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**CONTENTS (VOLUME 4, ISSUE 10, JANUARY 2021)**

S.No	TITLE	AUTHOR NAMES	PAGE NUMBERS	DOI
<b>GUEST COMMENT</b>				
1.	Bird Flu: A Birding Threat	Dr. Surabhi Duggal	GC1-GC3	<a href="https://doi.org/10.26440/IHRJ/0401.10377">https://doi.org/10.26440/IHRJ/0401.10377</a>
<b>REVIEW(S)</b>				
2.	Yoga and Dental Health: A Review	Soujanya Koyalada	RV1-RV4	<a href="https://doi.org/10.26440/IHRJ/0401.10380">https://doi.org/10.26440/IHRJ/0401.10380</a>
3.	Can Mohalla Clinics be a Catalyst for Ayushman Bharat Pradhan Mantri Jan Arogya Yojna to achieve Universal Health Coverage in India?	Debraj Mukhopadhyay, Vibhor Dudhraj, Niharika Malhotra, Kritika Jain, Sananda Mishra	RV5-RV10	<a href="https://doi.org/10.26440/IHRJ/0401.10381">https://doi.org/10.26440/IHRJ/0401.10381</a>
4.	Sports Dentistry: Dental Traumatology with Preventive Measures- A Review	Nandita Gautam, Shivalingesh KK, Swati Pathak, Krishna	RV11-RV17	<a href="https://doi.org/10.26440/IHRJ/0401.10382">https://doi.org/10.26440/IHRJ/0401.10382</a>
5.	Antibiotic Therapy Associated Cardiotoxicity	Manisha Jha, Akram Khan	RV18-RV21	<a href="https://doi.org/10.26440/IHRJ/0401.10384">https://doi.org/10.26440/IHRJ/0401.10384</a>
<b>ORIGINAL RESEARCH(S)</b>				
6.	Caries Pattern in Primary Molars With Early Pulpal Involvement In Mixed Dentition	Deepti Arora, Anil Gupta, Shalini Garg, Ankit Shrivastava, Shikha Dogra, Sakshi Joshi, Adhishree Singh Chib	OR1-OR6	<a href="https://doi.org/10.26440/IHRJ/0410.01378">https://doi.org/10.26440/IHRJ/0410.01378</a>
7.	Complications, Indication and Tolerance of Foam Sclerotherapy in Varicose Vein Management Done in A Tertiary Care Centre in South India	Punitha Thetraravu Oli, Mahitha MC	OR7-OR14	<a href="https://doi.org/10.26440/IHRJ/0410.01379">https://doi.org/10.26440/IHRJ/0410.01379</a>



## Bird Flu: A Birding Threat

SURABHI DUGGAL 

A common viral infection Flu, otherwise known as influenza is one of the infectious diseases prevalent in this season. It spreads easily with its mode of transmission being droplets of cough, cold, or sneeze in the atmosphere, contaminated surfaces such as doorknobs, pillows and blankets, utensils, and much more. A form of communication such as a handshake, kissing, hugging, sharing personal items, sharing drinks as well as food also tends to transmit the infection.<sup>1</sup>

Flu viruses are classified following the 'Centre for Disease Control and Prevention' (CDC) as influenza A, B, C, and D. Every winter the human influenza A virus infects humans. Currently, avian influenza also known as bird flu infects wildlife and human beings.<sup>2</sup> A majority of the virus forms commonly infects birds when in contact with a carrier.

Bird flu or "avian influenza" is a common viral respiratory disease of domesticated birds along with migratory waterbirds, shipped pet birds, and ostriches which can be directly communicated to humans.<sup>3,4</sup>

An outbreak of H5N1, the most common form of bird flu appeared in India in 2006 as well as 2021. According to WHO, this strain of bird flu was initially discovered in humans in 1997 leading to the death of 60% of the human population. It led to severe illness among 18 people of Hong-Kong, of which one-third died. At present, there is no information on the spread of the virus via human contact to a human still specialists are anxious that H5N1 may fake a chance of transforming into danger for humans. The World Health Organisation revealed a maximum number of infections and deaths caused by the H5N1 virus in Egypt, Indonesia, and Vietnam. The major symptoms include fever, cough, sore throat, nausea, head and muscle aches. Sometimes they may be even worse ranging from conjunctivitis, breathing difficulties, pneumonia, and acute respiratory distress syndrome (ARDS).<sup>3</sup>

Bird flu was seen in the late 1990s when a new and highly pathogenic strain originated resulting in the death of millions of birds and poultry. Between 2003 and late 2005 onset of the H5N1 strain, a highly mutated one took place amid the poultry in countries like Cambodia, China, Indonesia, Japan, Malaysia, Romania, Russia, South Korea, Thailand, Turkey, and Vietnam. In 2011 H5N1, a strain of bird flu arose. Furthermore H7N1, a new strain appeared in China in the year 2013. Millions of birds died from the disease whereas many were killed in an attempt to control the contagion. Identical coincidental events have been taking place in countries such as Asia, Africa, and the Middle East.<sup>4</sup>

To prevent and control outbreaks of bird flu it is crucial to detect it at an early stage. A mode of detection is polymerase chain reaction (PCR) wherein nucleic acids from blood or tissue samples are analyzed for the presence of molecules specific to bird flu. In addition to PCR, other ways to recognize bird flu are viral antigen detection which discloses the response of antibodies to the viral antigen in samples of skin cells, and viral culture which is used to validate the existence of specific influenza subtypes based on PCR results. Development based on a lab-on-chip technology that takes minimal time to attain and precisely identifies a subtype of bird flu is going on. A chip with surfaces coated with series of scaled-down laboratory analyses that require only a tiny volume of sample is being developed in this technology. These chip-based tests can be used to detect different subtypes of influenza in both poultry and humans along with being portable and cost-effective.<sup>4</sup>

Currently, the virus subtypes that cause influenza in animals are immunologically distinct and also can rapidly evolve into new strains, therefore preparation and discovery of an effective vaccine are complex. A technique to effectively control the outbreaks in poultry as well as reduce human exposure is the removal of infected populations and



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decontamination of farms and types of equipment. Drug manufacturers and policymakers are working towards establishing a vaccine to provide some measure of protection against a future outbreak of bird flu. Studies suggest that antiviral drugs developed for human flu viruses work against bird flu infection in humans. However, the H<sub>5</sub>N<sub>1</sub> virus seems to be resistant to drugs such as amantadine and rimantadine.<sup>5</sup>

Wild ducks are the primary hosts for all bird flu subtypes. They carry the virus in their intestines and spread them via feces into the environment. Here they infect domestic birds and the virus passes on to healthy birds through saliva, nasal secretions, and feces. The flu is transmitted at once from farm to farm by airborne feces-contaminated dust and soil, clothing, feed, and equipment, or by wild animals carrying the virus on their bodies within a single region. The disease is spread from region to region by migratory birds and through international trade in live poultry. Humans in close contact with sick birds are at the greatest risk of becoming infected. Virus-contaminated surfaces and intermediate hosts such as pigs can also be sources of infection for humans.<sup>6</sup>

According to IANS (Indo-Asian National Service), seven states of the country have confirmed bird flu. These states are Kerala, Rajasthan, MP, HP, UP, Haryana, and Gujarat. States such as Chhattisgarh, Maharashtra, and Delhi have reported unusual deaths of birds – their reports are awaited. An advisory by the Department of Animal Husbandry and Dairying can be issued to avoid further spread of the disease.<sup>7</sup> A toll-free number has been issued by the department of animal husbandry of Uttarakhand along with a control room to monitor the situation in the state. Six crows were found dead in Dehradun (Uttarakhand) giving rise to a bird flu scare in the region.<sup>7</sup>

Zoological Park in Kanpur has closed its entry for visitors and morning walkers after the death of four fowls and two parrots in the zoo. Samples of dead birds confirmed the presence of H<sub>5</sub> strain of bird flu in them. District magistrate of the region has imposed a ban on the transportation of poultry products including live birds and unprocessed poultry meat as a precautionary measure. The ADM of Kanpur has issued advisories involving disinfection of all the farms within one km of the zoo along with inspection of shops selling raw chicken and mutton. Arrangements have also been made for the disposal

of dead birds along with a strict watch on unusual sickness in poultry birds and migratory birds.<sup>8</sup>

## REFERENCES

1. Normandin B. What is bird flu?. (Online Article). Available from: <https://www.healthline.com/health/avian-influenza>. [Last Accessed on 10<sup>th</sup> January, 2021]
2. Wikipedia. 2006 H<sub>5</sub>N<sub>1</sub> outbreak in India. (Online Article). Available from: [https://en.wikipedia.org/wiki/2006\\_H5N1\\_outbreak\\_in\\_India](https://en.wikipedia.org/wiki/2006_H5N1_outbreak_in_India). [Last Accessed on 10<sup>th</sup> January, 2021]
3. Sengupta S. Bird Flu: FSSAI Issues 10-Point Guide to Eat Egg And Chicken The Right Way. (Online Article). Available from: <https://food.ndtv.com/news/bird-flu-fssai-issues-10-point-guide-to-eat-egg-and-chicken-the-right-way-2356922>. [Last Accessed on 10<sup>th</sup> January, 2021]
4. CDC. Information on Avian Influenza. (Online Article). Available from: <https://www.cdc.gov/flu/avianflu/index.htm>. [Last Accessed on 10<sup>th</sup> January, 2021]
5. Davis CP. Bird Flu (Avian Influenza, Avian Flu). (Online Article). Available from: [https://www.medicinenet.com/avian\\_influenza\\_bird\\_flu/article.htm](https://www.medicinenet.com/avian_influenza_bird_flu/article.htm). [Last Accessed on 10<sup>th</sup> January, 2021]
6. UAB Medicine News. (Online Article). Available from: [https://www.uabmedicine.org/news-results/-/asset\\_publisher/CqJrIkSPLBWV/content/flu-strains-explained-and-how-the-vaccine-works?inheritRedirect=true](https://www.uabmedicine.org/news-results/-/asset_publisher/CqJrIkSPLBWV/content/flu-strains-explained-and-how-the-vaccine-works?inheritRedirect=true). [Last Accessed on 10<sup>th</sup> January, 2021]
7. Times of India. Bird flu: 6 crows found dead, Uttarakhand sets up control room, toll free number. (Online Article). Available from: <https://timesofindia.indiatimes.com/city/dehradun/bird-flu-6-crows-found-dead-uttarakhand-sets-up-control-room-toll-free-number/articleshow/80150792.cms>. [Last Accessed on 10<sup>th</sup> January, 2021]
8. Times of India. Avian flu scare: Eight zoo birds among 49 culled in Kanpur. (Online Article). Available from: <https://timesofindia.indiatimes.com/city/kanpur/avian-flu-scare-eight-zoo-birdsamong-49-culled-in-kanpur/articleshow/80202804.cms>. [Last Accessed on 13<sup>th</sup> January, 2021]

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# Yoga and Dental Health: A Review

SOUJANYA KOYALADA 

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Yoga is a holistic healing process which provides overall balance to the human body. Yoga has also proved its worth in prevention and management of various oral-facial conditions by stimulating and relaxing various bodily systems which leads to the decrease in the inflammation in the body. The complete information about yoga in dental health had been collected from various journals for the time period of 1997-2018. Conditions such as oral lichen planus, Myofascial Pain Dysfunction Syndrome (MPDS), xerostomia, aphthous ulcers, bruxism and burning mouth syndrome have been effectively managed by yoga.

**KEYWORDS:** Yoga, Periodontal Disease, Bruxism, Saliva

## INTRODUCTION

“Yoga” is derived from a Sanskrit word “yuj” which means union, or to join, basically joining to one’s own entity.<sup>1</sup> It is defined as the unification of the physical, mental, intellectual, and spiritual aspects of human beings. This science which was pioneered centuries ago brought about a balance in different elements of a human body.<sup>2</sup> In present-day, appreciable amount of consciousness is seen among people regarding health and natural remedies. A recent survey published in Yoga Alliance and Yoga Journal, reported that the total number of Americans practicing yoga has increased from 20.4 million to 36 million between 2012 and 2016. According to yoga statistics in last six months about 15% of Americans have practiced yoga.<sup>3</sup> It has been observed that, when yoga is practiced regularly it cultivates the feeling of calmness thereby helps to promote flexibility, endurance and strength and develops the characteristics of compassion, greater self-control and friendliness.<sup>4</sup>

Yoga involves mind-body techniques known as asanas: the physical pose; controlled breathing pranayama; and Meditation or a brief time of deep relaxation.

Asanas involve different kind of body postures that help to maintain an equilibrium among the internal and external organs of the body bringing about an overall good health. A person of any age group can practice yoga. Asanas or yoga postures help to develop a robust and healthy body by enhancing flexibility and improving circulation.<sup>5</sup>

Pranayama is practised to decrease the stresses in human body and provide a state of lightness to it. In this asana deep conscious breathing is performed. A connection of mind with the body is achieved by it providing a state of calmness and solace.<sup>5</sup>

Dhayan or Meditation is the state of mind where there are no conscious thoughts or vishyas. Meditation helps one to realize his or her self-worth. Though it is recognized mostly as a spiritual practice, it offers many health benefits. It induces a deeper level of relaxation and is an actual key to achieve peace of mind and eliminate negativity from our lives.<sup>5</sup>

## HEALTH IMPACTS OF YOGA

Yoga has various health benefits and works for overall wellbeing of an individual. The first and foremost benefit is that it eliminates stresses. During a stressful event the Human body produces various harmful chemical stimuli that affect various organs. The prolonged exposure to these chemicals leads to various metabolic, homeostatic, immunologic, endocrinal/immunological disturbances. These lead to headache, diabetes mellitus, gastric ulcerations, hypertension, etc. Numerous studies published recently have reported that Yoga reduces the stress and anxiety and triggers the neurohormonal mechanisms by suppressing sympathetic activity thus improving the autonomic functions.<sup>6</sup>

Yoga impedes the sympathetic part of hypothalamus thus altering the human body’s sympathetic reaction



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to a stressful stimuli. Researchers have widely documented that yoga significantly increases the serotonin levels together with decrease in the levels of monoamine oxidase thus resulting in decrease of stresses by significant levels. This enzyme breaks down neurotransmitters and cortisol (stress hormone).<sup>7</sup>

In yoga, a lot of concern is on breathing, which causes the movement of diaphragm, which then stimulates the vagus nerve. The main nerve of the parasympathetic nervous system is vagus, extending from the medulla through the diaphragm to the abdomen. Main functions of this nerve is to, reduce the rate of respiration, lower down the heart rate, lessen the blood pressure, and invigorate the digestive activity.<sup>8</sup>

### IMPACT OF YOGA ON DENTAL HEALTH

Dental diseases mostly result from negligence towards the oral health, lack of the enthusiasm and changing lifestyles. A rapid increase in the rate of psychosomatic disorders has been associated with these changes. These disorders are manifested in the oral cavity in various forms such as oral lichen planus, Myofascial Pain Dysfunction Syndrome (MPDS), xerostomia, aphthous ulcers, bruxism and burning mouth syndrome.<sup>9</sup>

**Yoga in periodontal health:** Psychosocial stresses have both direct and indirect effect on periodontal health. It is the biological mechanism which is responsible for the direct effects and indirectly it is affected by the lifestyle changes. The individual under stress is unlikely to pay any heed to the oral hygiene. Even the pain threshold of an individual with high cortisol level is reduced.<sup>10</sup> Yoga, when practiced regularly results in fall of the inflammatory cytokines levels such as interleukin-6 and tumor necrosis factor  $\alpha$ . Thus yoga aids in prevention of the dental disorders related to the stress, it also helps in improving the motivation for mechanical plaque control. A study by Sudhanshu et al. shows that in spite of the fact that yoga has no direct role in improving periodontal disease, it accelerates the treatment outcomes by combating the stress which is a major factor affecting the treatment of periodontal disease.<sup>11</sup>

**Yoga and Myofascial pain dysfunction syndrome (MPDS):** It is a disorder in which disturbance occurs in stomatognathic system, resulting in pain, muscle spasms and difficulty in jaw movements. Wide range

of treatment modalities are there for MPDS, depending on the biologic model, which involves drugs such as muscle relaxants, nonsteroidal anti-inflammatory drugs [NSAIDs], and certain therapeutic exercises but none of these modalities are helpful in effectively treating the patient. There have been several studies performed in different population in which it was observed that Yoga was very helpful in the treatment of these disorders.<sup>12,13</sup>

Asanas and pranayama increase the blood flow to the area thus activating the Parasympathetic system, which stimulates nerve plexus and the endocrine system thereby affecting the neuronal flow. Deep breathing exercises in yoga relax majority of the skeletal muscles. Asanas and pranayama led to initiation of a relaxation response in the neuroendocrinal system thus balancing the physiological system which further decreases the myofascial tension. Further Meditation with pranayama and asanas helps the individuals to compact chronic pain, reduce depression and anxiety effectively.<sup>13</sup>

**Yoga in bruxism:** The American Academy of Orofacial Pain in 2008 defined bruxism as a diurnal or nocturnal parafunctional activity that includes unconscious clenching, grinding or bracing of the teeth.<sup>14</sup> Various theories have been put forward regarding the factors which might be responsible for bruxism. They include the peripheral, connected to teeth occlusion interferences, central, connected to neurotransmission from brain to chewing muscles and psychosocial, associated to stress. According to recent studies, stress has an important role in the pathogenesis of bruxism, and it is a useful indicator of stress. Over time bruxism can result in various dental problems like: Flat teeth, Chipped teeth, Broken teeth, Cheek damage, Headaches, Jaw misalignment, Jaw pain, Neck pain, Tooth sensitivity, Worn tooth enamel.

Recent Studies have documented that practicing yoga regularly can significantly decrease stress (stress hormone).<sup>15</sup>

**Yoga and salivation:** Saliva contains antibacterial enzymes that break down food and make it easier to swallow and helps washing away bacteria and food debris. When there is decrease in salivary flow, bacterial growth speeds up, thus causing "morning breath". A dry mouth creates an environment suitable for bacterial growth. Chronic dry mouth can cause

dental caries, diseases of gums and plaque build up. Proper breathing techniques prevent the drying of mouth and throat. It also results in stimulation of the salivary glands. Yoga (Pranayamas) help breathing properly and certain yoga poses also helps in increased saliva production.<sup>10</sup>

**Yoga and inflammation:** Researchers are of the opinion that yoga helps reduce body inflammation by relieving stress. The pro-inflammatory cytokines besides being inflammation markers are also detrimental to health, thus being both cause and effect of inflammation. Severe stress causes an increase in plasma levels of these cytokines. It reduces Immunoglobulin- A (IgA) levels leading to immune deficiency and increased vulnerability to infections. This can further cause chronic gingival inflammation with bleeding gums and foul smell. Since yoga involves mild to moderate physical exercise (Asanas) and relaxation techniques (pranayama and meditation), its regular practice can reduce the resting levels of inflammatory cytokines like TNF- $\alpha$  and IL-6. Yoga reduces the oxidative stresses of life to the tune of 20% in yoga practitioners which in turn reduces gingival inflammation leading to healthy gums. Hence yoga is helpful in prevention and treatment of gum diseases and achieving good healthy gingiva. Yoga helps improve body immunity and defense. Yoga helps reduce oxidative stress in type 2 diabetes. This helps to improve the symptoms of gingival inflammation that is bleeding from gums which leads towards a healthy gingiva.<sup>10</sup>

## CONCLUSION

Yoga is emerging as an alternate medical therapy in controlling, preventing and managing various health related problems thus reducing our dependency on the drugs. Various studies have been conducted using yoga as an alternate therapy for preventing and managing chronic oral health conditions. Thus, yoga should be regularly practiced for improving physical, emotional, mental, and spiritual dimensions of the individual.

## REFERENCES

1. Lasater J. The heart of pantajali. *Yoga J.* 1997;137:134-44.
2. Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life. *Int J Yoga.* 2011;4(2):49-54. <https://doi.org/10.4103/0973-6131.85485>.
3. Yoga Alliance. 2016 Yoga in America Study Conducted by Yoga Journal and Yoga Alliance Reveals Growth and Benefits of the Practice. (Online Article). Available from: [https://www.yogaalliance.org/Get\\_Involved/Media\\_Inquiries/2016\\_Yoga\\_in\\_America\\_Study\\_Conducted\\_by\\_Yoga\\_Journal\\_and\\_Yoga\\_Alliance\\_Reveals\\_Growth\\_and\\_Benefits\\_of\\_the\\_Practice](https://www.yogaalliance.org/Get_Involved/Media_Inquiries/2016_Yoga_in_America_Study_Conducted_by_Yoga_Journal_and_Yoga_Alliance_Reveals_Growth_and_Benefits_of_the_Practice). [Last Accessed on 16<sup>th</sup> October, 2020]
4. McCall T. *Yoga as Medicine: The yogic prescription for health and healing.* New York: Bantam publishers;2007.
5. Sengupta P. Health Impacts of Yoga and Pranayama: A State-of-the-Art Review. *Int J Prev Med.* 2012;3(7):444-58.
6. Bhushan K, Sandhu PK, Sandhu S. Psychological stress related oral health problems- Dental perspective. *Int J Res Dent.* 2014;4:43-7.
7. Arora S, Bhattacharjee J. Modulation of immune responses in stress by Yoga. *Int J Yoga.* 2008;1(2):45-55. <https://doi.org/10.4103/0973-6131.43541>.
8. Gerritsen RJS, Band GPH. Breath of Life: The Respiratory Vagal Stimulation Model of Contemplative Activity. *Front Hum Neurosci.* 2018;9:12:397. <https://doi.org/10.3389/fnhum.2018.00397>.
9. Kaur D, Behl AB, Isher PP. Oral manifestations of stress-related disorders in the general population of Ludhiana. *J Indian Acad Oral Med Radiol.* 2016;28:262-9
10. Singh K, Singh P, Oberoi G. Effect of yoga on promotion of oral health. *Int J Dentistry Res.* 2017;2:18-21.
11. Sudhanshu A, Sharma U, Vadiraja H S, Rana RK, Singhal R. Impact of yoga on periodontal disease and stress management. *Int J Yoga.* 2017;10:121-7.
12. Sharan D, Manjula M, Urmi D, Ajeesh PS. Effect of yoga on the Myofascial Pain Syndrome of neck. *Int J Yoga.* 2014;7:54-9
13. Khan AA, Srivastava A, Passi D, Devi M, Chandra L, Atri M. Management of myofascial pain dysfunction syndrome with meditation and yoga: Healing through natural therapy. *Natl J Maxillofac Surg.* 2018;9(2):155-9. [https://doi.org/10.4103/njms.NJMS\\_25\\_17](https://doi.org/10.4103/njms.NJMS_25_17).
14. Murali RV, Rangarajan P, Mounissamy A. Bruxism: Conceptual discussion and review. *J Pharm Bioallied Sci.* 2015; 7 (Suppl 1): S265-70. <https://doi.org/10.4103/0975-7406.155948>.
15. Cavallo P, Carpinelli L, Savarese G. Perceived stress and bruxism in university students. *BMC Res Notes.* 2016;9(1):514. <https://doi.org/10.1186/s13104-016-2311-0>.

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# Can Mohalla Clinics be a Catalyst for Ayushman Bharat Pradhan Mantri Jan Arogya Yojna to achieve Universal Health Coverage in India?

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**BACKGROUND:** Expenditure on health sector in India is one of the lowest public health expenditures in the world at just over 1% of GDP, with substantial disparities in population, infrastructure, availability and provision of services that define the Indian health care system. In a reform of Indian health systems approved by the Indian Government in March 2018, Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB-PMJAY) was launched on 23rd September, 2018 to provide financial health insurance coverage of Rs. 5 lakhs per family per year for secondary and tertiary care hospitalizations to more than 10.74 million poor families that form the bottom 40% of population in India.

**OBJECTIVES:** The objective of this paper is to discuss and analyze the benefits and weaknesses of the AB-PMJAY model and investigating the position that these clinics can play in (I) improving the provision of urban health facilities (II) resolving health inequities (III) and enhancing primary health care.

**MATERIALS AND METHOD:** The authors explored different databases. Government portals, research publications on AB-PMJAY and Mohalla clinics (MC) to do in-depth analysis of various parameters.

**RESULTS:** Although there are significant obstacles to the programme, by building impetus for program reform, AB-PMJAY offers an opportunity for the nation to resolve long-standing and ingrained shortcomings in governance, quality control and stewardship, and to accelerate India's development towards the stated UHC supply goal. The main achievement of these facilities in the last 18 months has been to introduce wellness to civic and political dialogue.

**CONCLUSION:** Mohalla Clinics can prove as a major catalyst for Ayushman Bharat Pradhan Mantri Jan Arogya Yojna for health reforms and progress towards universal health coverage in India.

**KEYWORDS:** Mohalla Clinics, Primary Health Care, Universal Health Coverage, AB- PMJAY

## INTRODUCTION

The protection of basic human rights is essential to the "right to health." Yet wellbeing will also be remembered as a constitutional right in our Constitution. Several papers and several decisions of the Honorable Supreme Court lay down ample requirements for "access to health" to people in compliance with the values of the Directive, but do not include it as a basic right, including the right to pursue substantive remedy if health / care is withheld.<sup>1</sup>

In India, for financial reasons about 6% do not receive health coverage<sup>2</sup> and, often experience is financially debilitating and impoverishing for those who have. After the report of the Bhore Committee (1946), central/state governments have made efforts to provide health care through the country's network of three tiers of health institutions and separate national health programmes. Certain milestones include success stories of smallpox eradication, dracunculiasis or regional leprosy removal, neonatal tetanus, controls against malaria / other vector-borne diseases and reduction of maternal and child mortality.

Household out-of-pocket expense in our nation is 67% of overall health spending<sup>3</sup> 12<sup>th</sup> among the supreme of 191 nations<sup>4</sup> and 6<sup>th</sup> among 50 low-middle-income nations.<sup>5</sup> Health is a neglected issue and government should not be deceptive. It was never a priority for either faction or usually a casual last-minute presence in the voting demonstrations. It is also inviting that vital steps are taken in recent years to resolve this problem – the 2017 National Health Policy (NHP) and the 2018 Ayushman Bharat Yojna, both critical for achieving the Universal Health Coverage (UHC) – both a World Health Day priority and a pledge from India to the Sustainable Development Goals (SDGs). In the past ten years, the Indian health programme, including measles, Jaws, Maternal and Neonatal Tetanus prevention, had some success.<sup>6</sup>

This leads to overcrowding, excessive turnarounds, inadequate level of care and deception with public health programmes. In this experience, people, including the poorest quintiles residents, find too many issues in public health, 'vote on their feet' and



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visit either unqualified providers or private providers, and not waste much time in travel without a service warranty, waiting for hours to be seen by their doctor and then wasting on medication and diagnostics.<sup>7,8</sup> The situation seems to have changed somewhat over the last 10–15 years, but there is still a lot to be desired. As provided by the Government, India's National Health Mission has contributed to increased attention to health, although not to the extent that one would have liked. Among state-level health service delivery initiatives, the Mohalla or Community Clinics of Delhi State, India, have received a great deal of national and international attention and interest – mostly favorable – from media and health experts alike.<sup>8,9</sup> A number of Indian states, all governed by political parties other than those in power in Delhi, have shown interest in establishing similar clinics.<sup>10</sup>

This article has been written to understand the design and evolution of Mohalla clinics along with AB-PMJAY; evaluating and examining the strengths and shortcomings of AB-PMJAY and proposing a wider vision for the advancement of universal health coverage (UHC) in contrast with Mohalla clinics, Delhi, India.

## MATERIAL AND METHODS

We thoroughly explored the National Library of Medicine's PubMed database and Google Scholar by using free text words like Mohalla Clinics, Primary Health Care, Universal Health Coverage, Ayushman Bharat Pradhan Mantri Arogya Yojana, AB-PMJAY. Around 27 full text articles and abstracts were selected.

**Ayushman Bharat Yojna:** In 2018 the budget announced on Ayushman Bharat on behalf upon launching of hospitals and wellness centres (HWCs) and an ambitious national health care security (NHPS) two big measures for India 2022.<sup>11</sup>

**Health & Wellness Centres Scheme:** A wider and more inclusive programme of primary health services will be provided at ground level by updating sub centres (SCs) to health & wellness centres (HWCs). Emphasis has now been extended from preventive part to primordial part, curative and palliative treatment. Up gradation of SC or HWC will include a point of treatment, a fitness room for yoga and naturopathy, physiotherapy and community sessions and a consulting space with full anonymity, free diagnostics and pharmacy, telemedicine services and

a waiting area for more than 30 citizens. The HWC programme plan is also comprehensive and includes specific otolaryngology and ophthalmic disorders, oral health, psychiatric illness and palliative wellbeing, emergency medical treatment, the control of communicable as well as non-communicable diseases, general OPDs development, parental, neonatal, child and teenage health facilities. It also involves the development of online health records in favor of a comprehensive IT programme.

**Ayushman Bharat National Health Protection Scheme (ABNHPS):** This flagship, scheme is funded centrally, seeks to provide annual health coverage of up to Rs. 5 lakh to poor 10 crore families (approximately 50 crore people – 40% of the country's population) based on the Socio Economic and Caste Census database. This framework has also been in operation since 2020 and a huge push has been initiated in order to create demand, which includes campaigns on health education, community mobilization and gram sabhas recognition and information. On April 30<sup>th</sup>, Ayushman Bharat Divas is observed when each rural beneficiary is not only briefed and told about the programme but is also reported for each deserving recipient by data (mobile phone, ration card numbers, change of family status, etc.). Each one of them will be linked with a HWC to ensure that no one is deprived of the scheme benefits. NHPS will be funded by existing federally financed programmes such as Rashtriya Swasthya Bima Yojana (RSBY) and the Senior Citizen Health Insurance Scheme. The scheme, called Modicare, will be the first state-funded health insurance scheme and a major leap forward in UHC, the OOPE and covering about 40% of vulnerable people from high health-care expenses.<sup>12</sup>

**Health Systems in Delhi, India:** Delhi is a city-state in India with a population of 1.68 crores (or 16.8 million) in 2011, with 97.5 per cent of the population living in urban areas, 1483 km<sup>2</sup> of geographical area, and a population density of 11.297 crores (range 3800–37.346/km<sup>2</sup>). This has about 18 lakh (1.8 million) or 11 percent of the people residing in the slums<sup>13</sup> and a significant proportion of this population has migrated from different parts of the world. Delhi is the most populated urban agglomeration in India and the third largest metropolitan area in the world. Twelve separate organizations offer health services in Delhi (if three municipal corporations are counted separately, the number will be fourteen). Delhi has different

outlets open for the quantity of health centres. As on 31st March 2014, there were 95 Hospitals, 2 Primary Health Centres, 1389 Dispensaries, 267 Maternity Homes & Sub Centres, 19 Polyclinics, 973 Nursing Homes, 27 Special Clinics existing in Delhi.<sup>8</sup> In addition, 15 government-run medical colleges were founded in the allopathic medicine system. The people's pulse is sensed by politicians and leaders; it is one of the services which really is common to the public. The healthcare systems assessed these clinics perform well, including budget allocation for the establishment of 1,000 such clinics (in INR 20 lakh) in terms of accessibility, equity, feasibility, responsiveness, and financial protection. INR 200 crore (approximately USD 30 million) was spent to develop 1000 such clinics. That accounted for around four percent (i.e. INR 5259 crores or \$784 million) of the Delhi government total health budget.

### MOHALLA CLINICS:

**The Concept and Design:** The Mohalla Clinic Initiative was launched by the Delhi Government in July 2015, with one clinic located in the slums.<sup>14,15</sup> The idea stemmed from the success of mobile vans or mobile medical units (MMUs). It was then complemented by the requirement of the top political leadership to fulfil the electoral promise and commitment to strengthen health systems rather than to provide ad hoc solutions.

**Evolution of Mohalla Clinics (July 2015–December 2019):** The first Delhi Mohalla clinic was opened in Peeragarhi community in West Delhi on 19<sup>th</sup> July 2015. It took another 9 months to set up another 100 clinics. By December 2016, a total of 106 clinics were founded across all 11 districts and in 55 of the total 70 state assemblies.<sup>14</sup> The first clinic was set up in the Portacabin system in government property. Another attempt to expedite the process by opening these clinics in government schools met the administrative hurdle and could not materialize until 31 December 2016, due to pending approval by the authorities.<sup>16</sup> Most clinics started in the beginning of 2016 and soon afterward became common in the community. An official Delhi Government release stated that almost 800,000 people in July 2016 were provided health services, and 43,000 tests were performed in five months.<sup>17</sup>

On average, 70-100 patients per day have been treated in each facility. In September–October 2016, when Delhi saw an epidemic of Dengue and Chikungunya

diseases and when patients were overloaded at health facilities, patients in the Mohalla clinics became a key entry point for examining and laboratory testing. Delhi Government undisclosed estimates have indicated that 40 to 50 per cent of patients in these clinics attended public health services for the first time. Many unskilled doctors of clinics at Mohalla Clinics recognize the decreased pressure of patients. It is generally accepted that these centres provide greater access, but this must be studied and more systematically registered, to health services by qualified professionals to the poorest of the poor. Several changes/improvements/mid-term design corrections have been made, all to make these clinics friendly to patients.

Certain decisions, such as private sector engagement, healthcare provision in three or four steps and the reduction of government agencies consumer fees, are directly related to effective usage and access of healthcare, which makes them affordable and decreases the burden in buckets.

### RESULT

**Critical areas under health and wellness centre scheme:** Budget allocated under HWC scheme is Rs. 1200 crores for upgradation of 1,50,000 SC.<sup>18</sup> The result is Rs. 80,000 a year per SC. If it is an annual award, the logistics, manpower and overhaul needed to fulfil the extended spectrum of programmes are also quite inadequate. In fact, most of the community health centres are not even eligible for HWC services (CHCs). Owing to a massive shortfall of physicians and other CHC assistance<sup>19</sup>, upgrading SCs to HWCs without matching referral setup can be counterproductive.

**Critical areas under Ayushman Bharat National Health Protection Scheme:** NHP 2017 is aimed at guaranteeing the UHC and strengthening the confidence in the public health system by strengthening and extending its programmes. The goal of this programme is to lift government health spending by 2025 from 1.15 to 2.5 per cent as a percentage of the gross national product.<sup>20</sup> This means almost doubling the budgetary allocation in the next 6–7 years. It seems impossible, considering that 2018–2019 budgetary allocation (Rs. 52,800 crores) is only 2.4% higher over the last year.<sup>19</sup> This is in contrast to a similar Rashtriya Swasthya Suraksha Yojna proposed in Budget 2016 with an allocation of Rs 1,500 crore, to provide an annual cover of Rs. 1 lakh per economically weaker household.<sup>21</sup> This gap is proposed to be

bridged by matching contribution from the state governments. It is to be noted that this premium is sure to go up to Rs. 5,000 or more in future; depending on the maturity of the scheme and pay outs in the long run. Single most important reason for no availability of health services (especially curative) in remote areas is the shortage of workforce at different levels. Situation review of current rural health services shows that the scarcity of health facilities rises as the quality of care increases. India's entire rural public health gap measured by rural population (Census 2011) for rural areas is 19%; primary health centres (PHC) are 22%; and CHCs 30%. Rural public health facilities are 22% in India.<sup>19</sup> This shortfall is compounded by the shocking shortage for specialist doctors (around 80%) – essential for secondary/tertiary care.

## DISCUSSION

Mohalla clinics are believed to be yet another centre of that kind. However, well-conceived considerations in design cause Mohalla clinics to differentiate them from traditional health care. However, the constructive approach to the area of harmonization/integration of activities and the convergence/coordination of different kinds of health centres managed by distinct entities, which are complicated, time-consuming and daunting for ordinary people, is one that must be addressed at various healthcare institutions. The Delhi State's health services are supplied by almost 25 different forms of health facilities.

In Delhi, several advancements have been made to enhance the quality of healthcare facilities, including paying doctors for treatment, leasing of premises for Mohalla Clinics, and flexible and variable clinic hours. A number of additional systems are now in operation, i.e. the successful use for staffing selected facilities of trainees and post-graduate students from medical schools. In these hospitals and other health centres, use of computer technology should be handled as optimally as possible.

The unsuccessful effort to create clinics in schools should not be deterrent, and the government is continuing to investigate options to strengthen student health care through such clinics. With nearly 40 lakh students<sup>22</sup> in schools across Delhi, an effective linkage in between Mohalla clinics and schools could be a game changer for the health of younger generations.

In order to achieve the systemic advancement of healthcare, legislative policies and proposed government reforms need to be speeded up. Mohalla clinics could prove an important platform for the promotion and strengthening of universal healthcare (UHC) coverage in India.

Lastly, much study in these clinics is unsystematic and experiential. One is the need to document and learn from these clinics in depth, backed by evidence collected through the clinical processes. Secondly, if the clinics are too many and ample time to set up a curriculum, it is valuable to carry out an exhaustive, systematic and objective review of the clinics and other progress in order to benefit from them and make corrections. Such clinics have raised the standard of healthcare in political discourses, a partial outcome already, but still far from the Bijli-Sadak-Pani (BSP) situation almost 15 years ago.

It is likely that with more similar initiatives on health (and education) by a growing number of states in India, Swachchata-Swashthya-Shiksha-Safai-Saamaajickshetra (cleanness-economic-education-health-health-social sector or CHESS, in short) will become the next electoral agenda, replacing B-S-P. It might be the CHESS, the Indian people wouldn't mind if politicians began to play more often.

## CONCLUSION

Mohalla clinics provide personal health care (curative and diagnostic), but the advancement of PHC requires a holistic approach and stronger dedication to neighbourhood and/or public health services through oriented interventions. While some people want mohalla clinics to be another kind of health centre, the concept has the potential to inspire improvement of the Indian health system. It is proposed that most of the current infrastructure in the health sector, such as pharmacies, and the incorporation of the operation of such hospitals into other existing/planned systems such as UPHC under NUHM can be built in addition to building new facilities. In reality, success and changes in the health sector would balance this initiative. As practitioners of community medicine, we would like to say that NHPS was a misnomer. It does not offer health insurance but only medical attention, and patients are often mainly provided in private/corporate hospitals. Until the governance structure is changed, the desired result on the currently exceptionally large budget out of pocket



spending will not be met. Allocations are not appropriate for both NHPS and HWC schemes and where there are any signs of RSBY vulnerabilities; the NHPS is likely to lead to undue care or unwanted interference. Therefore the premium level is expected to rise if the device is used (misused, overused/abused). In order to ensure the feasibility of this system, well-designed standardised protocols and guidelines should be required on admission, examination, diagnosis, reference, documentation and good quality control. The Mohalla Clinics are a positive beginning; however, the greatest success will be when: (1) it enhances the need for more country-wide primary healthcare (2) health services are able to influence electoral outcomes and (3) catalyze efforts in, for example, the growth of health systems. These measures are critical as India continues to make progress towards universal health coverage. In this amazing journey, Mohalla clinics can prove such a small but significant factor.

## REFERENCES

1. A Study of Constitutional and Judicial Attitude Right to Health in India 2010. (Online PDF). Available from: [https://shodhganga.inflibnet.ac.in/bitstream/10603/40578/10/13\\_chapter4.pdf](https://shodhganga.inflibnet.ac.in/bitstream/10603/40578/10/13_chapter4.pdf). [Last Accessed on 16<sup>th</sup> November, 2020]
2. Bakshi H, Sharma R, Kumar P. Ayushman bharat initiative (2018): What we stand to gain or lose!. *Indian J Community Med* 2018;43:63-6. [https://doi.org/10.4103/ijcm.IJCM\\_96\\_18](https://doi.org/10.4103/ijcm.IJCM_96_18)
3. Mohanty SK, Kastor A. Out-of-pocket expenditure and catastrophic health spending on maternal care in public and private health centres in India: a comparative study of pre and post national health mission period. *Health Econ Rev.* 2017; 7(1):31. <https://doi.org/10.1186/s13561-017-0167-1>
4. WHO. Global action plan on physical activity 2018-2030: more active people for a healthier world. (Online PDF). Available from: <https://apps.who.int/iris/bitstream/handle/10665/272722/9789241514187-eng.pdf?ua=1>. [Last Accessed on 15<sup>th</sup> November, 2020]
5. Vivek V. Indians Sixth Biggest Private Spenders on Health Among Low-Middle Income Nations. (Online Article). Available from: <https://www.indiaspend.com/indians-sixth-biggest-private-spenders-on-health-among-low-middle-income-nations-78476/>. [Last Accessed on 15<sup>th</sup> November, 2020]
6. Lahariya C. 'Shining a light on invisibles': Specific learning disabilities and Universal Health Coverage. *J Postgrad Med* 2019;65:132-3. [https://doi.org/10.4103/jpgm.JPGM\\_95\\_19](https://doi.org/10.4103/jpgm.JPGM_95_19)
7. Lahariya C. Mohalla Clinics of Delhi, India: Could these become platform to strengthen primary healthcare?. *J Family Med Prim Care.* 2017;6(1):1-10. [https://doi.org/10.4103/jfmpe.jfmpe\\_29\\_17](https://doi.org/10.4103/jfmpe.jfmpe_29_17).
8. PTI. Delhi gets first 'Aam Aadmi Clinic', CM Kejriwal says 1000 more in line. (Online Article). Available from: <https://indianexpress.com/article/cities/delhi/delhi-gets-first-aam-aadmi-clinic-cm-kejriwal-says-1000-more-in-line/>. [Last Accessed on 15<sup>th</sup> November, 2020]
9. Pomeroy M, Shankland A, Poskitt A, Bandyopadhyay KK, Tandon R. Civil Society, BRICS and International Development Cooperation: Perspectives from India, South Africa and Brazil. *The BRICS in International Development*: Springer; 2016. p. 169-206.
10. Eye on polls, Gujarat govt to set up 'mohalla clinics' in 4 cities: *Indian Express*; 2016 [Available from: <https://indianexpress.com/article/cities/ahmedabad/eye-on-polls-gujarat-govt-to-set-up-mohalla-clinics-in-4-cities-3069359/>].
11. Panda PK. Ayushman Bharat: Challenges and Way Forward. *Jaipuria International Journal of Management Research.* 2019;5(2):89.
12. Pareek M. Ayushman Bharat-national health protection mission a way towards universal health cover by reaching the bottom of the pyramid-To be a game changer or non-starter. *international journal of advanced and innovative research.* 2018;7(7):1-10.
13. Sindhvani R, Goyal P. Assessment of traffic-generated gaseous and particulate matter emissions and trends over Delhi (2000-2010). *Atmospheric Pollution Research.* 2014;5(3):438-6.
14. Mohalla Clinics: Govt. of India; 2016. Online PDF. Available from: <https://www.dshd.delhi.gov.in/pdf/AamAadmiMohallaClinics.pdf>. [Last Accessed on 16<sup>th</sup> November, 2020]
15. Lahariya C. Health & Wellness Centers to Strengthen Primary Health Care in India: Concept, Progress and Ways Forward. *Indian J Pediatr.* 2020;87(11):916-929. <https://doi.org/10.1007/s12098-020-03359-z>.
16. Lahariya C. 'Ayushman Bharat' program and universal health coverage in India. *Indian Pediatr.* 2018;55(6):495-506.
17. Hindustan Times. Eight lakh treated in five months at Delhi mohalla clinics. (Online Article). Available from: <https://www.hindustantimes.com/delhi/eight-lakh->

[treated-in-five-months-at-delhi-mohalla-clinics/story-KQl2baCrJ5lz8TS3ZmuziN.html](https://www.cbhidghs.nic.in/WriteReadData/l892s/Before%20Chapter1.pdf). [Last

Accessed on 16<sup>th</sup> November, 2020]

18. National Health Profile 2015. Central Bureau of Health Intelligence. Nirman Bhawan, New Delhi: MoHFW, Govt. of India: Government of India; 2018. (Online PDF). Available from: <http://www.cbhidghs.nic.in/WriteReadData/l892s/Before%20Chapter1.pdf>. [Last Accessed on 16<sup>th</sup> November, 2020]

19. Reserve Bank of India. State Finances a Study of Budgets Of 2017-18 And 2018-19. (Online PDF). Available from: [https://smartnet.niua.org/sites/default/files/resources/osf201718\\_full6ee17cfbd8004287aocd4fdb0632afe8.pdf](https://smartnet.niua.org/sites/default/files/resources/osf201718_full6ee17cfbd8004287aocd4fdb0632afe8.pdf). [Last Accessed on 16<sup>th</sup> November, 2020]

20. Berman P, Bhawalkar M, Jha R. Government financing of health care in India since 2005: What was

achieved, what was not and why?. (Online PDF). Available from: <https://cdn.sph.harvard.edu/wp-content/uploads/sites/2031/2017/01/Government-financing-of-health-care-in-India-since-2005.pdf>. [Last Accessed on 16<sup>th</sup> November, 2020]

21. Chowdhury S, Mukherjee S. Can Ayushman Bharat National Health Protection Mission protect health of India's Poor?. (Online Article). Available from: <http://idsk.edu.in/wp-content/uploads/2019/01/OP-64.pdf>. [Last Accessed on 16<sup>th</sup> November, 2020]

22. Ravi S, Ahluwalia R, Bergkvist S. Health and morbidity in India (2004-2014). Brookings India (2016). (Online PDF). Available from: [https://www.brookings.edu/wp-content/uploads/2016/12/201612\\_health-and-morbidity.pdf](https://www.brookings.edu/wp-content/uploads/2016/12/201612_health-and-morbidity.pdf). [Last Accessed on 17<sup>th</sup> November, 2020]

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# Sports Dentistry: Dental Traumatology with Preventive Measures- A Review

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In sports, dental trauma is the main link between sport and dentistry. Sports dentistry is the treatment of sporting oral / facial injuries and associated oral disorders and manifestations. Sporting practices have been found to be responsible for 13 per cent of total oral trauma in children. It is emphasized that from high schools to professional teams there is a great need for a "Team Dentist." In this review, we discuss the relationship between sport and dentistry, and the importance of educating parents, teachers, and children on sport-related injury prevention.

**KEYWORDS:** Contact Sports, Dental Trauma, Mouth Guards, Protectors, Headgears

## INTRODUCTION

New booming exercises, competitions, self-enjoyment, fame, recreational activity, are attracting newer generation especially young youth toward sports activity, leading to more and more sports participants and related dental and craniofacial injuries.<sup>1</sup>

Sports dentistry is the branch of dental sciences which includes prevention, protection, clinical management of oral and maxillofacial region of athletes and sports active members and deals with the safety precautions concerning orofacial region and its disorders. Hence, precaution, prevention and safety measures are the key factors in avoiding oral and maxillofacial injuries.<sup>2</sup>

For all sports, particularly touch related, it is normal for children to get injured, with face being the principal area of injury. A dentist has to deal with various types of dental and facial bone fractures. Injury in sports is the key link between sports and dentistry. The combined effects of crime, accident traffic, and sporting events have helped to establish a public dental health issue with serious dental injuries.<sup>3</sup>

Contact sports are described as those sports in which players communicate physically with each other in an effort to prevent the opposing team or person from winning. As can be seen in Table 1, this leads to a very high incidence of dental trauma ranging from 16 to 80%.<sup>4</sup>

Threat of injury due to sports, including orofacial solid

and delicate tissue trauma, is unfortunate and often has life-long consequences. Tiwari V et al. reported that the occurrence of orofacial injuries during sporting activities was 39.1% in contact athletes and 25.3% in noncontact athletes.<sup>11</sup>

Tulunoglu et al. (2006) performed a study to assess the occurrence of dental firm and fragile tissue injuries in the young adult community during contact sports involvement, mainly in semi-professional or inexperienced boxers and tae kwon do. Their samples included 274 young adults, of which 185 (67.5%) were tae kwon do practitioners and 89 (32.5%) were boxers. The respondents replied to a standard questionnaire. Of the total sample of 274 participants, 228 (83.2 percent) were well notified about mouthguard use. 153 (55.8 percent) of the participants used mouthguards out of the overall study, all of which were of type boil-and-bite.<sup>12</sup>

Persic et al. conducted a survey to research dental squash injuries among players and coaches in Switzerland, Germany and France. A structured questionnaire interviewed a total of 653 people, 600 squash players, and their 53 coaches. 133 (20.4 per cent) of these 653 interviewees had already observed dental injury; 27 (4.5 per cent) had suffered dental injuries themselves. The ability for replanting avulsed teeth was known to less than half of all coaches and players interviewed (47.6 per cent). The package for tooth rescue was familiar to just 5.1 per cent. The findings reveal that the squash area requires more



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VARIOUS SPORTS	PREVALENCE	AUTHOR	YEAR
1. Basket Ball	80.6%(Professionals) 37.7 (semi-professionals)	Wenli Ma et al. <sup>5</sup>	2008
2. Base Ball	27%	Pasternack JS et al. <sup>6</sup>	1996
3. Foot Ball	16.6%	Esber C et al. <sup>7</sup>	2009
4 Handball	21.8%	Galic T et al. <sup>8</sup>	2018
5. Water polo	18.6%	Galic T et al. <sup>8</sup>	2018
6. Swiss Rugby	39.5%	Schildknecht S et al. <sup>9</sup>	2012
7. Hockey	33.8%	Praveena J et al. <sup>10</sup>	2018

**Table 1.** Prevalence of orofacial injuries in various contact sports

prevention information via associations for sports, trainers and dentists.<sup>13</sup>

## SPORTS INJURIES OF THE OROFACIAL REGION

### Incidence of sports injuries in orofacial region:

The face is highly vulnerable and often least protected section of the body. Depending upon the quantity of people involved, the magnitude of sports facilities and activities, of the most popular sports, the following facts have been presented:

- Athletes are projected to have 10 percent risk of being injured in face or mouth during the season of play according to National Youth Sports Organizations for Preventive Athletic Injuries.<sup>14</sup>
- Camp J reported that 13-39% of all sports-related incidents and 11-18% of all sports deaths are due to maxillofacial injuries.<sup>15</sup>
- Soft tissue injury and "T-zone" bone fractures (nose, zygoma and mandible) are very traditional types of injuries to face in sports.<sup>16</sup>
- The risk of sports trauma is twice in males as compared to females.<sup>17,18</sup>
- Meadow D et al. reported that in infants, 13% of the total oral trauma was caused by sports activities.<sup>19</sup>
- Kumamoto D et al. concluded that most dental and orofacial sports injuries have an impact on the upper lip, maxilla and maxillary incisors, with 50 % to 90% dental damage.<sup>20</sup>

## COMMON ATHLETIC INJURIES (Table 2)

**1. Soft Tissue Injuries:** Often in athletic competition, the face is the highly vulnerable area. Injuries to the body and surrounding tissues throughout the face are often seen. Abrasions, bruises and lacerations are frequent and therefore should be investigated for the purpose to rule out fracture or other severe underlying injury.<sup>15</sup> These usually occur over a bony prominence of the facial skeleton such as the brow, cheek, and chin. Lip lacerations are also common.<sup>22</sup>

**2. Fractures:** Facial bone fractures are an even more complex issue. A zygoma (cheekbone) is perhaps the most specific site of injury. Zygoma fractures account for about 10 percent of fractures in the maxillofacial region that occur during sport injuries due to the overt sharp damage resulting from fall, elbow, or fist.<sup>8</sup> In a research by Linn et al., of the 319 subjects treated for sports-related damages, males were much more vulnerable to zygomatic trauma than females due to heavy body interaction during sports.<sup>23</sup> The prominent form and elevation of the mandible, like the zygoma, also contributes to traumatization. About 10 per cent of fractures of the maxillofacial region happens in the mandible whenever the player hits, another player or equipment.<sup>23</sup> The most vulnerable area of the mandible in both kids and adults is the condyle and therefore can produce serious facial disfigurement as the development of the lower face

Injuries to the dental hard tissues and pulp	Infraction Enamel Fracture Enamel-dentin fracture Enamel-dentin-pulp fracture Crown-root fracture (uncomplicated) Crown-root fracture (complicated) Root fracture Alveolar fracture
Injuries to the periodontal tissue	Concussion (shock) Subluxation Intrusion (central luxation) Extrusion (peripheral luxation) Lateral luxation Total luxation (exarticulation)

**Table 2.** Classification of dental and periodontal traumas (Andreasen -WHO)

can change in children.<sup>22</sup>

**3. TMJ Injuries:** Most hits to the jaw don't really lead to injuries, but considerable force transferred to the temporo-mandibular disc as well as the mechanisms sustaining it can cause permanent injury, to a degree that perhaps the retrodiscal tissue is strained across and the condyle may then be forced posteriorly. This trauma sometimes results in bruising that could be intracapsular and can lead to joint ankylosis.<sup>22</sup>

**4. Tooth Intrusion:** Tooth intrusion happens, by an axially directed effect, when the tooth has been pushed into the alveolar process. This is perhaps the most extreme type of injury from displacement. Pulpal necrosis is far more probable to appear in full-formed rooted teeth and happens in 96% of cases of invasive displacement. Immature development of the root usually involves spontaneous re-eruption. The progression of mature root requires repositioning and splitting or orthodontic extrusion.<sup>22</sup>

**5. Crown and Root Fractures:** A most widespread permanent dental injury is crown fracture, which can happen in a variety of directions. Crown infarction is the easiest type. There is an enamel craze without losing the structure of tooth. No treatment is needed but appropriate pulpal vitality tests are necessary.<sup>18</sup> Fracture extended to dentine are usually sensitive to high temperature as well as other stimuli. A severe crown fracture induces the exposure of pulp completely and leads to contamination inside a closed apex tooth or can trigger a root fracture. Mobility is the major clinical predictor of a root fracture. To assess the site and seriousness of the fracture and the likelihood of related alveolar fracture, radiographic

assessment and evaluation of adjacent teeth must be conducted. The extent of injury defines treatment.<sup>14</sup>

**6. Avulsion:** Amongst the most severe sports-related dental accidents is the full avulsion of a tooth. Of all oral injuries, two to sixteen percent contribute to an avulsed tooth. A tooth completely depending on the length of the period outside the tooth socket, pushed out from the socket may be substituted with various degrees of performance. If, by improper treatment, periodontal fibres bound to the root surface have not been damaged, an avulsed tooth is likely to regain full function. The risk of success is considerably reduced after two hours. The fibres turn necrotic and the substituted tooth is resorbed and then lost.<sup>22</sup>

## DENTISTRY AND SPORTS

There are many aspects of engaging in sports as we as in physical activity, including fun and recreation, competitiveness, socialization, nutrition and health care, and development. Physical activities support all generations but participating in sports often entails a chance of injury alongside this, which can in some cases lead to continued disability.<sup>25,26</sup>

Jackson suggested a systematic approach for dental practitioners to involve in sports and for the athletic dentists' possibility. The author further emphasizes that a "team dentist" from high schools to professional teams is very much in need.<sup>27</sup>

## EVALUATION OF OROFACIAL INJURIES

Face damage assessment is important and should be focused on trauma assessment principles and begins with open airways, ventilation, circulation, injury and environmental controls. After the initial evaluation

and stabilization, the facial examination is then carried out. The procedure is used to determine the extent of the injury and the appropriate care of the wounded teeth, periodontium and structures involved.<sup>28</sup>

The examination includes a thorough medical and dental history, a clinical and x-ray review and further tests like palpation, percussion, stability and mobility assessment. Intraoral x-rays are useful for evaluation of dentoalveolar trauma. If the field of concern reaches the dentoalveolar complex, extraoral visualisation is possible.<sup>29</sup>

### TREATMENT OF OROFACIAL INJURIES

Treatment planning considers the state of the patient's wellbeing and developmental status, as well as the seriousness of the damages. Advanced behavioural guidance techniques or an adequate referral may be necessary to ensure proper diagnosis and care. Dental rescue kit for Sporting event includes gloves, mouth mirror, pen light, tongue depressor, scissors, rope wax, zinc oxide eugenol, spatula, mixing pad, clean gauze (2 x 2, 4 x 4), sterile small wire cutters (to replace damaged orthodontic wires), spare retail mouth guards, Save-a-Tooth urgent tooth protection solution.<sup>14</sup>

### PREVENTING SPORTS INJURIES

As the strength, pace, magnitude and sometimes even violent conduct of players among the plurality of professional teams continues to rise, there is a need for important prerequisites dental care. Wearing mouth guards and headgear comprising of a mask and face shield is the primary strategy for avoiding oral sports injuries. In sports requiring their use, the efficacy of sports mouthguards for dental trauma avoidance is reported.<sup>27,32</sup>

**Mouthguards or "Gumshields":** These were initially invented by London-based dentist Woolf Krause in 1890 to safeguard boxers against lip lacerations. Mouthguards also help reduce the probability of neck injury, concussion, cerebral haemorrhage, unconsciousness, significant injury of the central nervous system and death. Such casualties were a popular accompaniment to boxing competitions in that period.<sup>31</sup> Originally these gumshields were made of gutta percha, were held in position by clenching the teeth. By the 1930s, mouthguards became component of boxers' original kit and have stayed so since then.<sup>32</sup>

**Classification of Mouth Guard:** ASTM (American Society of Testing And Materials) reapproved the classification for athletic mouth guards as follows.

Type I - Stock Mouth guards. (Least preferred)

Type II - Mouth formed mouth guards.

Type III - Custom fabricated (over a dental cast) mouth guards (Most preferred).

**Stock Mouth Guards:** Stock mouth guards are either formed of rubber, polyvinyl chloride or polyvinyl acetate as a copolymer. Their major benefit is that they are fairly cheap. These are only available in small sizes, however, do not adapt well enough, hinder communication and respiration, and require jaw closure to hold the mouthguard in position.<sup>33</sup>

The ethylene-vinyl acetate copolymer materials which varied in thickness and stiffness were tested by Park et al. They observed that the thickness of the occlusal section of the mouthguard must be maintained ideal for greater energy uptake. The authors concluded that a mouthguard with a steeper insert which softens in the occlusal portion at a higher temperature is proposed as a more protective mouthguard.<sup>34</sup> The impact of occlusal supporting mouthguards in decreasing bone distortion and fractures was studied by Takeda et al. They believed that carrying of a mouthguard with insufficient occlusion can induce mandible bone fracture. Consequently, mouthguards should have proper occlusion.<sup>34</sup>

**Mouth-Formed Protectors:** Two forms of mouth-formed protectors are:

- The shell-liner type which comprises of a preformed shell with either a lining of acrylic plastic or silicone rubber. In the mouth and moulds of the athlete, the lining substance is put to the teeth and afterwards allowed to fix.

- The preformed, thermoplastic coating (also known as "boil and bite") is held for 10-45 seconds in boiling water, shifted to cold water and afterwards adjusted to the teeth. This mouthguard is perhaps the most common of the three classes and is used by more than 90% of the athletic population.<sup>35</sup>

**Custom Made Mouth Protectors:** A dentist is equipped with specially made mouthguards and has been proven to provide the highest level of protection from dental injuries. This mouthguard is manufactured of thermoplastic polymer and produced using the athlete's dentition pattern. The

dentist constructs the mouthguard and covers the athlete's mouth specifically. The advantages include fitness, communication ease, convenience and persistence.<sup>30</sup>

Stokes et al. compared the mouth-protectors of the laboratory (L) and intraorally formed (I). One mouth protector type was worn for eight weeks and then exchanged for another. They found both forms of mouth protector preventing dental injury, but the type L was better fit and more comfortable.<sup>36</sup>

While mouth guards are shown to be successful and have also been promoted for more than 30 years, mouth protectors are not considered as an essential part of safety gear in certain sports. Dentists need to educate patients regarding the needs and benefits of safeguards.<sup>2</sup>

**Helmets:** They are created to safeguard the skin of the scalp including ears from abrasions, contusions and lacerations. The skull bones, brain and central nervous system are protected from direct concussion, unconsciousness, cerebral haemorrhage, brain injury, coma, and death. During the years from the 1920s through the early 1950s, the sturdy leather helmet was the prevalent kind of football headgear. This form of helmet is made of various layers of leather knitted together to cover the head of the player, the lateral parts of the face as well as the ears. A further adjustment was the placement of a rubberized pad at the centre line of the forehead portion of the plastic helmet to avoid lacerations of the nasal pyramid induced by the helmet being pushed during touch or collision into the soft tissues of the front. Another important benefit of rigid plastic helmet has made it easier to add face masks to shield the mouth as well as other facial structures.<sup>36</sup>

**Face Masks:** These are meant to defend from traumatic forces such as a face-directed hand, ball, puck or stick in the eyes, nose, nasal pyramid, zygomatic arches, and mouth. Face masks improve player's health using varying diameters of plastic or rubber tubing or welded steel and decrease morbidity when used correctly. There are face masks constructed of aluminium and coated with a vinyl plastisol coating. The earliest type of facial mask implemented into football in the 1950s, begin with a single contoured bar. Both facial mask types provide the maxilla horizontally with varying levels of defence from an extended finger, tightened finger, forearm, or helmet to the zygomatic nasal pyramid or mandibular arch,

accordingly.<sup>36</sup> The highest level of overall facial safety is offered by the full cage face mask which is primarily selected by defensive players to prevent line play and tackle damages. Football players such as quarterbacks, running backrests and wide receivers frequently choose a transitional style between the single bar and the complete cage to provide appropriate facial security while reducing constraints of peripheral vision and thereby enabling perception of a broader view of the playing field.<sup>36</sup>

## CONCLUSION

A broad range of oral/facial sports injuries and related oral disorders and their sources, including treatment and prevention modalities, are protected by sports dentistry. The dentist should have good clinical basic understanding of children and adolescents with sport-related orofacial injuries, as well as different preventive strategies. With the growing trend of sports involvement in schools and colleges, protective devices and preventive options are gaining in importance. Sport related dental injuries during involvement are not uncommon and deserve our immediate attention. In this regard, to ensure comprehensive dento-facial care, the dentist should work closely with the teachers, coaches / trainers, parents and other health professionals. Protective programmers should provide information on sport-related orofacial accidents, preventive measures such as helmets and mouthguards, and recovery. This will result in a significant understanding of the general public. It is therefore our duty to recognise, inform and provide athletes with preventive and protective measures.

## REFERENCES

1. Kumamoto DP, Maeda Y. A literature review of sports-related orofacial trauma. *Gen Dent.* 2004;52(3):270-80; quiz 281.
2. Ali FM, Bhushan P, Kumari S, Patil S, Sahane D. Dental trauma: Athletes, coaches and school teachers must know - A brief review. *Saudi J Sports Med.* 2013;13:7-9.
3. Andresean JO, Andresean FM. *Textbook of Color Atlas of Traumatic Injuries to the Teeth.* 3rd ed. Copenhagen, Denmark: Munksgaard ; 1994.
4. Selva Mani S, Aparna S, MadanKumar PD. Prevalence of Orofacial Injuries in Contact Sports: A Systematic Review. *International Journal of Physical Education, Sports and Health* 2019;6(3):39-46.
5. Ma W. Basketball players' experience of dental injury and awareness about mouthguard in China.

- International Healthcare Research Journal 2021;4(10):RV11-RV17.  
Sports Dentistry Gautam N et al.  
Dental Traumatology 2008;24: 430-4.  
<https://doi.org/10.1111/j.1600-9657.2008.00586.x>
6. Pasternack JS, Veenema KR, Callahan CM. Baseball injuries: a Little League survey. *Pediatrics* (1996) 98:445-8. [https://doi.org/10.1016/S0278-2391\(97\)90154-3](https://doi.org/10.1016/S0278-2391(97)90154-3).
  7. Caglar E, Kusur OO, Kiranatioglu G, Sandalli N. Do American football players in Turkey protect themselves from dental or orofacial trauma?. *Dent Traumatol.* 2009;25(1):115-7. <https://doi.org/10.1111/j.1600-9657.2008.00699.x>.
  8. Galic T, Kuncic D, Poklepovic Pericic T, Galic I, Mihanovic F, Bozic J, Herceg M. Knowledge and attitudes about sports-related dental injuries and mouthguard use in young athletes in four different contact sports-water polo, karate, taekwondo and handball. *Dent Traumatol.* 2018 ;34(3):175-81. <https://doi.org/10.1111/edt.12394>
  9. Schildknecht S, Krastl G, Kühl S, Filippi A. Dental injury and its prevention in Swiss rugby. *Dent Traumatol.* 2012;28(6):465-9. <https://doi.org/10.1111/j.1600-9657.2012.01115.x>.
  10. Praveena J, Battur H, Fareed N, Khanagar S, Bhat M. Orofacial injuries and use of protective wear among field hockey players of Coorg District, Karnataka, India – A KAP Study. *Indian J Dent Res* 2018;29:852-7.
  11. Tiwari V, Saxena V, Tiwari U, Singh A, Jain M, Goud S. Dental Trauma and Mouthguard Awareness and Use among Contact and Noncontact Athletes in Central India. *J Oral Sci* 2014;56(4):239-43.
  12. Tulunoglu I, Ozbek M. Oral trauma, mouthguard awareness, and use in two contact sports in Turkey. *Dent Traumatol.* 2006; 22:242-6.
  13. Persic R, Pohl Y, Filippi A. Dental squash injuries – A survey among players and coaches in Switzerland, Germany and France. *Dent Traumatol.* 2006; 22:231-6.
  14. Padilla R, Balikov S. Sports dentistry: Coming of age in the '90s. *J Calif Dent Assoc.* 1993;21:27-34, 36.
  15. Camp J. Emergency dealing with sports-related dental trauma. *J Am Dent Assoc.* 1996;127:812-5.
  16. Saini R. Sports dentistry. *Natl J Maxillofac Surg.* 2011;2:129-31.
  17. Andreasen JO, Ravn JJ. Epidemiology of traumatic dental injuries to primary and permanent teeth in a Danish population sample. *Int J Oral Surg.* 1972;1:235-9
  18. Sane J. Maxillofacial and dental injuries in contact team sports. *Proc Finn Dent Soc.* 1988;84:1-45.
  19. Meadow D, Lindner G, Needleman H. Oral trauma in children. *Pediatr Dent.* 1984;6:248-51.
  20. Kumamoto D, Maeda Y. Global trends and epidemiology of sports injuries. *J Pediatr Dent Care.* 2005;11:15-25.
  21. Crow RW. Diagnosis and management of sports-related injuries to the face. *Dent Clin North Am.* 1991;35(4):719-32.
  22. Guyette RF. Facial injuries in basketball players. *Clin Sports Med.* 1993 Apr;12(2):247-64.
  23. Linn EW, Vrijhoef MM, de Wijn JR, Coops RP, Cliteur BF, Meerloo R. Facial injuries sustained during sports and games. *J Maxillofac Surg.* 1986;14(2):83-8. doi: 10.1016/s0301-0503(86)80266-1.
  24. Camp JH. Diagnosis and management of sports-related injuries to the teeth. *Dent Clin North Am.* 1991;35(4):733-56.
  25. Ranalli DN. Sport's dentistry and dental traumatology. *Dent Traumatol.* 2002;18:231-6.
  26. Newsome PR, Tran DC, Cooke MS. The role of the mouthguard in the prevention of sports-related dental injuries: A review. *Int J Paediatr Dent* 2001;11:396-404.
  27. Powers JM, Godwin WC, Heintz WD. Mouth protectors and sports team dentists. Bureau of Health Education and Audiovisual Services, Council on Dental Materials, Instruments, and Equipment. *J Am Dent Assoc.* 1984;109(1):84-7.
  28. American Academy on Pediatric Dentistry Council on Clinical Affairs. Guideline on management of acute dental trauma. *Pediatr Dent.* 2008-2009;30(7 Suppl):175-83.
  29. Bureau of Dental Health Education. Mouth protectors for football players: the dentist's role. *J Am Dent Assoc.* 1962;64:417-21.
  30. McNutt T, Shannon SW Jr, Wright JT, Feinstein RA. Oral trauma in adolescent athletes: A study of mouth protectors. *Pediatr Dent.* 1989;11:209-13.
  31. American Dental Association and Academy for Sports Dentistry. *Protect Your Smile with a Mouthguard.* Farmersville: American Dental Association and Academy for Sports Dentistry; 1999.
  32. American Society for Testing and Materials. *Standard practice for care and use of mouthguards.* Designation: F 697-80. Philadelphia: American Society for Testing and Materials; 1986. p. 323
  33. McCarthy MF. Sports and mouth protection. *Gen Dent.* 1990;38:343-6.
  34. Park JB, Shaull KL, Overton B, Donly KJ. Improving mouth guards. *J Prosthet Dent.* 1994;72:373-80.
  35. Takeda T, Ishigami K, Ogawa T, Nakajima K, Shibusawa M, Shimada A et al. Are all mouthguards the same and safe to use? The influence of occlusal supporting mouthguards in decreasing bone distortion and fractures. *Dent Traumatol.* 2004;20:150-6.



36. Stokes AN, Croft GC, Gee D. Comparison of laboratory and intraorally formed mouth protectors. Endod Dent Traumatol 1987;3:255-8.

37. Rontal E, Rontal M, Wilson K, Cram B. Facial injuries in hockey players. Laryngoscope 1977;87:884-94.

38. Watterson JS. Inventing modern football. Am Herit. 1988;39:113

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# Antibiotic Therapy Associated Cardiotoxicity

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The improper and frequent use of antibiotics has been on a rise. Empirical use for unapproved indications leads to development of resistant pathogens. Many other adverse drug reactions are associated with the use of antibiotics. These may be due to the direct effect of these drugs or due to their interactions with other therapeutic agents. Cardiac toxicities like QT prolongation, aortic aneurysms and dissections are of high concern and may result in long-term health risks. To prevent these adverse reactions, antibiotics should be used as per the manufacturer's and physician's instructions. The use of interacting drugs should be avoided wherever possible. Polypharmacy practice should be done after considering all the patient's health aspects. This review summarizes the cardiac toxicities of commonly prescribed antibiotics and their interactions with other drugs.

**KEYWORDS:** Antibiotics, Cardiac Toxicity, Adverse Reactions

## INTRODUCTION

Medical literature suggests that antibiotics are frequently not appropriately prescribed and their use in everyday clinical practice is not based on an evidence centered approach.<sup>1,2</sup> For instance, antibiotics are prescribed for viral fever and common cold, against which they are not effective. The chronic and inappropriate use of antibiotics leads to development of resistance. This development of bacterial resistance to antibiotics has been one of the most important challenges faced by medical professionals globally. Rational antibiotic therapy and patient information are important building blocks for maintaining the efficacy of these drugs, which are essential to modern medicine. It is however also important to consider other risks associated with antibiotic use. These include possible cardiovascular side effects and risks of antibiotic therapy as well as the risks resulting arising therefrom. Long-term use of antibiotics in middle-aged or older women may increase the risk of subsequent cardiovascular diseases.<sup>3</sup> Possible causes include the following cardiac side effects or risks of antibiotics QT interval prolongation, risk of aortic aneurysms and dissection, adverse reactions due to clinically significant interactions with antibiotics.

Prolongation of the QTc interval is probably the most therapeutically significant and best-documented side effect of therapy with certain classes of antibiotics, which may lead to life-threatening polymorphic

ventricular tachyarrhythmias, so-called torsades de pointes.<sup>4</sup> Both fluoroquinolones and macrolides are associated with these side effects. Fluoroquinolones in general, and moxifloxacin in particular, have a direct effect on a specific potassium current which delays cardiac repolarization, reflected in a surface ECG as prolonged QT interval. This type of change in repolarization may result in the development of torsades de pointes in patients. Fluoroquinolones are no longer the first choice in the treatment of infections due to medically significant side effects. They should only be used if other and better tolerated antibiotics are unavailable. Severe musculoskeletal side effects include tendinitis, tendon rupture, myalgia, muscle weakness, arthralgia, joint swelling and gait disorders. Severe side effects involving the peripheral and central nervous systems include peripheral neuropathy, sleeplessness, depression, fatigue, impaired memory as well as visual, auditory, olfactory and gustatory disorders. Special caution is generally advised in elderly patients, those with renal problems or following organ transplantation, as well as patients being concomitantly administered systemic corticosteroids. Macrolides are widely used class of antibiotics used in the treatment of many common infections.

They are considered safe and are well tolerated in general. However, several studies have demonstrated an association between macrolides and cardiotoxicity



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in recent years.<sup>1,2</sup> Reported adverse cardiac events due to macrolides include QT interval prolongation, torsades de pointes, ventricular tachycardia, and sudden cardiac death. These have especially been observed in patients with pre-existing cardiovascular diseases. All macrolides in current use carry a risk of QTc interval prolongation and/or torsades de pointes. A few studies have demonstrated an association between administration of macrolide antibiotics and sudden cardiac death. The extent of difference of this risk between the various macrolides remains controversial. Thus, certain precautions and attention to risk factors are recommended for all active substances. These include cardiovascular diseases, long QT syndrome, electrolyte disturbances and pharmacokinetic interactions.<sup>5-16</sup>

It is important to take these risk factors into account and monitor patients accordingly or avoid the use of QT prolonging drugs in such cases whenever possible. In principle, the combination of the two antibiotic groups with other drugs which may also induce significant QT prolongation and torsades de pointes is critical. This combination is recommended only under intensive observation or is contraindicated. In principle, the combination of two or more drugs which may potentially prolong the QTc interval or increase the risk of TdP should be avoided.<sup>4</sup> Thus, in polypharmacy, the possibility of using a QT-neutral drug with the same therapeutic efficacy instead of a QT-prolonging drug should be evaluated in every patient and must be given preference. If combination therapy is unavoidable, then the lowest effective dose must be selected and administered under ECG monitoring. Fluoroquinolones may promote the degradation of collagen. Predisposing factors for aortic aneurysms and dissection include: family history of aneurysm, pre-existing aortic aneurysm or aortic dissection, Marfan syndrome, vascular Ehlers-Danlos syndrome, Takayasu arteritis, giant cell arteritis, Behçet's disease, hypertension and atherosclerosis. Clarithromycin and erythromycin are potent CYP<sub>3A4</sub> and P-glycoprotein inhibitors. Caution is advised in combination with drugs which are primarily metabolized by CYP<sub>3A4</sub> or are good substrates for the transport protein P-gp due to the greater toxicity of these drugs. Concomitant administration of clarithromycin and calcium antagonists such as amlodipine and felodipine may lead to hypotension and acute kidney failure, with high mortality. Azithromycin is the drug of choice in

such cases since it does not exhibit such pharmacokinetic interactions. The use of azithromycin is therefore recommended in polypharmacy.<sup>17</sup>

Cotrimoxazole is an important and potential trigger of hyperkalemia in elderly patients as well as in those with renal dysfunction, which is of particular significance during concomitant intake of ACE inhibitors or AT<sub>1</sub> blockers. The trimethoprim component acts like the potassium-sparing diuretic amiloride. High cardiovascular mortality has been observed in combination with ACE inhibitors and angiotensin blockers.<sup>18</sup> Changes in microbiomes and possible cardiovascular effects. The intestinal flora plays a key role in many physiological processes and pathological diseases. Every dose of the antibiotic affects the balance and composition of intestinal flora by alteration in the microbiome such as a possible reduction in the occurrence of probiotic bacteria. Findings from animal experiments suggest that exposure to antibiotics may also increase cardiovascular risk by alteration of the microbiome. Thus, intestinal bacteria, which enter serum via their metabolites and exhibit a protective effect against arteriosclerosis, may be reduced. Some antibiotics stimulate the proliferation and activity of macrophages in vitro, which may lead to accumulation of lipids and result in atherosclerosis in the long term. Recently conducted studies indicate an unexpected effect of antibiotics in furthering inflammation.<sup>19-25</sup>

According to current recommendations, caution is advised while administering fluoroquinolones due to their side effects. These include cardiac toxicities and associated risks. The patient's individual risk factors must be considered while administering macrolides and concomitant use with other QT-prolonging drugs must be avoided at any cost. The macrolides clarithromycin and erythromycin exhibit drug interactions and should be avoided whenever possible. Azithromycin is the macrolide of choice in polypharmacy. In general, effects on the microbiome must be considered while prescribing antibiotics. This may also result in cardiac toxicities or long-term risks according to initial reports. It is therefore imperative that antibiotics be administered in accordance with the given indication, with therapy targeted at the treatment of bacterial infections. Restricted use of antibiotics is therefore important since it contributes

not only to the reduction of bacterial resistance, but also towards reduction of cardiovascular risks.

## CONCLUSION

The frequent use of antibiotics for inappropriate indications leads to selection of resistant pathogens, promotion of their spread and development of resistance. Other risks associated with the use of antibiotics must be considered. These include possible cardiovascular side effects of antibiotic therapy as well as the risks resulting arising therefrom, and include prolongation of the QTc interval, the risk of aortic aneurysms and dissection, side effects due to clinically significant interactions and changes in microbiomes with resultant possible side effects and risks. According to the current recommendations, caution is advised while administering fluoroquinolones due to their side effects. The patient's individual risk factors must be considered while administering macrolides and concomitant use with other QT-prolonging drugs must be avoided at any cost. Use of the macrolides clarithromycin and erythromycin which exhibit potent interactions should be avoided whenever possible. Azithromycin is the macrolide of choice in polypharmacy. In general, the effects on the microbiome must be considered when prescribing antibiotics. These may result in long-term cardiovascular risks based on initial reports. It is therefore imperative that antibiotics be administered in accordance with the given indication, with therapy targeted at the treatment of bacterial infections. Restricted use of antibiotics is therefore important since it contributes not only to the reduction of bacterial resistance, but also towards reduction of cardiovascular risks. This confirms the compelling need to use antibiotics in an indication-oriented and targeted manner for bacterial infections. The restrictive use of antibiotics is therefore not only important to reduce bacterial resistance but also contributes to the reduction of cardiovascular risks.

## REFERENCES

1. Fleming-Dutra KE, Hersh AL, Shapiro DJ, Bartoces M, Enns EA, File TM Jr, et al. Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010–2011. *JAMA* 2016; 315: 1864–73.
2. Linder JA, Brown T, Lee JY, Chua K-P, Fischer MA. 1632. Non-Visit-Based and Non-Infection-Related Ambulatory Antibiotic Prescribing. *Open Forum Infect Dis*. 2018; 5 (Suppl 1): S43.
3. Heianza Y, Zheng Y, Ma W, Rimm EB, Albert CM, Hu FB, et al. Duration and life-stage of antibiotic use and risk of cardiovascular events in women. *Eur Heart J*. 2019; 40: 3838–3845.
4. Nachimuthu S, Assar MD, Schussler JM. Drug-induced QT interval prolongation: mechanisms and clinical management. *Ther Adv Drug Saf*. 2012; 3: 241–53.
5. Li X, Wang M, Liu G, Ma J, Li C. Association of macrolides with overall mortality and cardiac death among patients with various infections: a meta-analysis. *Eur J Intern Med*. 2016; 28:32–7.
6. Wong AYS, Chan EW, Anand S, Worsley AJ, Wong ICK. Managing cardiovascular risk of macrolides: systematic review and meta-analysis. *Drug Saf*. 2017; 40: 663–77.
7. Bin Abdulhak AA, Khan AR, Garbati MA, Qazi AH, Erwin P, Kiswa S, et al. Azithromycin and risk of cardiovascular death: a meta-analytic review of observational studies. *Am J Ther*. 2015; 22: e122–e129.
8. Ray WA, Murray KT, Hall K, Arbogast PG, Stein CM. Azithromycin and the risk of cardiovascular death. *N Engl J Med*. 2012; 366: 1881–90.
9. Schembri S, Williamson PA, Short PM, Singanayagam A, Akram A, Taylor J, et al. Cardiovascular events after clarithromycin use in lower respiratory tract infections: analysis of two prospective cohort studies. *BMJ* 2013; 346: f1235.
10. Svanström H, Pasternak B, Hviid A. Use of clarithromycin and roxithromycin and risk of cardiac death: cohort study. *BMJ* 2014; 349: g4930.
11. Khosropour CM, Capizzi JD, Schafer SD, Kent JB, Dombrowski JC, Golden MR. Lack of association between azithromycin and death from cardiovascular causes. *N Engl J Med*. 2014; 370: 1961–2.
12. Chou HW, Wang JL, Chang CH, Lai CL, Lai MS, Chan KA. Risks of cardiac arrhythmia and mortality among patients using new-generation macrolides, fluoroquinolones, and  $\beta$ -lactam/ $\beta$ -lactamase inhibitors: a Taiwanese nationwide study. *Clin Infect Dis*. 2015; 60: 566–77.
13. Mortensen EM, Halm EA, Pugh MJ, Copeland LA, Metersky M, Fine MJ, et al. Association of azithromycin with mortality and cardiovascular events among older patients hospitalized with pneumonia. *JAMA* 2014; 311: 2199–208.
14. Winkel P, Hilden J, Hansen JF, Kastrup J, Kolmos HJ, Kjølner E, et al.; CLARICOR trial group. Clarithromycin for stable coronary heart disease increases all-cause and cardiovascular mortality and cerebrovascular morbidity over 10 years in the

CLARICOR randomised, blinded clinical trial. *Int J Cardiol.* 2015; 182: 459–65.

15. Wong AY, Root A, Douglas IJ, Chui CS, Chan EW, Ghebremichael-Weldeselassie Y, et al. Cardiovascular outcomes associated with use of clarithromycin: population based study. *BMJ* 2016; 352: h6926.

16. Inghammar M, Nibell O, Pasternak B, Melbye M, Svanström H, Hviid A. Long term risk of cardiovascular death with use of clarithromycin and roxithromycin: a nationwide cohort study. *Am J Epidemiol.* 2018; 187: 777–85.

17. Gandhi S, Fleet JL, Bailey DG, McArthur E, Wald R, Rehman F, Garg AX. Calcium-channel blocker – clarithromycin drug interactions and acute kidney injury. *JAMA* 2013; 310: 2544–53.

18. Fralick M, Macdonald EM, Gomes T, Antoniou T, Hollands S, Mamdani MM, Juurlink DN; Canadian Drug Safety and Effectiveness Research Network. Co-trimoxazole and sudden death in patients receiving inhibitors of renin-angiotensin system: population based study. *BMJ* 2014; 349: g6196.

19. Jie Z, Xia H, Zhong SL, Feng Q, Li S, Liang S, et al. The gut microbiome in atherosclerotic cardiovascular disease. *Nat Commun.* 2017;8:845.

20. Kita E, Sawaki M, Mikasa K, Oku D, Hamada K, Maeda K, et al. Proliferation of erythromycin-

stimulated mouse peritoneal macrophages in the absence of exogenous growth factors. *Nat Immun.* 1993; 12: 326–38.

21. Xu G, Fujita J, Negayama K, Yuube K, Hojo S, Yamaji Y, et al. Effect of macrolide antibiotics on macrophage functions. *Microbiol Immunol.* 1996; 40: 473–9.

22. Robbins CS, Hilgendorf I, Weber GF, Theurl I, Iwamoto Y, Figueiredo JL, et al. Local proliferation dominates lesional macrophage accumulation in atherosclerosis. *Nat Med.* 2013; 19: 1166–72.

23. Kappel B, De Angelis L, Nonnast A, Stoehr R, Menghini R, Marx N, Federici M. Oral antibiotics increase atherosclerosis independently of diet. *Eur Heart J.* 2017; 38 (Suppl 1): 138.

24. Wang Z, Klipfell E, Bennett BJ, Koeth R, Levison BS, Dugar B, et al. Gut flora metabolism of phosphatidylcholine promotes cardiovascular disease. *Nature* 2011;472:57–63.

25. Scott NA, Andrusaite A, Andersen P, Lawson M, Alcon-Giner C, Leclaire C, et al. Antibiotics induce sustained dysregulation of intestinal T cell immunity by perturbing macrophage homeostasis. *Sci Transl Med.* 2018; 10 (464): eaa04755. <https://doi.org/10.1126/scitranslmed.aa04755>

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# Caries Pattern in Primary Molars with Early Pulpal Involvement in Mixed Dentition

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ADHISHREE SINGH CHIB<sup>1</sup> 

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**INTRODUCTION:** Caries in primary dentition may lead to high risk in permanent dentition; it is therefore important to identify those children who are caries affected. Specific and distinct patterns of caries attack might indicate a distinct etiology or are most likely associated with the subsequent development of carious lesions on other surfaces of teeth.

**AIM:** To assess caries susceptibility and prevalence in primary teeth and evaluate the prevalence of caries according to individual molar surfaces in 4-8 year old children.

**MATERIAL AND METHODS:** A cross sectional retrospective study was conducted in the pediatric department of SGT Dental College using convenient sampling with caries in teeth as chief complaint. 70 radiographs were examined in the age group of 4-8 years. Lesions present on mesial, distal and occlusal surfaces were recorded on the chart after radiographic examination.

**RESULTS:** As per results, distal surface of D(45.40%) and mesial surface of E (37.80%) showed maximum caries on adjacent proximal surfaces and significant dependence (p value<0.05) was found between the presence of lesions on adjacent proximal surfaces. The D(76.1%) and E(79.1%) showed significantly higher caries experience on the proximal surfaces in conjunction with occlusal caries but were statistically not significant.

**CONCLUSION:** In the presence of non-proximal caries (occlusal caries), the chances of proximal caries are increased as seen radiographically. Thus need for treatment, are likely being underestimated during visual examinations alone.

**KEYWORDS:** Dental Caries, Mixed Dentition, Dental Pulp

## INTRODUCTION

Dental caries is found to be the most vulnerable oral health issue and is a widespread oral disease in children across the world. The prevalence of cavitated carious lesions is of abundant concern over ages and is a predominant topic of several epidemiological studies conducted in India and abroad because it not only damages the tooth structure, but is also responsible for numerous disorders of mouth and other body systems (WHO, 1981).<sup>1-3</sup>

Caries in primary dentition may lead to high risk in permanent dentition; it is therefore important to identify those children who are caries affected. It has been reported that caries distribution follows a typical pattern in the mixed dentition. The dental caries pattern varies with age, sex, race, feeding habits, oral hygiene practices, geographical location, and socioeconomic status. Moreover, the presence of two windows of infectivity by the time of mixed dentition makes caries occurrence unpreventable in addition to the above-mentioned etiological factors. Not every tooth and every surface are equally susceptible to caries. It is therefore important to know the relative caries susceptibility of the teeth in the maxillary and the mandibular arch. There is not much data about the

association of pattern of early dental caries with the caries progression in mixed dentition period. Specific and distinct patterns of caries attack might indicate a distinct etiology or are most likely associated with the subsequent development of carious lesions on other surfaces of teeth.<sup>4-7</sup>

Based on etiological factors caries pattern may vary. For instance, occlusal surfaces are the most susceptible, and labial and lingual surfaces the least susceptible in both the dentition. In addition, approximal surfaces are also commonly affected in mixed dentition after eruption of first permanent molars because the contact points of the primary molars become tighter. The broader proximal contact areas observed in primary teeth increase caries susceptibility as the self-cleansing action is reduced because of the limited movement thereby leading to increase in plaque accumulation. In neighbouring approximal tooth surfaces, caries susceptibility differs which shows that one surface may show obvious radiographic signs of caries, while the neighbouring surface does not.<sup>8-9</sup>

The aim of the present study was to assess caries susceptibility and prevalence in primary teeth and



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evaluate the prevalence of caries according to individual molar surfaces in 4-8 year old children.

The objectives were to evaluate the differences in caries prevalence and caries lesion location with regard to tooth surfaces in primary canines, first and second molars, to compare individual tooth surface caries rates and to evaluate correlation between caries on adjacent proximal surfaces and between proximal and occlusal caries.

## MATERIAL AND METHODS

A cross sectional retrospective study was conducted in the pediatric department of SGT Dental College using convenient sampling with caries in teeth as chief complaint.

Parents and guardians of these children were asked to give informed written consent for participation in the study. Examined children were in the age group of 4-8 years. The study was performed with the consent of the ethical committee of the SGT University.

**Materials:** PMT Set, cotton rolls, CPI probe, radiographic films, dental charts

**Methodology:** The clinical examination was performed between mid-2018 –mid 2019 by trained dental examiners with standard dental mirror and probe under artificial light, using standardized criteria based on WHO guidelines. The status of occlusal, mesial and distal surfaces of primary canine, first and second molars and first permanent molar if visible were recorded separately from IOPA radiographs. The teeth considered in this study were C,D,E,6 and their surfaces mesial, distal and occlusal. Electronic patient records such as dental charts and radiographs were reviewed to obtain the data in this study.

Lesions present on mesial, distal and occlusal surfaces were recorded on the chart after radiographic examination. Charts and radiographs were screened by a single examiner using convenient sampling. 70 radiographs with carious lesions were studied and charts were prepared to calculate following outcomes:

- Correlation between caries on adjacent proximal surface lesions
- Frequency of proximal caries in teeth with and without occlusal caries

The statistical analysis was done using SPSS version 15.0 statistical analysis software. Chi-square test was used to assess the statistical significance and correlation between various surfaces. The level of statistical significance was taken as  $p < 0.05$ .

## RESULT

A total of 70 radiographs of children aged 4-8 years with carious lesions were included in the study.

In Table 1, the correlation between adjacent proximal surface lesions showed that 21 adjacent proximal surfaces were seen i.e. mesial surface of 6 in contact with distal surface of E and 5 (23.8%) teeth with carious distal surface were found. 66 pairs with distal surface of D and mesial surface of E were examined [Figure 1(a) and (b)]. 25(37.8%) out of 66 had caries on mesial surface of E and 30 (45.4%) had caries on distal surface of D. It was also found that in distal of D and mesial of E group there were 14 (21.2%) pairs with both surfaces carious, In another pair i.e. (mesial of D and distal of C) 18 teeth were examined in which one pair (16.6%) in both surfaces had caries. It was also found that one (5.5%) pair in this group had both surfaces carious (mesial of D and distal of C). Figure 2 shows percentage of carious surfaces on the teeth examined in descending order -Distal surface of D (45.40%) > Mesial surface of E (37.80%) > Distal surface of E (23.80%)>Mesial surface of D (16.6%)>Distal surface of C(16.6%)>Mesial surface of 6(0%). A significant dependence ( $p$  value<0.05) was found between the presence of lesions on adjacent proximal surfaces.

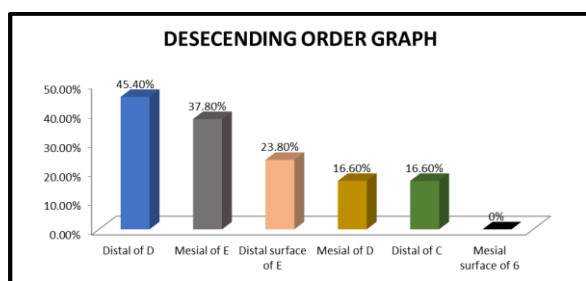


**Figure 1 (a) and (b):** Correlation between caries on adjacent proximal surfaces in descending order

In Table 2, Frequency of proximal caries in teeth with or without occlusal caries were examined. In E ,79.1% (19 teeth with occlusal and proximal caries out of 24

Arch and adjacent paired surfaces	Number of pairs examined	No. and %age of carious surfaces	No. of pairs with both surfaces carious	Chi square	p-value
Mesial surface of 6	21	0%	0	14.24	0.001(S)
Distal surface of E		5(23.8%)			
Mesial of E	66	25(37.8%)	14(21.2%)	17.47	0.001(S)
Distal of D		30(45.4%)			
Mesial of D	18	1/6(16.6%)	1(5.5%)	9.65	0.001(S)
Distal of C		1/6(16.6%)			

**Table 1.** Correlation between caries on adjacent proximal surfaces



**Figure 2:** Correlation between caries on adjacent proximal surfaces in descending order

occlusal carious teeth) were found. In D, 76.1% (16 teeth with occlusal and proximal caries out of 21 occlusal carious teeth) were found.

In E, proximal caries were found in 40% (12 teeth without occlusal caries but with proximal caries out of 30 teeth without occlusal caries) of cases and in D, 51.6% (16 teeth without occlusal caries but with proximal caries out of 31 teeth without occlusal and proximal caries) were found.

Tooth number D and E showed significantly higher caries experience on the proximal surfaces in conjunction with occlusal caries but were statistically not significant.

## DISCUSSION

In paediatric dentistry, knowledge of site of occurrence of carious lesions is crucial so that early interventions can be done as soon as the lesion is identified and the caries process is arrested, thereby, reducing potential stress and burden of disease for children and their

families and in saving expenditure for health care services.

The basis of the site of caries occurrence, depends on various factors. Subka S et al., 2019<sup>10</sup> have stated that the tight contact points between proximal surfaces of primary molars lead to higher plaque accumulation thus contributing to initiation and progression of proximal carious lesions. Moreover, the presence or absence of generalized spaces (Baume spaces) in primary dentition also leads to proximal lesions as there are primate spaces mesial to upper canine and distal to lower primary canine in mandibular arch because of which in mandibular primary first molar (D), distal surface has tight proximal contacts in comparison to the mesial surface thus leading to increased prevalence of caries (Addy M, 2006).<sup>11</sup>

The width of contact area affects the susceptibility to caries of the proximal surfaces. For instance, mesial surface of the first primary molar with narrow contact area adjacent to the distal surface of primary cuspid being much less susceptible than the distal surface. Another factor significantly influencing the risk of developing caries is morphology of approximal surfaces in primary molar teeth, in particular both surfaces being concave.<sup>12</sup>

The time of contact also influences the caries experience of the interproximal surfaces. For example, at the age of 6, caries is found to be more prevalent between distal surface of D and mesial surface of E than distal surface of E and mesial surface of first permanent molar.<sup>13</sup>

It was observed in the study that the first primary molar



Arch and tooth	Teeth with occlusal caries	Teeth with occlusal and proximal caries	n%	Caries free	Teeth without occlusal caries but with proximal caries (n)	n%	Chi-Square	p-value
6				21				
E	24	19	79.1%	30	12	40%	0.99	0.61(NS)
D	21	16	76.1%	31	16	51.6%		

**Table 2.** Frequency of proximal caries in teeth with and without occlusal caries

had more caries prevalence when compared to the second molar. This is because of eruption sequence. The second primary molar erupts 10-12 months later than the first primary molar. Hereby, first primary molar remains for an overall longer duration in the oral cavity, thus it is more prevalent to caries (Torres BL et al. 2015).<sup>14</sup>

Table 1 showed that correlation between adjacent proximal surface lesions exists. It can be due to the fact that until eruption of the first permanent molars, the second primary molar has only one proximal surface (mesial) in contact with another tooth. On the other hand, first primary molar has contact points with both canine and second primary molar creating additional predilection site for developing proximal caries (Baume LJ., 1950).<sup>15</sup> In a study, Bruzda-Zwiech A et al (2015)<sup>16</sup> stated that in 5-year-old children, distal surfaces were affected more in first molars than in second molars.

In another study, paired association of caries of primary second molar and permanent first molar though found in large number of cases was not significant in mixed dentition (Srinivasan D, Louis CJ, 2015).<sup>17</sup> This is not in accordance with our study. Also, study by Subramaniam P et al (2012)<sup>18</sup> done in 4-6 year old children showed that tight proximal contacts in the primary dentition are at higher risk for dental caries.

In Table 2, it was observed that frequency of proximal caries in teeth with occlusal caries was more compared to those with only proximal caries. The frequency of proximal caries in teeth without occlusal caries should be taken into account when preventive treatment with pit and fissure sealant is considered. The value of

sealant fissures of occlusal surface of primary molar at mixed dentition stage would be questionable because of high prevalence of proximal caries (Sreedevi A, Mohamed S, 2020).<sup>19</sup> In a study by Dhar V et al. (2018)<sup>20</sup> found significant association between non-proximal carious lesions and radiographically detectable proximal carious lesions. Proximal lesions were twice as likely to exist on primary molars when non-proximal i.e., pit and fissure carious lesions were present which is in accordance with our study. As we know that, previous caries experience, parental education, socioeconomic status and mutans streptococci levels are among the reliable predictors for new caries and since caries experience is one of the best predictors for new caries, it initiates an interest to know if existing non proximal caries can serve as reliable objective criteria to predict the presence of proximal caries that may or may not be visible clinically.

## CONCLUSION

- The width, morphology and time of contact significantly influences the pattern and frequency of caries on proximal surfaces in the mixed dentition period.
- In the presence of non-proximal caries i.e. occlusal caries the chances of proximal caries are increased as seen radiographically. Thus, need for treatment of caries, are underestimated during visual examinations alone.

## REFERENCES

1. Sachdeva A, Punhani N, Bala M, Arora S, Gill GS, Dewan N. The prevalence and pattern of cavitated carious lesions in primary dentition among children under 5 years age in Sirsa, Haryana (India). J Int Soc

- Prev Community Dent. 2015;5(6):494-8. <https://doi.org/10.4103/2231-0762.170527>
2. Rathee M, Sapra A. Dental Caries. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020. (Online Article). Available from: <https://www.ncbi.nlm.nih.gov/books/NBK551699/> [Last Accessed on 15<sup>th</sup> June, 2020]
  3. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of untreated caries: a systematic review and meta regression. *J Dent Res.* 2015;94(5):650-8.
  4. Heng C. Tooth Decay Is the Most Prevalent Disease. *Fed Pract.* 2016;33(10):31-3.
  5. Ndagire B, Mwesigwa CL, Ntuulo JM, Mayanja-Kizza H, Nakanjako D, Rwenyonyi CM. Dental Caries Pattern and Treatment Needs among Ugandan Adolescent Students: A Cross-Sectional Study. *Int J Dent.* 2020;2020:8135865. <https://doi.org/10.1155/2020/8135865>
  6. Al-Samadani KH, Ahmad MS. Prevalence of first permanent molar caries in and its relationship to the dental knowledge of 9-12-year olds from Jeddah, kingdom of Saudi Arabia. *ISRN Dent.* 2012;2012:391068. <https://doi.org/10.5402/2012/391068>
  7. Chandan GD, Saraf S, Sangavi N, Khatri A. Pattern of dental caries in 3-6-year-old children using decayed, missing, filled surface index and hierarchical caries pattern system: A descriptive study. *J Indian Soc Pedod Prev Dent.* 2018;36:108-12
  8. Batchelor PA, Sheiham A. Grouping of tooth surfaces by susceptibility to caries: a study in 5-16 year-old children. *BMC Oral Health.* 2004;4(1):2. <https://doi.org/10.1186/1472-6831-4-2>
  9. Demirci M, Tuncer S, Yuceokur AA. Prevalence of caries on individual tooth surfaces and its distribution by age and gender in university clinic patients. *Eur J Dent.* 2010;4(3):270-9.
  10. Subka S, Rodd H, Nugent Z, Deery C. In vivo validity of proximal caries detection in primary teeth, with histological validation. *Int J Paediatr Dent.* 2019; 29:429-38.
  11. Addy M. Tooth brushing, tooth wear and dentine hypersensitivity - are they associated? *J Ir Dent Assoc.* 2006;51(5):226-31.
  12. Cortes A, Martignon S, Qvist V, Ekstrand KR. Approximal morphology as predictor of approximal caries in primary molar teeth. *Clin Oral Investig.* 2018;22(2):951-9. doi:10.1007/s00784-017-2174-3
  13. Bimstein E, Eidelman E, Klein H, Chosack A. Distribution of caries in different tooth surfaces in 7-year-old children. *Caries Res.* 1981;15(4):324-30. <https://doi.org/10.1159/000260533>
  14. Torres BL, Martínez MMR, de Nova GJM. A study on the chronology and sequence of eruption of primary teeth in Spanish children. *Eur J Paediatr Dent.* 2015;16(4):301-4.
  15. Baume LJ. Physiological tooth migration and its significance for the development of occlusion the biogenesis of the successional dentition. *J Dent Res.* 1950 Jun; 29(3):338-48.
  16. Bruzda-Zwiech A, Filipińska R, Borowska-Strugińska B, Żądzińska E, Wochna-Sobańska M. Caries Experience and Distribution by Tooth Surfaces in Primary Molars in the Pre-school Child Population of Lodz, Poland. *Oral Health Prev Dent.* 2015;13(6):557-66. <https://doi.org/10.3290/j.ohpd.a34371>
  17. Srinivasan D, Louis CJ. Evaluation of caries in deciduous second molar and adjacent permanent molar in mixed dentition. *J Pharm Bioallied Sci.* 2015;7(Suppl 2):S572-S575. <https://doi.org/10.4103/0975-7406.163544>
  18. Subramaniam P, Babu KI G, Nagarathna J. Interdental spacing and dental caries in the primary dentition of 4-6 year old children. *J Dent (Tehran).* 2012;9(3):207-14.
  19. Sreedevi A, Mohamed S. Sealants, Pit and Fissure. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; (Online Article). Available from: <https://www.ncbi.nlm.nih.gov/books/NBK448116/> [Last Accessed on 15<sup>th</sup> June, 2020]
  20. Dhar V, Mon S, Macek MD. Evaluation of Nonproximal Caries as Predictor of Proximal Caries in Primary Molars. *Int J Clin Pediatr Dent.* 2018 Nov-Dec;11(6):457-461. <https://doi.org/10.5005/jp-journals-10005-1557>.

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# Complications, Indication and Tolerance of Foam Sclerotherapy in Varicose Vein Management Done in A Tertiary Care Centre in South India

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**INTRODUCTION:** Foam sclerotherapy is used for treating varicose veins in our institution for patients who are not willing for surgery, debilitated patients, recurrent ulcers, cosmetic & in SFV (Sapheno Femoral Vein) <6 mm size.

**AIM:** The aim of this study was to find and assess the rate and pattern of post-sclerotherapy complications in our institution compared with international standards.

**MATERIALS AND METHOD:** The present study was retrospective in nature and case records of patients who underwent foam sclerotherapy [2009-2013, lower limb-Ultrasound (USG) guided and blind] in our hospital [10% Sodiumtetradecylsulfate (STS), Tessari technique] were assessed to look for indication, tolerance to the procedure and immediate outcomes. A pre-tested and pre-validated questionnaire was used and physical examination were done to assess post-procedural complications. Statistical significance was  $p < 0.05$ .

**RESULTS:** Among 112 patients, 62.5 % were aged >50 years and 69% were males. It was observed that 22% had indication as recurrence; 43% had mild pain during procedure and 36.6% developed post-foam sclerotherapy complications. 47.6% of patients whose age were <50 years had CEAP(Clinical Etiological Anatomical Pathological) criteria C<sub>2</sub>( $p=0.007$ ). 48.8% with complications had multiple criteria( $p=0.012$ ) and 57.7% C<sub>2</sub> had least complication ( $p=0.000$ ). Cosmetic indication showed least tolerance. Use of 10% STS was found to have lesser complication rate (36%), compared to study which had 76% success with STS 3% and complication-64%.

**CONCLUSION:** Foam sclerotherapy is less invasive and its efficacy could be improved by performing under USG guidance, selection of sclerosant, appropriate candidate (age>50 years, multiple CEAP criteria, without pre-existing co-morbidities).

**KEYWORDS:** Varicose Vein, Sclerotherapy, Sclerosant

## INTRODUCTION

Varicose veins are the most common vascular disease and it is due to incompetent valves, presenting with heaviness, aching and cramps of lower limbs.<sup>1</sup> It is defined as dilated, usually tortuous, subcutaneous veins  $\geq 3$ mm in diameter measured in the upright position with demonstrable reflux.<sup>2</sup>

Its overall prevalence is 20% to 60% (25-30% among women and 15% in men). It has a genetic predisposition as when both parents are affected, there is a 90% chance for the offspring to get the disease and when one parent is affected, chances of inheritance in daughter is 60% and the chance of inheritance in son is 25%.<sup>3</sup> The prevalence of varicose vein depends on the following factors : gender, age(most commonly in the age group of 55 -64 years, and least in the age group of 18 -24 years), based on ethnicity, more prevalent among North America and Europe; least among South America and India.<sup>4</sup> Other factors influencing prevalence are pregnancy, occupation and lifestyle (smokers, constipation, prolonged standing increases the risk).<sup>2</sup> In a study among 100 teachers in Trivandrum, prevalence of varicose vein was 19%. In a study among sweepers (men) it was 25.08% and 6.8% (South & North India).<sup>5</sup> About 20-25 million Americans have varicose veins.<sup>6</sup>

Treatment of varicose vein includes: conservative: compression stockings, intermittent pneumatic compression. Active:

1. Surgical: TSSA(Trendelenberg stripping and stab avulsion), SPJ (Sapheno Popliteal Junction)Ligation, ambulatory phlebectomy, cryosurgery.
2. Non-surgical : Sclerotherapy (reticular veins), endovenous thermal ablation.

In foam sclerotherapy which was introduced in 2001, lipid membranes(endothelial cells) are destroyed by sclerosant(detergent), by inducing sclerosis.

**Tessari's Method:** Here, sites are marked, and two syringes are connected by a three-way tap. 1:3 or 1:4 - sclerosant: air is drawn into syringe and then oscillated. The foam is stable only for 2 minutes. The veins are emptied and foam is injected (1-2 ml, maximum 10-20 ml) from superficial veins to Long Saphenous Vein or Short Saphenous Vein. Incidence of complications is directly proportional to the volume of sclerosant injected. Compression bandage is applied and left in-situ for 7-10 days.<sup>2</sup>

Sclerosant approved by US FDA are 1. Sodium morrhuate and Sodium tetradecyl Sulfate. In UK,



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polidocanol is also used.<sup>7</sup> The sclerosant used in our hospital is 10% Sodium tetradecyl sulphate.

The complication rate of foam sclerotherapy is <1%, which commonly includes phlebitis, pigmentation, headache, superficial skin necrosis, visual disturbances, chest tightness.<sup>1,2</sup>

Sclerotherapy, even if less invasive, is not widely used. In our hospital, sclerotherapy is carried out in patients who are not willing for surgery, debilitating patients, recurrent ulcers, cosmetic purposes and in patients with <6 mm SFV size. The aim was to find out and assess the rate and pattern of post-sclerotherapy complications. The study also intended to analyse the complication rate of the procedure in US and UK and to find out whether the present methods are to be modified for better results.

## MATERIALS AND METHOD

**Ethical Consideration:** This study was approved by Dr.SMCSI Medical College and Hospital ethical committee.

**Method:** The study group comprised of 112 patients who had undergone foam sclerotherapy (both ultrasound guided and blind sclerotherapy) during the years 2009-2013. Patients who were willing, had recurrent venous ulcers, debilitating, GSV size < 6mm, who had undergone foam sclerotherapy during 2009-2013 were included in the study. Those who had incomplete case records were excluded from the study. The study included dependent variables like superficial skin pigmentation at site of injection, pain at site of injection, skin necrosis, transient blindness and transient renal failure. Independent variables included name, age, sex, residence, morbidity.

Case records were studied for indications of sclerotherapy, details of the procedure, tolerance to the procedure and immediate outcomes. Data regarding post procedure followed upto 3 months and 6 months were obtained from case records. The data was entered in MS Excel and analysed using software (SPSS, version 22.0). Complication rate was computed as the total number of complications divided by the total subjects who had undergone foam sclerotherapy. Pattern of complications was assessed by taking the proportion of each complication.

## RESULTS

Among 112 subjects, 77 were males and 35 were females. 37.5% belonged to the age group of 31-50 years, 37.5% were aged 51-70 years. 22% of the subjects underwent foam sclerotherapy due to recurrence either after surgery (mostly as thread veins) or previous foam sclerotherapy. 16% got it done for cosmetic benefits. Among the total subjects surveyed, only 81% had their data regarding tolerance to procedure being recorded. Among them, 43% experienced mild pain yet tolerable, while 20% had no pain and 5 % had severe pain during the procedure. 97.32% of foam sclerotherapy were done under ultrasound guidance. Among the study subjects, 36.61% was found to have post-foam sclerotherapy complications, immediately after the procedure/within 3-6 months of procedure.

The most common complication was skin pigmentation (19%) which lasted for more than 1 week after the procedure and for which patient had to revisit the general surgery OPD. Next common complication found was ulcer at the injection site, majority of whom had associated pain at the injection site. Next common complication was skin necrosis which took long time to settle. These complications needed hospitalisation. Other less common complications observed were Deep Vein Thrombosis (DVT)(2%) and itching. Among these, itching associated with skin pigmentation/ulcer/necrosis had been excluded and included only those who presented with itching alone as the complaint which accounted for about 1 %. Recurrence after foam sclerotherapy was one of the main complications which led to repetition of foam sclerotherapy after first course. Renal failure was not found in any of the patients.

Among the subjects who had undergone foam sclerotherapy, 57% were in the age group <50 years and 47.6% of them had CEAP (Clinical-Etiological-Anatomical-Pathophysiological) criteria C<sub>2</sub>, next being more common than one criteria(C<sub>1</sub>-C<sub>6</sub>)(p=0.007). Those belonging to age >50 years, 47.9% had more than one CEAP criteria (p=0.007) and 37.5% had C<sub>2</sub> criteria. 41.5% of subjects aged<50 years had ulcer as indication for foam sclerotherapy(p=0.015). 27.1% of subjects aged>50years presented with recurrence of varicose vein of lower limb as indication for foam sclerotherapy. Interestingly 25% of older age group presented in OPD for cosmetic indication

POST FOAM SCLEROTHERAPY COMPLICATION	PRESENT		ABSENT		CHI SQUARE (p VALUE)
	n	%	n	%	
<b>1. Age</b>					
< 50 years	23	56.1	41	57.7	0.029(p=0.865)
>50 years	18	43.9	30	42.3	
<b>2. CEAP criteria</b>					
C <sub>1</sub>	1	2.4	0	0	2.025(p=0.155)
C <sub>2</sub>	7	17.5	41	57.7	16.886(p=0.000)
C <sub>3</sub>	4	9.8	7	9.9	0.000(p=0.986)
C <sub>4</sub>	0	0	1	1.4	0.917(p=0.338)
C <sub>5</sub>	1	2.4	0	0	2.025(p=0.155)
C <sub>6</sub>	7	17.1	4	5.6	3.677(p=0.051)
Subjects having more than one CEAP criteria	20	48.8	18	25.4	6.364(p=0.012)
<b>3. Indication for foam sclerotherapy</b>					
A). Cosmetic	8	19.5	10	14.1	0.568(p=0.451)
B). Skin changes	13	31.7	4	5.6	13.724(p=0.000)
C). Edema	7	17.1	9	12.7	0.410(p=0.522)
D). Ulcer	17	41.5	8	11.3	13.668(p=0.000)
E). Minor abrasion	1	2.4	11	15.5	5.644(p=0.018)
F). Recurrence	16	39	8	11.3	11.893(p=0.001)
<b>4. Mode of foam sclerotherapy</b>					
A). USG guided	39	95.1	70	98.6	1.145(p=0.285)
B). Blind	2	4.9	1	1.4	1.145(p=0.285)
<b>5. Level of tolerance</b>					
a). No pain	2	4.9	2	2.8	0.309(p=0.578)
b). Mild pain	10	24.4	3	4.2	10.012(p=0.002)
c). Severe pain	5	7	0	0	4.692(p=0.030)

**Table 1.** Presence or absence of post foam sclerotherapy complication among the study subjects. (CEAP: Clinical-Etiological-Anatomical-Pathophysiological)

whereas it was only 9.4% among younger age group (p=0.026). Better tolerance to procedure was shown by those with age<50 years (14.1 %). 35.9% with age<50 years and 37.5% with age>50 years had post foam sclerotherapy complications atleast within 6 months of procedure (p=0.827). Both the age groups had skin pigmentation as the most seen complication (18.8 %) with a p value=0.978.

Among subjects who had post foam sclerotherapy complications, 56.1% belonged to age <50 years

(p=0.865). 48.8% of those with complications belonged to multiple CEAP criteria (p=0.012) and those with C<sub>2</sub> criteria were found to have least complications (p=0.000, table 1). 41.5% of subjects who had complications was found to have ulcer as their indication for foam sclerotherapy and the relation was found to be statistically significant (p=0.000, table 1). Next common indication was recurrent varicose vein(39%) and skin changes(31.7%), with a statistically significant relation to occurrence of complication (p value of 0.001 and p=0.000 respectively). Those with

TOLERANCE TO PROCEDURE	YES		NO		CHI SQUARE (p VALUE)
	n	%	n	%	
<b>1. Age</b>					
<50 years	1	1.6	63	58.3	1.767(p=0.184)
>50 years	3	75	45	41.7	
<b>2. CEAP criteria</b>					
2. CEAP multiple criteria present	3	75	1	25	2.928(p=0.087)
<b>3. Indication for foam sclerotherapy</b>					
a)cosmetic	0	0	18	16.7	1.420(p=0.232)
b)skin changes	1	25	16	14.8	0.271(p=0.603)
c)edema	2	50	14	13	3.014(p=0.083)
d)ulcer	2	50	23	21.3	1.530(p=0.216)
e)minor abrasion	0	0	12	11.1	0.924(p=0.336)
f)recurrence	0	0	24	22.2	1.969(p=0.161)
<b>4. Complication present</b>					
4.complication present	2	50	39	36.1	0.309(p=0.578)
<b>5. Post foam sclerotherapy complication</b>					
A). Skin necrosis	0	0	11	10.2	1.596(p=0.450)
B). Skin pigmentation	1	25	20	18.5	0.311(p=0.856)
c). DVT	0	0	2	1.9	0.514(p=0.773)
D). Itching	2	50	5	4.6	7.916(p=0.019)
E). Headache	0	0	1	.9	0.411(p=0.814)
F). Ulcer	1	25	12	11.1	0.613(p=0.736)
G). Renal failure	0	0	0	0	0
H). Recurrence	1	25	7	87.5	1.301(p=0.522)

**Table 2.** Tolerance of foam sclerotherapy among the study subjects (CEAP: Clinical-Etiological-Anatomical-Pathophysiological)

minor abrasion as the indication for foam sclerotherapy were found to have least (15.5%) occurrence of complications (p=0.018) (Table 1).

It was observed that 60.5% of subjects having multiple CEAP criteria belonged to age>50years. Among subjects who presented with multiple CEAP criteria, 47.4% presented with ulcer, 31.6% with edema as their indication for foam sclerotherapy. 17.6% of those with single CEAP criteria had cosmetic indication. 97.4% of subjects with multiple CEAP criteria had undergone with USG guided foam sclerotherapy. Post foam sclerotherapy complications were present in 52.6% of subjects having multiple CEAP criteria- p value of 0.012. Statistically significant relation was found among presence of multiple CEAP criteria and occurrence of all post-foam sclerotherapy complications were studied.

Majority (75%) of subjects of older age group (>50years) and having multiple CEAP criteria were found to tolerate the procedure better than those of

younger age group(p=0.184 & p= 0.087 respectively). It has been found that none of those having cosmetic indication for foam sclerotherapy could tolerate the procedure (p=0.232). 50% of subjects who could not tolerate the procedure were later found to have post-foam sclerotherapy complications (p=0.578). Subjects with post-foam sclerotherapy complications like skin necrosis (p=0.450), DVT (p=0.773), headache (p=0.814) have not been found to tolerate the procedure (table 2).

## DISCUSSION

There are various treatment choices for lower limb varicose veins. Foam sclerotherapy causes complete endothelial damage and eventually fibrosis of the entire vein wall without recanalization and locates the points of irregular flow in the veins permanently obliterated by the sclerosant injection.<sup>4</sup> In our institution 10% sodium tetradecyl sulphate is used, a detergent sclerosant agent. With this, the valves that are permanently damaged can regain their normal functions. The most important aspect of the treatment is to minimize the local venous hypertension by

interrupting the points of leakage into the superficial network by the perforating veins. The migration of sclerosing solution into isolated segments of the injected superficial vein (digital compression) will effectively close the perforator complex of perforators. The incompetent perforators are located almost always near changes in the skin and in typical locations in the legs.<sup>8</sup>

Among the 145 subjects selected for the study during the year 2009-2013 in our hospital, according to inclusion criteria and availability of proper data records, 112 were actually included in the study, 77 were males and 35 were females. Of this, 94.64% belonged to age < 70 years, 57% were aged < 50 years, 19.64% aged < 30 years.

22% of the subjects underwent foam sclerotherapy due to recurrence either after surgery (mostly as thread veins) or previous foam sclerotherapy or due to ulceration. 16% got it done for cosmetic benefits, 15% due to skin changes, 14% edema and 11% minor abrasions, in contrast to an Italian study by Tessari L et al. wherein 70% of the sclerotherapy sessions were performed on recurrent varices, or collaterals and 30% for reticular varices and telangiectases.<sup>9</sup>

In another study, common indications found were (a) pain in the affected limb - 38 patients (76%); (b) eczema - 40 patients (80%); (c) oedema - 15 patients (30%); (d) ulceration - 15 patients (30%); (e) lipodermatosclerosis - 10 cases (20%); and (f) telangiectasia and atrophie blanche - 2 cases (4%), which reveals a similar group of indications but lesser prevalence in present study. The disparity may be because the above mentioned research done by Subbarao et al. was based on dermatological outcome of the treatment and thus skin changes were more included as the indications.<sup>10</sup>

A research carried out by Fun SK on the etiology and symptomatology of varicose veins of lower limbs showed that patients having pain were 59%, pigmentation was seen in 58%, edema in 53%, eczema in 29%, ulceration in 28%, bleeding in 21% and lipodermatosclerosis in 20% which correlates well with the current study in case of prevalence of ulcer as indication (22%).<sup>11</sup>

Among the total subjects studied, only 81% had their data regarding tolerance to procedure being recorded.

Among them, 43% experienced mild yet tolerable pain, which was found to be a factor that increases the patient compliance to procedure and makes them willing for repeated sittings.

97.32% cases were done under ultrasound guidance which improved the efficacy of the procedure by effectively localising the incompetence.

Among the study subjects, 36.61% were found to have post-foam sclerotherapy complications, immediately after the procedure/within 3-6 months of procedure, which goes in hand with the findings in study conducted by Subbarao et al, in which 64% had post-foam sclerotherapy complications like bruising-38%, pigmentation-10%, recurrence-4%, DVT-2%.<sup>10</sup> This study showed a higher incidence of complications possibly due to inclusion of thrombophlebitis, which is considered as a part of mode of action of sclerosant and not taken into account in the present study.

Post-sclerotherapy complications observed in the present study were 10% skin necrosis, 19% skin pigmentation, 2% DVT, 1% itching, ulcer 12%, recurrence 7% & no renal failure. Whereas the above study had not reported any case of skin necrosis.<sup>10</sup> Mostly observed post procedural complication was skin pigmentation (19%) which lasted for more than 1 week after the procedure and for which patient had to revisit the general surgery outpatient department (OPD) and had undergone either repeat foam sclerotherapy or other treatment. Next most common complication found was ulcer at the injection site, majority of which had associated pain at the injection site. Next common was skin necrosis which required longest time period for recovery among the complications. These were the complications which had required hospitalisation. Other less common complications observed were DVT & itching. Among this, itching associated with skin pigmentation/ulcer/necrosis had been excluded. Recurrence after foam sclerotherapy was one of the main complications which led to repetition of foam sclerotherapy after first course, among which some even had to undergo surgical avulsion of the vein due to initial sclerotherapy failure. Another complication which had been looked for was renal failure which had not been reported in any of the patients may be due to plenty of oral fluids after the procedure. Other possible causes for the above mentioned complications were excluded to maximum by detailed history and



thorough physical examination and radiographic studies before attributing to foam sclerotherapy.

Among the subjects who underwent foam sclerotherapy, those belonging to age <50 years presented with tortuous asymptomatic lower limb veins (C<sub>2</sub>) and also with more than one criteria (C<sub>1</sub>-C<sub>6</sub>) (p=0.007), showing complicated presentation. Such patients with multiple CEAP criteria showed statistically significant relation with more incidences of post sclerotherapy complications also. Younger age group presented more with ulcer as indication for the procedure whereas for older group it was recurrence which was probably due to time lapse after first occurrence of varicose vein. Interestingly 25% of older age group presented in OPD for cosmetic indication whereas it was only 9.4% among younger age group (p=0.026), yet they tolerated the procedure well.

Among subjects who had post foam sclerotherapy complications, 56.1 % belonged to age<50 years (p=0.865).

41.5% of subjects who had complications were found to have ulcer as their indication for foam sclerotherapy and the relation was found to be statistically significant (p=0.000). Next common indication was recurrent varicose vein (39%) and skin changes (31.7%), with a statistically significant relation to occurrence of complication with a p value of 0.001 and p=0.000 respectively. Those with minor abrasion as the indication for foam sclerotherapy were found to have least (15.5 %) occurrence of complications (p=0.018). Among subjects who presented with multiple CEAP criteria, 47.4% presented with ulcer (p=0.000), 31.6% with edema(p=0.000) and 26.3% with skin changes(p=0.019) as their indication for foam sclerotherapy.

17.6% of those with single CEAP criteria had cosmetic indication (p=0.547) for foam sclerotherapy. 97.4% of subjects with multiple CEAP criteria underwent a USG guided foam sclerotherapy (p=0.982).

18.4% of subjects with multiple criteria had mild pain during the procedure. Post foam sclerotherapy complications were found to be present in 52.6% of subjects having multiple CEAP criteria and the relation was found to be statistically significant with a p value of 0.012.

Statistically significant relation were found among presence of multiple CEAP criteria and occurrence of

all post-foam sclerotherapy complications studied for : skin necrosis-18.4% (p=0.022), skin pigmentation-31.6% (p=0.021), DVT-2.6% (p=0.043), itching-10.5% (p=0.039), headache-2.6% (p=0.021), ulcer-15.8%(p=0.042), recurrence-10.5%(p=0.043).

Majority (75%) of subjects in older age group (>50 years) & having multiple CEAP criteria were found to tolerate the procedure better than those in younger age group (p=0.184 & p= 0.087 respectively). It has been found that none of those having cosmetic indication for foam sclerotherapy could tolerate the procedure (p=0.232). Those with recurrence of varicose vein in lower limb as the indication were also not found to tolerate the procedure (p=0.161).

Among the 81% of procedure tolerance data available, 50% of subjects who could not tolerate the procedure were later found to have post-foam sclerotherapy complications (p=0.578). Subjects who did not tolerate the procedure presented with post-foam sclerotherapy complications like skin necrosis (p=0.450), DVT (p=0.773), headache (p=0.814).

In short, regarding tolerance to procedure, older individuals and those with multiple criteria were found to show better tolerance than those having cosmetic indication and recurrence of varicose vein. Better tolerance may be because multiple criteria varicose veins were all ultrasound guided procedures, reducing local reactions thereby. Also poor tolerance had ended up in post procedure complications also.

Even if there are associated post procedural complications, sclerotherapy is found to be a safer and more compliant procedure which could manage many varicose cases on an OPD basis, as proved in a study by Kanter and Thibault, who in 1996 reported a 76% success rate at 24 months in treating saphenofemoral junction and great saphenous vein incompetence with STS 3% solution.<sup>12</sup> In order to control reflux in the small saphenous vein, Padbury et al. found that ultrasound guided sclerotherapy was successful.<sup>13</sup> Barrett et al. found that microfoam ultrasound guided sclerotherapy was effective in treating all sizes of varicose veins with high patient satisfaction and improvement in quality of life.<sup>14</sup>

According to Cochrane Collaboration review of the medical literature "the evidence supports the current place of sclerotherapy in modern clinical practice, which is usually limited to treatment of recurrent varicose veins following surgery and thread veins".<sup>15</sup> A

second Cochrane Collaboration review comparing surgery to sclerotherapy found out that sclerotherapy was better than surgery in terms of treatment success, complication rate and cost at one year, but surgery was better after five years.<sup>16</sup>

The European Consensus Meeting on Foam Sclerotherapy in 2003 concluded that "Foam sclerotherapy allows a skilled practitioner to treat larger veins including saphenous trunks".<sup>17</sup>

When so much evidence is given on the clinical success of a procedure which had been evolving over a decade to the present state, more research could aid to overcome present complications too, making it a better resort to varicose vein management.

## CONCLUSION

On the grounds of available knowledge on benefits of foam sclerotherapy, despite of the presence of post-procedure complications, it must be increasingly advocated to patients in indicated cases. Efficacy could be enhanced by performing under ultrasound guidance, selection of appropriate sclerosant, appropriate candidate. In the current study appropriate candidates were found to be older people with multiple CEAP criteria, without systemic illnesses who may predispose to complications studied herewith.

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## REFERENCES

- Solomon AC, Maurya DK. Ultrasound guided foam sclerotherapy for varicose veins using two needle technique – A case series. *Indian J Surg.* 2010;72:249-51. <https://doi.org/10.1007/s12262-010-0048-x>
- Bailey, Love. Short practice of surgery. (26th ed.) London: Hodder Arnold; 1991.
- Callam MJ. Epidemiology of varicose veins. *Br J Surg.* 1994 Feb;81(2):167-73. <https://doi.org/10.1002/bjs.1800810204>
- Eklöf B, Rutherford RB, Bergan JJ. Revision of the CEAP classification for chronic venous disorders: consensus statement. *J Vasc Surg.* 2004;50(6): 1248-52. <https://doi.org/10.1016/j.jvs.2004.09.027>
- Malhotra SL. An epidemiological study of varicose veins in Indian railroad workers from the south and north India with special reference to causation and prevention of varicose veins. *Int J Epid.* 2011;1(2):177-83. <https://doi.org/10.1093/ije/1.2.177>
- Tan VKM, Tan SG. Technique and early results of ultrasound-guided foam sclerotherapy of the long saphenous vein for treatment of varicose veins. *Singapore Med J.* 2009;50(3): 284-7.
- Robert L. Wrothington-Kirsch. Injection Sclerotherapy. *Semin Intervent Radiol.* 2005;22(3):209-17. <https://doi.org/10.1055/s-2005-921954>
- Labas P, Ohradka B, Cambal M, Reis R, Fillo J. Long term results of compression sclerotherapy. *Bratisl Lek Listy.* 2003;104(2):78-81.
- Tessari L, Cavezzi A, Frullini A. Preliminary experience with a new sclerosing foam in the treatment of varicose veins. *Dermatol Surg.* 2001 Jan;27(1):58-60. <https://doi.org/10.1111/j.1524-4725.2001.00192.x>
- Subbarao NT, Aradhya SS, Veerabhadrapa NH. Sclerotherapy in the management of varicose veins and its dermatological complications. *Indian J Dermatol Venereol Leprol* 2013; 79:383-8. <https://doi.org/10.4103/0378-6323.110746>
- Fun SK. Varicose veins of the lower limbs: A study of aetiology and symptomatology. *Hong Kong Pract.* 1988;10:3319-26.
- Kanter A, Thibault P. Saphenofemoral junction incompetence treated by ultrasound-guided sclerotherapy. *Dermatol Surg.* 1996. 22: 648-52. <https://doi.org/10.1111/j.1524-4725.1996.tb00612.x>
- Padbury A, Benveniste GL. Foam Echosclerotherapy of the small saphenous vein. *Australian and New Zealand Journal of Phlebology.* 2004;8:5-8.
- Barrett JM, Allen B, Ockelford A, Goldman MP. Microfoam ultrasound-guided sclerotherapy treatment for varicose veins in a subgroup with diameters at the junction of 10mm or greater compared with a subgroup of less than 10 mm. *Dermatol Surg* 2004; 30 :1386-1390 <https://doi.org/10.1111/j.1524-4725.2004.30430.x>
- Michaels JA, Campbell WB, Brazier JE. Randomised clinical trial, observational study and assessment of cost-effectiveness of the treatment of varicose veins (REACTIV trial). *Health Technol Assess.* 2006;10(13): 1-196. <https://doi.org/10.3310/hta10130>
- Tisi PV, Beverley C, Rees A. Injection sclerotherapy for varicose veins. *Cochrane Database Syst Rev.* 2006;(4):CD001732. <https://doi.org/10.1002/14651858.CD001732.pub2>
- Breu FX, Guggenbichler S. European Consensus Meeting on Foam Sclerotherapy, April, 4-6, 2003, Tegernsee, Germany. *Dermatol Surg.* 2004;30(5):709-

17; discussion 717. <https://doi.org/10.1111/j.1524-4725.2004.30209.x>

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