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Message from Vice Chancellor



It's an honor and a privilege to address you on the momentous occasion of the inaugural issue of the Journal of Madhesh Institute of Health Sciences. This journal represents a significant milestone for our institution and for the broader medical community, not just within Nepal but globally.

The launch of Journal of Madhesh Institute of Health Sciences marks our unwavering commitment to fostering a culture of rigorous scientific inquiry, evidence-based practice, and continuous learning. In an era where medical knowledge is expanding at an unprecedented pace, a dedicated platform for disseminating original research, innovative clinical practices, and thoughtful reviews is not just beneficial, but essential. This journal will serve as a vital conduit for our faculty, researchers, and students, alongside colleagues from around the world, to share their invaluable contributions, spark intellectual discourse, and ultimately, improve patient care.

I extend my deepest gratitude to the dedicated editorial board and every individual who has contributed to bringing this vision to fruition. Your commitment to academic excellence and your meticulous efforts have laid a strong foundation for what I am confident will become a leading voice in medical scholarship.

To our readers and prospective authors, I encourage you to engage actively with Journal of Madhesh Institute of Health Sciences. Submit your groundbreaking work, critically appraise the findings presented, and join us in our mission to advance medical science. Together, we can elevate the standards of healthcare through robust research and collaborative knowledge sharing.

My sincerest congratulations to all involved on this remarkable achievement. I look forward to witnessing the profound impact Journal of Madhesh Institute of Health Sciences will have on the future of medicine.

Sincerely,

A red ink signature of Prof. Dr. Ankur Shah, which appears to read "ANKUR SHAH".

Prof. Dr Ankur Shah

Vice-Chancellor

Madhesh Institute of Health Sciences

Janakpurdham, Madhesh Province, Nepal

Message from the Rector



It's with immense pride and great anticipation that I address you on the launch of the inaugural issue of the Journal of Madhesh Institute of Health Sciences. This moment marks a pivotal achievement for our college, Madhesh Institute of Health Sciences, and a testament to our collective dedication to advancing medical knowledge and practice.

The creation of this journal underscores our unwavering commitment to academic excellence, rigorous research, and evidence-based healthcare. In an ever-evolving medical landscape, the need for a robust platform to disseminate cutting-edge research, innovative clinical practices, and critical insights is more crucial than ever. The Journal of Madhesh Institute of Health Sciences will serve as that vital conduit, providing our esteemed faculty, bright researchers, and eager students—alongside colleagues from across Nepal and beyond—a dedicated space to share their valuable contributions.

I extend my heartfelt gratitude to every individual who has poured their expertise and effort into making this journal a reality: the visionary editorial board, the diligent reviewers, and the entire team whose meticulous work has laid such a strong foundation. Your commitment to scientific integrity and scholarly discourse is truly commendable.

To our readers and future contributors, I urge you to engage deeply with this journal. Let it be a source of inspiration, a tool for professional development, and a forum for lively academic exchange. We invite you to submit your groundbreaking work, challenge existing paradigms, and contribute to the ongoing conversation that shapes the future of medicine.

Congratulations to everyone involved on this remarkable accomplishment. I look forward to witnessing the profound impact the Journal of Madhesh Institute of Health Sciences will have on healthcare delivery and medical education.

Sincerely,

A red ink signature of the name "Ram Naresh Pandit".

Prof. Dr. Ram Naresh Pandit

Rector

Madhesh Institute of Health Sciences

Janakpurdham, Madhesh Province, Nepal

Message from the Registrar



It is with great pride and enthusiasm that I extend my warmest congratulations on the publication of the first issue of the Journal of Madhesh Institute of Health Sciences, a remarkable initiative that reflects our institution's growing academic and research strength.

The launch of this journal is not just a milestone but a testament to our collective commitment to academic excellence, critical inquiry, and the advancement of medical knowledge. In an era where evidence-based practice is paramount, this journal will serve as a valuable platform for clinicians, academicians, and students to share their insights, innovations, and research findings.

As the Registrar, I am deeply encouraged by the efforts of the editorial board, faculty, and contributors who have worked diligently to bring this vision to life. I believe this journal will play a pivotal role in nurturing young researchers and promoting a vibrant scholarly culture within our institution and beyond.

I wish the editorial team continued success and look forward to many more impactful editions in the years to come.

Sincerely,

A handwritten signature in red ink, appearing to read "Binod".

Prof. Dr. Binod Kumar Yadav

Registrar

Madhesh Institute of Health Sciences

Janakpurdham, Madhesh Province, Nepal



Message from the Hospital Director

It gives me immense pleasure to extend my heartfelt congratulations on the publication of the inaugural issue of the Journal of Madhesh Institute of Health Sciences, a significant academic milestone for our institution and the broader medical community of Nepal.

The launch of this journal marks a new chapter in our ongoing commitment to fostering a culture of research, innovation, and scholarly excellence. In today's evidence-driven healthcare environment, the role of medical journals in bridging the gap between clinical practice and academic inquiry cannot be overstated. This platform will not only highlight the valuable work being done by our faculty, students, and clinicians but also encourage rigorous scientific dialogue and continuous learning.

I commend the editorial board, contributors, and all involved for their dedication and vision. As the Hospital Director, I am confident that this journal will serve as a beacon of academic inspiration and will significantly enhance the visibility of research from our medical college, both nationally and internationally.

I look forward to witnessing the journal's growth and its positive impact on the quality of patient care, education, and policy development in Nepal.

With best wishes,

Dr. Jamun Prasad Singh

Hospital Director

Provincial Hospital

Madhesh Institute of Health Sciences

Janakpurdham, Madhesh Province, Nepal

Message from the editorial team

The pursuit of medical knowledge is an ever-evolving journey, driven by innovation, research, and the collective dedication of healthcare professionals worldwide. As we stand at the forefront of scientific discovery, this issue of Journal of Madhesh Institute of Health Sciences brings together groundbreaking research, insightful reviews, and thought-provoking discussions that aim to advance patient care and shape the future of medicine.

In this edition, we present a diverse collection of studies spanning in health sector. Each contribution reflects the rigor and passion of researchers committed to addressing today's most pressing medical challenges.

We extend our deepest gratitude to the authors, reviewers, and editorial team whose expertise and dedication have made this publication possible. To our readers—clinicians, researchers, and policymakers—we hope this journal serves as a valuable resource, fostering collaboration and driving progress in medical science.

Together, let us continue to push the boundaries of knowledge and translate research into transformative care for patients around the globe.

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Journal of Madhesh Institute of Health Sciences

Madhesh Institute of Health Sciences

Janakpurdham, Madhesh Province, Nepal

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EDITORIAL

Reconsidering geriatric care management in the 21st centuryMuni Raj Chhetri^{1,*}¹Professor, National Open College, Pokhara University, Nepal

Aging is a natural lifelong process until death. The proportions of the older population are increasing rapidly in Nepal too. There are 2.97 million older people in Nepal as of the 2021 census which is a 38.2% increase compared to the previous census of 2011. The proportion of the older population reached 10.21% of the total population of Nepal. During this decade, Nepal's average population growth rate is 0.92% and the older population growth rate is 3.29% per year.¹

As global populations age at an unprecedented rate, geriatric care management has emerged as a vital strategy to address the complex needs of older adults. With people over 60 projected to outnumber children under five by 2030,² the demand for coordinated, person-centered care for the elderly is no longer optional—it is essential.

Geriatric care management refers to the holistic planning and coordination of health, social, and personal care services focused to elderly individuals, particularly those with chronic conditions or cognitive deterioration. It requires a multidisciplinary approach involving geriatricians, nurses, social workers, physiotherapists, and family caregivers. Effective geriatric care management ensures that older adults age with dignity, independence, and access to quality care while reducing unnecessary hospitalizations and healthcare costs.³

One of the biggest challenges in geriatric care is the fragmentation of services. Older adults often see multiple specialists,

use various medications, and rely on both formal and informal caregivers. When not effectively managed, this complexity can result in care fragmentation, service duplication, and even patient harm. In low- and middle-income countries like Nepal, the situation is more critical due to under-resourced health systems and weak geriatric infrastructure and trained human resources in geriatric health care.⁴ Although the Senior Citizens Act⁵ and the National Policy on Ageing⁶ acknowledge the rights and needs of older adults. However, Widespread implementation remains constrained by systemic and operational challenges. Community-based care models, such as elder-friendly primary health care centers and caregiver support programs, need to be scaled up to bridge the existing care gaps.

As we know that loneliness, elder abuse, depression, and financial insecurity are as detrimental as physical illnesses, to address these hidden challenges, geriatric care managers must be equipped with the skills to recognize psychosocial distress and connect older adults with comprehensive mental health services and resilient community-based support networks. In the pursuit of the Sustainable Development Goals and universal health coverage. Positioning geriatric care at the forefront of national and global health agendas is vital to advancing inclusive, equitable, and dignified care for the world's aging population. Nepal Government, health system, and academic institutions must invest in workforce training, policy innovation, and research in gerontology. Integrating geriatric care into mainstream health systems as a core component of primary care—is crucial to building an age-friendly future.

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ORIGINAL RESEARCH ARTICLE

Children's perspective on color, smell and flavor of toothpaste

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Key words: Color; Flavor; Smell; Toothpaste.

ABSTRACT

Background: Tooth brushing must be done to prevent dental caries, but many children resist tooth brushing because of sensory aversions to toothpaste. As children's oral hygiene compliance relies heavily on enjoyment, it is important to know their preferences regarding toothpaste color, odor, and taste. Research indicates that attractive sensory traits can have a great impact on brushing frequency and duration in children.

Objective: To assess children's perspective on sensory attributes of toothpaste namely: color, flavor and smell of toothpaste.

Methods: It is a descriptive cross-sectional study which included 140 students studying in Zenith National Academy, Janakpur. The questionnaire along with the consent form, ascent form and information sheet were sent to the parents along with the students to fill the form. The data was analyzed using SPSS. Data were analyzed for frequencies, percentage, mean and standard deviation and presented in form of table.

Results: The main reasons for selecting a particular toothpaste were taste (44%) and cleaning effectiveness (61%), followed by brand loyalty and advertisements. When asked about the most important attribute of toothpaste, most children prioritized how well it cleans their teeth, though sensory factors like taste and color still influenced their satisfaction and motivation. Over half of the children believed that kids' toothpaste should taste like candy and be different from adult toothpaste, reflecting a desire for enjoyable and distinct flavors.

Conclusions: Children prefer red color, sweet taste and minty smell in their toothpaste. Primary motivation in brushing remains maintenance of "clean teeth" even in children.



INTRODUCTION

Maintenance of disease-free oral cavity involves use of various aids like brushing, flossing and oral rinses for achieving good oral hygiene. Most common and simplest method of mechanical plaque removal is via teeth brushing which comprises of two components: tooth brush and toothpaste. It is recommended that toothbrushing should be started in children with eruption of first primary teeth in oral cavity.¹ Adherence to regular brushing habit largely depends on sensory perception of toothpaste in children; namely flavor, color and smell. Good experience with toothpaste can have positive impact of inducing lifelong oral hygiene practice; thus

understanding children's perspective and preference can help create child friendly products.² Various studies have suggested that children usually get excited by vivid colors while adherence to act of regular brushing requires mild and soothing flavor of toothpaste.³ While sensory properties of toothpaste are important, achieving these features should not compromise the safety and health features of the product.

The purpose of this study was to assess children perspective of flavor, color and smell of contemporarily available toothpaste in Janakpur which gives insight to whether these toothpastes are preferred by children or there is a need of more customized products which can cater to child's need and ultimately make tooth brushing a joyful and awaited event of the day with long-term impact on oral health.

METHODS

The present study was a descriptive cross-sectional study conducted among students of Zenith National Academy, Janakpur. All the students of age group 10-16 years belonging to same school and whose parents filled the ascent

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form were included in the study. Ethical clearance for the study was obtained from Madhesh Institute of Health Sciences (MIHS-IRC/081/082-012).

First of all, permission to conduct the study was taken from the school authorities. The questionnaire along with the consent form, ascent form and information sheet were sent to the parents along with the students to fill the form. The next day the students who came along with the consent and ascent participated in the study. In total 140 students participated in this study.

All the patients received a participant information sheet, and informed consent was obtained before data collection. The data were entered into Statistical Package for Social Sciences (SPSS) version 21 for Windows (SPSS Inc, Chicago, IL) for final analysis and interpretation. Data were analyzed for frequencies, percentage, mean and standard deviation and presented in form of table.

RESULTS

A total of 140 students participated in the study where nearly all participants (97.9%) reported brushing their teeth with toothpaste indicating awareness of oral hygiene practices among children. 60.7% students had no experience of herbal toothpaste use while popularity of colgate brand was found to be more with almost 2/3rd of participants (64.3%) favoring it. Some diversity was seen in brand selection with 19.3% participants using other local brands of toothpaste; 12.9% participants using Pepsodent and 3.6% participants using closeup toothpaste. Determining factor for specific choice of

toothpaste was found to be taste in 44.3 % students; known brand in 25.7% of students while, 21 i.e 15% students were influenced by advertisement. Only 19 students (13.6%) were using dentist recommended toothpaste (Table 1).

Red (49.3%) followed by white (22.1%) were found to be most preferred toothpaste colors. The majority of children (95.7%) liked the color of their toothpaste, and 85.7% participants reported that an appealing color motivated them to brush more frequently. Mint was the most favored smell ((42.9% participants) followed by light (35.7%) and fruity scents (5.7%). 117 students (83.6%) reported that they were fond of smell of their toothpaste while 23 students (16.4%) didn't prefer smell of their toothpaste (Table 1).

Peppermint and cloves flavor were reported as most common tastes in toothpastes used by students (28.6% of participants) while 20% of students could not appreciate any flavor in their toothpaste. High proportion of participants (94.3%) expressed a liking for the taste of their toothpaste. When asked about important toothpaste attributes, most children (61.4%) valued how well it cleans their teeth over color (12.9%), smell (6.4%), or taste (19.3%). Out of 140 students, 89 students believed that taste of their toothpaste should be like that of candy while 51 students did not prefer that. Although majority of students (53.6%) thought that kid's toothpaste should be different than the adults, but 60.7 % participants answered that would not brush more even if the toothpaste matched their preferred color, taste, and smell. 80% of participants reported using a pea-sized amount of toothpaste (Table 1).

Table 1: Assessment of children's perspective on color , smell and flavour of toothpaste

Distribution of response		Frequency	Percent
Do you brush your teeth with toothpaste?	Yes	137	97.9
	No	3	2.1
What is the brand of toothpaste you are using now?	Colgate	90	64.3
	Pepsodent	18	12.9
	Close-up	5	3.6
	Others	27	19.3
What is the reason behind choosing the present toothpaste?	Taste	62	44.3
	Advertisement	21	15.0
	Dentist's recommendation	19	13.6
	Cost	2	1.4
	Brand	36	25.7
What is the color of your toothpaste?	Blue	16	11.4
	Red	69	49.3
	White	31	22.1
	Green	5	3.6
	Others	19	13.6
Do you like the color of your toothpaste?	Yes	134	95.7
	No	6	4.3
Do you like to brush more due to the color of your toothpaste?	Yes I like to brush more	120	85.7
	Yes but little bit	17	12.1
	No	3	2.1
What is the smell of your toothpaste?	Light	50	35.7
	Mint	60	42.9
	Fruits	8	5.7
	No smell	22	15.7

Do you like the smell of your toothpaste?	Yes	117	83.6
	No	23	16.4
What is the taste of your toothpaste	Peppermint	40	28.6
	Cloves	40	28.6
	Strawberry	3	2.1
	Tasteless	28	20.0
	No taste	29	20.7
Do you like the taste of your toothpaste	Yes	132	94.3
	No	8	5.7
What is more important in toothpaste?	Colour	18	12.9
	Smell	9	6.4
	Taste	27	19.3
	How much does it cleans my teeth	86	61.4
Do you think kids toothpaste should taste as candy?	Yes	89	63.6
	No	51	36.4
Do you think kids toothpaste should be different than adults?	Yes	75	53.6
	No	22	15.7
	I don't know	43	30.7
Do you ever brush your teeth if your toothpaste was according to your color, taste and smell?	Yes	55	39.3
	No	85	60.7
Do you know about kid's toothpaste	Yes	87	62.1
	No	53	37.9
How much toothpaste do you use?	Pea size	112	80.0
	Toothbrush length	22	15.7
	I don't care	6	4.3
Have you ever used herbal toothpaste	Yes	55	39.3
	No	85	60.7

DISCUSSION

Brand dominance of colgate found in our study (64.3%) was comparable to study by choudhari et al² (46%) where choice of particular brand was found to be independent decision by participants(43 %) with minority participants influenced by friends(19 %) and TV commercials(21 %). Brand dominance could be based purely on parental preferences .

European archives of pediatric dentistry (EAPD)⁴ recommended using dentifrice with low fluoride concentrations (less than 500 ppm) for children who are below the age of six. While Scottish intercollegiate guideline network (SIGN – 2005)⁵ recommends using 1000 ppm of fluoride irrespective of age followed by spitting rather than rinsing. These recommendations aim to reduce incidence of dental fluorosis affecting unerupted and erupting teeth in children less than 6 years of age. Many children lack fine manual dexterity required and fail to expectorate toothpaste after brushing. Thus, a pea size amount of toothpaste is recommended while brushing in children of age between 3 to 6 years old to prevent dental fluorosis⁶. 80% of our participants were found to adhere to this recommendation. While, in study by Choudhari et al²; only 24% participants were using “pea-sized” quantity with all remaining participants using toothpaste in excess amount.

Awareness regarding kid's dentifrice was found to be satisfactory with, majority of participants(62 %) using kids toothpaste which varied from the study by Bennadi¹ et al and Chandra et al⁷ where 72% of the mothers used adult tooth pastes to brush their children's teeth.

Children are attracted to vivid colors, which can increase their degree of excitement about the use of toothpaste. Color-changing toothpaste, being of changing color, can offer an exciting visual experience, which can make the experience more attractive to children.³ Variations occur in attention to any product with difference in color of the product where warm colors seem to have a stimulating power in comparison to cold colors.⁸ Studies indicate that red and pink are two of the most sought-after colors for oral care products, which can suggest that these colors are associated with positive expectations and high acceptability.² This observation was also found in our study where red and white were the most preferred toothpaste colors with majority (85.7% participants) stating that color makes them motivated for brushing.

Flavor plays an important role in gaining the acceptance of children. Children's toothpaste typically has mild and non-irritating flavor like clove oil and oleum menthae, so they are the best for young users.⁹ The pleasant flavor of the toothpaste also makes brushing more enjoyable and therefore, it is often used.¹⁰ Mint was found to be most favoured smell in our study followed by light and fruity smell. . Most children enjoyed the smell of their toothpaste, which may enhance the brushing experience. The study by choudhari et al² found that children prefer sweet taste in their toothpaste(50% participants);similar result was found in our study with 63.6% participants preferring their toothpaste to taste like candy.

Despite various preferences towards color, taste and flavor of toothpaste ,the primary reason for choosing a particular toothpaste was found to be " how well it cleans teeth" (61.4%)

followed by taste (19.3%) and color (12.9 %). This highlights the importance of both sensory appeal and functional benefits in product selection. Prioritization of cleaning efficacy of toothpaste over sensory characteristics like color, smell, or taste indicates a practical understanding of oral hygiene benefits. Despite the emphasis on cleaning, sensory factors remain influential in product satisfaction and motivation to brush.

CONCLUSION

This study aimed to assess children's perspective on sensory attributes like color, smell and flavor of their toothpaste with goal of understanding their choices. The study revealed that children's toothpaste preferences are shaped by a combination of sensory appeal and perceived cleaning effectiveness. While taste, color, and smell are important for product enjoyment, the primary motivation remains oral hygiene in adhering to

routine of tooth brushing.

CONFLICT OF INTEREST: None

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AVAILABILITY OF DATA AND MATERIALS: The datasets used and analyzed for the study are available from the corresponding author upon reasonable request

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ORIGINAL RESEARCH ARTICLE

Parents' perceptions of the dental and oral health in children in Janakpur

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ABSTRACT

Background: Parents along with clinicians play a key role in achieving the best oral health outcomes in their young children. Early childhood and adolescents are heavily reliant on parents/caregivers for day-to-day routine, which includes oral health practices such as brushing, flossing, and healthy dietary intake.

Objective: To assess the parents' perception regarding the dental and oral health of their school-going children.

Methods: A cross-sectional study was conducted among parents of school going children regarding their perception of the dental and oral health of their children in Janakpur. The study tool was a questionnaire-based which contained basic information of participants and 25 questions related to the dental and oral health of their children. Data were analyzed for frequencies, percentage, mean and standard deviation.

Results: Out of total 215 participants, 77.2% participants were aware that primary teeth were as important as the permanent teeth. 96.7% of the participants believed that the main causative agent of cavities in teeth was eating too much sugar. Among the major problems, 89.3% children had experienced cavities according to their parents. 96.3% parents believed that the schools should provide dental health education.

Conclusions: Increasing parents' knowledge about children's oral health, raising awareness of the importance of regular dental check-ups, and fostering positive attitudes toward their children's oral health underscore the need for more effective educational programs. Strengthening community-based interventions is crucial for enabling parents to adopt more informed behaviors regarding their children's oral health.



INTRODUCTION

Early childhood oral health practices and outcomes are considered pivotal in determining oral health trajectories across the life course, and can impact oral health and disease occurrence in adulthood.¹ Since parents are the most influential social force affecting a child's development during early childhood, it is well-established that interventions aimed at improving parents' knowledge and attitudes about oral and dental health effectively prevent dental issues in children.²

Parents along with clinicians play a key role in achieving the best oral health outcomes in their young children.³ Early

childhood and adolescents are heavily reliant on parents/caregivers for day-to-day routine, which includes oral health practices such as brushing, flossing, and healthy dietary intake. Prospectively educated parents would be more apt to teach better oral hygiene skills to their kids, which decreases the risk for dental caries and other oral health related diseases.⁴

Some parents might not schedule regular visits to dentists or notice early manifestations of oral disease since they think that primary teeth are temporary, and would shed on its own after a period of time, therefore less critical. Such beliefs will postpone diagnosis and treatment of the oral condition, with adverse effects on the oral health, nutrition, and self-esteem, ultimately affecting the general health of the child.^{5,6}

Good oral health is crucial for overall health and well-being in school going children. Children's oral and dental health depends significantly on parents' awareness, knowledge, education, and socioeconomic status.⁷ This study assessed parent's perception of oral and dental health of their children in Janakpur, Nepal.

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Table 1: Parent's response on oral and dental care of their children

Parents perception on oral and dental care		Frequency	Percent
How many children do you have?	1	30	14.0
	2-3	185	86.0
What is the age of your youngest child?	3-6 years	11	5.1
	7-12 years	177	82.3
	Above 12 years	27	12.6
How important do you think dental and oral health is for your child's overall health?	Very important	191	88.8
	Important	24	11.2
At what age do you think a child should first visit a dentist?	Before 1 year	166	77.2
	1-2 year	28	13.0
	3-5 years	10	4.7
	Only when there is a problem	11	5.1
Do you think baby teeth (primary teeth) are as important as permanent teeth?	Yes	166	77.2
	No	25	11.6
	Not sure	24	11.2
What do you believe is the main cause of cavities in children?	Eating too much sugar	208	96.7
	Poor brushing habits	7	3.3
Are you aware of the role of fluoride in preventing tooth decay?	No	215	100.0
	Twice a day	142	66.0
How often does your child brush their teeth?	Once a day	56	26.0
	Ocassionally	8	3.7
	Never	9	4.2
	Always	26	12.1
Do you supervise or assist your child while brushing?	Sometimes	9	4.2
	Never	180	83.7
	No	215	100.0
Does your child use fluoride toothpaste?	Yes	26	12.1
	No	9	4.2
	Not sure	180	83.7
How often does your child floss?	Never	215	100.0
	Daily	182	84.7
Does your child consume sugary snacks or drinks frequently?	A few times a week	26	12.1
	Rarely	7	3.3
	Yes	21	9.8
Do you think prolonged use of pacifiers or bottle feeding have an effect on your child's teeth?	No	22	10.2
	I don't know	172	80.0
	Yes	10	4.7
Do you think that some oral habits such as (digit sucking, lip and cheek biting) can affect your child teeth?	No	190	88.4
	I don't know	15	7.0
	Yes	10	4.7
Do you think oral habits can be prevented?	No	190	88.4
	I don't know	15	7.0
	Yes	10	4.7
How often does your child visit the dentist?	Once a year	15	7.0
	Never	200	93.0
What is the main reason for your child's dental visits?	Toothache or cavity	15	7.0
	Never visited	200	93.0
How would you describe your child's experience at the dentist?	Positive	8	3.7
	Neutral	196	91.2
	Negative	11	5.1
Do you think dental treatments for children are affordable?	Yes	12	5.6
	No	188	87.4
	Somewhat	15	7.0
What prevents you from taking your child to the dentist regularly?	Cost	205	95.3
	Lack of time	10	4.7
Are you worried about your child's dental health?	Yes	203	94.4
	No	12	5.6
What dental problems has your child experienced?	Cavities	192	89.3
	Toothache	12	5.6
	Malaligned teeth	11	5.1

Do you believe that schools should provide dental health education?	Yes	207	96.3
	Not sure	8	3.7
Where do you usually get information about children's dental health?	Dentist	16	7.4
	Family/Friends	15	7.0
	TV/Radio	184	85.6

METHODS

This was a descriptive cross-sectional study conducted among parents of school going children regarding their perception of the dental and oral health of their children. In total 215 parents participated in the study. This study received ethical clearance from Madhesh Institute of Health Sciences Institutional Review Committee (MIHS-IRC/081/082-011)

Based on the study of Hammouri et al., using formula $n=Z^2pq/d^2$, where $p=73\%$, $q=1-p=27\%$, $d=6\%$ margin of error, and Z at 95% confidence interval, the sample size was calculated as 210.24. However, in the final study 215 children's parents will be included.

The study tool was a questionnaire which had prior undergone validity testing. In addition, the reliability testing was also done. The Cronbach's alpha value was obtained as 0.79. The questionnaire consisted 2 parts. First part was related to basic information of participants and the second part was containing 25 questions related to the dental and oral health of their children. Total of 240 questionnaires were sent to the parents through the students. Later on only 215 fully filled questionnaires were returned.

Statistical analysis, in this study, was done using Statistical Package for the Social Sciences Software SPSS version 23 (IBM, Chicago, IL, USA). Data were analyzed for frequencies, percentage, mean and standard deviation.

RESULTS

The study included 215 parents, with a response rate of 89.58%. Of the total of 215 study subjects, all were females (100%). Majority of the participants (66.5%) had education level of bachelor's degree. The frequency of youngest children was between the age of 7-12 years (82.3%).

About 88.8% of the parents think that the dental and oral health is very important for their children's overall health. 77.2% participants thought the first visit to the dentist should be done before 1 year of age. 77.2% participants were aware that primary teeth were as important as the permanent teeth. 96.7% of the participants believed that the main causative agent of cavities in teeth was eating too much sugar. 84.7% of parents responded that their children consumed sugary snacks or drinks daily (Table 1).

About 66% of the parents claimed that their children brushed their teeth twice daily but 83.7% of the parents never supervised their children while brushing. All the participants (100%) in this study were unaware of the importance of fluoride in preventing tooth decay. About 93% of the parents

never visited their children to the dentists. The higher cost of treatment for children prevented 95.3% of the parents from taking their children to the dentists. 94.4% of the parents were worried about their child's dental health. 96.3% of parents believed that the schools should provide dental health education (Table 1).

DISCUSSION

Parents play a significant role in raising awareness about oral and dental health and ensuring adherence to treatment processes. Nevertheless, a lack of knowledge, anxiety, or misconceptions about oral and dental procedures often negatively affects this cooperation. Parental attitudes and knowledge about oral health are critical factors that directly impact children's experiences during dental visits and their long-term oral and dental health.⁸

The American Academy of Pediatric Dentistry (AAPD) recommends that children have their first dental visit between 6 months and 1 year of age and attend regular dental check-ups every six months. Regular dental examinations help detect children's oral and dental problems early, including changes in tooth color.⁹ In the study by Tokuç et al., it was reported that nearly 50% of the children were taken to the dentist for the first time between the ages of 4–6 due to dental pain.¹⁰ Studies frequently report that parents tend to take their children to the dentist only when complaints arise.^{10,11} In another study, Alaa et al. found that most parents believed their children's first dental visit should occur between the ages of 3–6.¹² In this study, 166 (77.2%) parents reported that the first dental visit should be before the age of 1. Parents should be actively educated to ensure that their children receive preventive care and maintain oral health before the onset of dental caries.

Access to oral and dental health services is an important factor affecting a child's oral and dental health. Low income and educational levels delay access to these services and complicate the general health of their children. In families with low income, social and financial constraints prevent giving adequate importance to oral and dental health, with related expenditures often being deprioritized. Consistent with the findings of other studies in the literature.^{8,10}

Untreated carious primary teeth can lead to various complications, including pain, infection, eating and sleeping problems, growth and developmental delays and early loss of teeth.¹³ Caries in primary teeth can significantly impact children's growth and development and may result in serious infection. According to the American Dental Association (ADA), children with healthy primary teeth are more likely to have healthy permanent teeth. Additionally, it is well established that caries in the primary dentition increases the risk of caries

development in the permanent dentition.¹⁴ In the study by Winnier et al., 71.8% of parents stated they preferred visiting a dentist for the treatment of primary teeth, whereas 28.2% managed the situation by using medication only, assuming the primary teeth would naturally fall out.⁸ Another study found that 43.6% of participants believed that primary teeth do not require proper care because they will eventually fall out.¹⁵ These findings are supported by other studies in the literature.¹⁶ On contrary, in this study, 77.2% of parents considered primary teeth an integral entity in child's health and were concerned regarding the primary teeth.

Dentistry adopts the view that early interventions can reduce or even eliminate future caries. Children who receive preventive dental care early in life are more likely to utilize future preventive services and incur lower dental treatment costs. Therefore, educating parents on oral and dental health should primarily aim to prevent caries in children. Evidence shows that such education is highly effective in reducing caries incidence.^{17,18}

Recently, fluoride applications are among the most common and effective methods for preventing dental caries. Topical fluoride applications that come into contact with enamel are particularly effective in caries prevention. According to a study by Jahandideh et al., 51.5% were unaware of the role of fluoride in preventing caries. In the study by Abdal et al., 50% of mothers reported not knowing that fluoride could prevent caries.⁹ Conversely, Abduljalil et al. found that 64.7% of parents were aware of fluoride's role in preventing dental caries.¹⁸ In a 2016 study, 69% of participants reported not knowing whether their toothpaste contained fluoride, and only 31% believed fluoride-containing toothpaste should be used.¹⁶ Similarly, Sabbagh et al. found that 75.6% of participants were unaware of pit and fissure sealants, a finding corroborated by Sowmya et al.^{19,20} In this study, 100% of parents stated that they were unaware of the role of fluoride to make teeth more resistant to decay.

The number of children brushing their teeth twice daily was comparatively higher. 66% of parents reported that their children brushed twice a day. Adair et al. stated that children are more likely to be caries free if their teeth are brushed twice daily with fluoride toothpaste, with parental involvement and in an environment where sugar is controlled.²³ In this study, 96.7% of the parents were aware that eating too much sugar

can cause tooth decay. The results of this study were in support to the results of studies conducted by Moulana et al. and Wyne et al.^{21,22}

Increasing parents' knowledge about children's oral health, raising awareness of the importance of regular dental check-ups, and fostering positive attitudes toward their children's oral health underscore the need for more effective educational programs. Additionally, it is evident that health policies should focus on promoting more accessible and cost-effective services that encourage children's oral and dental health. Strengthening community-based interventions is crucial for enabling parents to adopt more informed behaviors regarding their children's oral health.

CONCLUSION

One of the biggest obstacles parents face in providing oral and dental health services for their children is a lack of awareness. Parents often visit the dentist only when necessary and fail to benefit from professional dental care. This situation may stem from insufficient information provided to parents by healthcare and social service workers about oral and dental health, leading to a lack of awareness. Moreover, a low level of parental education is considered one of the factors contributing to insufficient knowledge about their children's oral and dental health. Considering that oral health habits acquired during childhood have lasting effects throughout life, parental awareness initiatives and the development of community-based oral health policies are of great importance.

CONFLICT OF INTEREST: None

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ORIGINAL RESEARCH ARTICLE

Trend of bacteriological profile and antibiotics sensitivity pattern in neonates with late onset sepsis

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ABSTRACT

Background: Neonatal sepsis is a major cause of morbidity and mortality in low- and middle-income countries (LMICs). It is categorized as early onset sepsis (EOS, ≤72 hours) and late onset sepsis (LOS, >72 hours). The World Health Organization (WHO) has emphasized antibiotic stewardship. In LMICs, antibiograms are crucial where sepsis significantly contributes to neonatal deaths.

Objective: To analyze trends in bacteriological profile and antibiotics sensitivity in neonates with Late Onset Sepsis (LOS).

Methods: This was a 10-year retrospective study of culture-proven LOS cases. Demographics, isolate types, and sensitivity patterns were recorded. Multidrug-resistant (MDR) gram-negative isolates were defined as resistance to ≥3 of 5 antibiotic classes: extended-spectrum cephalosporins, carbapenems, aminoglycosides, fluoroquinolones, and piperacillin-tazobactam.

Results: Among 14,336 NICU admissions (2010–2019), 6092 (42.5%) were evaluated for sepsis, and 647 (10.6%) had culture-positive LOS. Gram-negative organisms comprised 488 (75.3%) isolates—*Klebsiella* (35.3%), *E. coli* (13.3%), and *Acinetobacter* (10.5%) were most common. Gram-positive isolates (24.7%) included *S. aureus* (9.4%), coagulase-negative staphylococci (10.5%), and *Enterococcus* (4.8%). High MDR rates were observed in *Klebsiella* (56.3%), *E. coli* (56.9%), and *Acinetobacter* (86.8%). Methicillin resistance was seen in 77.3% of *S. aureus* and 74.2% of *Enterococcus*.

Conclusions: Alarming antimicrobial resistance in both gram-negative and gram-positive organisms calls for urgent attention. Antibiotic stewardship and regular antibiogram surveillance are essential to develop effective hospital policies.



INTRODUCTION

Neonatal sepsis is a leading cause of morbidity and mortality in low- and middle-income countries (LMICs). Globally, 2.5 million neonates die annually, with over a quarter of these deaths occurring in India.¹ The National Neonatal Perinatal Database (NNPD) of India reported an incidence of blood culture-proven sepsis of 8.5 per 1,000 live births during 2002–2003.² A community-based rural study found culture-confirmed neonatal sepsis at 6.7 per 1,000 live births.³ Neonatal care improvements have reduced the Neonatal Mortality Rate (NMR) from 38 to 23 per 1,000 live births between 2000 and 2017.⁴

Neonatal sepsis is classified as early-onset sepsis (EOS) if occurring within 72 hours of life, and late-onset sepsis (LOS) if after 72 hours.⁵ In developed countries, gram-positive organisms predominate in both EOS and LOS,^{6,22} whereas in LMICs, gram-negative bacteria account for two-thirds of isolates.⁷

The rise of resistant pathogens over the last two decades is mainly attributed to uncontrolled antibiotic use. The DeNIS multicentric study reported high antimicrobial resistance among neonatal pathogens.^{7,21} In response, the World Health Organization (WHO) emphasized antibiotic stewardship,⁸ and the Indian Council of Medical Research (ICMR) launched the Antibiotic Stewardship, Prevention of Infection & Control (ASPIC) program.^{9,19}

Since bacterial profiles and resistance patterns vary regionally, regular review of antibiograms guides antibiotic policies^{18,20}. In LMICs, antibiograms are crucial due to the high neonatal mortality burden from sepsis. This study aimed to evaluate pathogen trends and antibiotic resistance in neonates admitted to a NICU in western India.

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METHODS

A retrospective study was conducted in neonates admitted in tertiary care NICU of Pune, India over a period of January 2010 to December 2019. Patients were identified from the local database of the hospital for discharge summaries. Ethical approval was waived by the local ethical committee due to retrospective nature of the study. For the robustness of the data, it was cross verified with the departmental annual audit data for culture proven sepsis as well as with the records from the microbiology database.

Data was collected from the patient file records for culture proven late onset sepsis after permission of Hospital and Head of Neonatology Department. It was analyzed for demographic characteristics, morbidities during hospital stay and various outcomes in neonates.

The type of organisms grown and its sensitivity pattern were noted. Antimicrobial susceptibility pattern was classified as susceptible, intermediate, resistant, or not tested for each individual antibiotic. The Gram-negative pathogens' resistance profiles were categorized based on resistance to various antimicrobial classes namely, (i) extended-spectrum cephalosporins (any two of ceftazidime, ceftriaxone, or cefotaxime), (ii) aminoglycosides (any one of gentamicin or amikacin), (iii) carbapenem (meropenem), (iv) fluoroquinolone (ciprofloxacin), and (v) piperacillin and tazobactam. If resistance to any three of the five specified classes were detected, the pathogen was labeled multidrug resistant (MDR).

Descriptive statistics and frequency distributions of all variables of interest were reported as proportion for categorical variables and as mean (SD) for continuous variables. Data was analyzed using a chi square test or Fisher's exact test as applicable for categorical variables and student t-test for continuous variables. All statistical analysis was performed using IBM SPSS Statistics version 20.0.

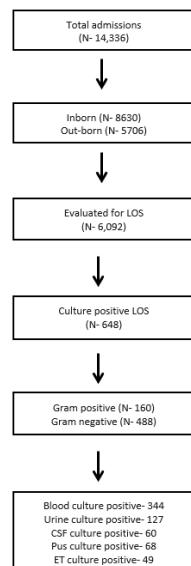


Figure 1: Flow chart of study patients

RESULTS

Of 14,336 neonates admitted in NICU between 1st January 2010 to 31st December 2019, 8630 (60.2%) were inborn and 5706 (39.8%) were out-born referrals. Of all admissions, 6092 (42.5%) neonates were evaluated and 648 (10.6%) neonates were diagnosed as culture positive LOS. Gram negative organisms were isolated from 488 (75.3%) cases and gram positive from 160 (24.7%) cases. Blood culture was positive in 344 (53%) cases, urine culture in 127 (19.6%) cases, CSF culture in 60 (9.3%) cases, pus culture in 68 (10.5%) cases, Endotracheal Tube culture in 49 (7.6%) cases (Fig.1).

Table 1 shows the baseline characteristics of study participants. Approximately, 56.3% (365) were males. Extremely Low Birth Weight (ELBW) neonates were most commonly affected 30% (195) followed by 24% (155) Very Low Birth Weight (VLBW) and 22.5% (146) Low Birth Weight (LBW) neonates. Mean gestational age was 33 (27-39) weeks. Of all, 20.4% (132) were Small for Gestational Age (SGA) neonates.

Neonatal morbidities noted were Hemodynamically significant Patent Ductus Arteriosus (HsPDA) 9.6% (62), Ventilator Associated Pneumonia (VAP) 5.5% (36), Necrotizing Enterocolitis (NEC) 6.2% (40), Respiratory Distress Syndrome (RDS) requiring surfactant 36.3% (235), Interventricular Hemorrhage (IVH) Grade III or IV 6.8% (44), Retinopathy of Prematurity (ROP) 1.9% (12), Hypoxic Ischemic Encephalopathy (HIE) of any grade 12% (78) and Broncho Pulmonary Dysplasia (BPD) 8.3% (54), respectively. Overall, mortality among culture positive LOS neonates was 23.4% (152).

Table 1: Demographic characteristics of patients (n- 648)

Characteristics of patients	Frequency (%)
Outborn	272 (42%)
Inborn	376 (58%)
Birth weight, gm	
a) ≥2500 gm	152 (23.5%)
b) 1500-2499 gm	146 (22.5%)
c) 1000-1499 gm	155 (24%)
d) ≤999 gm	195 (30%)
Gestational age, weeks	33 (27-39 weeks)
Term neonates	174 (26.8%)
Preterm neonates	474 (73.2%)
Small for Gestational Age (SGA)	132 (20.4%)
Sex	
Male	365 (56.3%)
Female	283 (43.7%)
a) Interventions Central line	
Umbilical arterial line	188 (29%)
Umbilical venous line	272 (42%)
b) Peripheral Inserted Central Catheter	119 (18.4%)
c) Vasopressor	339 (52.3%)
d) Surfactant	128 (19.8%)
e) CPAP	301 (46.5%)
f) Mechanical ventilation	286 (44.1%)
Neonatal Morbidities	

a) HsPDA	62 (9.6%)
b) VAP	36 (5.5%)
c) NEC (Stage III)	40 (6.2%)
d) RDS (Requiring surfactant)	235 (36.3%)
e) IVH (Grade III or IV)	44 (6.8%)
f) ROP (Requiring LASER)	12 (1.9%)
g) HIE (Any stage)	78 (12%)
h) BPD	54 (8.3%)
Neonatal death	152 (23.4%)

Table 2 shows the distribution of pathogens. Of the total of 648 culture positive cases, about 24.7% were gram positive and 75.3% were gram negative organisms. The predominant gram positive pathogens were *Staphylococcus aureus*, *Coagulase-negative Staphylococcus* and *Enterococcus* spp. in that order. The predominant gram negative organisms were *Klebsiella*, *E. coli*, *Acinetobacter*, *Enterobacter*, *Serratia*, *Pseudomonas*, *Elizabethkingia* and *Burkholderia*.

Table 3 shows the resistance pattern of predominant organisms against antimicrobial agents. Most of the pathogens showed antimicrobial resistance to not only common antibiotics but also to reserve antibiotics such as carbapenems and extended spectrum penicillins. Majority of Gram negative organisms

Table 3: Antimicrobial resistance among common organisms

Pathogens	Antimicrobial class	Resistance
Gram negative		
<i>Klebsiella</i> (N-229)	Extended Spectrum Cephalosporins	180/229 (78.6%)
	Carbapenems	117/229 (51.0%)
	Aminoglycosides	102/229 (44.5%)
	MDR	129/229 (56.3%)
<i>E. coli</i> (N- 86)	Extended Spectrum Cephalosporins	78/86 (90.7%)
	Carbapenems	19/86 (22.0%)
	Aminoglycosides	43/86 (50.0%)
	MDR	49/86 (56.9%)
<i>Acinetobacter</i> (N- 68)	Extended spectrum Cephalosporins	59/68 (86.8%)
	Carbapenems	51/68 (75.0%)
	Aminoglycosides	55/68 (80.9%)
	MDR	59/68 (86.8%)
Gram positive		
<i>Staphylococcus aureus</i> (N- 75)	Methicillin	58/75 (77.3%)
	Vancomycin	4/75 (5.3%)
<i>Enterococcus</i> (N- 31)	Methicillin	23/31 (74.2%)
	Vancomycin	6/31 (19.4%)

Table 4: Change in trend of bacteria causing late onset sepsis over last 10 years

Bacteria	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<i>Klebsiella</i>	18	21	26	35	26	34	12	14	19	24
<i>E.coli</i>	8	4	4	2	16	6	7	14	15	10
<i>Acinetobacter</i>	4	7	16	10	7	5	6	4	6	3
<i>S. aureus</i>	6	5	8	7	5	5	8	7	6	4
MRCNS	7	9	3	4	10	7	8	7	8	5
<i>Enterococcus</i>	1	2	2	3	7	4	3	2	5	2

were multidrug resistant (*Klebsiella*- 56.3%, *E.coli*- 5.9% and *Acinetobacter*- 86.8%). Antimicrobial resistance was also very high among gram positive organisms, 77.3% *Staphylococcus aureus* and 74.2% of *Enterococcus* were methicillin resistant. Vancomycin resistance was also seen among 5.3% *Staphylococcus aureus* and 19.4% of *Enterococcus*.

Table 2: Distribution of microorganisms

Microorganisms	Number of isolates (n = 648)
Gram negative	
<i>Klebsiella</i> spp.	229 (35.3%)
<i>E. coli</i>	86 (13.3%)
<i>Acinetobacter</i>	68 (10.5%)
<i>Enterobacter</i>	27 (4.2%)
<i>Serratia</i>	25 (3.8%)
<i>Pseudomonas</i>	19 (3%)
<i>Elizabethkingia</i>	10 (1.5%)
<i>Burkholderia</i> spp.	8 (1.2%)
Others	16 (2.5%)
Gram positive	
<i>Staphylococcus aureus</i>	61 (9.4%)
MRCNS	68 (10.5%)
<i>Enterococcus</i>	31 (4.8%)

Table 4 shows the trend of common organisms over a period of 10 years. *Klebsiella* and *E. coli* remained the most common organisms over the years. *Acinetobacter* cases increased in 2012-2013 but after improving infection control measures their number showed a decreasing trend. Trend of other common organisms like *Staphylococcus aureus*, Methicillin Resistant Coagulase Negative *Staphylococcus* (MRCONS) and *Enterococcus* remained same over the years (Fig.2).

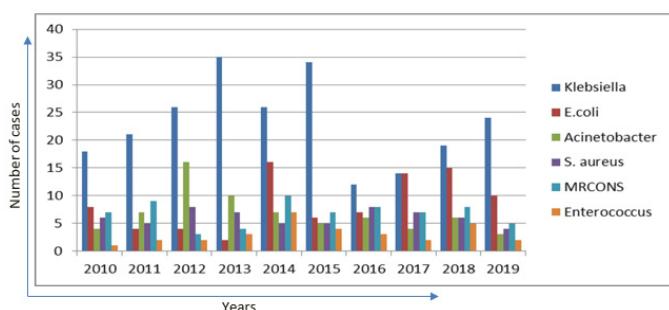


Figure 2: Change in trend of pathogens causing Late Onset Sepsis (LOS)

DISCUSSION

In our study, majority of neonates were low birth weight or preterm. About 40% were out-born referrals from other centers. We found a predominance of gram negative organisms 69.1% which is much higher than DeNIS study⁷ but similar to Thapa S et al.¹⁰ Among culture positive cases, 272 (42%) were out-born with 234 (86%) had gram negative sepsis. Of 648 neonates, 30% (195) were ELBW and 24% (155) were VLBW neonates. Neonatal comorbidities like HsPDA, VAP, NEC, RDS, IVH, ROP, HIE and BPD were frequent.

The NNPD network involving 10 leading out-born units in India reported a prevalence of about 40%.² DeNIS study reported a prevalence of 55% among the enrolled neonates.⁷ In this study, we found neonatal sepsis in 42.5% of all neonates admitted in NICU. Culture positive rates are also variable among various studies conducted in Low and Middle Income Countries LMICs. In India, DeNIS study reported culture proven sepsis in 13.1% neonates,⁷ Thapa S et al reported a culture positivity rate of 10.8% in Nepal¹⁰ which is quite similar to our study (10.6%). Mudzikati et al. in 2015 reported a prevalence of culture positive neonatal sepsis 9.8% in Botswana (Southern Africa).¹¹ Blood and CSF culture positivity rate in our study was similar to Turhan et al. except for urine culture positivity rate which was more in our study.¹² The variation in culture positivity rate of neonatal septicemia might be due to differences in population characteristics, prior antibiotic administration before sample collection, and infection with anaerobes, viral or fungal pathogens, and effective control in spread of nosocomial infection.

Bacteriological profile revealed high prevalence of gram-negative bacteria (75.3%) with predominance of *Klebsiella*, *E.coli* and *Acinetobacter* which was similar to DeNIS study.⁷ *Klebsiella* was also reported as one the most common gram-negative organism from other studies.¹³⁻¹⁵ Among gram positive

isolates, *Staphylococcus aureus* (9.4%) and MRCONS (10.5%) were the predominant organisms which are common causes of hospital acquired infections.¹⁶

We have identified significantly high resistance to antibiotics, including reserve antibiotics in both gram-positive and gram-negative isolates. *Acinetobacter* was the most resistant among gram negative organisms, with 86.8% isolates showed multidrug and extensive resistance which was similar to DeNIS study.⁷ Gram positive organisms also showed high degree of resistance to penicillin group. Some degree of resistance to vancomycin was also noted among MRCONS and *Enterococcus* species.

In our study, we reported significantly high mortality rate (nearly one fourth) among neonates with culture positive sepsis. This could be because of high rate of sepsis among vulnerable premature neonates, prolonged requirement of ventilatory support, central intravenous and arterial lines, longer duration of NICU stay and high rate of antibiotic resistance.

This study is one of the largest from India with data collected over a period of ten years. Bandopadhyay et al conducted a similar retrospective study with a sample size of 183 neonates and a duration of 24 months in terms of sample size and duration.¹⁷ However, our study has several limitations. First, our study was a single center retrospective study and 40 % babies suffering from LOS were referred to our center, which limits the applicability of the results. Second, we have not collected data on EOS because of the low yields on blood culture in EOS in our center.

CONCLUSION

This study describes the bacteriological profile of neonates with late onset sepsis in a tertiary care NICU in western India. We observed a high rate of gram-negative sepsis especially in low-birth-weight babies. There was an alarming rate of antimicrobial resistance among both gram negative and gram-positive organisms which needs urgent attention. There is a great need of antibiotic stewardship and periodic study of antibiograms to formulate hospital policies to curb antibiotic resistance.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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AUTHORS CONTRIBUTION: Concept and design: LKS; data

collection and statistical analysis: LKS; writing of the manuscript: LKS; monitoring and supervising the research finalizing the manuscript: LKS, PP, SS, NB, PS; and all authors read and agreed with the contents of the final manuscript.

AVAILABILITY OF DATA AND MATERIALS: The datasets used and analyzed for the study are available from the corresponding author upon reasonable request

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ORIGINAL RESEARCH ARTICLE

Prevalence of dental caries on permanent first molars among children of age group 6-14 years at Janakpurdham

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ABSTRACT

Background: Dental caries is the most common chronic infectious disease of oral cavity. It specifically affects the permanent first molars because they erupt early and have a complicated occlusal anatomy. Understanding the prevalence of caries is essential for developing preventive strategies, especially in socioeconomically underprivileged groups.

Objective: To assess the prevalence of dental caries in permanent first molars among children aged 6 to 14 years in Janakpurdham, Madhesh Province, Nepal.

Methods: A cross-sectional study was conducted among school children of age 6-14 years of Zenith National Academy, Sitachowk-1, Janakpurdham, Nepal. Oral examination was carried out using WHO diagnostic criteria for dental caries. Data were collected. Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21 for Windows (SPSS Inc, Chicago, IL). Frequency distribution analysis was performed. Descriptive statistics were used to describe the results.

Results: The overall prevalence of dental caries in permanent first molars was found to be Among 290 participants, 136 (46.9%) were males remaining being female 154(53.1%).(Mean \pm SD:11.65 \pm 3.72) The prevalence of dental caries of left mandibular first permanent molar was high 24(8.3%) among the studied teeth. The prevalence of dental caries was high in mandibular arch.

Conclusions: A high prevalence of dental caries in permanent first molars was higher in mandibular arch than maxillary arch observed among children in Janakpurdham, highlighting an urgent need for targeted oral health education, regular dental screenings, and preventive interventions at the school and community level.



INTRODUCTION

Dental caries is an irreversible microbial disease of the calcified tissues of the teeth, characterized by demineralization of the inorganic portion and destruction of the organic substance of the tooth, which often leads to cavitation.¹

Dental caries has considered as the major public health problem globally due to its high prevalence and significant social impact. World Health Organization (WHO) reports 60-90% of school going children worldwide have experienced caries, with the disease being most prevalent in Asian and Latin American countries.²

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Dental caries is a multi-factorial disease involving various factors such as diet, microorganisms, tooth morphology, saliva, environment, gender, location, dietary habits as well as genetic predisposition.³

The permanent first molars are particularly susceptible due to their early eruption and anatomical structure. This response provides a clear explanation of the prevalence of dental caries on PFM in children supported by evidence from various studies.^{4,5}

Permanent first molars dental caries is a prevalent condition among children aged 6-14 years. It has been reported with high prevalence rates in diverse populations in many studies, including 61% in Sudan and 29% in China.^{6,7}

The mandibular arch is highly susceptible to caries compared to the maxillary arch.^{6,8} Voluminous literature exist on the status of dental caries in the Nepali population. Despite several attempts to cure and prevent the disease, its prevalence has increased over the last couple of decades.

This descriptive cross-sectional research was carried out in order to find and the prevalence of dental caries on permanent first molar among children of age group 6 to 14 years a in Janakpurdham, identifying key factors contributing to its occurrence and proposing potential interventions.

METHODS

This study employed descriptive cross-sectional study design. It was conducted among school children of age 6-14 years of Zenith National Academy, Sitachowk-1, Janakpurdham, Nepal. This study was conducted after obtaining ethical clearance from Institutional Review Committee of Madhesh Institute of Health Sciences (MIHS-IRC/081/082-014). Permission form the school higher authorities was also obtained. After explaining the purpose and details of the research, a written informed consent was obtained from parents of all the study participants. Based on the study of Thapaliya et al., using formula $n = Z^2pq/d^2$, where $p=40\%$,⁸ $q=1-p=60\%$, $d=6\%$ margin of error, and Z at 95% confidence interval, the sample size was calculated as 256. However, in the final study 290 students participated.

The WHO criteria were used to diagnose the carious maxillary and mandibular first permanent first molars (World Health Organization, Oral Health Surveys, Basic Methods, WHO, Geneva, Switzerland, 4th edition, 1997.). Only the carious first permanent molars were recorded in this study. Oral examination was conducted with the help of mouth mirror and explorer under natural light in a simple sitting chair.

Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21 for Windows (SPSS Inc, Chicago, IL). Frequency distribution analysis was performed. Descriptive statistics were used to describe the results.

RESULTS

For each participant the mean, standard deviation, range, value of every parameter were calculated. Frequency distribution analysis was performed. Descriptive statistics were used to describe the result . Among 290 children of age group 6 to 14 years(Mean \pm SD : 11.65 ± 3.72) participated in the study which 136 (46.9%) were males remaining being female 154(53.1%) (Table 1)

Table 1: Age and Gender wise distribution of children

Characteristics	Category	Frequency (%)
Gender	Male	136 (46.9%)
	Female	154 (53.1%)
Age (Mean \pm S.D.)		11.65 \pm 1.72

Table 2 shows the prevalence of dental caries on permanent first molar of children. The prevalence of dental caries of left mandibular first permanent molar was high 24(8.3%) among the studied teeth.

Table 2: Prevalence of dental caries on permanent first molars of children (n=290)

Tooth	Present	Absent
Maxillary right first permanent molar (16)	11 (3.8%)	279 (96.2%)
Maxillary left first permanent molar (26)	7 (2.4%)	283 (97.6%)
Mandibular left first permanent molar (36)	24 (8.3%)	266 (91.7%)
Mandibular right first permanent molar (46)	21 (7.2%)	269 (92.8%)

DISCUSSION

The research was conducted with aim to identify prevalence of dental caries in permanent first molars among children aged 6 to 14 years in Janakpurdham, Madhesh Province, Nepal. The study showed high prevalence of the permanent first molars are particularly susceptible due to their early eruption and anatomical structure.⁹ This response provides a clear explanation of the prevalence of dental caries on permanent first molars in children supported by evidence from various studies.⁴ The findings revealed a significant burden of dental caries in this age group, indicating a persistent public health issue, particularly in early-erupting molars which are critical for long-term oral function. since permanent first molars. Dental caries is a prevalent condition among children aged 6-14 years.¹⁰It has been reported with high prevalence rates in diverse populations in many studies, including 61% in Sudan and 29% in China.^{6,7}These teeth often go unnoticed by caregivers and are harder for young children to clean effectively. Moreover, their deep pits and fissures make them more prone to food retention and bacterial accumulation.

In our study, caries prevalence increased progressively with age, peaking in the 12–14 years group. This trend may be attributed to the prolonged exposure of molars to cariogenic challenges, inadequate oral hygiene practices. Increasing autonomy in dietary choices, is often associated with higher sugar consumption. Together limited access to preventive dental services, especially in rural or underserved areas are also the main cause of prevalence of dental caries.¹⁰

The WHO criteria were used to diagnose the carious maxillary and mandibular first permanent first molars.¹¹ Gender differences were also explored, although the results showed among 290 participants,136 (46.9%) were males remaining being female. About 154(53.1%) of total participants prevalence of caries are gender, with more risk in girls.¹² and geographical region, with rural areas having higher rates.¹²Gender distribution was noted, suggesting that behavioral and environmental factors outweigh biological differences.

The study showed high prevalence of caries mandibular arch(8.3%) is highly susceptible to caries compared to the maxillary arch(3.8%). Which is in accordance with the results reported by Vanders et al. and Prabhu P et al.¹³⁻¹⁴ The reason for the mandibular first permanent molar exhibiting higher caries may be due to the location, morphology and the eruption time. Mandibular first permanent molar has more number of pits and supplementary grooves which can act as food-retentive areas promoting caries. The other factor could be that in the majority of children mandibular first permanent molar erupts slightly earlier than its maxillary counterpart, hence mandibular first permanent molar is exposed to the oral environment for a longer period, making it more susceptible to caries than the maxillary first permanent molar.¹⁰

The higher prevalence in older children underscores the lack of early intervention, highlighting missed opportunities for preventive care such as pit and fissure sealants or fluoride application soon after molar eruption.¹⁵ Additionally, the role of parental education, socioeconomic status, and awareness about oral health is crucial in shaping a child's dental care practices.¹⁶⁻¹⁹

The findings suggest that oral health services and education remain underdeveloped in many parts of Nepal. Public health policies must prioritize school-based oral health programs, incorporating regular dental checkups, fluoride therapy, and health education for both students and parents. Training of schoolteachers and local health workers could also play a supportive role.

This study had certain limitations. Being cross-sectional, it does not provide causal relationships or long-term caries progression data. The absence of radiographic confirmation likely resulted

in underestimation of interproximal lesions. The sample may also not fully represent all ecological and socioeconomic strata of Nepal. Future research should include larger, multi-center studies with longitudinal follow-ups to assess both incidence and preventive outcome.

CONCLUSION

Oral health is an important component of general health and quality of life, with dental caries impacting a person's ability to eat, speak, or socialize. In the above study, the overall prevalence of dental caries is found to be higher and more in mandibular arch. These findings reinforce the urgent need for preventive oral health interventions, early detection, and comprehensive oral health education. Strengthening the primary oral health care system and integrating dental care into school health programs can significantly reduce the burden of caries in children

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ORIGINAL RESEARCH ARTICLE

Assessment of tooth brushing habits among school going children aged 11-14 years in Janakpur

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ABSTRACT

Background: Oral hygiene plays a fundamental role in maintaining overall general health of human and in this regards tooth brushing is one of the most influential methods for preventing dental caries and periodontal diseases. Brushing behaviors that children learn in their early years become strongly embedded in their minds for longer time.

Objective: To assess toothbrushing habits among school going children aged 11-14 years in Janakpur.

Methods: This was a descriptive cross-sectional study done for assessment of tooth brushing habit among school going children aged 11-14 years in Janakpur. Study includes 139 students studying at Zenith Nathaniel school, Janakpur. This was a questionnaire-based study including parameters like frequency of brushing, timing and duration of brushing, parental supervision in brushing, type of brush used, awareness regarding need of maintaining oral hygiene etc.

Results: The study included 139 students; out of which 77.7 % were brushing once daily while only 22.3 % participants were brushing twice daily. Regarding duration of brushing; 38.8% brushed their teeth for more than 2 minutes, 38.3% brushed between 1-2 minutes, while 23.7% brushed their teeth for less than a minute; 85.6% participants rinsed their mouths after brushing teeth. Only 37.4% students received regular parental supervision during brushing; 39.6% occasionally, while 23% were never checked.

Conclusions: Results obtained in this study point towards need of school based oral health education programs for installation of positive attitude and behavior in children of this age group with regards of maintaining good oral hygiene.



INTRODUCTION

Constant accumulation of microbial deposits in oral cavity known as “plaque” is associated with diseases like dental caries and periodontal problems leading to discomfort, pain and untimely tooth loss causing significant derailment of oral health.¹ Poor oral health has significant impact on quality of life as a result of irreversible dental damage, more serious escalation of general health problem and missed school attendance.² Simple yet most effective method of maintaining good oral health is via regular teeth brushing habit which disrupts oral biofilm formation; ultimately preventing from diseases like dental caries and gingivitis.³ Various studies recommend initiation of

tooth brushing as early as with eruption of first primary teeth with supervised brushing twice daily for two minutes with fluoridated toothpaste in pre-schoolers.⁴

Children of age group above 11 are able to perform oral hygiene procedures without parental supervision as manual dexterity for teeth brushing usually completely develops by age of 10.⁵ Piaget’s theory of cognitive development places children of age above 11-years-old at the formal operational stage who are amenable to deductive reasoning where regular and proper tooth brushing habit can be instilled via trainings and education.^{1,6} In school children, particularly those between the ages of 11 and 14 years, oral hygiene habits are essential since this is the age at which developmental changes are taking place, such as the change from primary to permanent dentition. At this time, children are learning to be more independent in their personal hygiene, and thus it is a good time to develop healthy habits for a lifetime.⁷

This study aimed to assess the tooth brushing habit among the school going children of age 11-14 years in Janakpur to establish baseline data of oral hygiene and oral health status

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which will be used as a foundation of further oral health related trainings and education strategies in future.

METHODS

A descriptive cross-sectional study was conducted among 11-14 years school going children in Janakpurdham with the main purpose to assess the tooth brushing habits. This study was carried out among students of age 11-14 years of Zenith Nathinal Academy. Permission to conduct the study was taken from school authorities. The ethical clearance for this study was obtained from Institutional Review Committee of Madhesh Institute of Health Sciences (MIHS-IRC/081/082-013). The inclusion criteria for this study were age group, health and students studying in same school.

Written consent letters with objectives of study, information sheet were sent to parents a day earlier to all the students of the age group. The consents were signed by only 139 parents. Only 139 students of age 11-14 years participated in the study. They filled the form in their classrooms. The questionnaire contained personal information, brushing techniques, habits, frequency.

The collected data were compiled and organized in Microsoft Excel vs. 2013 for windows. It was then exported to the Statistical Package of Social Science (SPSS version 23; Chicago Inc., USA). Data were analyzed for frequencies, percentage, mean and standard deviation.

RESULTS

The study encompassed children aged between 11 and 14 years, with a mean age of 11.8 years and a standard deviation of 2.75 years. Out of the total sample of 139 children, 54(38.8%) were females and 85 (61.2%) were males. 108 children (77.7%) reported brushing their teeth once daily. The remaining 31 (22.3%) stated that they brushed twice daily.

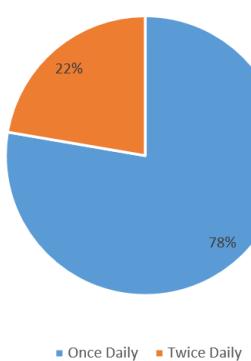


Figure 1: Frequency of tooth brushing

Similarly, on questioning about the time of the day, 127 (91.4%) children brushed in at morning, while 8(5.4%) brushed after breakfast, and only 4(2.9%) brushed after lunch. About 54(38.8%) brushed their teeth for more than 2 minutes, 54(38.3%) brushed between 1-2 minutes, while 33(23.7%) brushed their teeth for less than a minute.

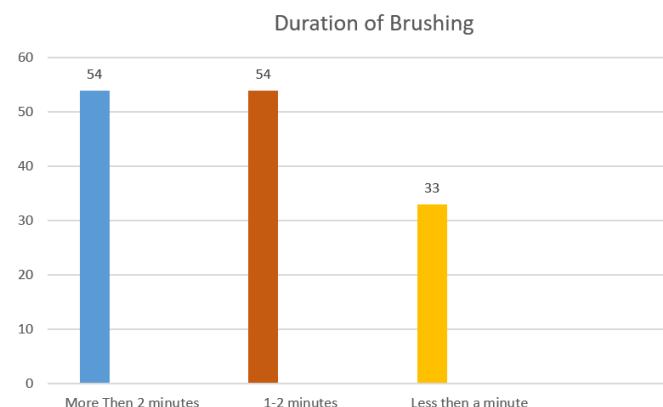


Figure 2: Duration of brushing among study participants

About 124 students (89.2%) reported using the manual method of tooth brushing, while 12(8.6%) used traditional ways like datiwan. 3 students (2.2%) were found to be using electric toothbrush.133 (95.7%) students were using toothpaste while brushing their teeth .

Majority of students (84.9%) reported that they learned about tooth brushing from their parents while 12.2% of participants revealed that they learned it on their own. Most of the children (85.6%) rinsed their mouths after brushing teeth.

About one-third of the children, 52 (37.4%), were checked daily by their parents to ensure proper tooth brushing. Another 55 (39.6%) were checked occasionally, while 32 (23%) were never checked.

When asked about the importance of brushing teeth, 83 children (59.7%) responded that it helps prevent dental caries, 25 (18%) said it keeps the mouth smelling fresh, 24 (17.3%) believed it maintains healthy teeth and gums, while 7 (5%) were unsure.

Among the children surveyed, 53 (38.1%) reported visiting the dentist every 6 months, 2 (1.4%) visited once a year, 70 (50.4%) went only when they had a problem, and 14 (10.1%) had never visited a dentist. 88 children (63.3%) reported having experienced a toothache, while 51 (36.7%) had not.

DISCUSSION

In a study conducted by Ibrahim et al⁸ in Sudan, about 15.9% participants brushed two or more times a day while almost 55.8% practiced brushing only once daily. In our study, more than 2/3rd of children(77.7%) were found to brush only once daily with only 22.3% adhering to routine of brushing twice daily which varied from similar study conducted in kaski, Nepal where more than half of the children (52.6%) were brushing twice daily. ⁹This variation could be due to different sociodemographic construct of these two regions . The study by Namal et al conducted in Turkey found that likelihood of developing dental caries was found to be 4.09 times higher in children who did not adhere to regular tooth brushing habit in comparison to those who brushed daily while it was 4.20 times higher than who brushed twice daily.¹⁰ It is of concern in our

Table 1: Assessment of toothbrushing habits

Distribution of response		Frequency	Percent
When do you brush your teeth?	Morning	127	91.4
	After breakfast	8	5.8
	After lunch	4	2.9
What type of toothbrush do you use?	Manual	124	89.2
	Electric	3	2.2
	Traditional	12	8.6
Do you use toothpaste?	Yes	133	95.7
	No	6	4.3
Who taught you to brush your teeth?	Guardian	118	84.9
	Teachers	1	0.7
	Dental	3	2.2
	Self	17	12.2
Do you rinse your mouth after brushing your teeth?	Everytime	119	85.6
	Sometimes	11	7.9
	Not really	9	6.5
Do your parents check you if you have brushed your teeth properly?	Everyday	52	37.4
	Sometimes	55	39.6
	Never	32	23.0
Why is it necessary to brush your teeth?	Teeth save from dental carries	83	59.7
	Fresh smell	25	18.0
	Healthy dental	24	17.3
	Dont know	7	5.0
How often do you visit dentist?	Every 6 month	53	38.1
	Once a year	2	1.4
	If any problem regarding tooth	70	50.4
	Never	14	10.1
Have you ever experienced tooth pain?	Yes	88	63.3
	No	51	36.7

community where only minority (22.3%) of students are following the routine of brushing their teeth twice daily.

It is believed that increased brushing time results in more plaque removal. Some studies have recommended three minutes as ideal for manual brushing while some concluded that little advantage could be realized when brushing for more than two minutes at a force of 150 grams.^{11,12} Powered toothbrush designs have incorporated this understanding by incorporating timers, typically set for two minutes for accurate assessment of brushing duration.¹²

The study by shakya et al² found that oral health related problems contributed as major reason for loss of attendance with 32% of participants taking a sick leave due to dental pain. This burden was found to be increased in our study with 63.3% of students experiencing severe pain due to dental decay. Poor brushing habit has been found to be associated with dental caries in studies conducted in various countries. In study done by Dixit et al¹³, 31% children suffering from toothache were found to have poor brushing habit.

Parent's oral hygiene behavior are often mimicked by their children. In study done by ozbek et al¹⁴, significant association was found with regards to frequency of tooth brushing, the

material used for oral hygiene, the duration of tooth brushing and method of tooth brushing between children and their parents ($p<0.01$). Parental supervision while brushing teeth was found in about 1/3rd of our students which was similar to study by Ozbek et al.¹⁴

In school children, particularly those between the ages of 11 and 14 years, oral hygiene habits are essential since this is the age at which developmental changes are taking place, such as the change from primary to permanent dentition. At this time, children are learning to be more independent in their personal hygiene, and thus it is a good time to develop healthy habits for a lifetime.⁷

With gain of age and experience, children start analyzing cause and consequences representing their cognitive maturation. Children are more open to deductive reasoning and abstract ideas by age of 11 years.¹⁵ Thus, groundwork for ultimate achievement of good oral health can be laid by integrating oral health in school and community health education programs.

CONCLUSION

In conclusion, while some positive oral hygiene practices were observed, such as 91.4% of children brushing in the morning

and 95.7% using toothpaste, significant gaps remain in the frequency and quality of brushing, parental supervision, and access to regular dental care. There is a clear need for school-based oral health programs, greater parental involvement, and community health initiatives to promote preventive dental care and establish lifelong healthy habits among children.

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CASE REPORT

Undescended testis in a middle-aged cadaver: a case report

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ABSTRACT

Cryptorchidism is most common genitourinary anomaly in males. The anatomical variations through the cadaveric studies provide crucial information about the relevant structure. We report a rare instance of unilateral testis that was not descended during anatomical dissection. After being preserved using conventional methods, the cadaver showed unilateral undescended right testis free of any visible indications of cancer or other testicular problems. While the left testis was palpable in the scrotal sac, the right testis was placed outside to the superficial ring. With intact blood vessels and vas deferens, both testes showed normal size and structure. Adult-onset cryptorchidism is an unknown origin, which highlights the significance of early diagnosis in patients who are still alive. Adults with undescended testes are at risk for infertility and hormone abnormalities. The importance of routine checkups and prompt treatment for cryptorchidism is needed. Cryptorchidism is a common anomaly requiring early recognition. Timely intervention reduces long-term risks including infertility and malignancy. Hormonal therapy is generally not recommended due to limited efficacy and potential side effects.



INTRODUCTION

Cryptorchidism is a condition where there is both abnormal testicular development and its descent into the scrotum. The stages of testicular embryogenesis and descent include; first stage of gonadal differentiation at 3-8 weeks and transabdominal descent at 7-10 weeks with second stage of inguinoscrotal descent occurring at 15-40 weeks.¹ This is aided by hormones like Mullerian inhibiting substance (MIS) in first phase of descent and Insulin-like hormone 3 (Insl-3) in the second phase of descent. The exact pathogenesis of the condition is not understood well but the evidence suggests that mutation in the genes encoding MIS and Insl3 poses the risk

in of undescended testis.² Risk factors include chromosomal abnormalities, mutations, in utero trauma, ischemia, infection, and maternal substance abuse. Cryptorchidism in long term may have complications such as infertility and neoplastic degeneration.³ Male genital abnormalities like cryptorchidism are extremely common; they affect 2–4% of male infants and are more prevalent in premature babies.² Although cryptorchidism is readily evident at birth, definitive treatment is frequently delayed because more than 50% of cases may spontaneously descend down to the scrotum by 1 year of age.⁴ Cryptorchidism may not present as a single anomaly rather it can be a part of broad testicular dysgenesis syndrome with functional abnormalities involving other organ system too.¹ The anatomical variations through the cadaveric studies provide crucial information about the relevant structure.

CASE PRESENTATION

During the regular anatomy dissection class, a middle-aged male cadaver was dissected as part of educational program. The dissection was performed in the dissection hall of anatomy department of Janaki medical college and Teaching Hospital.

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Conventional embalming methods had been used to preserve the cadaver.

While performing the dissection of femoral triangle and exploring of inguinal ligament, a mass was felt in the right inguinal region. The skin of inguinal region was reflected, and layered dissection were performed. A mass of tissue was observed in superficial inguinal ring. Scrotal sac and Testes were examined. Left testis was normally positioned in scrotum, and right testis was absent from the scrotal sac. The right testis was present just at the outside of superficial inguinal ring.

Due to the nature of cadaveric specimens, we were unable to acquire a thorough medical history for the subject. On the basis of the anatomical context and the existence of additional anatomical features that were preserved, the cadaver seemed to be a male middle-aged adult.

There were no obvious indications of atrophy or cancer, and both testes were comparatively normal in size and shape. Notably, neither testis showed any signs of pathological abnormalities or malignancies. This finding indicates that the person's cause of death had nothing to do with testicular problems. Further dissection was performed and structures were examined. The vas deferens, blood vessels, and associated structures were found to be present and intact on both sides (Figure 1 and 2).



Figure 1: Showing right testis in superficial inguinal ring



Figure 2: Showing right and left testis

DISCUSSION

Cryptorchidism, another name for undescended testis (UDT), is a frequent congenital disorder affecting the male genitalia in which one or more testicles are absent from the scrotum. This is a common anomaly requiring early recognition. The UDT is subdivided according to the lower extremity of its range of movement either in abdominal, inguinal or canalicular and emergent types. All of them are associated with patent processus vaginalis. The ectopic testis with complete hernial sac is rare and may occupy a pubic, femoral or most commonly the superficial inguinal position contained in superficial inguinal pouch. The inguinal canal is another place to look for the lost testicle.⁵

Normally starting to form between weeks 7 and 8, the testes remain cephalad to the internal inguinal ring until week 28, at which point, with the help of condensed mesenchyme (the gubernaculum), they begin to descend into the scrotum. Maternal exposure to estrogenic or antiandrogenic medicines, androgens, mullerian-inhibiting factor, gubernacular regression, and intra-abdominal pressure are some of the hormonal, physical, and environmental factors that mediate the onset of descent.¹

After their normal descent, true undescended testicles remain in the inguinal canal or, less commonly, in the abdominal cavity or retroperitoneum. Ectopic refers to a testis that normally descends through the external ring but diverts to an unusual location and resides outside of the traditional descent path⁶ (suprapublically, in the superficial inguinal pouch, within the perineum, or along the inner surface of the thigh).

The terms ectopic, canalicular, extra-canalicular, suprapubic, and peeping (sliding in and out of the internal inguinal ring) are also used to describe the location of the palpable testis.^{6,7} A testicular examination should be performed on the patient at birth and regularly, to ascertain the position and growth of the testicles. One physician must distinguish between palpable and non-palpable testicles in the context of undescended testes.

The diagnosis and treatment of cryptorchidism usually occur in infancy or childhood because testicular descent is a crucial stage in fetal development.⁸ This case, however, emphasizes how untreated or undetected cryptorchidism can continue into adulthood. Possible causes of the unilateral undescended testes in this instance could be genetic susceptibility, gubernaculum structural anomalies, or hormonal abnormalities. However, it is difficult to determine the precise cause with certainty in the absence of the person's genetic information or medical history.

Torsion, hernias, trauma and pathologic changes are risk factors for pathologic changes that result in subfertility and malignant transformation in the undescended testes.⁸ As a result, it is essential that therapy should be given at the right moment.

Spontaneous descent rarely occurs after 6 months of age. Orchidopexy is the standard of care and should be ideally

performed between 6–12 months. Timely intervention reduces long-term risks including infertility and malignancy. Hormonal therapy is generally not recommended due to limited efficacy and potential side effects.⁹ Although we were unable to obtain all the relevant detailed medical history of the person, the anatomical variations through the cadaveric studies provide crucial information about the relevant structure. This case study provides knowledge of the wider ramifications of cryptorchidism and the necessity of providing all-encompassing clinical care over the course of a person's life.

CONCLUSION

This case highlights the significance of taking cryptorchidism into consideration even in adult patients who do not appear

to have any symptoms or cancers, even though the precise etiology is still unknown due to the lack of a thorough medical history. Prompt diagnosis and timely intervention is necessary to prevent complications of infertility, hormonal imbalances and risk of testicular neoplasm development associated with undescended testes.

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CASE REPORT

Conservative management of a severe extravasation injury: A therapeutic nightmare

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ABSTRACT

Intravenous calcium gluconate is commonly used in neonatal intensive care units (NICU) to treat hypocalcemia in preterm infants, who are especially prone to metabolic disturbances. Although effective, it carries the risk of extravasation injury, which can lead to local tissue necrosis and, rarely, systemic complications such as septic shock.

We report a male preterm neonate (gestational age 31+4 weeks; birth weight 1750 g) who developed a significant extravasation injury following intravenous infusion of 10% calcium gluconate on day 1 of life for symptomatic hypocalcemia. Within 24 hours, progressive swelling and superficial skin and subcutaneous tissue necrosis extended from the dorsum of the right ankle to the knee. At presentation to our center on day 16 of life, the neonate was in septic shock, necessitating fluid resuscitation, inotropic support, and mechanical ventilation for 72 hours. Conservative wound management with daily dressing using normal saline and Vaseline gauze was undertaken. The patient's sepsis resolved with antibiotics, and gradual wound healing occurred without the need for surgical intervention.

Extravasation injuries from calcium gluconate are uncommon but can be severe, especially in preterm neonates with fragile skin and immature vasculature. Septic shock as a complication is rarely reported but highlights the critical need for vigilant monitoring. Management typically varies; however, this case demonstrates that timely conservative wound care, combined with supportive therapy, may result in favorable outcomes.

This report underscores the importance of prevention, early recognition, and multidisciplinary management to reduce morbidity in this vulnerable population.



INTRODUCTION

Intravenous calcium gluconate is frequently administered in neonatal intensive care units (NICU) to treat hypocalcemia in preterm infants who are vulnerable to metabolic disturbances.¹ Though beneficial, it carries the risk of extravasation injury, leading to local tissue damage ranging from erythema and swelling to cutaneous necrosis and calcinosis cutis and rarely sepsis and septic shock.^{2,3} Premature neonates are vulnerable due to fragile skin and limited subcutaneous tissue, exacerbating the severity of extravasation injuries.⁴

This case report highlights such a severe occurrence in a preterm

neonate, discussing clinical presentation, management, and emphasizing the importance of prevention, early recognition, and conservative care.

CASE REPORT

We report a male preterm neonate (gestational age 31+4 weeks; birth weight 1750 g) born by spontaneous vaginal delivery, who developed an extravasation injury on the dorsum of the right leg following intravenous infusion of 10% calcium gluconate administered on day 1 of life for symptomatic hypocalcemia.

Within 24 hours, there was progressive swelling followed by superficial skin and subcutaneous tissue necrosis extending from the dorsum of the right ankle up to the right knee (Figure 1).

At presentation to our center on day 16 of life, the infant was in septic shock; fluid resuscitation and inotropic support were initiated, and mechanical ventilation was required for 72 hours.

Wound care consisted of daily dressing with normal saline and

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Vaseline gauze. The sepsis improved with antibiotic therapy, and gradual wound healing was achieved without need for surgical debridement or grafting (Figure 2).



Figure 1: An image at day one of life during presentation showing extent of involvement



Figure 2: An image showing improvement at two weeks of treatment

DISCUSSION

Extravasation injuries in preterm neonates represent a significant clinical challenge due to their fragile skin, immature vasculature, and limited subcutaneous tissue, which increase vulnerability to severe tissue damage. Calcium gluconate extravasation is a recognized but uncommon cause of soft tissue injury, with potential to cause local necrosis, calcinosis cutis, and secondary complications such as infection and septic shock, as observed in this case.^{2,3}

The incidence of extravasation injuries in NICU is reported to be as high as 70%, with preterm infants disproportionately affected due to their anatomical and physiological vulnerabilities.^{3,4} Calcium gluconate, a vesicant agent, can cause tissue injury by precipitating calcium salts in the interstitial space, leading to inflammation, ischemia, and necrosis. Our case demonstrates extensive necrosis from the dorsum of the ankle to the knee, a severe manifestation rarely documented in the literature, especially complicated by septic shock.³

Management of neonatal extravasation injuries varies widely, lacking consensus. Conservative treatment with regular wound care, is generally not the treatment of choice in vesicant infusion injuries manifesting necrosis but was employed in this case still leading to satisfactory healing, when recognized and initiated promptly.⁵ Recent studies emphasize the importance of early identification and cessation of the offending infusion, elevation of the affected limb, and appropriate wound dressing to prevent infection and promote healing.⁶ Surgical intervention is generally reserved for extensive necrosis or failure of conservative management.

Septic shock as a complication of extravasation injury is infrequently reported but represents a severe manifestation requiring intensive care support, including fluid resuscitation, inotropes, and respiratory support, as seen in this patient.³ This highlights the need for vigilant monitoring and aggressive management of systemic signs in neonates with extravasation injuries.

Preventive strategies include vigilant intravenous catheter placement, transparent dressing, frequent site inspection, use of central lines when appropriate, and staff education on early signs of extravasation.⁴ Given the high morbidity associated with such injuries, especially in preterm infants, this case highlights the critical importance of prevention, early recognition, and multidisciplinary approach.

In conclusion, this case adds to the existing evidence on severe calcium gluconate extravasation injuries in preterm neonates. It illustrates the potential for extensive tissue necrosis and life-threatening complications such as septic shock, while also demonstrating that conservative wound management can lead to favorable outcomes. Further research is needed to establish standardized treatment protocols and preventive measures tailored to this vulnerable population.

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CONFLICT OF INTEREST: None

CONSENT: Informed consent has to be taken for case report if you are using any photographs of individuals face and it has to be submitted to the journal.

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CASE REPORT

A solution for EPL ruptures in pediatric forearm fractures fixed with intramedullary devices: a case series on EIP to EPL transfer

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ABSTRACT

Delayed rupture of the extensor pollicis longus (EPL) tendon is a rare complication following pediatric forearm fractures, particularly after intramedullary fixation. We present a series of three cases managed with extensor indicis proprius (EIP) to EPL tendon transfer, highlighting surgical outcomes. All three patients, aged between 10 and 13 years, presented with inability to extend the thumb between four to eight months after fixation of both bone forearm fractures with intramedullary devices. EPL rupture was diagnosed clinically and confirmed by ultrasonography. Surgical management involved removal of intramedullary devices and EIP to EPL tendon transfer using the Pulvertaft weave technique in a single setting. Postoperative recovery was uneventful in all patients, with restoration of thumb extension and return to normal activities. This case series underscores the importance of maintaining a high index of suspicion for EPL rupture in children with loss of thumb extension following pediatric forearm fixation with an intramedullary device and the efficacy of timely tendon transfer in restoring function.



INTRODUCTION

Extensor pollicis longus (EPL) tendon rupture is a recognized but uncommon complication following distal radius fractures, especially in adults.¹ However, EPL rupture in pediatric patients is rare and less documented. It commonly results from ischemic attrition or mechanical damage caused by orthopedic implants such as Titanium Elastic Nailing System (TENS) or Rush Pins for intramedullary fixation of forearm fractures.²

This case series presents three paediatric patients with delayed EPL rupture after fixation of midshaft or distal radius fractures using intramedullary devices. All were successfully treated with

extensor indicis proprius (EIP) to EPL tendon transfer, a reliable reconstructive technique that yields excellent functional results.^{3,4}

CASE PRESENTATIONS

Three children aged 10 (male), 12 (male) and 13 (female) years presented with painless loss of active thumb extension several months post-fixation of both bone forearm fractures with intramedullary devices. Two patients had Rush Pin fixation and one was treated with TENS. None had systemic illness or prior tendon pathology.

Clinical examination revealed inability to extend the interphalangeal joint of the thumb actively, with preserved passive range of motion and intact neurovascular status. Ultrasonography confirmed complete EPL tendon rupture. Intraoperatively, EPL discontinuity was identified, presumed secondary to mechanical attrition from dorsal implant placement near Lister's tubercle: a well-known anatomical risk area for EPL injury.²

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Surgical Technique and Postoperative Care

All patients underwent implant removal followed by EIP to EPL transfer in the single setting under brachial plexus block and sedation. Primary end-to-end EPL repair was not possible because the tendon ends were found to be severely retracted with unhealthy fibrotic stumps. Through a dorsal approach, the EIP tendon was harvested and transferred to the distal EPL stump using the Pulvertaft weave technique with three passes to ensure strong attachment.^{4,5} Postoperatively, the limb was immobilized in a dorsal slab for four weeks with suture removal at two weeks. Rehabilitation started afterward, focusing on gradual thumb mobilization.

At 10 to 12 weeks follow-up, all patients regained full active thumb extension with near-normal strength with power > 4 according to the Medical Research Council (MRC) grading.⁶ They returned to normal daily activities without donor site morbidity, preserving index finger function.



Figure 1: 13/F, fixation of both bone fractures done with TENS. She could not extend her interphalangeal joint of right thumb after 6 months of fracture fixation



Figure 2: Implant removal followed by EIP to EPL transfer was done in the single setting



Figure 3: Final closure and post operative Xray after implant removal



Figure 4: Full active extension of interphalangeal joint of right thumb: 10 weeks post tendon transfer

DISCUSSION

Delayed EPL rupture following pediatric forearm fracture fixation is a rare but disabling complication. The EPL tendon's anatomical course around Lister's tubercle predisposes it to injury from dorsally placed implants, particularly intramedullary devices such as Rush Pins or TENS.^{1,3}

Early diagnosis can be challenging due to the insidious onset and absence of acute inflammatory signs, necessitating a high index of suspicion when patients present with painless loss of thumb extension months after fixation.^{1,2}

EIP to EPL tendon transfer is the gold standard for restoring thumb extension in cases where direct tendon repair is impossible.⁵ The EIP tendon is an excellent donor due to its anatomical proximity, similar excursion, and minimal donor site morbidity.⁸ Multiple studies support the effectiveness of this transfer in pediatric and adult populations, demonstrating restored thumb function, minimal complications and good patient satisfaction.^{2,4,7,8} Alternative methods like tendon grafts or other tendon transfers carry higher complexity and variable outcomes.⁹ The Pulvertaft weave technique provides secure tendon coaptation, allowing

early mobilization and excellent functional recovery.¹⁰

Orthopedic surgeons must maintain vigilance for this complication by educating patients and caregivers about warning signs post-implant fixation. Ultrasonography or MRI can aid early diagnosis.² Prophylactically, avoiding dorsal implant placement near Lister's tubercle and timely implant removal once fracture healing occurs are recommended strategies to prevent EPL rupture.⁷

CONCLUSION

EPL rupture after pediatric forearm fracture fixation with intramedullary devices is rare but functionally disabling. EIP to EPL transfer effectively restores thumb extension with minimal

morbidity. Early diagnosis and careful implant placement are essential to prevent this complication.

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CASE REPORT

CKD or is it a Fabry Disease: a case report

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ABSTRACT

Fabry disease is a rare X-linked lysosomal storage disorder caused by mutations in the GLA gene, leading to deficient activity of the enzyme alpha-galactosidase A. This case report presents a rare instance of Fabry disease in a 37-year-old female patient, highlighting the unique clinical presentation with multisystem involvement. The patient presented with a complex array of symptoms, including loss of appetite, generalized body weakness and significant blurring of vision accompanied by a history of hypertension and chronic kidney disease (CKD). Laboratory investigations revealed deranged complete blood count, elevated renal function parameters, and significant proteinuria. Ophthalmic evaluation showed decreased visual acuity in right eye with normal visual acuity in left eye, typical whorl like deposits in both corneas, tortuous conjunctival vessels and tortuous retinal vessels in both retinas with venous beading and flame shaped hemorrhages prominent in left eye whereas right macula had significant macular edema. On further screening on her offspring, her male child also had similar whorl like deposits in both corneas. This case is a rare and unique example of Fabry disease in a female patient, with symptoms affecting multiple organ systems, including the renal, cardiovascular system and eye. It underscores the importance of maintaining a high index of suspicion for Fabry disease, even in female patients, and the need for a comprehensive diagnostic approach to ensure timely diagnosis and appropriate management. Early recognition of this rare condition in females is crucial for the implementation of targeted therapies to prevent the progression of multi-organ damage.



INTRODUCTION

Fabry disease (systemic angiokeratoma) is an X-linked recessive inherited lysosomal disorder due to α-galactosidase, an enzyme deficiency in the body caused by mutations in the GLA gene. The progressive accumulation of glycosphingolipids, specially globotriaosylceramide (GL-3), in the lysosomes of the cells of multiple tissues and organs causes progressive impairment of renal and cardiac functions as well as cerebrovascular and ocular pathologies. The estimated prevalence of Fabry's disease is about one per 80,000 to 117,000.¹ Due to X-linkage, it affects both males and females. Males usually have an earlier onset and a more severe form of the disease whereas female

carriers are asymptomatic.² Age of onset can range from early childhood to the 7th decade with mean age 45±17 years (range: 22-75 years).³

CASE REPORT

A 37 years female from Buldingtar, Chitwan was referred to Department of Ophthalmology from Department of Nephrology ward of Chitwan Medical College with the provisional diagnosis of chronic kidney disease with hypertension for routine ophthalmic evaluation to look for hypertensive retinopathy changes. She had presented with the complaint of loss of appetite for 3 months and weakness of body for 5-6 days and there was history of significant blurring of vision in both eyes (right more than left) for 2 weeks. She had no past medication history. She was non-smoker, non-alcoholic and had no history of substance abuse. On general examination she was conscious, well oriented to time, place and person, looked mildly pale. Her vitals were stable except blood pressure being 160/100 mm of Hg despite anti-hypertensives. Her general systemic examinations were insignificant and were within normal limits.

Citation: Dahal P, Mishra S, Suvedi A, Acharya N. CKD or is it a Fabry disease: a case report. Journal of Madhesh Institute of Health Sciences. 2025;1(1):33-35.

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Her ophthalmological evaluation was done and found to have uncorrected visual acuity (VA) with Snellen chart of 6/24 on her right eye and with pin hole improvement to 6/18 and 6/6 partial in left eye which did not improve with pin hole. Intraocular pressure (IOP) was 17 mmHg in both eyes with Goldmann applanation tonometry. Slit lamp bio-microscopy revealed increased tortuosity in conjunctival vessels. There was a whorl like deposits in corneal epithelium bilaterally (cornea verticillata) (Fig. 1).

Anterior chamber was quiet with normal depth. Lens was clear with no any significant opacities. Posterior segment evaluation revealed vertically oval optic disc with normal margins and dimensions in both eyes. Disc was slightly pale bilaterally. There was mild vessel tortuosity and venous beading in both eye with few flame-shaped hemorrhages present only in the left eye in infero-nasal quadrant. There was significant macular edema on the right eye which justifies the decrease in visual acuity in right eye which wasn't improved with refraction. These findings were documented in Amsler-Dubois chart (Fig. 2). FAF imaging couldn't be performed due to unavailability of resource. Further ophthalmological evaluation by OCT, Visual field and Fundus photo couldn't be performed due to poor resource availability.

On further elaboration of history, she has a family history of blindness in her grandfather, sudden death of her sibling from unknown cause at young age. On family screening for Cornea verticillata, her siblings didn't have significant ocular findings, but her elder son has similar corneal verticillata (Fig. 3). Her elder son's visual acuity and fundus examinations are all within normal limit. Her echocardiography showed mild MR, Mild TR, dilated LA and LVEF=60%, rest within normal limit.

On her ultrasonographic scan of abdominal and pelvic there was increased cortical echogenicity in both kidneys with poorly maintained cortico-medullary differentiation (CMD), suggestive of stage V CKD. Her blood parameters was deranged with Hemoglobin 8.7gm%, platelets 142,000/mm³, TLC 7,120/mm³, RBS 111mg/dl, Serum uric acid 11.47mg/dl, serum creatinine 12.64mg/dl, blood urea 236mg/dl, serum potassium (K+) 3.74mmol/l, serum sodium (Na+) 142mmol/dl, ANA (IFA) positive reaction at 1:40, viral markers (HIV, HBSAG, ANTI-HCV) –Non reactive, Urinary protein 204.7mg/dl, Urinary creatinine 32.53mg/dl, protein/ creatinine ratio (PCR) 6292.652mg/g. Urine R/E RBC+, Epithelial cells (2-4), Pus cells (2-4), Glucose (Nil), Bilirubin (Nil), pH acidic. In addition, CT head showed normal findings and blood culture showed no growth in 7 days.

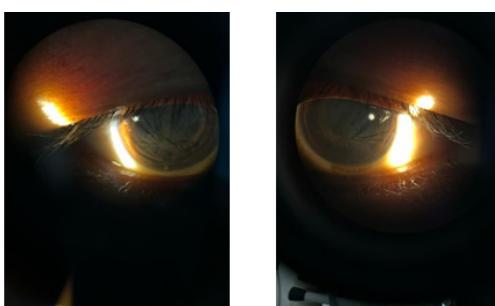


Figure 1: Cornea verticillata in patient with Fabry Disease

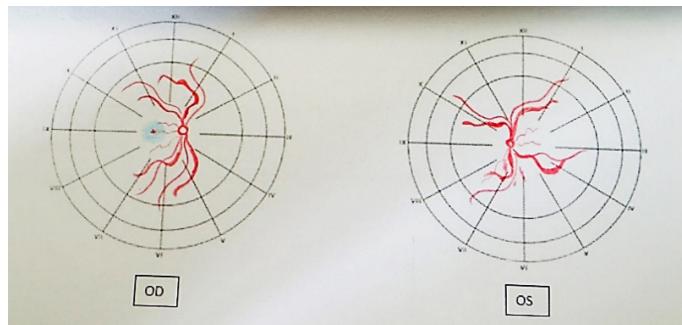


Figure 2: Fundus drawing representing the posterior segment findings

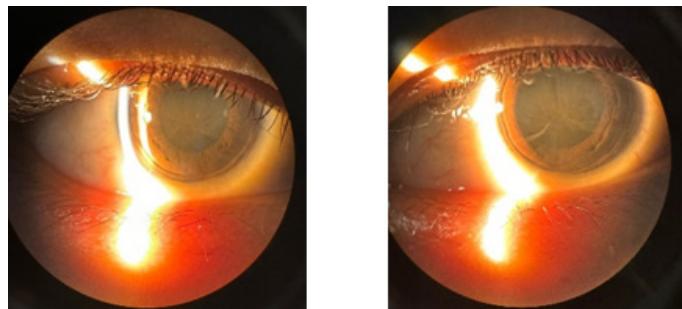


Figure 3: Cornea verticillata in patient's asymptomatic male child



Figure 4: Pedigree chart showing familial trait

DISCUSSION

Fabry disease (systemic angiokeratoma) is an X-linked inherited lysosomal disorder due to α -galactosidase, an enzyme deficiency in the body caused by mutations in the GLA gene. The symptoms of Fabry disease are mainly due to the tissue accumulation of globotriaosylceramide (GL-3), which may include a burning sensation in the hands and feet, reduced sweating, nausea, abdominal pain, postprandial diarrhea, and developmental disorders⁴. Conjunctival and retinal vessel tortuosity, and corneal verticillata are frequently observed in Fabry disease⁵. Cornea verticillata is the most common and earlier ocular manifestation of Fabry disease, detection of which should prompt consideration of Fabry disease as a provisional diagnosis. The patient should be examined for the extra-ocular findings such as progressive cardiomyopathy, nephropathy, renal failure, and cerebrovascular events. The rare findings are retinal artery vein occlusions, anterior ischemic optic neuropathy, optic disc pale or atrophy, disc edema and tear film disorders².

Fabry disease being an X-linked condition family screening is crucial, as early detection of this disease may help in treating the patient with the disease and thus decrease morbidity

and mortality⁶. Although the overall prevalence of FD is low in patients with kidney involvement, screening, especially in patients who have not yet undergone kidney replacement therapy, is important, in order to provide timely and effective treatment interventions, including disease modifying therapies⁷. With the advent of enzyme replacement therapy, it is important that general practitioners and physicians in a range of specialties recognize the signs and symptoms of Fabry

disease so that effective treatment can be given⁸.

CONCLUSION

Cornea verticillata, dilated tortuous conjunctival and retinal vessels are the most common and earlier ocular manifestation of Fabry disease and thus, patient with unexplained CKD must be referred for Ophthalmological evaluation for early screening of Fabry disease.

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CASE REPORT

Mandibular access osteotomy to retrieve a bullet lodged in infratemporal fossa: a case report

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ABSTRACT

Gunshot injuries to facial region are challenging due to complex anatomy of facial skeleton and presence of vital structures. The bullet or projectile can get lodged in an area of limited access and close to neurovascular structures. Here, we present a case of 20 years male who presented with an accidental gunshot injury to his face with penetrating entry wound over right malar region and no exit wound. CT scan of face revealed comminuted fractures of bones of right midface and a single bullet lodged in right infratemporal fossa. To gain access to the bullet, mandibular right subcondylar osteotomy was done. Mandibular access surgery via right subcondylar osteotomy provided the shortest route of access to the bullet with reduced need of soft tissue dissection and preservation of vital neurovascular structures.



INTRODUCTION

Firearm related injuries in civilian settings is an issue of public health concern globally. Most common scenarios of injuries are homicides and suicide attempts; however, unintentional firearm discharges are also reported.¹ In Nepal, firearms possession for illegal hunting of wild animals is a common practice, occasionally leading to self-inflicted accidental injuries.² Gunshot injuries to maxillofacial regions present multiple challenges primarily due to presence of numerous vital structures. The high velocity projectile causes extensive tissue damage in its pathway and can even get lodged in complex facial spaces. Removal of bullet is surgically challenging in such

cases. The primary aim is removal of bullet while preserving the vital structures.³ Access surgeries have been regularly used in craniomaxillofacial surgeries in removal of inaccessible tumors of head and neck region. This case uses the principle of access surgery to gain the shortest and safest route for removal of a bullet lodged in infratemporal fossa.

CASE REPORT

A 20-year-old male presented to Emergency Department with alleged history of self-inflicted accidental gunshot injury with impact over right side of his face 9 hours back. Patient had assembled a homemade rifle to practice hunting in remote areas of Ruby valley, Nepal. The gun backfired with wooden and metallic contents of the gun hitting the patient on his right cheek. There was no history of loss of consciousness, nausea or vomiting ruling out any neurological injury. Patient gave history of right nasal bleeding suggesting injury to nasomaxillary region.

Physical examination revealed charred skin appearance over right midface, right periorbital edema and ecchymosis, right subconjunctival hemorrhage. Vision was blurred with intact eye

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movements in the right eye. There was penetrating laceration injury over the right malar region with irregular margins. There was no exit wound. Mouth opening was reduced with pain in the right temporomandibular joint. Occlusion was intact. Neurological examinations of trigeminal and facial nerve revealed no deficit.

CT scan images revealed fracture of right zygomaticosphenoid suture, right zygomaticomaxillary buttress, lateral wall and floor of right orbit, comminuted fracture of anterolateral wall of right maxillary sinus with hematosinus. A hyperdense foreign body, round of about 2cm was noted to be lodged medial to right condyle neck in the infratemporal fossa (Fig. 1).



Figure 1: Initial clinical and radiographic presentation of the patient

In view of above findings, surgical intervention was planned focusing on extraction of lodged bullet, open reduction and fixation of midface fracture, and soft tissue repair. Given the complex location of the bullet, mandibular access surgery was planned. Right retromandibular incision was given to access mandibular ramus. Subcondylar osteotomy was completed using peizosurgical tips (Fig. 2). The bullet was retrieved under direct vision (Fig. 3). The proximal and distal segments were

reduced and fixed using a Delta miniplate incorporating four monocortical screws (Fig. 4). Closure was completed in layers. Midface fracture segments were reduced and fixed using routine principles.

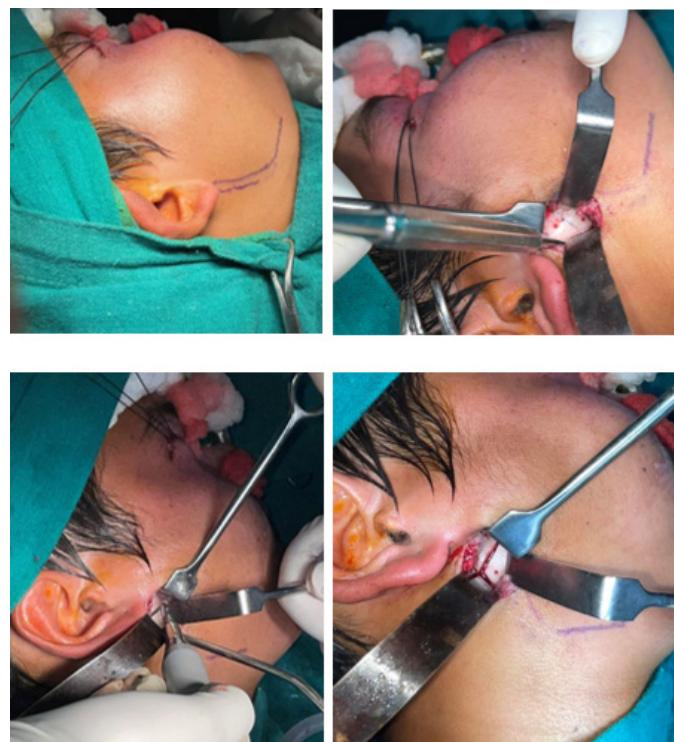


Figure 2: Right Subcondylar osteotomy



Figure 3: Direct Visual access to bullet and extracted bullet



Figure 4: Subcondyle fixation and closure

Postoperatively, patient was kept on intravenous antibiotics and discharged after one week of uneventful hospital stay. Follow up visits of the patient revealed satisfactory healing.

DISCUSSION

Based on Global Burden of Disease study reports, firearm

related injuries have caused more than 2.75 million deaths in civilian settings in the past decade.¹ Secondary to its prevalence, economic and social loss, firearm violence is regarded as an issue of public health concern globally.

Adolescents and young adults are most affected and highest number of cases are recorded in western countries like Brazil, United States, Colombia. Although, homicides makeup most of the burden, self-harm and unintentional firearm discharges are also common.² In Nepal, Arms and Ammunition Act prohibits possession of a firearm without a valid license. Possession and use of firearms is a cognizable offence.^{4,5} However, significant number of people, especially in rural Nepal possess firearms in their homes. Use of guns for illegal hunting for wild animals, is common in these areas resulting in unintentional injuries.⁶ Injured individuals often report late to hospital and provide misleading histories to avoid legal complications. In this case, the patient initially gave a fabricated story about accidental fall injury from a tree while harvesting medicinal leaves. However, later through physical examinations and imaging, it was determined to be a gunshot wound.

Maxillofacial region is made up of a rigid skeletal framework made up of multiple bones enveloped by a thin, delicate but highly vascular soft tissue envelope. It houses numerous vital structures that include nerves, blood vessels, muscles, special organs and glands that are essential for breathing, speaking, eating and facial expressions.⁷ Gunshot injuries to craniofacial regions present with myriads of challenges to treating surgeons. The high kinetic injury of projectile often results in extensive soft tissue lacerations, comminuted fractures of bones, cavitation injuries and disruption of vital structures. Treatment goals include airway management and basic life support measures, hemorrhage control, prevention of infection, bone and soft tissue reconstruction among others.³

The projectile or bullet can get lodged in tissue spaces in what is called a penetrating type of gunshot injury.⁸ This case presented with a bullet lodged in infratemporal fossa, an area between mandibular ramus and lateral plate of the pterygoid process just behind maxilla. Major structures present in infratemporal fossa

are the lateral and medial pterygoid muscles, the mandibular division of the trigeminal nerve, the chorda tympani branch of the facial nerve, the otic parasympathetic ganglion, the maxillary artery and the pterygoid venous plexus.⁷ Surgical objectives in this case were removal of bullet followed by reduction and fixation of fractured bone and soft tissue repair for functional and cosmetic restoration of midface. Proximity to base of skull and presence of key vital structures makes surgical access to infratemporal fossa extremely challenging requiring meticulous planning, advanced imaging and surgical techniques.

Entry wound of the bullet offered minimal help in surgical access as it provided a longer approach complicated by posttraumatic edematous tissue and comminuted bone pieces. Other approaches to infratemporal fossa include Transzygomatic approach, Transmaxillary approach, Retromaxillary approach, endoscopic approach each with their unique advantages and disadvantages. Transmaxillary and Retromaxillary approaches were disregarded as comminuted fracture of maxilla in this case would not provide stable reference for dissection. Transzygomatic approach involved increased risk of injury to facial and trigeminal nerve branches. Access surgery in the form of right subcondylar osteotomy was used in this case. It provided a shorter route, clean dissection through unaffected tissues and preservation of vital structures, resulting in minimal postoperative morbidity. This technique, however, requires meticulous surgical skills, careful handling of surrounding tissues and close postoperative follow up.

CONCLUSION

Infratemporal fossa is a deeply situated complex tissue space containing major neurovascular and other vital structures which makes it inherently difficult to access surgically. Access osteotomy surgeries have been frequently utilized in maxillofacial tumor cases. This case presented with a great example of utilizing principles of access surgeries in complex ballistic trauma cases resulting in desired outcome with minimal morbidity, while also saving precious time and preserving vital maxillofacial structures.

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CASE REPORT

A progressive ANCA associated glomerulonephritis leading to chronic kidney disease and stroke in a child with congenital heart disease: a case report

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Key words: ANCA-Associated Glomerulonephritis; Nephrotic-Nephritic Syndrome; Refractory Hypertension; Stroke.

ABSTRACT

Nephrotic-nephritic syndrome in children is a rare but significant cause of chronic kidney disease (CKD). This case highlights a challenging diagnostic and therapeutic course involving persistent hematuria, ANCA positivity, refractory hypertension, and cerebrovascular complications. A 10-year-old female, post-patent ductus arteriosus (PDA) closure, presented with generalized swelling, hematuria, and proteinuria. Initial workup suggested post-infectious glomerulonephritis (PIGN) with persistently low complement levels (C3, C4), and she was managed with diuretics. However, recurrent episodes led to further evaluation, revealing PR3-ANCA positivity, nephrotic-range proteinuria, and progressive renal dysfunction. Despite treatment, she developed refractory hypertension and an intracranial hemorrhage. The absence of renal biopsy posed challenges in definitive diagnosis, and the patient is now on dialysis.

This case underscores the diagnostic challenges in differentiating between PIGN, ANCA-associated glomerulonephritis, and rapidly progressive glomerulonephritis (RPGN) in pediatric patients. The interplay between congenital heart disease and renal dysfunction highlights the need for interdisciplinary management. Early biopsy in recurrent nephrotic-nephritic cases is crucial to prevent irreversible renal damage. The case emphasizes the need for early renal biopsy and comprehensive management of pediatric nephrotic-nephritic syndrome with persistent proteinuria and hematuria.



INTRODUCTION

Nephrotic-nephritic syndrome is a rare but serious pediatric condition characterized by proteinuria, hematuria, and renal dysfunction. While post-infectious glomerulonephritis (PIGN) is more common, persistent hematuria and nephrotic-range proteinuria necessitate further investigation for alternative etiologies, including ANCA-associated glomerulonephritis (AAGN) and rapidly progressive glomerulonephritis (RPGN). AAGN is an uncommon but aggressive form of glomerulonephritis in children, with an increasing annual incidence in recent years.¹ Fortunately, mortality rates in pediatric AAV remain low (5–10%).² Despite advancements in

immunosuppressive therapy, renal prognosis remains poor, with over half of pediatric AAGN patients progressing to chronic kidney disease (CKD) within a year.¹ Additionally, overlapping features between ANCA vasculitis, immune-complex GN, and cardiorenal dysfunction can further complicate diagnosis and treatment, often leading to delays in targeted intervention.

Here, we present a unique case of pediatric nephrotic-nephritic syndrome with PR3-ANCA positivity, initially misdiagnosed as post-infectious glomerulonephritis, later progressing to refractory hypertension, cerebrovascular complications, and end-stage kidney disease (ESKD). This case highlights diagnostic pitfalls, challenges in management, and the devastating consequences of missed early recognition in pediatric AAGN.

CASE REPORT

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2.2 g/day), persistently low C3 and C4 levels, and a positive ASO titer. Autoimmune markers, including ANA and anti-dsDNA, were negative. She was admitted with a provisional diagnosis of PIGN and managed symptomatically with furosemide. Her symptoms improved, and she was discharged.

One month later, she presented with similar complaints of anasarca and hematuria. Laboratory investigations showed persistent proteinuria and hypercholesterolemia (284 mg/dL). With a provisional diagnosis of nephrotic-nephritic syndrome, she was started on prednisolone. However, her swelling and hematuria persisted, despite normal blood pressure. The patient defaulted treatment, and at discharge, her serum creatinine was 0.6 mg/dL, and urine protein-creatinine ratio (PCR) was 70 mg/mmol.

Two months later, she was evaluated at a cardiac center for anasarca and was diagnosed with cardiac failure (elevated Troponin I). After stabilization, she was referred to a nephrology center, where persistent nephrotic-range proteinuria and hematuria were noted. Investigations revealed serum creatinine of 0.9 mg/dL, PR3-ANCA 7 IU/mL (Positive when > 2IU/mL), MPO-ANCA 1 IU/mL (normal when <3.4 IU/mL), and NT-proBNP >35,000 pg/mL. Renal ultrasound showed loss of corticomedullary differentiation, suggestive of CKD. Additional investigations revealed elevated iPTH (388.8 pg/mL) and low vitamin D levels (18.1 ng/mL).

The patient subsequently developed refractory hypertension requiring multiple antihypertensives, including furosemide, hydrochlorothiazide, spironolactone, enalapril, and labetalol infusion. She later developed right-sided hemiparesis, and a CT scan of the head revealed acute-on-chronic intracranial hemorrhage. She is currently undergoing dialysis but has since been lost to follow-up. Renal biopsy could not be performed because of financial constraints and patient non-compliance.

DISCUSSION

This case highlights a rare and complex interplay between nephrotic-nephritic syndrome, PR3-ANCA positivity, refractory hypertension, cardiorenal syndrome, and cerebrovascular complications in a pediatric patient. The progression from recurrent glomerulonephritis to CKD, hypertensive crisis, and stroke highlights critical challenges in early diagnosis and optimal management strategies.

ANCA-associated glomerulonephritis (AAGN) is a rare but significant cause of rapidly progressive glomerulonephritis (RPGN) and CKD. While its incidence is well-characterized in adults, pediatric cases remain exceedingly uncommon.¹ Unlike in adults, where AAV is more common in males, pediatric AAV exhibits a female predominance and typically presents in the early second decade of life, with a median age at diagnosis of 11–14 years, approximating the age of case presented.² The annual incidence of PR3-AAGN in adults is estimated at 0.5 per 100,000 population, with MPO-AAGN being more common at 1.5 per 100,000.³ The low prevalence in children emphasizes diagnostic challenges and the need for early renal biopsy in

persistent or atypical glomerulonephritis presentations.

The persistently low C3/C4 levels in this case argue against classical ANCA-associated vasculitis, which typically has normal complement levels, and instead suggest an immune complex-mediated process, but overlap syndromes and immune-complex mediated ANCA vasculitis are recognized enemies. Unfortunately, renal biopsy which could distinguish between ANCA-associated vasculitis, immune-complex glomerulonephritis, and other RPGN mimics, could not be performed in this case.

The interaction between congenital heart disease (CHD), cardiac failure, and CKD in this patient highlights the phenomenon of cardiorenal syndrome (CRS), where dysfunction in one organ exacerbates pathology in the other. Approximately 25-63% of heart failure patients exhibit some form of CRS,⁴ making it a critical consideration in pediatric patients with CHD and renal dysfunction. The markedly elevated NT-proBNP (>35,000 pg/mL) likely reflects both volume overload and impaired renal clearance, as CKD is known to elevate NT-proBNP levels beyond that seen in heart failure alone.⁵

Additionally, secondary hyperparathyroidism (iPTH 388.8 pg/mL) and vitamin D deficiency may have further exacerbated vascular dysfunction, hypertension, and CKD progression. Early recognition of CRS in pediatric patients with both cardiac and renal disease is crucial, as delayed intervention may accelerate CKD progression and increase cardiovascular morbidity.

The child developed severe hypertension requiring multiple antihypertensive agents, including labetalol infusion, yet remained uncontrolled, suggesting refractory hypertension (RfH). This severe subtype of resistant hypertension, defined as uncontrolled BP despite ≥5 antihypertensives, including spironolactone and a thiazide diuretic, is associated with a high risk of target organ damage, including stroke.⁶

The acute-on-chronic intracranial hemorrhage in this child is particularly concerning, as hypertensive crisis in CKD patients predisposes them to cerebrovascular events. The combination of CKD, secondary hyperparathyroidism, and refractory hypertension likely created a high-risk environment for stroke, highlighting the importance of aggressive blood pressure control and early intervention in such patients.

CONCLUSION

This case highlights the importance of early renal biopsy in children with recurrent or persistent nephrotic-nephritic syndrome. PR3-ANCA positivity in pediatric patients should prompt consideration of AAGN and early immunosuppressive therapy. Additionally, aggressive management of hypertension is crucial in CKD to prevent severe end-organ damage. Recognition and treatment of secondary hyperparathyroidism in CKD are also essential. A multidisciplinary approach involving nephrology, cardiology, and neurology is vital for optimizing outcomes in such complex cases.

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REVIEW ARTICLE

Neuroprotective potential of green tea polyphenols in age-related dementia: a review

Ram Chandra Shah^{1,*}¹Associate Professor, Department of Pharmacology, Madhesh Institute of Health Sciences, Janakpurdham, Nepal**Article Information****Received:** 12 Jun, 2025**Accepted:** 28 Jun, 2025**Published:** 30 Jun, 2025**Key words:** Age-related; Dementia; Green tea; Review**ABSTRACT**

The clinical manifestations of dementia are brought on by the deterioration of particular cognitive areas, particularly those linked to memory dementia. Nowadays, dementia is a severe issue that requires quick care. The avoidance dementia may be affected by dietary variables. Polyphenols are the main active components of tea. Epicatechin-3-gallate, epicatechin, gallic acid, and gallic acid gallate are the main polyphenolic components of green tea, which are referred to as catechins. The amyloid cascade hypothesis states that naturally existing A β monomers form insoluble fibrils through a nucleation-dependent process, which are then deposited as plaques in the brain. Focused on green tea and carried out a thorough review of observational studies that examined the connection between green tea consumption and dementia. The publications that were recovered were then examined to determine whether they included original studies assessing a connection between drinking green tea and dementia, Alzheimer's disease, mild cognitive impairment, or cognitive impairment. These results seem to support the hypothesis that consuming green tea may reduce the risk of dementia, Alzheimer's disease, moderate cognitive impairment, or cognitive impairment. More results from well designed and carried out cohort studies are required to provide conclusive evidence. Recent research demonstrating the protective effects of tea polyphenols against dementia is reviewed in this article and summarized.

**Nutritional aspects in brain aging and neurodegeneration:**

Dementia has grown to be a significant social problem that needs to be addressed and prevented immediately. There are over 50 million dementia sufferers globally, and 10 million new cases are reported each year. It is anticipated that there would be 82 million dementia sufferers by 2030 and 152 million by 2050.¹ Given that age is the greatest known risk factor for dementia, this sharp rise is caused by the aging population. In terms of the expenses of informal care as well as direct medical and social care, dementia has substantial social and economic impacts. The prevention of dementia may be influenced by dietary factors, and beverages are thought to be helpful

because their consumption is more acceptable and does not significantly alter other dietary practices. One of the most popular drinks in the world is tea. Tea consumption, which includes tea polyphenols and caffeine, may be significant.^{2,3} The most popular beverage in the world is tea. In Asia, tea is the most popular beverage aside from water, and Chinese and Japanese people have been drinking it for generations. It has a wealth of pharmacologically active compounds that have been linked to a number of health advantages. Depending on the level of fermentation, there are three main types of tea: oolong, black, and green.⁴ Different species, seasons, leaves, climates, and horticulture techniques all affect the composition of tea. Among the main active ingredients in teas are polyphenols.⁵ The primary polyphenolic components found in green tea are called catechins, and they comprise epicatechin-3-gallate, epicatechin, gallic acid, and gallic acid gallate. The most common and researched catechin in green tea is EGCG.^{6,7} It's possible that dietary modifications could help prevent AD. Plant-based polyphenol-containing beverages have been suggested as a natural supplemental treatment to reduce AD symptoms.⁸

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Green tea epidemiological and clinical studies: Cognitive impairment

Tea drinking has been linked by numerous epidemiological studies to a lower incidence of AD and other neurological illnesses. The action-based memory of individuals with AD dementia was evaluated using the process of making a cup of tea.^{9,10} A community-based complete geriatric assessment conducted in Japan with 1003 Japanese citizens 70 years of age or older revealed that a reduced prevalence of cognitive impairment (CoI) was linked to higher green tea drinking.¹¹ The greatest class of flavonoids found in green tea, the naturally occurring antioxidant polyphenolic catechins, may meet the criteria for a potential neuroprotective medication due to their wide range of pharmacological actions.^{12,13} Compared to black tea, green tea extract has about four times more of the catechin fraction and is especially rich in flavanols called catechins, which make about 30–40% of the dry weight of the leaves. According to the amyloid cascade hypothesis, naturally occurring A β monomers combine through a nucleation-dependent process to create insoluble fibrils, which are then deposited in the brain as plaques. AD is characterized by the self-assembly of A β into neurotoxic oligomers and fibrillar aggregates. Amyloid fibrils misfold, aggregate, and build up in the brain in an insoluble state as a result of AD. To protect cells from A β -mediated neurotoxicity, green tea polyphenols (GTPs) such as (-)-epigallocatechin gallate (EGCG), (+)-catechin (C) and (-)-epicatechin (EC), myricetin, quercetin, and kaempferol can destabilize preformed fA β and dose-dependently inhibit the formation of A β fibrils (fA β) from fresh A β (1–40) and A β (1–42).^{14,15} In neuronal cell oxidative stress, A β peptides are involved on both sides. The production of A β by reactive oxygen species (ROS) promotes oxidative stress and neuronal damage. Usually, antioxidants and free radical scavengers slow down this process.¹⁴ Tea catechins are a class of natural antioxidants that scavenge reactive oxygen species (ROS) and have protective effects against A β -induced neuronal death. Following a 48-hour exposure to A β , one study found significant hippocampus neuronal damage along with elevations in malondialdehyde (MDA) levels and caspase activity.¹⁶ Green and black tea extracts including rutin, EGCG, and L-theanine (a unique amide present in tea leaves) demonstrated protective effects against mitochondrial dysfunction, a very early stage in the pathophysiology of AD. Therefore, treatments that focus on enhanced mitochondrial function may be helpful. A β contributes to the development and progression of AD by producing ROS, which causes mitochondrial dysfunction and synaptic deficits.^{16,17}

Neuroprotective studies with green tea:

a. Preclinical animal data: EGCG has been shown to significantly increase longevity in *Caenorhabditis elegans* under stress and to reduce cognitive deficits, antioxidant enzyme decrease, and apoptotic parameters in D-galactose-induced mice. Additionally, EGCG has been demonstrated to prevent brain inflammation, neuronal damage in experimental autoimmune encephalomyelitis, and cerebral ischemia/reperfusion injuries, as well as to alleviate age-related cognitive decline.^{18,19} In rat

models of middle cerebral artery occlusion (MCAO), the impact of EGCG against neuronal damage was examined. Following MCAO, EGCG treatment decreased the neurological function score, preserved nerve cells, suppressed neuronal apoptosis, and decreased the amount of brain injury indicators and oxidative stress injury.²⁰

b. Neuronal cell culture studies: The neurotoxins 6-OHDA and 1-methyl-4-phenylpyridinium (MPP+) caused neuronal cell death in human neuroblastoma (NB) SH-SY5Y cells. EGCG shielded rat pheochromocytoma (PC12) cells and native hippocampus neurons from A β -induced toxicity. By preventing cytosolic calcium increase, catechin and EC have more recently been demonstrated to shield cultured rat cortical neurons from A β -induced damage.^{21,22}

Mechanism of neuroprotective action of green tea polyphenol EGCG:

The anti-amyloid mechanisms of these bioactive compounds include: a. APP cleavage inhibition through the regulation of related enzyme activity b. prevention of A β -induced membrane damage and protein misfolding c. mitigation of A β -induced oxidative stress d. suppression of A β oligomer aggregation e. regulation of signalling pathways involving A β generation f. reduction of A β -induced mitochondrial dysfunction, and g. inhibition of TAU protein hyperphosphorylation.

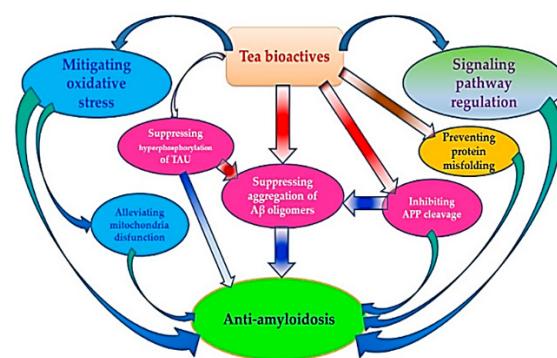


Figure 1: Anti-amyloidosis effects of tea²³

Before conclusively supporting a connection between tea drinking and the prevention of an AD cure, more research will be needed. More clinical research is specifically required to help elucidate contradictory epidemiological findings.^{24,25}

Summary and future perspectives

Data from animal studies and human epidemiology indicate that tea consumption may lower the risk of dementia. Specifically, (-)-epigallocatechin-3-gallate (EGCG), the primary catechin polyphenol ingredient in tea, has demonstrated neuroprotective effects in a variety of cellular and animal models of neurological diseases.²⁶ Through α -secretase activation and unfolded peptide disruption, EGCG also prevents A β aggregation in animal models. EGCG significantly increases the cleavage of α -C-terminal APP fragments and raises the N-terminal of the soluble APP- α , the result of APP cleavage.

Additionally, it prevents the production of A β oligomers by adhering to the protein directly or perhaps by interacting with a protein chaperone.²⁷

Before definitive support, a connection between tea drinking and preventing dementia in old age, more research is needed.²⁸ More clinical research is specifically required in order to assist elucidate contradictory epidemiological findings. Low bioavailability, dosage variations between in vitro and in vivo

testing, poor stability of tea's bioactive components, and conversion of bioactivities in the gastrointestinal tract are some of the factors contributing to inconsistencies.²⁹ Research on these parameters in depth will be important to bridge the gap between clinical applications and in vitro investigations.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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STUDY PROTOCOL

Integration and mobilization of female community health volunteer: A better response and prevention of community transmission of COVID-19 in Nepal: A lesson learned strategies from Thailand

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INTRODUCTION

Nepal is in Southeast Asia, one of the least developed and most densely populated regions in the world, with poor performance in education, healthcare, and sanitation.¹ Health services are provided through tertiary hospitals and provincial centers in urban areas, while rural areas rely on district hospitals, primary healthcare centers, and health posts.² Annually, two-thirds of health issues in Nepal are infectious diseases.³ Pandemics also occur frequently, with high rates of morbidity and mortality. As a high-risk area for pandemics, Nepal has been poorly prepared and has responded inadequately to the COVID-19 emergency.⁴ The national strategies and operational plans mainly focused on hospital-based services, neglecting health education, testing, and tracing of seasonal labor migrants, which led to a significant rise in cases across the country (from only 2 cases in March 2020 to 221 in April, and reaching 20,000 by the end of July).^{3,5} This increase threatens to lead to community transmission. Therefore, Nepal must prioritize pandemic preparedness and response efforts centered on health education, sanitation, and prevention measures, utilizing community health resources. Female Community Health Volunteers (FCHV) can be an effective strategy in responding to and preventing community transmission of COVID-19 in Nepal.

In the 1980s, Nepal began a program of female community health volunteers. In the early days, their roles focused on supporting family planning.⁶ Over time, their responsibilities expanded to include other programs. These volunteers have been crucial in achieving the health-related Millennium Development Goals and other targets. The program has been the backbone of Nepal's health system for the past three decades. Currently, there are more than 50,000 volunteers in Nepal, contributing significantly to health programs, health status improvements, and disaster

management.^{7,8} Thailand's success in controlling the spread of COVID-19 has been credited to factors such as a strong healthcare system and active public cooperation.⁹ Additionally, over one million village health volunteers effectively expanded the public healthcare system to every remote village across the country. They served as excellent intermediaries between authorities and communities, helping to build trust, dispel myths about COVID-19, and persuade communities to adopt preventive health measures. They also screened returnees and established local quarantine facilities despite resource shortages. Therefore, this new model strategy for the "new normal" could serve as an evidence-based approach to prevent community transmission of COVID-19 in Nepal.

STAKEHOLDER ANALYSIS

S.N.	Major Stakeholders	Major Responsibilities and activities towards the strategic plan
1	Ministry of Health and Population (MOHP)	Responsible for overall policy formulation, planning, organization, and coordination of the health sector at national, provincial, district, and community levels
2	Epidemiology and Disease Control Division (EDCD)	It provides relevant information to decision makers for public health priorities and resource allocation during epidemic
3	National Health information and communication center	Policies, strategies, laws regarding health communication and Health communication guidelines
4	Nepal Research Health Council (NHRC)	Conducting and supporting research related to the health policy of the Government of Nepal.

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PROJECT GOAL, OBJECTIVE AND ACTIVITIES

Goal:	To Ensure Mitigation and slow spread and to protect all individuals, especially those at increased risk for severe illness through mobilizing Female community Volunteers in Nepal.								
Objective:	To Promote behavior that helps to Prevent from Spread of Infection								
	To Maintain Healthy Environments								
	To Maintain Healthy Operations								
	To Prepare for When Someone Gets Sick								
Activities:	<table border="1"> <tr> <td>Health Education</td> <td>Physical and Social distancing</td> <td>Protect people at high risk</td> <td>Encourage Home isolation</td> </tr> <tr> <td> <ul style="list-style-type: none"> Stay in Home Hand Hygiene Cloth face covering/ Use </td> <td> <ul style="list-style-type: none"> Limit sharing of Objects Ensure Proper ventilation </td> <td> <ul style="list-style-type: none"> Cope with stress Dental care Ensure child contact </td> <td> <ul style="list-style-type: none"> Notify local health authority Tracing of close contact </td> </tr> </table>	Health Education	Physical and Social distancing	Protect people at high risk	Encourage Home isolation	<ul style="list-style-type: none"> Stay in Home Hand Hygiene Cloth face covering/ Use 	<ul style="list-style-type: none"> Limit sharing of Objects Ensure Proper ventilation 	<ul style="list-style-type: none"> Cope with stress Dental care Ensure child contact 	<ul style="list-style-type: none"> Notify local health authority Tracing of close contact
Health Education	Physical and Social distancing	Protect people at high risk	Encourage Home isolation						
<ul style="list-style-type: none"> Stay in Home Hand Hygiene Cloth face covering/ Use 	<ul style="list-style-type: none"> Limit sharing of Objects Ensure Proper ventilation 	<ul style="list-style-type: none"> Cope with stress Dental care Ensure child contact 	<ul style="list-style-type: none"> Notify local health authority Tracing of close contact 						

PROJECT IMPLEMENTATION STRATEGIES, INDICATORS, MEASUREMENT AND TIMELINE

S.N	Objectives	Implementation strategies/ Activities/Process	Indicators	Responsible Units	Outputs	Timeline		
						September to November 2025		
1	Provision of a Health education program on Healthy behavior, Healthy environment and healthy operations	1. Individual action -Personal Protection -Self-Isolation -Tracing /Testing 2. Community action Physical /Social distancing Close the school and gathering 3. Environmental action Cleaning and disinfection	1.Percent change in mobility (e.g., time spent at home, distance traveled, and by destination 2.Number/ proportion of population that report using masks outside the home in the last week/ Month	MOHP/WHO EDCD/EOC NHIEC NHRC/LHA	1. Reduce exposure to the individual 2. Reduce and interrupt transmission 3. Reduce the burden on health care System	✓	✓	✓
2.	Special attention to disproportionately affected People, high risk and unknown or travel history	1. people at risk with Physical, Mental and emotional outcomes 2. People at risk with severe mental illness 3. unknown people or history of travel people in community	3.Total and incident COVID-19 tests/cases/ hospitalizations/ death 4.Number of calls to local/ state hotline requesting housing assistance	MOHP/WHO EDCD/EOC NHIEC NHRC/LHA Boarder Check point office	4.Trends in excess cases, hospitalization, and mortality among disproportionately affected populations 5. improve in Social/Economic and environmental	✓	✓	✓

EXPECTED OUTCOME OF PROJECT

The public health approach and implementation strategies learned from Thailand will help ensure the prevention of community transmission of COVID-19 in Nepal through the mobilization and integration of female community health volunteers, which will be one of the better responses and sustain management of COVID-19 to achieve a new normal in Nepal.

MONITORING AND EVALUATION PLAN

The Ministry of Health and Population (MOHP), and Provincial Health Ministry, and the Local health authority will be responsible for Monitoring and evaluation using the output indicators.

KEYWORDS: COVID-19; Female community health volunteers; Integration; Lessons from Thailand; Mobilization; Strategies.

CONFLICT OF INTEREST: None

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