid Profile in Type 2 Diabetes Mellitus and their Correlation

Noor ul Ain[1], Shazia Shakoor[1], Afsheen Zehra[1], Muhammad Saeed[2], and Zakia Aamir[1]

ABSTRACT

Objective: To determine the association between thyroid disorders and type 2 diabetes mellitus (DM)
Methodology: A prospective case-control study was conducted at the National Medical Center, Karachi to find out the correlation analysis between studied parameters and type 2 diabetes (T2D).
Results: A positive correlation was observed between the cases and controls including age (0.180), fasting blood sugar (0.626), random blood sugar (0837), HbA1c (0.850), systolic blood pressure (0.281), diastolic blood pressure (0.166) and TSH levels (0.449). The correlation of RBS with HbA1c and TSH was positive and statistically significant ($p < 0.05$).
Conclusion: Individuals with type 2 diabetes are at higher risk to develop thyroid disorder specifically subclinical hypothyroidism because it is closely associated with glucose metabolism.

Keywords: Diabetes mellitus, hyperthyroidism, hypothyroidism, thyroid dysfunction, thyroid stimulating hormone

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INTRODUCTION

The prevalence of diabetes mellitus continues to rise and has become one of the most severe and costly chronic illnesses globally. Diabetes mellitus is a complex disease resulting from dynamic interactions between genetic, environmental, and other factors such as obesity and physical inactivity[1]. Thyroid hormones regulate both pancreatic and carbohydrate metabolism[2]. Diabetic patients with a history of hyperlipidemia, obesity, and anemia are at an increased risk of developing hypothyroidism. These comorbidities not only reduce patients' quality of life but also lead to higher medical costs, greater treatment complexity, and increased mortality[3]. Thyroid dysfunction has been reported to be associated with type 2 diabetes mellitus (T2DM) in various studies. Mild subclinical thyroid dysfunction has been linked to multiple complications such as chronic kidney disease and cardiovascular disease[4]. Thyroid hormones play an essential role in regulating carbohydrate metabolism and insulin secretion; therefore, alterations in the levels of one hormone can influence the effectiveness of the other. Individuals with type 2 diabetes mellitus have been found to have a significantly higher prevalence of thyroid disorders, with reported rates ranging between 9.9% and 48%[5]. According to the International Diabetes Federation (IDF), 537 million people worldwide were living with diabetes in 2021, a number projected to rise to 643 million by 2030 and 783 million by 2045. Recent studies have indicated that hypothyroidism affects approximately 6–24% of individuals with type 1 diabetes mellitus and 3–6% of those with type 2 diabetes mellitus[6]. According to Mehalingam et al., the prevalence of thyroid dysfunction among diabetic patients is 17.5%[7]. Diseases such as hypertension, obesity, and dyslipidemia, as well as other risk factors like cardiovascular disease, are more common among patients with type 2 diabetes and further increase the risk of heart attacks, especially in the presence of thyroid dysfunction. The increased risk of cardiovascular disease-related death observed in diabetic patients ranges from 1–3 times higher in males and 2–5 times higher in females. There is growing evidence that T2DM and thyroid dysfunction are interrelated.

1. Bahria University Health Sciences, Karachi, Pakistan
2. Mekran Medical College, Turbat, Pakistan

Correspondence: Dr. Noor-ul-Ain, Assistant Professor, Bahria University Health Sciences, Karachi, Pakistan

Email: noorulainthebo@yahoo.com

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Diabetes can alter thyroid hormone metabolism and regulation through multiple physiological pathways, while thyroid dysfunction can worsen metabolic control and contribute to the progression of diabetes and its complications. Understanding the nature and extent of this relationship is important for improving disease management and patient outcomes. Therefore, this study seeks to determine the correlation between thyroid dysfunction and T2DM to better understand the mechanisms linking these two endocrine disorders[8].

METHODOLOGY

IRB/ERC Approval:

This was a prospective case control prospective study conducted at National Medical Centre, Karachi, from December 2022 to May 2023. Ethical approval was obtained from Ethical Review Committee of Bahria University of Health Sciences, Karachi Campus (Ref No: 112/2022) dated 19-12-2022 and informed consent was taken from all the participants. Total duration of study was 6 months after approval from Bahria university of Health sciences.

A total of 144 subjects were selected, including 72 diabetic patients and 72 non-diabetic subjects. Sample size was calculated through the open Epi software. All the participants were informed about the objective of the study and their participation in it. Thyroid function test was carried out by analyzing serum levels of thyroid profile and then compared in both cases and control. All participants had been diagnosed with T2DM for minimum two years and were receiving oral hypoglycemic agents, insulin, or a combination. Sampling technique was convenient. Subjects were medically examined including anthropometric values. Blood pressure measurements were taken using a mercury sphygmomanometer. Blood samples from the participants were analyzed for fasting blood sugar, random blood sugar, and HbA1c levels with the help of Roche 501 Routine Chemistry Analyzer.

Diabetic Patients over the age of 40 with a fasting blood sugar of =126 mg/dl, RBS levels >200 mg/dl and, HbA1c >6.5%, were included in this study. Exclusion criteria consisted of patients with history of type 1 diabetes mellitus, thyroid dysfunction, liver disease or renal disease, hypertension and pregnancy. Thyroid function test i.e. TSH was conducted with the help of Chemiluminescence Abbott 1000 ISR (Immunoassay Analyzer) on both groups. FT3 and FT4 were performed by Chemiluminescence Abbott 1000 ISR (Immunoassay Analyzer) in cases.

Data were stored and studied using IBM-SPSS version 23.0; Pearson chi square test was used to calculate the percentages which were reported on gender, marital status, education, exercise, diabetes, hypertension, diabetes duration, oral hypoglycemic, and outcome on FBS, RBS, HbA1c, TSH, FT3 and FT4 for cases and control samples. Spearman rank correlation analysis was done to study the relationship of studied parameters. Bar diagram was used to give graphical presentation of studied parameters.

RESULTS

In our study, we included 144 samples; with 50% in the cases group and 50% in the control group. In the control group, 69.4% were female, mean age was 49.1 years (SD=±7.8), 1.4% were single, 97.6% were married, 12.5% had primary education, 43.1% had secondary education, 41.7% were graduates, 2.8% held a masters degree, and 79.2% did no exercise. In the case group, 44.4% were female, mean age was 53.1 years (SD=±11.1), 2.8% were single, 94.4% were married, while 2.8% were widowed, 20.8% had primary education, 55.6% had received secondary education, 18.1% were graduates, and 5.6% were held a master degree. Additionally, 63.9% of case group did not exercise as reported in figure 1. Pearson Chi Square test did give a significant association of gender, age, education, exercise, and diabetic status with cases and control samples ($p<0.05$).

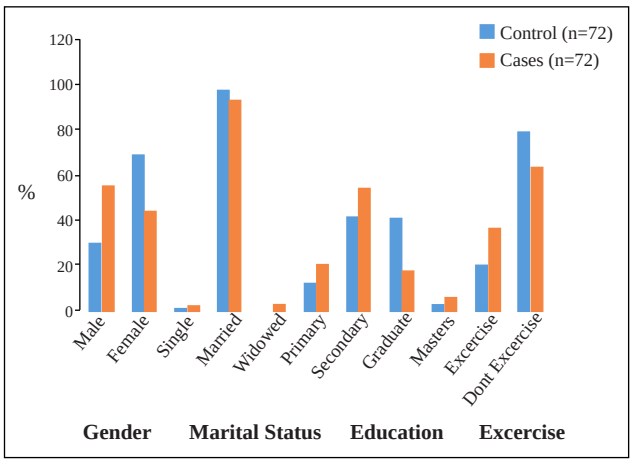

Figure 1: Base line characteristics of studied sample

In control group there were 97.22% normal FBS, 91.7% were normal RBS, all 100% were normal HbA1c, 98.6% were normal TSH and in cases 65.3% were normal FBS, 58.3% were normal RBS, 18.1% were normal HbA1c, 37.5% were normal TSH, 97.2% were normal FT3 and all 100% were normal FT4. Pearson Chi Square test did give a significant association of FBS, RBS, HbA1c, and TSH outcomes with cases and control samples ($p<0.05$) as shown in figure 2.

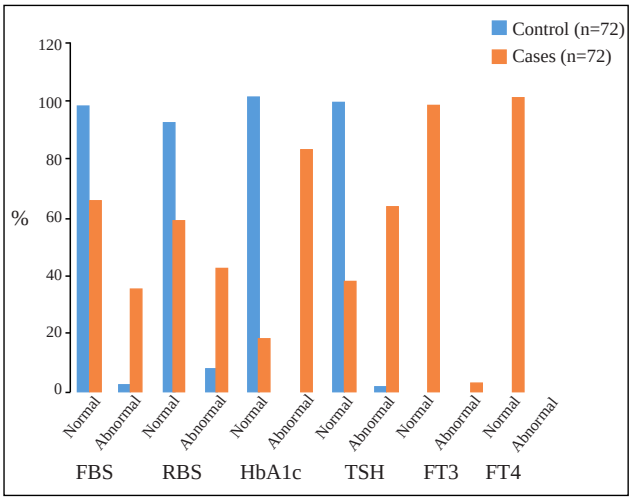

Figure 2: Outcomes on FBS, RBS, HbA1C, TSH, FT3 and FT4

Table-1 reports the detailed correlation analysis of studied parameters using Spearman Rank correlation with T2DM. Age, systolic blood pressure, diastolic blood pressure, fasting blood sugar, random blood sugar, HbA1c, and TSH showed a positive correlation with the cases, and these associations were statistically significant ($p < 0.05$). Age demonstrated a positive correlation with systolic blood pressure, random blood sugar, and TSH, but a negative correlation with BMI, all of which were statistically significant. Both systolic and diastolic blood pressure were positively correlated with BMI, fasting blood sugar, and HbA1c. Additionally, random blood sugar showed a positive and statistically significant correlation with both HbA1c and TSH.

DISCUSSION

Diabetes ranks as the third commanding cause of death worldwide, posing a significant threat to human health and placing a substantial burden on patients, their families, and society reference. Diabetes mellitus and thyroid disorders are the most common endocrinopathies, significantly affecting cardiovascular health[9]. In this study, the mean glycated hemoglobin in T2DM was 8.0 (SD+- 1.6), depicts poor glycemic control in T2DM patients. Our finding is coinciding with Alo et al[10]. Elevated HbA1c levels have been strongly associated with development of chronic complications in DM. Patients with T2DM with raised HbA1c were 4.3 times more likely to develop thyroid dysfunction compared to those with well controlled glycaemia (HbA1c <7%). This may be due to the adverse effects of chronic hyperglycemia on the hypothalamus-pituitary axis where it blunts or abolishes the nocturnal TSH peak[11].

Table-1: Correlation Analysis of Studied Parameters

Parameters		Group	Age	SBP	DBP	BMI	FBS	RBS	HbA1c (%)	TSH	FT3
Age	r-value	0.180	1.000								
	p-value	0.03*	-								
Gender	r-value	-0.252	-0.092								
	p-value	0.002*	0.273								
SBP	r-value	0.281	0.167	1.000							
	p-value	0.001*	0.046*	-							
DBP	r-value	0.166	0.045	0.461	1.000						
	p-value	0.047*	0.593	<0.01*	-						
BMI	r-value	0.112	-0.186	0.149	0.178	1.000					
	p-value	0.180	0.02*	0.075	0.03*	-					
FBS	r-value	0.626	-0.053	0.165	0.238	0.109	1.000				
	p-value	<0.01*	0.528	0.04*	<0.01*	0.192	-				
RBS	r-value	0.837	0.195	0.157	0.163	-0.02	0.617	1.000			
	p-value	<0.01*	0.01*	0.060	0.052	0.810	<0.01*	-			
HbA1c (%)	r-value	0.850	0.138	0.322	0.170	0.074	00.557	00.73	1.000		
	p-value	<0.01*	0.098	<0.01*	0.04*	00.378	<0.01*	<0.01*	-		
TSH	r-value	0.449	0.205	-0.032	0.026	-0.05	00.129	00.438	0.407	1.000	
	p-value	<0.01*	0.01*	0.705	0.760	00.529	00.123	<0.01*	<0.01*	-	
FT3	r-value	-	0.143	-0.007	-0.076	-0.07	-0.105	0.117	-0.075	-0.079	1.000
	p-value	-	0.230	0.956	0.524	00.51	00.379	0.328	0.532	0.508	-
FT4	r-value	-	0.090	-0.168	-0.128	-0.08	0.074	0.139	<0.01*	0.196	0.258
	p-value	-	0.452	0.159	0.283	0.47	0.535	0.244	0.974	0.099	0.02*

*Correlation with p<0.05 was considered statistically significant

In cases, the mean serum Fasting glucose, Random glucose and HbA1c levels among diabetic patients were 127.7 ± 53.0 mg/ dl, 235.5 ± 77.0 mg/dl, 8.0 ± 1.6%, For control participants, the parameters were within normal limits. Our findings are coinciding with the findings of Obgonna et al[11]. There was positive correlation between HbA1c, and TSH and this finding is coinciding with June et al[12]. In this study, we found higher BMI both in cases and control which is not supported by Hossain et al which found higher BMI in T2DM patients with thyroid dysfunction than without thyroid dysfunction. Zhu et al. found patients with BMI> 25 kg/m2 had increased risk of having subclinical hypothyroidism in diabetic patients[13].

In the present study, we observed that high serum TSH levels are another risk factor for increased glycemic variability. Among patients with T2DM but no evidence of thyroid disease, a higher serum TSH level was found to be closely associated with central obesity and hyperlipidemia[14]. Clinical and subclinical hypothyroidism increase risk of hypertension, heart failure, coronary artery disease related fatalities and overall mortality. Hypothyroidism treatment by supplementation of thyroid hormones can mitigate the cardiovascular risk. Obese diabetic individuals are at a greater risk of thyroid disease[15]. This is the first study which shows the correlation of T2DM with age, blood pressure, BMI, and with thyroid hormones simultaneously. The limitations of the study included its single-center design and small sample size. Additionally, FT3 and FT4 levels were not measured in the control group, and the relationship between diabetes-related complications and thyroid function status was not evaluated. Thyroid function in Type 2 Diabetic patients should be diagnosed early, and timely intervention should be performed if the levels of glycemic parameters were significantly increased as compared to non-diabetic subjects. People with Subclinical hypothyroidism may be at significantly increased risk of progression of T2DM, which requires clinical attention and effective prevention and treatment measures. Further follow-up study should be done in order to assess the importance of early identification of thyroid dysfunction, especially in its subclinical manifestation, and its enduring relationship with T2DM across diverse age, gender, and body mass index (BMI) categories. There is a requirement for extensive population-based longitudinal studies with extended observation periods. Follow-up studies in a cohort of subclinical hypothyroid patients with T2DM, need to be done to observe the complications in T2DM patients.

CONCLUSION

Patients with Type 2 diabetes Mellitus are more prone to develop thyroid disorder, specifically subclinical hypothyroidism, because it is closely associated with glucose metabolism. Regular screening of thyroid profile is recommended in routine medical practices for timely diagnosis of thyroid abnormalities in diabetics to lessen the risk of developing other associated morbidities.

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ORIGINAL ARTICLE

Impostor Syndrome Among Medical Students: A Comparative Study of Public and Private Medical Institutions in Pakistan

Momina Jilani[1], Minal Akbar[1], and Thoraya Salah Murtada Sidahmed[2]

ABSTRACT

Objective: To determine and compare the prevalence of impostor syndrome among students of public and private medical colleges in Pakistan

Methodology: This cross-sectional study included 430 MBBS students from public and private medical schools in Pakistan from March 2025 to June 2025. These students were selected using simple random sampling. They completed an online form that used the Clance Impostor Phenomenon Scale (CIPS). Jamovi software was used to analyze the data. Variables such as age, medical school type, and year of study were analyzed to determine the severity of impostor feelings.

Results: In total, 91.4% of students in the study had moderate to severe feelings of being an impostor. Fourth-year students experienced it the most, suggesting that they may face challenges as they begin clinical training. Female students (58%) were more affected than male students. No significant difference was noted between students from public and private medical schools.

Conclusion: The widespread prevalence of impostor syndrome in all groups shows a strong need for quick action through mental health initiatives in medical schools. Plans should aim to build resilience, promote mentorship, and encourage acceptance of imperfection. This helps to support student well-being, regardless of their medical school type.

Keywords: Clance impostor phenomenon scale, impostor phenomenon, medical students, mental health, perfectionism, self-doubt

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INTRODUCTION

Impostor Syndrome (IS) is defined as a persistent failure to take personal achievements and fear of being found out as incompetent, despite objective achievement[1]. Clance and Imes initially defined IS in 1978 and it has since been recognized in numerous high-achieving careers such as medicine[2].

In medical education, the impostor syndrome (IS) is significantly common with a percentage of between 22.5 and 46.6%[3]. The demanding nature of medical education, the culture of competitive exams, and the hierarchical learning environments may worsen the feelings of inadequacy and anxiety, especially in female students and early trainees[4,5]. The impostor syndrome among medical students has been associated with anxiety, depressive symptoms, low self-esteem, burnout, poor academic achievement, and a lack of confidence during clinical training. Such psychological consequences may affect the learning process, clinical judgment, and the general professional growth6. Existing studies from different regions have recorded different prevalence trends and emphasized the links with gender, culture of the institution, academic stress, and competitive learning conditions[6,7]. Nevertheless, the vast majority of studies have concentrated on a single institution or even a single sector, and have not compared medical students in the public and private sectors of education in Pakistan.

Medical colleges in Pakistan are different in terms of academic pressure, competition, number of classes in colleges, clinical exposure, and institutional support systems between the public and the private colleges.

1. MBBS, Islam Medical College, Sialkot, Pakistan

2. Teaching Assistant, Department of Surgery, Faculty of Medicine, Dongola University, Sudan.

Correspondence: Momina Jilani, Islam Medical College, Sialkot, Pakistan

Email: mominadr41@gmail.com

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With these structural and cultural variations, it is significant to compare impostor syndrome in the two sectors to determine whether there are institutional specifics in the factors that can cause psychological burden. The objective of the study was to determine the prevalence and severity of the impostor syndrome among medical students in Pakistan and to compare the trends across the public and private medical institutions. Additionally, the study has also focused on relationships with gender, year of study, and awareness of impostor syndrome.

METHODOLOGY

IRB/ERC Approval:

The Institutional Review Board of Islam Medical and Dental College, Sialkot, granted permission for the study protocol under registration number 900/IMC/ERC/000103.

A descriptive cross-sectional study was conducted between March and June 2025 across public and private medical schools in Pakistan. Data were collected using a self-administered questionnaire designed in Google Forms and distributed through LinkedIn and WhatsApp platforms. Participation was entirely voluntary, and informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were strictly maintained throughout the study. Medical students from 11 medical colleges across Pakistan participated, representing both public and private sectors. Public institutions included King Edward Medical University, Jinnah Sindh Medical University, Bolan Medical College, and Khyber Medical College, while private institutions included Islam Medical College, Avicenna Medical College, Jinnah Medical College, United Medical and Dental College, Quetta Institute of Medical Sciences, Northwest School of Medicine, and Rehman Medical College.

All MBBS students from first to final year were eligible for inclusion in the study. Students who reported having a pre-existing mental health condition were excluded to minimize potential confounding. Participants were selected using a simple random sampling technique. The minimum required sample size was calculated using Cochrane's formula for large populations, assuming a 95% confidence level, a 50% estimated population proportion, and a 5% margin of error. The initial sample size was calculated as 384.16. Since the total population of medical students across the selected institutions was approximately 11,000, a finite population correction was applied, resulting in an adjusted sample size of approximately 371. To enhance statistical power and account for non-response or incomplete questionnaires, the final sample size was increased to 430 participants.

Data were collected using a structured questionnaire comprising two sections. The first section included demographic information such as age, gender, year of study, and type of institution (public or private). The second section consisted of the Clance Impostor Phenomenon Scale (CIPS), a validated 20-item instrument used to assess the severity of impostor feelings.

The primary outcome of the study was the prevalence and severity of impostor syndrome, measured using total CIPS scores. The main independent variable was the type of medical school (public versus private). Additional variables included gender, academic year, and age, which were considered potential confounders. Students with self-reported pre-existing mental illness were excluded from the analysis.

Several measures were implemented to reduce bias. Selection bias was minimized through random sampling, while information bias was reduced by using a standardized and validated instrument (CIPS). Ensuring participant anonymity and confidentiality helped reduce social desirability bias.

Statistical analysis was performed using Jamovi software. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize participant characteristics. Pearson's chi-square test was applied to assess associations between categorical variables. Mean CIPS scores across different academic years and institution types were compared using one-way analysis of variance (ANOVA). Although comparisons involved only two groups in some analyses, one-way ANOVA was used to maintain consistency across statistical procedures, as it yields equivalent results to an independent t-test while allowing standardized handling of multiple comparisons and control of potential Type I error.

Sample size:

The minimum required sample size was calculated using Cochrane's formula, which is appropriate for large populations:

$$N = \frac{Z^2.p.1-p}{e^2}$$

Where:

N= first sample size
Z = Z-score corresponding to the desired confidence level
p = estimated proportion of the population with the characteristic
e = margin of error (set at 5% or 0.05)

$$N = \frac{(1.96)^2.0.5.(1-0.5)}{(0.05)^2} = \frac{3.8416-0.25}{0.0025} \frac{0.9604}{=0.0025} = 384.16$$

Since the population size was finite (approximately 11,000 medical students in selected medical colleges of Pakistan), the sample size was adjusted using the finite population correction:

$$N = \frac{n_0}{1+(\frac{n_0-1}{N})} \frac{384.16}{=1+(\frac{384.16-1}{11000})} \frac{384.16}{=1+0.0349} = \frac{384.16}{1.0349} \approx 371.2$$

To ensure statistical power and account for non-response or incomplete forms, a final adjusted sample size of 430 was selected.

RESULTS

The study comprised 430 participants, including 241 women (56%) and 189 men (44%). The median age of participants was 21 years (interquartile range [IQR]: 20–23 years). The sample was evenly distributed between private (n = 215, 50%) and public (n = 215, 50%) institutions. The distribution across study years was as follows: first year (n = 78, 18%), second year (n = 82, 19%), third year (n = 82, 19%), fourth year (n = 112, 26%), and fifth year (n = 76, 17%). (Table 1)

Table 1: Demographic Characteristics of Participants

Characteristic	N = 430 (%)
Gender	
Female	241 (56%)
Male	189 (44%)
Age	21 (20, 23)
Institute	
Private	215 (50%)
Public	215 (50%)
Year of Study	
1st	78 (18%)
2nd	82 (19%)
3rd	82 (19%)
4th	112 (26%)
5th	76 (17%)

n (%); Median (IQR)

Of all participants, 280 (65.1%) were familiar with the term “impostor syndrome,” while 115 (34.9%) were not. The median Clance Impostor Phenomenon (CIP) score was 61 (IQR: 51–71), with scores ranging from 20 to 97. According to CIP classification, 393 participants (91.3%) had characteristics consistent with impostor syndrome. Specifically, 37 participants (8.7%) had mild or no features, 176 (40.9%) had moderate features, 172 (40%) had frequent features, and 45 (10.5%) had severe impostor syndrome. (Table 2)

Table 2: Knowledge and Prevalence of Impostor Syndrome (N = 430)

Characteristic	Overall (N=430)
Do you know about impostor syndrome?	
Yes	280 (65.1%)
No	115 (34.9%)
CIP Score	
Median (IQR)	61 (51, 71)
Range	20.0 - 97.0
having impostor Syndrome	
Yes	393 (91.3%)
No	37 (8.7%)
CIP Classification	
Mild or no characteristics	37 (8.7%)
Moderate	176 (40.9%)
Frequent	172 (40.0%)
Severe	45 (10.5%)

Among private medical school students, 196 (91.2%) reported experiencing impostor syndrome, compared to 198 (91.4%) in public medical schools. Only 37 students (8.7%) across both institution types did not exhibit impostor characteristics. The chi-square test ($\div^2$ = 0.00155, p = 0.969) indicated no significant difference in the prevalence of impostor syndrome between public and private medical school students. The relative risk (0.999; 95% CI: 0.949–1.05) and odds ratio (0.988; 95% CI: 0.547–1.79) indicated similar probabilities of experiencing impostor syndrome among students in both institution types. Additionally, the contingency coefficient, phi-coefficient, and Cramer’s V were each 0.00167, indicating a negligible association between impostor syndrome and institution type. (Table 3)

Gender-based comparisons showed that a greater proportion of females reported impostor characteristics (n = 228, 58.0%) compared to males (n = 165, 42.0%), a statistically significant difference (p = 0.0141). Among those who did not exhibit impostor characteristics, males represented a higher proportion (22/37; 60.4%) compared to females (15/37; 39.6%). Institution type (p = 0.9691), year of study (p = 0.1681), age (p = 0.4272), and prior awareness of impostor syndrome (p = 0.4761) had no significant association with impostor characteristics. Across all study groups, the mean participant age was 21.4 years (SD = 1.9). (Table 4)

Analysis of impostor syndrome severity by gender showed that females were predominantly represented in the moderate (n = 93, 52.7%) and frequent (n = 105, 61.1%) categories, whereas males were more often represented in the mild or none (n = 23,WHY IS

Table 3: Contingency Table for Impostor Syndrome by Institute

Institute	Having Impostor Syndrome (Yes)	Having Impostor Syndrome (No)	Total	÷² Test	Comparative Measures	Nominal Association Measures
Private	196 (49.7%)	19 (50.0%)	215 (49.7%)	÷² = 0.00155	Odds Ratio: 0.988	Contingency Coefficient: 0.00167
Public	198 (50.3%)	17 (50.0%)	215 (50.3%)	df = 1	95% CI: 0.547, 1.79	Phi-Coefficient: 0.00167
Total	393 (91.3%)	37 (8.7%)	430 (100%)	p = 0.969	Relative Risk: 0.999	Cramer's V: 0.00167

Table 4: Characteristics of Participants with and without Impostor Syndrome

Characteristic	Yes (N=393)	No (N=37)	Total (N=430)	p value
Institute				
Private	196.0 (49.7%)	19.0 (50%)	215.0 (49.7%)	0.969*
Public	198.0 (50.3%)	17.0 (50%)	215.0 (50.3%)	
Gender				
Female	228.0 (58.0%)	15.0 (39.6%)	243.0 (56.4%)	0.014*
Male	165.0 (42.0%)	22.0 (60.4%)	187.0 (43.6%)	
Year of study				
1st	70.0 (18.4%)	5.0 (12.5%)	77.0 (17.9%)	0.168*
2nd	76.0 (19.4%)	7.0 (18.8%)	82.0 (19.3%)	
3rd	80.0 (20.2%)	4.0 (10.4%)	84.0 (19.3%)	
4th	100.0 (25.5%)	11.0 (31.2%)	111.0 (26.0%)	
5th	65.0 (16.4%)	10.0 (27.1%)	75.0 (17.4%)	
Age				
Mean (SD)	21.4 (1.9)	21.6 (1.7)	21.4 (1.9)	0.427**
Range	16.0 - 39.0	19.0 - 24.0	16.0 - 39.0	
Do you know about impostor syndrome?				
Yes	257.0 (65.5%)	22.0 (60.4%)	280.0 (65.1%)	0.476*
No	136.0 (34.5%)	15.0 (39.6%)	150.0 (34.9%)	

** Pearson's Chi-squared test ** Linear Model ANOVA*

THERE A DIFFERENCE? STATES 22 ABOVE. 60.4%) and severe (n = 15, 32.8%) categories. No statistically significant differences were found between institution type (p = 0.7661), year of study (p = 0.2041), age (p = 0.0652), or awareness of impostor syndrome (p = 0.3051). The mean age remained approximately 21.4 years (SD = 1.9) across all severity levels. However, participants who were aware of impostor syndrome were more frequently represented in the severe category (n = 34, 75.9%) compared to those who were unaware (n = 11, 24.1%). (Table 5)

DISCUSSION

Impostor syndrome is a mental state in which a person often doubts their abilities, even when it is clear that they are competent in what they do. This study aimed to investigate how impostor syndrome manifests in students of public and private medical schools. The severity of impostor syndrome was categorized according to the CIP score: a mild score of 40 or less indicated that students hardly ever felt like an impostor; a moderate score between 41 and 60 reflected occasional impostor feelings; scores between 61 and 80 indicated frequent feelings; and a severe score of 80 or above suggested that students nearly always experienced these feelings[8].

Table 5: Severity of Impostor Syndrome by Demographic Characteristics

Variables	Mild or no Characteristics (N=37)	Moderate (N=176)	Frequent (N=172)	Severe (N=45)	Total (N=430)	p-value
Institute						
Private	18.0 (50%)	90.0 (50.4%)	87.0 (50.7%)	19.0 (43.1%)	213.0 (49.7%)	0.766*
Public	19.0 (50%)	86.0 (49.6%)	85.0 (49.3%)	26.0 (56.9%)	217.0 (50.3%)	
Gender						
Female	14.0 (39.6%)	93.0 (52.7%)	105.0 (61.1%)	30.0 (67.2%)	242.0 (56.4%)	0.009*
Male	23.0 (60.4%)	83.0 (47.3%)	67.0 (38.9%)	15.0 (32.8%)	188.0 (43.6%)	
Year of study						
1st	5.0 (12.5%)	30.0 (16.8%)	34.0 (19.9%)	9.0 (19.0%)	77.0 (17.9%)	0.204*
2nd	7.0 (18.8%)	28.0 (15.9%)	35.0 (20.4%)	13.0 (29.3%)	83.0 (19.3%)	
3rd	3.0 (10.4%)	37.0 (21.2%)	37.0 (21.3%)	5.0 (12.1%)	85.0 (19.3%)	
4th	12.0 (31.2%)	48.0 (27.0%)	42.0 (24.4%)	11.0 (24.1%)	111.0 (26.0%)	
5th	10.0 (27.1%)	33.0 (19.0%)	24.0 (14.0%)	7.0 (15.5%)	74.0 (17.4%)	
Age						
Mean (SD)	21.6 (1.7)	21.6 (1.7)	21.3 (2.2)	21.0 (1.7)	21.4 (1.9)	0.065**
Range	19.0 - 24.0	18.0 - 30.0	16.0 - 39.0	18.0 - 24.0	16.0 - 39.0	
Do you know about impostor syndrome?						
Yes	22.0 (60.4%)	113.0 (63.7%)	111.0 (64.7%)	34.0 (75.9%)	280.0 (65.1%)	0.305*
No	15.0 (39.6%)	63.0 (36.3%)	61.0 (35.3%)	11.0 (24.1%)	150.0 (34.9%)	

** Pearson's Chi-squared test ** Linear Model ANOVA*

Although we hypothesized that the prevalence of impostor feelings would differ between students of public and private medical schools, our study found no significant difference. This may suggest that students in both types of institutions encounter similar academic stressors, rigorous exams, and structured curricula—factors that can contribute to feelings of impostrism. The prevalence of our study (91.3%) align with previous findings from the Middle East (45.2%)[9], India (56.7%)[10], Saudi Arabia (42%)[11], and Pakistan (62.65%)[12], showing that impostor feelings are common among medical students worldwide and highlighting the need for better support in these settings.

Our study found that more female students (58%) experienced impostor syndrome symptoms, a trend that was not observed in the Nigerian study[13] or other research reporting no significant gender-based disparities[14]. However, our findings are consistent with previous research, including a study from the United States, which reported a higher prevalence of impostor feelings among female students[15], and a study from Pakistan, where 53.5% of females were found to have impostor syndrome[16]. This disparity could be explained by internalized feelings of inadequacy, fear of failure, and a tendency among female students to compare themselves to high-achieving peers, all of which may exacerbate impostor syndrome symptoms[17].

Furthermore, the highest prevalence of impostor syndrome was observed among fourth-year students, differing from prior studies that reported peaks in the first or third year[18]. The transitional change from pre-clinical to clinical training in the fourth year could explain why this period is particularly challenging.

This study has several limitations. Its cross-sectional design prevents determination of causality or tracking changes over time. The use of self-reported data may be influenced by recall bias or social desirability. Additionally, recruitment via LinkedIn and WhatsApp may have excluded students less familiar with technology, introducing selection bias. Despite these limitations, the study provides valuable insight into how many medical students in Pakistan experience impostor feelings, irrespective of gender, year of study, or type of institution. These findings highlight the importance of identifying and addressing impostor syndrome as part of medical student mental health care.

CONCLUSIONS

This cross-sectional study observed no statistically significant difference in the prevalence of impostor syndrome among students from public and private medical schools. The data show that feelings of inadequacy and self-doubt are common in both educational settings, demonstrating that these experiences are influenced by the inherent challenges of medical training rather than the type of institution. Addressing impostor syndrome as a common challenge among medical students highlights the importance of implementing supportive interventions in all medical institutions. Mentorship programs, peer support networks, and mental health counseling services all assist students in boosting their confidence and mental well-being. Future longitudinal and qualitative studies are needed to better understand the contributing factors, coping mechanisms, and long-term effects of impostor syndrome in medical education.

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Authors' Contributions: MJ: Conceived the study, defined the intellectual content, conducted the literature search, collected data, and prepared and edited the manuscript. **MA:** Contributed to the study design, literature search, data collection, and manuscript preparation, review, and editing. **TS:** Performed data analysis and results writing.
All authors approved the final manuscript.

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ORIGINAL ARTICLE

Epidemiological Analysis of Elbow Fractures in Children of Urban Populations of the Third World Country

Ghazanfar Ali Shah[1], Mukesh Kumar[2], M. Sabir Memon[3], Affan Tayyab[4], Syed Muhammad Sibtain[5], and Imran Khan Mangi[6]

ABSTRACT

Objective: To evaluate the demographic patterns, injury mechanisms, fracture distribution, factors associated with delayed presentation, in children presenting with elbow fractures at a tertiary trauma center of Karachi
Methodology: This retrospective cross-sectional study was conducted at the department of orthopaedic surgery, Shaheed Mohtarma Benazir Bhutto Institute of Trauma (SMBBIT), Karachi from January 2022 to March 2024. All paediatric patients (<14 years) with radiologically confirmed elbow fractures requiring surgical intervention were included. The variables analyzed in this study included age, sex, injury mechanism, fracture type, laterality, bonesetter contact, time to presentation, swelling, neurovascular status, and treatment modality. Fisher's exact test assessed associations between bonesetter visits, delay, and swelling.
Results: A total of 180 patients with mean age 7.2 ± 3.6 years were included. Supracondylar fractures accounted for 73% of cases, predominantly affecting males (69.5%) and on the left side (66.7%). The most common mechanism of injury falls were during play (53.9%). Those patients who presented after 24 hours had visited bonesetters priorly and were all associated with significant swelling at presentation, and its association was confirmed with Fisher's test OR ~ 3.8, $p < 0.001$). In children who presented with Road Traffic Accident (RTA), about 2.8% had vascular injuries. The most frequently performed procedure was close reduction and percutaneous pinning (CRPP), followed by open reduction and internal fixation (ORIF), accounting for 60% and 35% of the cases, respectively.
Conclusion: The most common elbow fracture among children in Karachi was the supracondylar fracture. Delay in presentation was mainly due to initial consultations with bonesetters, which is a preventable factor that can be addressed through public awareness and early referral to reduce complications associated with this disabling condition.

Keywords: Bone-setter, child, elbow injuries, fractures, orthopaedic procedures, Pakistan, retrospective studies, traditional medicine

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INTRODUCTION

Every year about 31 million children around the world suffer from bone fractures, making it a major global health issue. These injuries are especially common in low to middle income countries, where unsafe play areas, poor infrastructure, and limited access to medical care increase the risk and delay proper treatment[1]. Supracondylar elbow fractures are the most commonly seen injuries among children, making up nearly 16% of all childhood fractures[2]. In Pakistan, where children make up more than one-third of the population, these injuries are especially common in large cities like Karachi. The increasing number of cases is mainly due to unsafe play areas, lack of safety measures, crowded living conditions, and delays in receiving proper orthopaedic treatment[3].

Elbow fractures in children usually result from falls on an outstretched hand, playground accidents, or road traffic trauma. Supracondylar fractures are the most prevalent type, followed by fractures of the lateral condyle, medial epicondyle, and radial neck. Clinical features typically include pain, swelling, and restriction of elbow movement. Diagnosis is often challenging because the paediatric elbow contains cartilage and

Consultant Orthopaedic Surgeon[1]/Senior Registrar Orthopaedic Surgery[2]/Chief Orthopaedic Surgeon & Executive Director[3]/Fellow Orthopaedic Surgery[4]/Registrar Orthopaedic Surgeon[5]/Registrar[6], SMBBIT Karachi, Pakistan

Correspondence: Dr. Ghazanfar Ali Shah, Consultant Orthopaedic Surgeon, Department of Orthopaedic Surgery, Shaheed Mohtarma Benazir Bhutto Institute of Trauma, (SMBBIT), Karachi, Pakistan

Email: ghazi9321@gmail.com

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multiple developing ossification centers[4]. The financial constraints, traditional treatments by bonesetters, and poor referral system in developing countries are the sole predictors of delayed presentation and thereby leads to complication associated with it such as malunion, neurovascular injury, Volkmann's ischemic contracture, and joint stiffness[5,6].

Though, International researches provide valuable insights in paediatric elbow fracture, the local epidemiological data is scarce. This study aimed at paediatric elbow fractures managed at a tertiary trauma center (SMBBIT) of Karachi, providing insights about pattern of injury, mechanism of injury, their presentations, and contributing factors of these injuries. This research aims to enhance paediatric trauma management and support comprehensive care planning in the region.

METHODOLOGY

IRB/ERC Approval:

We conducted a retrospective cross-sectional study at the Department of Orthopaedic Surgery, SMBBIT Karachi, from January 2022 to March 2024. The study was approved by the ERC (ERC-000132/SMBBIT /Approval/2024) with an abandonment of informed consent.

The study included children aged 14 years or younger who had elbow fractures confirmed by X-ray and needed surgical treatment. We excluded cases with Gartland type I fractures treated conservatively, pathological fractures, polytrauma requiring transfer, and incomplete records. Fractures were classified by orthopaedic consultants using standard radiographs.

Variables included age, sex, mechanism of injury, fracture type, laterality, time to presentation, bonesetter contact, swelling, neurovascular status, and treatment modality. Delayed presentation was defined as 24 hours post-injury. Bonesetter visit was self-reported. Swelling was defined as a comparative increase in limb circumference with loss of skin wrinkles relative to the contralateral side. Neurovascular compromise included motor/sensory deficits or diminished pulses at presentation.

Descriptive statistics were expressed as mean ± SD or frequency (%). The relationships between bonesetter visits, delayed hospital presentation, and swelling were evaluated using the Chi-square test or Fisher's exact test, depending on data suitability. In situations where one group contained all the cases (perfect separation), odds ratios could not be calculated, and Fisher's exact test was used to determine significance at a 0.05 level (á = 0.05). Variables with less than 5% missing values were included in the analysis, and calculations were based on the available data without imputing any missing values to ensure the authenticity of the results. All analyses were performed using SPSS software version 26.0 (IBM Corp., Armonk, NY, USA). The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure accuracy, transparency, and methodological consistency.

RESULTS

A total of 180 paediatric patients with radiographically confirmed elbow fractures were included in this study. The mean age was 7.2 ± 3.6 years, with a clear male predominance (male-to-female ratio: 2:1). The predominant mechanism of injury was a fall during play, accounting for 53.9% of cases (n = 97), followed by road traffic accidents (24.5%, n = 44) and falls from height (21.6%, n = 39). The left elbow was more frequently involved, representing nearly two-thirds of all cases, indicating a consistent lateralization trend across the cohort. Detailed demographic and injury characteristics are presented in Table 1.

Table 1: Descriptive Statistics

Variable (n = 180)		Mean ± SD or Frequency(%)
Age (years)		7.2 ± 3.6
Gender	Male	126 (69.5%)
	Female	54 (30.5%)
Injury Mechanism	Fall while playing Road Traffic Accident (RTA)	97 (53.9%)
		44 (24.5%)
	Fall from height	39 (21.6%)
Side of Injury	Right Side	60 (33.3%)
	Left Side	120 (66.7%)
	Both Sides	0
Bone Setter Visit	Yes	37 (20.6%)
	No	143 (79.4%)

Table 2 Association Between Bonesetter Visit and Time to Presentation

Time to Presentation	Bonesetter Visit – No	Bonesetter Visit – Yes	Total
< 24 hours	143	0	143
24-72 hours	0	23	23
>72 hours	0	14	14
Total	143	37	180

Table 3 Swelling on Presentation vs Bonesetter Visit

Time to Presentation	Bonesetter Visit – No	Bonesetter Visit – Yes	All	p-Value
No	143	0	143	<0.001
Yes	0	37	37	
All	143	37	180	

*Note: Odds ratio not estimable due to perfect separation; significance determined by Fisher's exact test ($p < 0.001$).

The most affected age group was 6 to 10 years, making up 53% of the cases (n = 95). Children aged 5 years or younger accounted for 25% of cases, while those aged 11 to 14 years made up 22%. This pattern indicates that children between 6 and 10 years are at the highest risk for elbow fractures, likely due to their increased physical activity and outdoor play. The age-wise distribution of cases is illustrated in Figure 1.

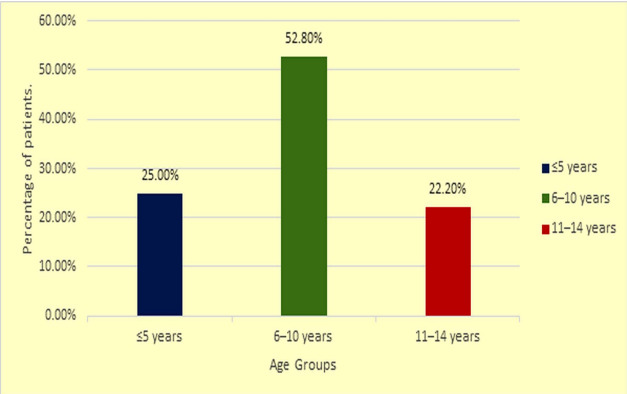

Figure 1: Age Distribution of Paediatric Elbow Fractures

Supracondylar fractures were the most common type of elbow injury in children, making up 73% of all cases. Other types of fractures included lateral condyle, medial epicondyle, and radial neck fractures, which were seen less often. A small number of patients had more complex injuries, such as elbow dislocations. The breakdown of fracture types is shown in Figure 2.

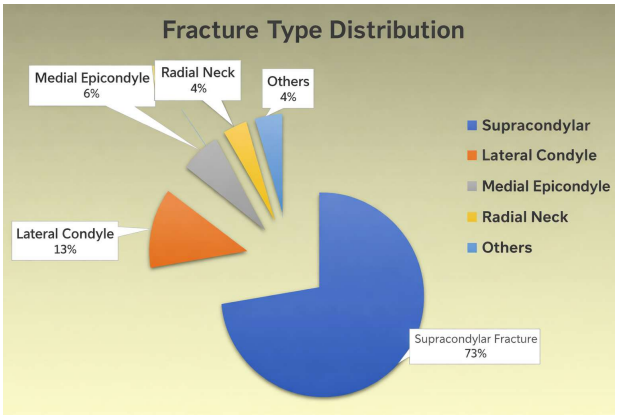

Figure 2: Distribution of Fracture Types in Paediatric Elbow Fractures

The majority of patients (79.4%, n = 143) presented to the hospital within 24 hours of injury, while rest were delayed presentations. All patients presenting after 24 hours had initially visited bonesetters and almost all of those patients presented with immense swelling. This routine traditional treatment seeking behavior and their outcomes, highlight the urgent need for community education to enhance timely referral to specialists. As presented in Table 2, Fisher's exact test confirmed a statistically significant association between preceding bonesetter contact and both delayed presentation and the presence of swelling ($p < 0.001$ for each). Due to perfect separation, the odds ratio could not be computed, as outlined in Table 3.

Five patients (2.8%) presented with vascular compromise, all secondary to RTA. One patient required amputation, while four underwent external fixation. These injuries were predominantly observed in the 6–10 years' age group and were associated with closed fractures in most cases.

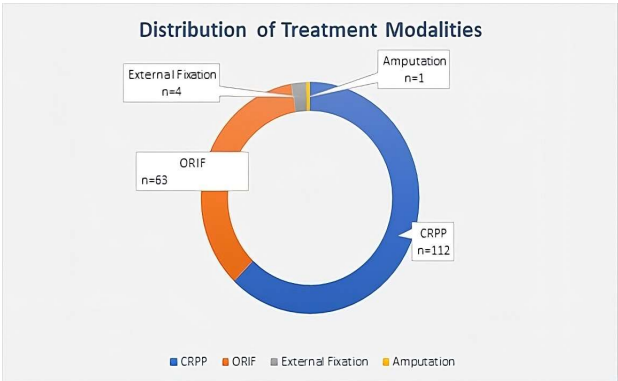

Figure 3: Distribution of Treatment Modalities

Out of 180 patients, approximately 60% (n=112) of patients underwent closed reduction and percutaneous pinning (CRPP), 35% (n=63) received open reduction and internal fixation (ORIF) with K-wires, 4 patients (2.2%) required external fixation, and one patient underwent amputation due to vascular compromise.

DISCUSSION

Our study highlighted that supracondylar humerus fractures in our population is accounted for 73% of paediatric elbow trauma, with less frequent injuries including lateral condyle, medial epicondyle, and radial neck fractures, and a small subset of dislocations/ fracture dislocations. This distribution reflects contemporary series where supracondylar fractures represent the dominant elbow pattern with leading indication for operative intervention, and the typical patient is a school-aged child (5–8 years) with male predominance, may be due to their activity exposure[7,8].

The left-sided predominance (66.7%) we observed is also widely reported and is commonly attributed to protective extension of the non-dominant limb during a fall; large retrospective series demonstrate similar laterality and link higher displacement grades to a greater risk of neurovascular injury[9].

Falls during play were the most common mechanism, aligning with global reports and highlighting environmental factors such as crowded playgrounds, variable surface compliance, and limited supervision, frequently observed in many low- and middle-income settings[10]. In contrast, high-income settings report proportionally more organized sports mechanisms, yet even there, falls from height/playground equipment remain prominent contributors to elbow injury. The understanding of injury mechanism matters because it predicts energy transfer: low-height falls tend to produce extension-type supracondylar fractures with intact soft tissue envelopes, while higher-energy mechanisms (e.g., trampolines, cycling) raise the index of suspicion for associated injuries and unstable patterns[11].

Our study strongly predicted an association of delayed presentation with prior bonesetter contact. All patients who presented after 24 hours of injury, had first visited traditional bonesetters and they all were associated with significant swelling. Fisher's exact testing confirmed significant associations for both delay and swelling (OR ˜ 3.8, $p < 0.001$). Similar patterns are documented across South Asia and sub-Saharan Africa, where traditional manipulation contributes to soft-tissue insult, mal-reduction, and later complications[12,13]. Outstandingly, many institutes and researches focusing on timing of surgical management of supracondylar fractures / paediatric elbow fractures support prioritizing early evaluation and splintage; however, early intervention vs delayed intervention has no significant difference in the postoperative outcomes or conversion to open reduction and internal fixation[9,14].

Although road-traffic accidents were less frequent, they were disproportionately severe: 2.8% presented with vascular compromise, all after RTA; four required external fixation and one amputation. Our vascular-injury fraction sits at the upper end for vessel compromise, consistent with high-energy mechanisms and delayed, pre-hospital manipulation.

Treatment choices in our series CRPP in about 60%, ORIF in 35%, a few external fixations, and one amputation, largely align with evidence-based paradigms. For non-SCHF elbow injuries, recent meta-analysis of lateral condyle fractures shows no difference in complications between CRPP and ORIF when reduction quality is equivalent, reinforcing that anatomic reduction and stable fixation is vital for better outcomes[10].

Limitations and Future Directions:

This was a single-center study, which may limit the generalizability of the findings to broader or rural populations.

Long-term follow-up was not performed, restricting evaluation of both functional recovery and radiographic healing outcomes.

Standardized patient-reported outcome measures (PROMs) and detailed assessments of bone remodeling were not included in the analysis.

Future studies should incorporate objective scoring systems, such as the Flynn criteria, along with validated PROMs to better assess recovery and compare results based on treatment delays and prior bonesetter interventions.

Implementation of early splinting protocols, creation of safe play environments, and establishment of structured referral systems are recommended to improve early management and reduce complications.

Development of a multicenter registry is suggested to enhance data sharing, facilitate long-term surveillance, and optimize paediatric orthopaedic care.

CONCLUSION

Supracondylar fractures are the most common paediatric elbow injury in Karachi, mainly caused by falls during play and more often affecting the left side. Delayed presentation due to prior bonesetter treatment is a key preventable factor linked to swelling and greater surgical difficulty. Early referral, community awareness, and improved trauma care systems are essential to reduce complications. These findings emphasize the need for early orthopaedic referral systems and community-based injury-prevention strategies to reduce paediatric elbow trauma and its complications.

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Authors' Contribution: GAS: Was responsible for data collection, methodology development, and patient recruitment. **MK:** Contributed to the study design, performed data analysis, and drafted the manuscript. **DS:** Handled radiological classification and conducted the literature review. **MSM:** Managed references and carried out proofreading. **SMS:** Performed the statistical analysis and assisted with manuscript editing. **DIKM:** Was involved in data curation and formatting of tables and figures.

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ORIGINAL ARTICLE

Impact of PF Ratio and Oxygenation on Non-Invasive Ventilation Failure during Acute Exacerbations of COPD

Syed Ali Abbas[1], Yusra Arshad[2], Kulsum Ghous[3], Nimra Akhtar[4], Ayesha Shahnawaz[5], and Hudaibya Ayub[5]

ABSTRACT

Objective. This research aims to investigate the role of P/F ratio and oxygenation in predicting non-invasive ventilation failure in patients going through acute exacerbation of chronic obstructive pulmonary disease.
Methodology: A Quasi Single Arm Study was carried out in the Medical ICU and medicine ward of a tertiary care hospital, including 170 patients presenting with acute exacerbations of chronic obstructive pulmonary disease. Data were collected using a structured pro forma after obtaining informed consent. The duration of the study was 6 months.
Results: The research involved a total number of 170 individuals who were admitted with acute exacerbation of chronic obstructive pulmonary disease. Among them, 38% experienced non-invasive ventilation (NIV) failure during treatment. The observed rate of mortality in this study was 23.5%. Within the NIV success group, 45% were males and 55% were females. Fraction of inspired oxygen and arterial oxygen saturation differed significantly at admission, 1 hour, 48 hours, and beyond, while Partial pressure of oxygen varied at admission and 1 hour but not after 48 hours. The PF ratio showed significant differences at all time points.
Conclusion: This study examined the outcomes of non-invasive ventilation (NIV) and the mortality rates in patients undergoing acute exacerbation of chronic obstructive pulmonary disease. The analysis of oxygenation metrics revealed significant variations between patients who had NIV failure and those who had not, as well as in relation to mortality. These findings contribute to the understanding of treatment outcomes in acute COPD exacerbation and can help in clinical decision making. More researches can be conducted for further evaluation.

Keywords: Acute exacerbation, acute respiratory failure, chronic obstructive pulmonary disease, mortality, non-invasive ventilation, P/F ratio

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common and extremely fatal illness that occurs globally. It arises from abnormal functioning in the airways and alveolar sacs, leading to an irreversible restriction of airflow. It is predicted that COPD will become one of the primary contributors to global mortality by 2030[1]. Individuals diagnosed with COPD encounter 1 to 4 episodes of acute exacerbation of COPD (AECOPD) annually, which also have a significant financial burden, comprising 50-70% of all costs associated with COPD. Furthermore, these episodes elevate the risk of developing subsequent AECOPDs, hospitalization, and mortality.

The occurrence of AECOPDs is associated with noteworthy breathlessness, which typically persists for a duration of 7 to 10 days. In certain instances, complete recovery may not be achieved for weeks or even months[2]. The mortality rate associated with acute exacerbations of COPD (AECOPD) is considerable. Following hospitalization for an exacerbation, only around half of COPD patients survive beyond a five-year period. The mortality rate within one year after an AECOPD ranges from 12% to 33%, while after two years, it increases to 26% to 40%[3]. Noninvasive ventilation (NIV) refers to a ventilation method that does not require the use of an invasive artificial airway. NIV relieves the workload of respiratory muscles, enhances alveolar ventilation, alleviates dyspnea,

Consultant Physician and Associate Professor, Head of Department of Pulmonology and Critical Care[1] / Registrar[2]/ Registrar, Department of Medicine[3] / Registrar, Community Medicine[4], Dr. Ziauddin Hospital[5], Karachi, Pakistan

Correspondence: Dr. Yusra Arshad, Registrar, Dr. Ziauddin Hospital, Karachi, Pakistan

Email: dryusra76@gmail.com

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reduces respiratory rate, and ultimately enhances arterial oxygenation, hypercapnia, and associated respiratory acidosis[4]. Due to these benefits, the utilization of "noninvasive ventilation (NIV)" for patients experiencing "acute exacerbation" of "chronic obstructive pulmonary disease" (COPD) has witnessed a steady rise in recent times. Furthermore, existing guidelines strongly support the use of NIV for individuals facing acute exacerbation[5].

While noninvasive ventilation (NIV) decreases the necessity for intubation in COPD patients, the mortality rate rises substantially in cases of NIV failure. Furthermore, when patients encounter 'NIV' failure, postponed intubation increases the risk of mortality[6]. The indications for intubation include ongoing respiratory distress characterized by a rate over 35 breaths per minute, persistent respiratory acidosis, and the inability to maintain a PaO2/FiO2 ratio above 100 mmHg, emergence of circumstances requiring intubation for airway safeguarding (such as coma or seizure disorders), management of excessive tracheal secretions, hemodynamic instability unresponsive to fluids and vasoactive medications and instances of respiratory or cardiac arrest.

NIV failure was identified as the necessity for intubation or mortality while undergoing noninvasive ventilation[7]. The success of NIV hinges upon several crucial factors, including meticulous patient selection, timely intervention and the use of a well-fitted interface, motivation and assistance offered to patients along with careful supervision by skilled team of healthcare professionals[8]. The causes of NIV ineffectiveness are frequently associated with the inability to enhance oxygenation levels, failure to alleviate breathlessness, discomfort from the mask, restlessness, anxiety, hemodynamic instability, and worsening of respiration[9]. The use of NIV in circumstances lacking definitive evidence to back its recommendation also increases the likelihood of failure.

Late recognition of patients at risk of NIV failure may experience a delay in starting invasive mechanical ventilation. This delay is significant as it can lead to avoidable complications and fatalities[10]. Impairment in oxygenation, indicated by a decreased ratio of partial pressure of arterial oxygen (PaO2) to fraction of inspired oxygen (FiO2) which is also known as the P/F ratio, is a widely supported risk factor and predictor of NIV failure. Patient outcomes are likely more influenced by the root cause instead of the initial severity of hypoxemia itself. The majority of endotracheal intubation (ETI) cases were attributed to NIV's failure to improve gas exchange (62%).

While the initial arterial blood gas (ABG) values at the start of the study did not demonstrate predictive value, severe hypoxemia (P/F =146) after one hour of NIV treatment was identified as an independent predictor of NIV failure according to the multivariate analysis[11]. The PaO2/FiO2 (P/F) ratio is commonly used to assess the lung's capability to oxygenate the blood in acute respiratory distress syndrome (ARDS)[12]. However, recent research indicates that including positive end-expiratory pressure (PEEP) in the P/F ratio (P/FP ratio) enhances prognostic capability in ARDS[13].

In the context of acute exacerbation of chronic obstructive pulmonary disease (COPD), previous studies have not specifically examined the role of the P/F ratio and oxygenation. Additional research is necessary to assess the significance and usefulness of the P/F ratio and oxygenation in acute exacerbation of COPD[14]. This study was carried out to examine the role of P/F ratio and its inability to improve after NIV and increased requirements of oxygen after NIV application in predicting NIV failure during acute COPD exacerbation.

The purpose of the study is to see the significance of proper maintenance of oxygenation and PF ratio during acute COPD exacerbation, as well as the role of inadequate oxygenation and PF ratio in non-invasive ventilation failure.

METHODOLOGY

IRB/ERC Approval:

A Quasi Single Arm Study was done in three campuses of the Ziauddin Hospital Karachi after taking approval from Ethical Research Committee (4930222YAMED) of Ziauddin University Hospital. Written informed consent was obtained from all the patients.

Patients admitting in Medical ICU and medicine ward with acute COPD exacerbation were part of this research. Inclusion criteria was 1) Age above 40 years, 2) Both genders 3) Known case of COPD, diagnosed by spirometry, 4) Having history of smoking or treated as COPD by attending Physician, 5) Admitting with acute exacerbation. Exclusion criteria was 1) Patients diagnosed with disease other than COPD like pneumonia, heart failure, acute myocardial infarction, pleural effusion, and 2) Patients whose attendants signed "Do not Resuscitate" code.

The calculated sample size was 170 via the WHO calculator, with a 95% confidence interval. The absolute precision required was 0.07. Anticipated population proportion 1 was 0.115 and anticipated population

proportion 2 was 0.119, considering in-hospital mortality rates reported by Correa et al. in 2015 (20.6% for NIV failure and 69.4% for success). Informed consent was taken from patient or family. Data were collected within a duration of six months from Sep 2024- Feb 2025 using a pro forma.

SPSS version 27 was used for data analysis. Shapiro Wilk test checked the normality of continuous variables (like age). Mean and standard deviations were calculated for normally distributed variables (like age in our data), while the median (IQR) was reported for non-normality distributed ones. Mann-Whitney U test compared continuous data. Percentages and frequencies measured qualitative variables like gender, weak cough reflex, non-invasive ventilation failure, and in-hospital mortality.

RESULTS

The research encompassed a sample of 170 individuals who were admitted to both the Medicine ward and medical ICU due to acute respiratory failure. Within the participant pool, there were 80 (47%) males and 90 (53%) females, as shown (Fig. 1) their average age was 66 ± 12 years (ranging from 40 to 80 years). The findings revealed that 66 (38%) of the patients encountered unsuccessful outcomes with non-invasive ventilation (NIV), whereas 104 (61%) achieved favorable results with NIV. Furthermore, a mortality rate of 23.5% was observed among the patients during their hospital stay.

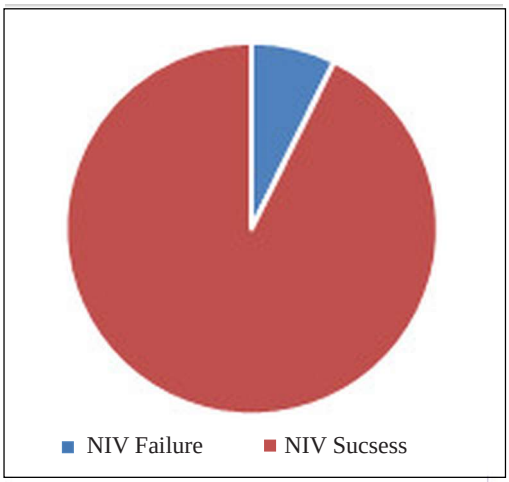

Figure 1: NIV Failure Among Patients

The patients who encountered non-invasive ventilation (NIV) failure, had equal distribution of genders, with 50% males and 50% females. Conversely, within the NIV success group, 45% were males and 55% were females as shown in (Fig. 2). These proportions indicate that there is no statistically significant correlation between gender and outcomes of NIV (p-value=0.636).

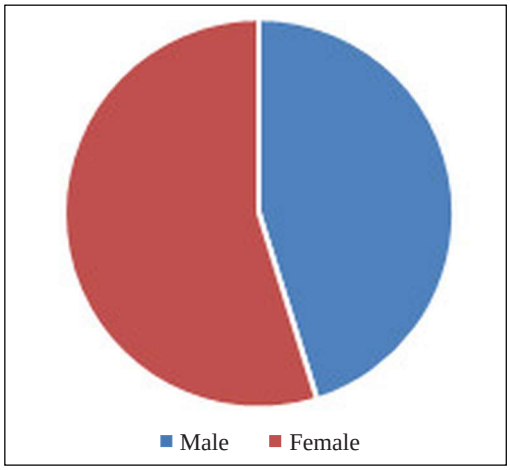

Figure 2: Gender Distribution of NIV Success

Shapiro-Wilk test was used to check the normality of data. The normality test showed that the data was non parametric therefore we used non-parametric statistical test for the analysis of the data.

The comparison of FiO2, SaO2 and PaO2 and PF Ratio among patients with and without non-invasive ventilation failure is presented in Table 1. FiO2 at the time of admission ($p<0.001$), FiO2 at 1 hour ($p<0.001$), FiO2 at 48 hours ($p<0.001$) and FiO2 after 48 hours ($p<0.001$) had highly significant median differences between those patients who developed and those who did not develop non-invasive ventilation failure, respectively. Also, statistically significant median differences in SaO2 at the time of admission ($p<0.001$), SaO2 at 1 hour ($p<0.001$), SaO2 at 48 hours ($p<0.001$) and SaO2 after 48 hours ($p=0.023$) were observed in both groups of patients, respectively. We observed significant difference in the PaO2 at the time of admission ($p<0.001$), PaO2 at 1 hour ($p<0.001$), PaO2 at 48 hours ($p<0.001$) between the patients who developed and those who did not develop non-invasive ventilation failure respectively but we found that PaO2 after 48 hour showed statistically insignificant median difference in patients with and without non-invasive ventilation failure ($p=0.120$). We also observed highly significant difference in the PF ratio at the time of admission ($p<0.001$), PF ratio at 1 hour ($p<0.001$), PF ratio at 48 hours ($p<0.001$) and PF ratio after 48 hours ($p<0.001$) between patients with and without non-invasive ventilation failure respectively.

The comparison of FiO2, SaO2 and PaO2 and PF Ratio among patients with and without mortality is presented in Table 2. We observed significant difference in the FiO2 at the time of admission ($p<0.001$), FiO2 at 1 hour ($p<0.001$), FiO2 at 48 hours ($p<0.001$) and FiO2 after 48 hours ($p<0.001$) between patients with and without mortality respectively. SaO2 at the time of admission ($p=0.007$), SaO2 at 1 hour ($p<0.001$), SaO2 at 48 hours ($p<0.001$) and SaO2 after 48 hours

Table 1: Comparison of Mean Arterial Blood Gas in Patients With and Without NIV Failure

	NIV Failure		P-value
	Yes Median (IQR)	No Median (IQR)	
FiO2 at time of admission	0.53(0.24)	0.41(0.20)	<0.001*
FiO2 at 1 hour	0.81(0.01)	0.61(0.28)	<0.001*
FiO2 at 48 hour	1.00(0.19)	0.49(0.20)	<0.001*
FiO2 after 48 hour	1.00(0.00)	0.33(0.20)	<0.001*
SaO2 at time of admission	72(16)	82(11)	<0.001*
SaO2 at 1 hour	88(10)	93(10)	<0.001*
SaO2 at 48 hour	95(7)	96(3)	<0.001*
SaO2 after 48 hour	97(4)	97(2)	0.023*
PaO2 at time of admission	49(17)	59(18)	<0.001*
PaO2 at 1 hour	75(30)	104(36)	<0.001*
PaO2 at 48 hour	104(44)	124(23)	<0.001*
PaO2 after 48 hour	125(62)	125(32)	0.120
PF Ratio at time of admission	111(79.95)	153(81)	<0.001*
PF Ratio at 1 hour	96(35.50)	186.80(87)	<0.001*
PF Ratio at 48 hour	104(34)	253(136)	<0.001*
PF Ratio after 48 hour	128(63)	346(194)	<0.001*

Mann-Whitney U test is applied
*P=0.05 indicates statistical significance

Table 2: Comparison of Mean Arterial Blood Gas in Patients With and Without Mortality

	NIV Failure		P-value
	Yes Median (IQR)	No Median (IQR)	
FiO2 at time of admission	0.49(0.22)	0.41(0.26)	0.001
FiO2 at 1 hour	0.81(0.01)	0.61(0.24)	<0.001*
FiO2 at 48 hours	1.00(0.19)	0.57(0.40)	<0.001*
FiO2 after 48 hours	1.00(0.0)	0.41(0.40)	<0.001*
SaO2 at time of admission	76(20.50)	81(16)	0.007*
SaO2 at 1 hour	88(9.50)	92(10)	<0.001*
SaO2 at 48 hours	90(15)	96(3)	<0.001*
SaO2 after 48 hours	95(20)	97(3)	<0.001*
PaO2 at time of admission	52(19.40)	57(18)	0.033*
PaO2 at 1 hour	84(36.50)	101(42.50)	<0.001*
PaO2 at 48 hours	87(37.50)	123(24)	<0.001*
PaO2 after 48 hours	78(47.50)	128(32)	<0.001*
PF Ratio at time of admission	123(62.57)	144(99.10)	0.002*
PF Ratio at 1 hour	113.50(47.75)	173(108.90)	<0.001*
PF Ratio at 48 hours	92(28.50)	221(163)	<0.001*
PF Ratio after 48 hours	78(47.50)	312(251.20)	<0.001*

Mann-Whitney U test is applied
*P=0.05 indicates statistical significance.

(p<0.001) had significant median differences between patients with and without mortality, respectively. Statistically significant median differences in PaO2 at the time of admission (p=0.033), PaO2 at 1 hour (p<0.001), PaO2 at 48 hours (p<0.001) and PaO2 after 48 hours (p<0.001) were observed among patients with and without mortality, respectively. We observed significant difference in the FiO2 at the time of admission (p<0.001), FiO2 at 1 hour (p<0.001), FiO2 at 48 hours (p<0.001) and FiO2 after 48 hours (p<0.001) between patients with and without mortality, respectively. We also observed significant difference in the PF ratio at the time of admission (p=0.002), PF ratio at 1 hour (p<0.001), PF ratio at 48 hours (p<0.001) and PF ratio after 48 hours (p<0.001) between patients with and without mortality, respectively.

DISCUSSION

The study analyzed 170 patients presented to the Medicine Ward and ICU with acute respiratory failure caused by COPD exacerbation. The sample included 80 males and 90 females, with an average age of 66 years. The study evaluated NIV outcomes and rates of mortality in patients. The findings showed NIV success in 61% of patients, while 38% had unfavorable outcomes.

The mortality rate during the hospital stay was observed to be 23.5%. The mortality rate due to NIV failure in AECOPD was 11.2% in a previous study[15]. When analyzing the subset of patients with NIV failure, we found an equal distribution of genders. However, within the NIV success group, there were slightly more females than males. The Statistical Analysis found no significant link between gender and NIV outcomes.

The researchers also compared various parameters related to oxygenation, such as FiO2 (fraction of inspired oxygen), SaO2 (arterial oxygen saturation), PaO2 (partial pressure of arterial oxygen), and PF ratio (ratio of arterial oxygen partial pressure to FiO2), between patients who developed NIV failure and those who did not develop NIV failure, as well as among patients who died and those who survived. The results revealed significant median differences in FiO2, SaO2, PaO2, and PF ratios over time between NIV success and failure groups. FiO2 and SaO2 differed significantly at admission, 1 hour, 48 hours, and beyond, while PaO2 varied at admission and 1 hour but not after 48 hours. The PF ratio showed significant differences at all time points. After 1 hour of NIV, patients who did not show improvement in PF ratio were more likely to develop NIV failure.

Similarly, significant median differences in FiO2, SaO2, PaO2, and PF ratio were noted at various time points between patients with and without mortality. FiO2 varied significantly at all points of time, while SaO2 and PaO2 showed significant differences at admission, 1 hour, and 48 hours. Finally, the P/F ratio showed significant differences at all points of time. Specially, failure to show improvement in PF ratio after 1 hour of NIV administration is a useful predictor of in-hospital morality after NIV failure. PF ratio can serve as the optimal parameter for evaluating a patient's oxygenation status. Individuals exhibiting a PF ratio below 150 are at a heightened risk of NIV failure[16].

CONCLUSION

The results indicated that NIV was effective in most of the cases, although a notable number of patients encountered failure with NIV. The analysis of oxygenation parameters showed significant differences between the groups of patients who did and who did not develop NIV failure, as well as between the groups of patients who survived and who died. These findings contribute to our understanding of the factors influencing treatment results in individuals with acute respiratory failure and may have implications for clinical decision-making.

Limitations of Study: This research is conducted in different campuses of same hospital setup. Results can be different if the same research is conducted in multiple hospitals including private and public setups.

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Conflict of interest: Authors declare that there is no conflict of interest.

Authors' Contribution: YA: Developed the concept of this research under the guidance of Dr. Syed Ali Abbas. **YA** and **KG:** searched literature and drafted the manuscript; **AS**, **NA** and **HA:** Contributed in collection and analysis of data

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CASE REPORT

Premaxillary Osteotomy and Fixation in Bilateral Cleft Lip and Palate: A Case Report

Summera Kanwal[1], Tahera Ayub[2], Muhammad Ashraf Ganatra[3], and Naid Rashid Qureshi[4]

ABSTRACT

In the bilateral cleft lip and palate patients, usually the premaxilla is the most commonly deformed, severely rotated to right or left side with downward displacement along with severe protrusion in some cases. In such cases, osteotomy of premaxilla is one of the options to reposition premaxilla to its normal position. In this case report, we are documenting a technique for repositioning and fixation of the premaxilla to vomerine bone after performing osteotomy and ostectomy of vomerine bone without damaging erupted and unerupted teeth. The osteotomy and ostectomy of premaxilla from bony nasal septum was performed under general anaesthesia alongwith fixation of premaxillary segment to the vomer bone with low profile miniplate. This technique was performed in one patient, who had undergone repair of bilateral cleft lip previously. There was no associated complication after premaxillary osteotomy was observed in this case. In the protruding premaxilla, ostectomy, osteotomy, and fixation of protruding premaxilla with miniplate to the vomer bone yielded satisfactory result without damaging the adjacent vital structures.

Keywords: Internal fixation, premaxillary osteotomy, stabilization of premaxilla, vomer bone

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INTRODUCTION

In bilateral cleft lip and palate patients, the premaxilla is sometimes severely protruded and rotated to right or left side with downward displacement[1]. This abnormal position of the premaxilla results in a markedly widened alveolar cleft, making surgical reconstruction and subsequent orthodontic management particularly challenging[2]. In such cases, surgical repositioning of the premaxilla becomes necessary to restore proper maxillary alignment and facilitate functional and aesthetic rehabilitation. Premaxillary osteotomy, followed by controlled repositioning and stabilization, is a well-established approach for managing these deformities. The premaxilla can be repositioned posteriorly and superiorly between the two lateral maxillary segments by performing an osteotomy, alongwith selective removal of a portion of the vomerine bone using a saw or chisel and mallet. The extent of bone that has to be removed, can be assessed by using prediction analysis on orthopantomogram and lateral cephalometric radiographs[3].

Several techniques and fixation devices have been described in literature for stabilizing the osteotomized premaxilla. These include internal fixation with miniplates[4] secured to the adjacent lateral maxillary segments without ostectomy, transosseous fixation using Kirschner wires placed between the maxillary central incisors, and posterosuperior repositioning of the premaxilla between the lateral segments combined with placement of a cortical bone graft secured with miniscrews across the alveolar cleft. Despite their effectiveness, these techniques are associated with notable complications, including damage to permanent tooth buds, injury to tooth roots, and loss of alveolar bone[5]. Such complications may have a profound impact on dental development, resulting in malalignment, compromised occlusion, and even loss of permanent teeth due to insufficient bony support.

Patients with cleft lip and palate often already exhibit dental anomalies, including hypodontia, malformed teeth, or ectopic eruption. Therefore, further

Senior Registrar[1] / Professor of OMFS[2] / Professor of Plastic Surgery[3] / Professor & Head of Department, OMFS[4], Liaquat College of Medicine & Dentistry, Karachi, Pakistan

Correspondence: Dr. Summera Kanwal, Senior Registrar Institution: Liaquat College of Medicine & Dentistry, Karachi, Pakistan

Email: summera.kanwal@yahoo.com

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compromise of sound teeth or developing tooth buds during surgical fixation can significantly worsen long-term dental outcomes. To minimize these risks, we present a case of a 15-year-old boy with a severely protruding premaxilla associated with bilateral cleft lip and palate, managed by premaxillary osteotomy combined with selective ostectomy of the vomerine bone and rigid fixation of the premaxilla to the vomer using a low-profile titanium miniplate. This approach allows stable posterosuperior repositioning of the premaxilla while avoiding fixation to the lateral maxillary segments, thereby reducing the risk of damage to erupted and unerupted teeth and preserving alveolar bone integrity.

CASE REPORT

A 15-year-old boy with a history of bilateral complete cleft lip and alveolus associated with cleft palate presented to the outpatient department with severe protrusion and inferior displacement of the premaxilla. He was born with a bilateral complete cleft lip and palate to parents with a first degree consanguineous marriage. There was no reported family history of cleft lip, cleft palate, or other craniofacial anomalies among siblings and first- or second-degree relatives. Primary lip repair was performed during infancy at another center, however, bilateral alveolar clefts remained unrepaired. At the age of 10 years, the patient underwent secondary lip revision at our institution for correction of a whistling deformity. Despite previous surgical interventions, the premaxilla remained markedly protruded and malpositioned, resulting in lip incompetence, widened alveolar clefts, and associated functional and aesthetic concerns, necessitating further surgical management. On examination, patient had lip incompetency, with protrusion and downward displacement of premaxilla, wide unrepaired bilateral alveolar clefts and oronasal fistula between incisors and canine (Figure 1).

Fig. 1: Pre-Operative Frontal and Lateral Views

After approval from IRB (Ref: AWS/2023/1214), the procedure was performed under general anaesthesia. Pre-operative consent, clinical photographs, and radiographic evaluation with orthopantomograph (Figure 2), and intraoral occlusal view was performed. The amount of ostectomy was decided preoperatively on clinical examination and by prediction tracing on occlusal view.

After oral intubation, local anaesthesia 2% lidocaine with 1:100000 adrenaline was infiltrated in the mucoperiosteum of premaxilla. The mucoperiosteum over the stalk of premaxillary was elevated properly and underlying bone was exposed. That bone was scored with the help of a fissure bur in piezoelectric surgical hand-piece. This block of the bone was measured and 12 mm was removed from this stalk (Figure 3). Care was taken to avoid injury of the nasal mucosa.

Fig. 2: Pre-Operative Orthopantomogram

Fig. 3: Intra-Operative Bone Removal

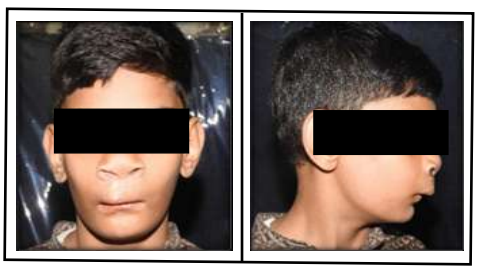

Fig. 4: Post-Operative Frontal And Lateral Views

Fig. 5: Post-Operative Occlusal View

After ostectomy and osteotomy, the premaxilla was repositioned manually, superiorly and posteriorly. After repositioning, premaxilla was fixed with a four-hole titanium L-shaped miniplate. Plate was fixed with bicortical screws with one screw in each hole. Closure of oronasal fistula was also performed. The mucoperiosteum was sutured back with 4–0 absorbable sutures. We followed the patient for one year and found him doing well without any complications. (Figure 4). After one year, an occlusal view was taken to assess the bony union (Figure 5).

DISCUSSION

Congenital clefts of the lip and/or palate are among the most common congenital craniofacial deformity. Patients born with bilateral cleft lip and palate have premaxillary protrusion and jaw deformities causing malposition of premaxilla and lateral bony segments. Before bone grafting, patients can be treated with orthodontics, premaxillary osteotomy[6] and Distraction osteogenesis[7], to decrease alveolar cleft gap and alignment of premaxilla with lateral bony segments. The minimum age described for premaxillary osteotomy is 8 years, so that normal maxillary growth is minimally interrupted.

Premaxillary osteotomy can be fixed with Kirschner wire[8], occlusal splints[9] cemented to maxillary arch, and direct interdental wiring[10]. Surgeons face problems with these fixation methods, such as, inadequate position[11], inadequate stability, tipping, malunion[12] and loss of premaxilla due to poor perfusion and damage to permanent tooth buds[13].

In this article, we presented a technique to reposition and premaxilla fixation with miniplate after performing osteotomy and ostectomy of vomerine bone. The miniplate fixation for premaxillary osteotomy has been described by Carlini et al[14], but the technique that we used has difference of repositioning and fixation of premaxilla posterosuperiorly to the vomerian bone, and lateral segment of the maxilla are spared so that damage to permanent unerupted tooth buds is avoided. To prevent tipping and mobility of premaxilla, we removed the part of vomerine stalk and fixed it with the miniplate so that good union of bony segments can be achieved. Although the cost of plate is high but good results can be achieved with this technique.

CONCLUSION

Premaxillary osteotomy followed by rigid fixation of the premaxilla to the vomer using a miniplate, provides a stable and effective method for correcting severe premaxillary protrusion in patients with bilateral cleft lip and palate. In the present case, this technique resulted in satisfactory posterosuperior repositioning of the premaxilla, good bony union, and an uneventful postoperative course without dental, vascular, or soft-tissue complications. By avoiding fixation to the lateral maxillary segments, the risk of damage to erupted and unerupted teeth is minimized, thereby preserving alveolar bone and dental structures. This approach offers a reliable surgical option and expands the armamentarium of cleft surgeons for managing complex premaxillary deformities in selected patients.

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Authors' Contributions: SK: Conception and design of the study, literature review, data collection, manuscript drafting and final approval. **TA:** Supervision, study guidance, critical review of the manuscript and intellectual input. **MAG:** Expert input, manuscript review and critical revision. **NRQ:** Overall supervision, final review, and approval of the manuscript.

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Tel. +92-21-99205185 Ext: 1076/1089, Fax: +92-21-99201372
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