VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Details of papers published in the journals other than UGC notified journals 2021

S.N	Publication type	Publication title	Author name	Journal name	Year
1.	Original article	Effect of Lung Specific Yoga Mudras on Pulmonary Function Tests in subjects with FEV1% predicted values less than 80%.	Selvakumar Palaniappan; Ramprassath Muthampatti Siddhan; Anu Sengottaiyan; Saravanan Mohanraj; Rohit Paul	International Journal of Scientific Research in Dental and Medical Sciences	2021
2.	Original article	Serum Beta2-Microglobulin as a Biomarker in Early Stages of Chronic Kidney Disease	Shenoy, M. T., Rukmini, M. S., Manjrekar, P. A., Hegde, A., & Akshatha, L. N	Journal of Krishna Institute of Medical Sciences University	2021
3.	Original article	An audit of prescription for rational use of fixed dose drug combinations dispensed in the pharmacy of a tertiary care hospital	Brajesh Thankamony, Jesudoss Prabhakaran,2 Raj Kishore Mahato, J Mohan	National Journal of Basic Medical Sciences	2021
4.	Original article	Sero surveillance of Scrub typhus in a tertiary care hospital at Madurai , Tamilnadu, South India	Jhansi Charles, Ramesh, Rajendran, Vithiya	IOSR Journal of Dental and Medical Sciences	2021
5.	Case Report	Jobs Syndrome – Hyper IgE Syndrome	Niranjan Prabhakar, C. Ramesh, Sriandaal Venkateshvaran	International Journal of Medical Science and Current Research	2021
6.	Original article	Prevalence and Risk Factors of Hypertension,	Trupti Bodhare , Samir Bele , Hareini	Journal of Krishna Institute of	2021

Dean
Velammal Medical College Hospital and Research Institute
'Velammal Village'
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai (TN)-625 009

		Overweight and Obesity among School Children in Madurai, Tamil Nadu: A Cross Sectional Study.	Murugvel , J. Vijay Anto	Medical Sciences University	
7.	Original article	Knowledge, attitude and practices regarding novel coronavirus disease among adults of mandya city: A cross-sectional study	M. Vinay, A Divya, B R Harish, H Bhagyalaxmi, S Vasumathi, K Shambhulinga	Annals of Community Health	2021
8.	Original article	Predictive accuracy of procalcitonin in diagnosing bacteramia in adult patients in a Tertiary hospital	Virgin Joena	Journal of Evidence Based Medical Health	2021
9.	Case report	Excellent outcome of a patient with acute back pain and osteoporotic fracture- A case report	Subramanian Nallasivan, Raja S Vignesh, Arunkumar Govindarajan	IP International Journal of Orthopaedic Rheumatology	2021
10.	Original article	Spectrum of febrile thrombocytopenia among children in a tropical country – a hospital based observational study in south India	Karthikraj T., Jenish Rajma J., Jeyabalaji R. V., Shivani Kuttuva	International Journal of Contemporary Paediatrics	2021
11.	Original article	Spectrum of febrile thrombocytopenia among children in a tropical country – a hospital based observational	Karthikraj T., Jenish Rajma J., Jeyabalaji R. V., Shivani Kuttuva	International Journal of Contemporary Paediatrics	2021

Dean
Velammal Medical College Hospital
and Research Institute
'Velammal Village'
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai (TN)-625 009

		study in south India			
12.	Original article	Safety of Percutaneous vs Open Tracheostomy on Intubated Patients in ICU Setting: Which One is Better?	S. Maheshwaran, Sara V. Thomas, Gopala Krishnan Raman & S. Pookamala	Indian Journal of Otolaryngology and Head & Neck Surgery	2021
13.	Original article	Association between MRI Findings and Histopathological Examination in Carcinoma Cervix: A Retrospective Study	Yogaraj, Kumaran	International Journal of Anatomy, Radiology and Surgery.	2021
14.	Original article	Profile of Road Traffic Accident Injuries in a Tertiary Care Teaching Hospital – An Institution Based Cross Sectional Observational Study in Velammal Medical College Hospital and Research Institute, Tamil Nadu	Kumaran R, Yogaraj S	Journal of Evidence Based Medicine and Healthcare	2021
15.	Original article	A Road to Physiological pacing.	Ponnusamy SS	Indian Journal of Clinical Cardiology	2021

Dean
Velammal Medical College Hospital
and Research Institute
'Velammal Village'
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai (Tk)-625 009

International Journal of Scientific Research in Dental and Medical Sciences

www.ijsrdms.com

Effect of Lung Specific Yoga Mudras on Pulmonary Function Tests in subjects with FEV1% predicted values less than 80%

Selvakumar Palaniappan[a], Ramprassath Muthampatti Siddhan[b,*], Anu Sengottaiyan[c], Saravanan Mohanraj[d], Rohit Paul[e]

[a] *Department of Anaesthesia, School of Medicine, Velammal Medical College Hospital & Research Institute, Madurai, India*
[b] *Department of Cardiothoracic surgery, School of Medicine, Velammal Medical College Hospital & Research Institute, Madurai, India*
[c] *Department of Physiology, School of Medicine, Velammal Medical College Hospital & Research Institute, Madurai, India*
[d] *Department of Physiology, School of Medicine, Velammal Medical College Hospital & Research Institute, Madurai, India*
[e] *School of Medicine, Velammal Medical College Hospital & Research Institute, Madurai, India*

ARTICLEINFO

Article history:
Received 03 June 2021
Received in revised form 29 July 2021
Accepted 15 August 2021
Available online 30 August 2021

Keywords:
Forced vital capacity
Lung
Pulmonary Function Tests
Yoga

ABSTRACT

Background and aim: Mudras are gesticulations of explicit body position. For the most part, Mudras help in correspondence like gesturing head to say indeed, raising thumb to pass on progress. They likewise utilized in yoga, reflection, and dance.

Materials and methods: The probable, similar examination was done in the division of Anesthesia of a private Medical College Hospital, Madurai subsequent to getting Institutional Ethical Clearance.100 individuals in the age gathering of 20-30 years going to General Medicine OP among June and September 2019 and clinic staff who undertook in were enlisted for the investigation. Both weight and stature coordinated with males and females with odd spirometry esteem with FEV1% anticipated qualities under 80% were comprised for the investigation.

Results: Pulmonary function tests (PFT) values in control group subjects were statistical, not Significant. On the other hand, significant enhancement in all the limits was seen apart from FEV1/FVC% in the study group. Even Though it is statistically significant, the value had enhanced after mudra practice from 78.57±14.28 to 81.12±9.85.

Conclusion: The outcomes demonstrate that explicit lung mudras essentially improve lung work. The day-by-day schedule can profit populaces experiencing prohibitive and obstructive lung conditions. Particularly this could be valuable for post Coronavirus patients with remaining lung discrepancies.

1. Introduction

Mudras are gesticulations of explicit body position. For the most part, Mudras help in correspondence like gesturing head to say indeed, raising thumb to pass on progress. They are likewise utilized in yoga, reflection, and dance. Aside from this, yogic mudras were known to have a healing job in ailments.[1, 2] Mudras include gestures of hand (hastha mudras), yet additionally head (mana mudras), and body (kaya mudras). Hasta mudras include the certain situation of hand and fingers. In yogic writing, each finger has got its capacity. Thumb indicates the fire component; the index finger signifies air, the center finger means ether, the ring finger means earth, and the little finger signifies water. Illness happens because of disparity in these five components. Putting the fingers in explicit positions adjusts every one of the components and improves health.[3]

Two-point separation edges are a proportion of material keenness. This worth will be littlest where the touch receptors are bountiful and most noteworthy where the touch receptors are lesser in the count. The palm and internal part of fingers have rich tactile innervation. Thus, the two-point separation esteem at the tip of the fingers is between 2-3 mm, because of the presence of plentiful tangible receptors around here.[4] At the foundation of the palmar part of fingers, it is almost 5-6 mm and in palm locale 8-15 mm. Hence, there is a bigger space of portrayal for thumb, fingers, and hand in the cerebral sensory and motor homunculus. Placing the fingers at an explicit position invigorates these tactile receptors, communicating impulses through the dorsal section pathway to the inverse sensory cortex. Since both the hands are used for mudras, there will be the concurrent actuation of related spaces of both the cerebral sides of the hemisphere. Customary acts of hand mudras

* *Corresponding author. Ramprassath Muthampatti Siddhan*
E-mail address: cmcrampi@gmail.com
Department of Cardiothoracic surgery, School of Medicine, Velammal Medical College Hospital & Research Institute, Madurai, India
http://doi.org/10.30485/IJSRDMS.2021.290063.1168

CC BY

can build the space of portrayal in the cortex by continually changing the homunculus map by cortical flexibility. The cerebral cortex thus initiates the autonomic nervous system (ANS) through the nerve center.[5] Autonomic efferent fibres supply the cardiovascular muscle, smooth muscles, including bronchial smooth muscle and glands. The movement of ANS keeps up homeostasis in every one of these structures.[6]

Scarcely any past investigations had shown the impact of hand mudras in improving emotional wellness and lessening stress.[7, 8] A mudra study on cardiovascular and neurological boundaries showed decreased circulatory pressure and enhanced myocardial perfusion and cerebral bloodstream. Even though reviews recommend explicit mudras to improve lung work, the trial proof is as yet inadequate. It is the main investigation of its sort to decide the impact of explicit lung mudras on PFT.

Pulmonary Function Tests are entirely important in both evaluation and management of lung work. Forced vital capacity (FVC) Forced expiratory volume in 1 second (FEV1), FEV1/FVC proportion, Peak expiratory stream rate (PEFR), Maximal mid expiratory stream rates (FEF25-75%,), V max 25%,50%, and 75% are for the most part used to discover block in bigger and more modest airways routes of the lung. FEV1/FVC esteem under 70 % with FEV1 diminished more than FVC signifies an obstructive sickness, and an FEV1/FVC, more than 70 % with FVC, decreased more than FEV1 indicates a prohibitive illness. FEF25-75%, the maximal flow rates amidst 25%-75% of the essential limit, implies a more modest airway route hindrance. PEFR is utilized to discover bigger airway route obstacles. Henceforth, the point of the current examination is to decide the impact of explicit lung mudras on lung work utilizing PFT.

Aim and objectives

1. To decide the prompt impact of explicit lung mudras on pneumonic function tests following 30 minutes of mediation in investigation subjects with FEV1% anticipated under 80%.

2. To decide the progressions in pneumonic function tests in controlled subjects with FEV1% anticipated under 80% following 30 minutes of rest.

3. To think about the pneumonic function test changes between the examination and the controlled group.

2. Materials and methods

A probable, similar examination was done in the division of Anesthesia of a private Medical College Hospital, Madurai, after getting Institutional Ethical Clearance No. VMCIEC/17(a)/2018. One hundred individuals in the age gathering of 20-30 years going to General Medicine O.P among June and September 2019 and clinic staff who undertook in were enlisted for the investigation. Both weight and stature coordinated with males and females with odd spirometry esteem with FEV1% anticipated qualities under 80% were comprised for the investigation. Volunteers with ordinary spirometry esteem, on drug treatment, with Musculoskeletal issues, mental infirmities, history of smoking, medical procedures in the current past and past acquaintance to mudra preparing, or other types of normal exercise were omitted from the investigation. The investigation was disclosed obviously to the members, and willful assent was obtained. Reference point information on all members was gathered utilizing an organized survey. Individuals who satisfied the consideration norms went through spirometry to quantify the pulmonary function test (PFT) values. One hundred individuals whose FEV1% anticipated qualities under 80% were then appointed as control bunch (n=50) and study bunch (n=50) by utilizing a random grouping created in Microsoft Excel.

Description of intervention

The examination subjects were told to abstain from caffeine, nicotine, and liquor. Subjects on free apparel were told to relax for 10 minutes at first in the sitting stance on the ground. At that point, they were educated to play out all hand mudras by a certified yoga teacher, alongside smooth and profound breathing. Specific guidance was given not to move their hands and focus on their fingertips while doing hasta mudras. The resulting were the mudras trained in instruction, using both the hands.[1]

Atmanjali mudra

Join the palms together in Namaste position (5minutes).

Bronchial mudra

Spot the little finger at the foundation of the thumb, the ring finger on the upper thumb joint, and the center finger on the stack of the thumb. Broaden the index finger (5 minutes).

Asthma mudra

Press the fingernails of both middle fingers by stretching other fingers. (5 minutes).

Brahmara mudra

Spot the index finger on the foundation of the thumb. Spot the tip of the thumb on a center fingernail. Expand ring and little finger (7 minutes).

Linga mudra

Place the two palms together and catch fingers. One thumb ought to stay upstanding; surround it with the thumb and forefinger of another hand (8 minutes). Mudra was adept in standup position synchronizing respiration.

Data collection method and tools

After an assortment of standard information on arthrometric procedures, both the examination and the controlled groups went through spirometry. PFT was estimated utilizing a Digital spirometer (NDD clinical technologies- Easy one air spirometer, Switzerland). Each day, the method was done between 9-12 pm to keep away from the impact of circadian pace on bronchial tone.

Pulmonary function tests

Subjects are told preceding abstain from the smoking, substantial feast, and tight dress. The subjects were approached to sit in a seat during the move to avoid fall or injury, and the lips were firmly shut to avoid the air spills around the mouth area. They are told to take a full breath in, hold the breath for a couple of moments and afterward breathe out as hard as conceivable into the gadget. Proper execution was guaranteed as the methodology is effort reliant and requires sufficient subject assistance. The move was performed multiple times to guarantee that the outcomes were reproducible and chosen the best three. The difference was under 200 ml between the moves for each subject. The adjustment was made before every session. Spiro meter was satisfactorily disinfected before the following use. Dispensable filters (for microbes and infection) in the spirometer are changed for each subject, and other high-touch surfaces are cleaned utilizing disinfecting wipes. Baseline FVC, FEV1, FEV1/FVC proportion, PEFR, FEF25-75%, Vmax 25%,50%,

and 75% qualities are recorded for the examination control bunch subjects at first. The PFT esteems re-recorded following 30 minutes of mudra practice in examination bunch subjects and 30 minutes of rest in controlled groups.

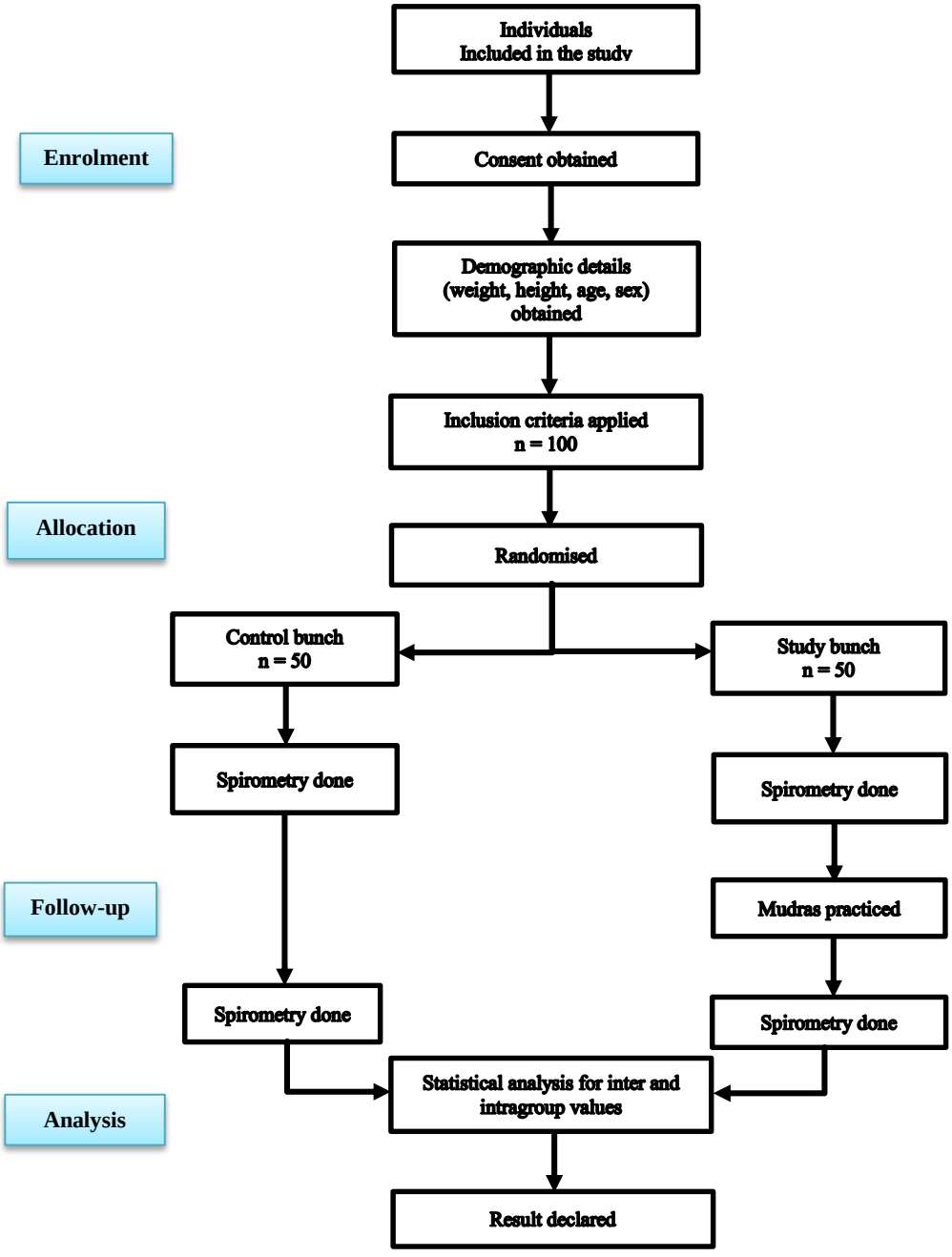


Fig. 1. Consort diagram.

3. Results

Statistics applied: Students' paired t-test for parametric data and Wilcoxon test for non-parametric data ($p \leq 0.05$ is considered significant).

Table 1. Demographic details.

Total enrolment	Sex	Age	BMI	Height (cm)
100	-----	22.54±1.97	-----	-----
-----	male = 48	22.2±2.14	23.12±1.85	167.7±5.5
-----	female = 52	22.85±1.8	23.11±1.99	160.1±5.1

Table 2. PFT values in control group subjects.

Parameters	Pre value (average ± SD)	Post value (average ± SD)	P-value	Remark
FVC(L)	3. 62±0.59	3.61±0.57	0.28	Statistically not significant.
FEV1(L)	2.82±0.54	2.82±0.52	0.31	Statistically not significant.
FEV1/FVC(%)	78.11±8.85	79.61±36.11	0.42	Statistically not significant.
PEF(L/s)	7.53±2.61	7.54±2.59	0.31	Statistically not significant.
FEF25-75(L/s)	4.63±0.82	4.63±0.83	0.50	Statistically not significant.
Vmax25%	11.23±2.65	11.22±2.70	0.42	Statistically not significant.
Vmax50%	9.14±2.83	9.22±1.97	0.07	Statistically not significant.
Vmax75%	6.60±1.30	6.57±1.30	0.18	Statistically not significant.

Table 3. PFT values in study group subjects before and after mudra practice.

Parameters	**Pre value (average ± SD)**	**Post value (average ± SD)**	**P-value**	**Remark**
FVC(L)	3.62±0.82	3.87±0.78	0.04	Statistically significant increase.
FEV1(L)	2.85±0.84	3.13±0.68	0.003	Statistically significant increase.
FEV1/FVC%	78.57±14.28	81.12±9.85	0.08	Increased. Statistically not significant.
PEF(L/s)	7.61±1.39	8.44±2.04	<0.001	Statistically significant increase.
FEF25-75(L/s)	4.67±1.48	9.66±18.65*	0.03	Statistically significant increase.
Vmax25%	11.32±16.41*	12.04±16.31*	<0.001	Statistically significant increase.
Vmax50%	9.27±16.21*	10.34±18.49*	0.002	Statistically significant increase.
Vmax75%	6.73±17.83*	7.74±20.57*	0.009	Statistically significant increase.

*non-parametric data.

Significant enhancements in all the limits were seen apart from FEV1/FVC%. Even Though there is no statistical importance, the value had enhanced after mudra practice from 78.57±14.28 to81.12±9.85.

4. Discussion

In the current investigation, MEP and MIP expanded fundamentally following four months of yoga preparing in examination bunch subjects. The current discoveries are reliable with Mandanmohan et al., who revealed that a half-year yoga preparing causes huge expansions in MEP& MIP esteems in subjects of 12-15 age gatherings.[6] De Godoy DV et al. announced that yoga causes enhancement in maximal inspiratory pressure.[7] Maximum respiratory pressures are accurate and straightforward indices of the strength of respiratory muscles.[8] The increases in MIP and MEP in our yoga group indicate yoga training improves the strength of expiratory as well as inspiratory muscles. Kapalbhati included in our present training program involves powerful exhalation strokes that train the subjects to use the diaphragm and abdominal muscles fully. Slow, deep, full inspiration and expiration in pranayama also train the respiratory muscles and increases respiratory muscle strength. Respiratory pressures are specific and sensitive indices of respiratory muscle strength.

Black and Hyatt[9] Have demonstrated that values of MIP and MEP are altered even before there is an alteration in other commonly used pulmonary function tests. Hence evaluation of respiratory muscle strength is important from a physiological as well as a clinical point of view.

The present study shows significant improvement in FEV1, PEFR after yoga training. In accordance with our findings, Joshi et al. and Madanmohan et al. showed a statistically significant increase in FEV1, PEFR after yoga training which was statistically significant.[4, 6] Hirschi G. et al. concluded that the practice of yoga seems to be beneficial for respiratory efficiency.[3] He found significant increases in FEV1 after yoga training of 10 weeks. Bhatt J. K D et al. also found improvement in lung function parameters after the practice of yoga.[10] Bhole et al. had reported a significant increase in vital capacity after three weeks of yoga training.[1] Singh K. et al. in his study, found that there was an improvement in FEV1 and PEFR after yoga training in asthmatic patients.[11] Kaniethapriya A S. et al. also studied the effects of pranayama and yoga on asthmatic patients and found that there were significant changes in these parameters at the end of 12 weeks of yoga training.[12]

- By asana 'pressing and soaking' measure happens, in which a respiratory organ is tightened (crushed) during an asana and after emerging from the position, in this manner delivered, after that body 'soaks' it with an abundance new, supplement rich blood.
- Asanas have the extra respiratory advantage of extending and rubbing the diaphragm, an essential muscle of breathing.
- There happens to reinforce respiratory musculature related to the normal activities of pranayama breathing, during which the lungs and chest blow up and empty to the fullest possible level, and muscles are made to work to the maximal amount.
- Lung expansion close to total lung capacity is a significant physiological upgrade for the issue of lung surfactants and prostaglandin into alveolar spaces, which builds lung consistency and diminishes bronchiolar smooth muscle quality and airway confrontation.[13, 14]
- Peak expiratory flow rate (PEFR) relies upon stretchy recoil of lungs, air route opposition, and strength of expiratory muscles.[15] Yoga impacts on the versatile elastic of lung and airway route obstruction. Yoga may build the strength of expiratory muscle and expansion in the top expiratory stream rate seen.
- By rehearsing pranayama, the different reflex components that control the respiratory focus may be changed or adjusted by creating a solid cortical power that modifies the autonomic sensory system. Hence, it moves towards the parasympathetic predominance and has advantageous effects respiratory framework.
- By Deep Relaxation strategy, the thoughtful sensory system quiets down, which helps in diminishing bronchiolar smooth muscle tone and airway route obstruction.
- Yogic rehearses cause one to take an increasingly slow breath with complete mindfulness; it straightforwardly and roundaboutly benefits the respiratory framework. Every one of the systems of the body are firmly related, and a large part of the gainful impact of yogic practices comes from their all-encompassing impact on the body as a bound together life form.

The above consequences express that yoga positively affects pulmonary functions and respiratory pressure and enhances physiological purpose.

5. Conclusion

The outcomes demonstrate that explicit lung mudras essentially improve lung work. Day-by-day schedules can profit populaces experiencing prohibitive and obstructive lung conditions. Particularly this could be valuable for post Coronavirus patients with remaining lung discrepancies.

Conflict of Interest

The authors declared that there is no conflict of interest.

Acknowledgements

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

[1] Bhole MV, Karambelkar PV, Gharote ML. Effect of yoga practices on vital capacity.(A preliminary communication). The Indian journal of chest diseases. 1970;12(1):32-5.

[2] Sunitha S, Sharma CP. Mudra Therapy and Its Classification. International Journal of Health Sciences and Research (IJHSR).2021;11(1):118-126.

[3] Hirschi G. Mudras: Yoga in your hands. Weiser Books; 2016.

[4] Mandanmohan, THOMBRE D. P, BALAKUMAR B, Nambinarayanan T, THAKUR S, Krishnamurthy N, et al. Effect of yoga training on reaction time, respiratory endurance and muscle strength. Indian J Physiol Pharmacol. 1992;36(4):229-33.

[5] Shibin K, Samuel AJ. The discrimination of two-point touch sense for the upper extremity in indian adults. Int. J. Health Rehabil. Sci. 2013;2(1):38-43.

[6] Mandanmohan, Jatiya L, Udupa K, Bhavanani A B. Effect of yoga training on handgrip, respiratory pressures and pulmonary function. Indian J Physiol Pharmacol. 2003;47(4):387-92.

[7] Godoy DV, Bringhenti RL, Severa A, Gasperi RD, Poli LV. Yoga versus aerobic activity: effects on spirometry results and maximal inspiratory pressure. Jornal Brasileiro de Pneumologia. 2006;32:130-5. https://doi.org/10.1590/S1806-37132006000200008.

[8] BHARGAVA H. Therapeutic Use of Mudras in Dance/movement Therapy with Children in a Partial Hospital Program: The Development of a Method.2020.

[9] Black LF, Hyatt RE. Maximal respiratory pressures : normal values and relationship to age and sex. Am Rev Respir Dis 1969; 99: 696–702.

[10] Tripathi D, Kalantri.Y, Kumar H, Chitnis V, Kalantri R.C, Bhatt.J.K. Effect of yoga hand mudra on cardiac and neurological parameters in preventing heart attack. Research Journal of Recent Sciences 2017;6(2):16-20.

[11] Singh K. Hasta Mudra's and respiratory system. Int J Phys Educ Sports Health. 2015;1:83-6.

[12] Anu S, Kaniethapriya A S, Paul R, Jeyashree K. Effect of specific yoga mudras on respiratory efficiency in asthma patients.Indian J Clin Anat Physiol.2019.6(3):353-358. https://doi.org/10.18231/j.ijcap.2019.077.

[13] Ranu H, Wilde M, Madden B. Pulmonary function tests. The Ulster medical journal. 2011;80(2):84-90.

[14] Kumar A, Kumari N. Effects of yoga mudras in daily life. International Journal of Yogic, Human Movement and Sports Sciences. 2017;2(2):202-5.

[15] D'Souza CD, Avadhany ST. Effect of yoga training and detraining on respiratory muscle strength in pre-pubertal children: A randomized trial. International journal of yoga. 2014;7(1):41-7. doi: 10.4103/0973-6131.123478.

How to Cite this Article: Palaniappan S, Siddhan RM, Sengottaiyan A, Mohanraj S, Paul R. Effect of Lung Specific Yoga Mudras on Pulmonary Function Tests in subjects with FEV1% predicted values less than 80%. International Journal of Scientific Research in Dental and Medical Sciences, 2021;3(3):117-121. http://doi.org/10.30485/IJSRDMS.2021.290063.1168.

Manipal Academy of Higher Education

Impressions@MAHE

Kasturba Medical College, Mangalore Theses and Dissertations

MAHE Student Work

Spring 4-1-2021

Serum Beta2-Microglobulin as biomarker in early stages of chronic kidney disease

Mamatha T. Shenoy

Follow this and additional works at: https://impressions.manipal.edu/kmcmlr

 Part of the Medicine and Health Sciences Commons

BACKGROUND: Chronic kidney disease (CKD) is a global health problem with rising incidence. Serum creatinine (SCr) is insensitive to moderate reductions in glomerular filtration rate (GFR). Low molecular weight proteins like beta$_2$-microglobulin (BMG) are cleared by the plasma through glomerular filtration. Hence serum concentrations increase progressively with reduction of GFR.

OBJECTIVE OF THE STUDY: To correlate serum concentrations of BMG with creatinine and estimated GFR (eGFR) in patients with early stages of CKD.

MATERIALS AND METHODS: 74 adults in early stages of CKD were included based on eGFR, calculated using the 4 variable MDRD (Modification of Diet in Renal Disease) equation and albumin creatinine ratio. They were divided into four groups based on the stages of CKD. SCr was measured using Jaffes reaction with Rosche Hitachi P800 autoanalyser and serum BMG was measured using Calbiotech ELISA kit and compared using one way ANOVA, followed by post hoc Tukey's test and Pearson's correlation tests with SPSS version 16 software.

RESULTS: Levels of serum BMG were significantly elevated in all groups, ($p<0.01$) while SCr levels were in normal range in patients with eGFR >60ml/min/1.73m^2. Both BMG($r=-0.792$) and SCr($r=-0.913$) increased with reduction of eGFR ($p<0.01$). Correlation with eGFR in stage1 CKD showed serum BMG ($r=-0.824$, $p<0.01$) and SCr ($r=-0.362$) and in stage2 CKD, BMG ($r=-0.705$ $p<0.01$) and SCr ($r=-0.609$, $p<0.01$).

CONCLUSION: Serum beta2-microglobulin is elevated in asymptomatic patients with normal creatinine, thereby demonstrating its reliability in detecting early stages of CKD.

Original Article

AN AUDIT ON PRESCRIPTION FOR RATIONAL USE OF FIXED DOSE DRUG COMBINATIONS DISPENSED IN THE PHARMACY OF A TERTIARY CARE HOSPITAL

Brajesh Thankamony[1], Jesudoss Prabhakaran[2], Raj Kishore Mahato[3], J. Mohan[3]

[1]Assistant Professor, Velammal medical college hospital and research institute Madurai-625009.

[2]Professor Department of Pharmacology, Pondicherry Institute of Medical Sciences Puducherry – 605014.

[3] Professor, Velammal medical college hospital and research institute Madurai-625009.

ABSTRACT

Objectives: The objective of this study would be to evaluate rationale use of fixed dose combinations (FDCs) dispensed in the pharmacy of a tertiary care hospital in Pondicherry.

Materials and Methods: This is a retrospective study where 300 prescription copies were collected, out of which 100 prescription copies containing FDCs was scrutinized in the tertiary care hospital P.I.M.S Pondicherry. The total number of FDCs were 114, which were taken for final analysis. FDCs were analyzed for the different pattern of prescribing and rationalism. Rational use of FDCs was analyzed using WHO seven-point criteria. The data regarding clinical evidence of safety and efficacy based on the WHO seven-point criteria were analyzed.

Results: Out of 114 FDCs, the most commonly prescribed FDCs were aceclofenac with paracetomol (19.30%) and amoxicillin with clavulanic acid (14.04%). The females were prescribed 52.63% of the total FDCs. The FDCs were maximum from the department of orthopaedics (22.81%), followed by ENT (14.03%) and medicine (12.28%). Out of 114 FDCs, 79% were rational, and only 21% of the FDCs were irrational.

Conclusions: The results of this study clearly demonstrate that majority of FDCs dispensed in the pharmacy were found to be rationale in accordance with WHO seven-point criteria.

Key words: Audit, Fixed Drug Combinations

Corresponding Author: Brajesh Thankamony, Department of Pharmacology, Velammal medical college hospital and research institute, Madurai 625009.

Email ID: brajesh.thankamony@gmail.com

DOI: https://dx.doi.org/10.31975/NJBMS.2020.11301

Introduction:

Fixed dose combinations (FDCs) is a combination product of two or more active pharmacological ingredients (APIs) in a single dosage form. In FDCs, drugs from different pharmacological groups having complementary mechanism of action should be combined. The FDC is an innovative product, the main advantages being increase in patient's compliance, decrease in pill burden, reduced complications and the cost [1].

The safety profile of the established drugs changes when they are combined in a single formulation. There is a growing concern about the increasing number of irrational FDCs in the developing countries which impose unnecessary financial burden, increase the occurrence of adverse drug reactions, including allergy, hospitalization and ultimately reducing the quality of life [2]. Combining two or more drugs in a single formulation causes changes in its efficacy, safety and bioavailability profile; hence FDCs are treated as new drugs.

There is an increase in the number of irrational FDCs in the Indian drug market at an alarming rate. The concept of rational FDCs has not yet penetrated in the minds of physicians; hence evaluation is needed, as large numbers of FDCs are of little importance in terms of effective health care [3]. Out of the total 433 medicines listed under the 20th edition of the WHO list of essential medicines issued in August 2017, only 37 are FDCs [4]. Similarly, the Indian list of National Essential List of Medicines (NLEM 2015) lists only 24 FDCs out of the total 376 [5].

Drug companies continue to rampantly promote brand-based sales of both rational as well as irrational FDCs with aggressive marketing strategies [6]. Medical practitioners currently do not have any alternative and credible platforms – from the professional associations or government agencies – to remain updated on the rational drug innovations and combinations but are forced to choose from an unnecessarily large number of brands being made available in the market [6].

As the clinician update-cum-brand promotion activities are primarily driven by the large field force of medical representatives, this in turn, translates into brand-based prescription behaviour of clinicians, creating a difficult scenario for promotion of generics too[6]. This is the predominant trend for drug sales, where the irrational FDCs comfortably pass through the sales counters [6]. Non-prescription-based sales by the pharmacists and opportunity for

replacement of the brands at the retail pharmacy level are other contributing factors for promotion and rampant growth of FDC [6].

Rational drug use (RDU) is conventionally defined as "patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community". [7] In an effort to initiate rational drug therapy, the World Health Organization (WHO) introduced the concept of an essential drugs list in 1977 and it updates the model list every two years. Although various opinions have been expressed regarding the rationality of FDCs, there are only a few studies taken up to find the rationality of FDCs where there were many irrational FDC which easily outnumbered rational FDC [8]. Fixed dose combination [FDC] are highly popular in the Indian pharmaceutical market and are particularly flourishing in the last few years. The pharmaceutical industry has been manufacturing and marketing fixed dose combinations (FDCs), many of them irrational and harmful for the last two decades [7]. Injudicious use of antibiotic FDCs can rapidly give rise to resistant strains of organisms, which is a matter of serious concern to the health care situation in our resource-poor country [9]. To develop a comprehensive criteria which will be useful and unbiased for the evaluation of FDCs, the guidelines of WHO "Draft guidelines for registration of fixed dose combination medicinal product" accessed on 13th March 2005 and the "Note for guidance on fixed-dose combination medicinal products" by the Committee for Proprietary Medicinal Products (CPMP), Europe and several research papers were carefully studied [10]. These are well-known guidelines, which serve as benchmark towards a rational FDCs. A comprehensive seven-point criteria developed by Panda et al can evaluate the rationality of the FDCs [11]. Hence with respect to ever-growing irrational FDC prescribed in India, this study aims to see the rationality of the different fixed dose drug combinations (FDC) prescribed in a tertiary care hospital by using WHO seven-point criteria for rationale of FDC.

METHODS:

This is a retrospective study where sample size of 300 prescription copies were collected randomly from the P.I.M.S pharmacy, out of which 100 prescription copies containing FDC's were included in this study. Sample size was selected based on a similar study by N. KASTURY et al, [12]. Study was done in Department of

Pharmacology, the tertiary care hospital P.I.M.S, Pondicherry. The study was conducted from August 2016 to September 2016. This study was approved by P.I.M.S institutional ethics committee. The total number of FDCs were 114, which were taken for final analysis for rationality using WHO guidelines [11] and values were entered in Data collection forms. The details included in each data collection form are provided in Annexure

Each Yes point of WHO seven-point criteria will carry 2 points and No carries 0 point. Maximum score of 14 is possible.

WHO CRITERIA	**Yes**	**No**	**Score**
1. APIs with complementary mechanism of action.			
2. Decrease the occurrence of resistance for antimicrobial agents (AMA).			
3. Increase the efficacy of the combination.			
4. Decrease the occurrence of adverse drug reactions or toxicity.			
5. Increase the compliance of the drug therapy with decrease pill burden.			
6. Decrease the total cost of the therapy and			
7. Dose of each API should be appropriate for defining or larger groups of populations.			
Total Score			

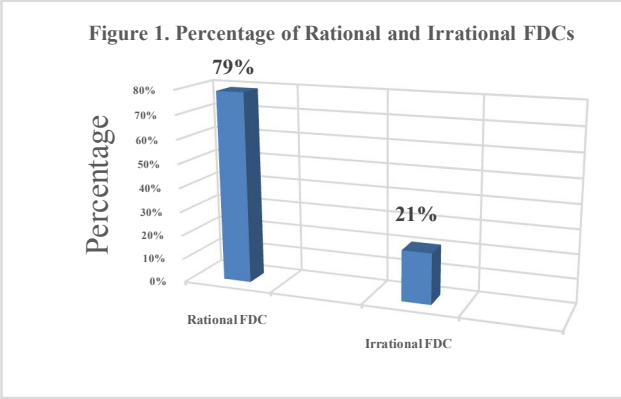
Depending on the score, FDC can be grouped as

- **Rational- 10 to 14**
- **Irrational- 8 to 10**
- **Absurd- 6 to 8**
- **Banned- 0 to 6**

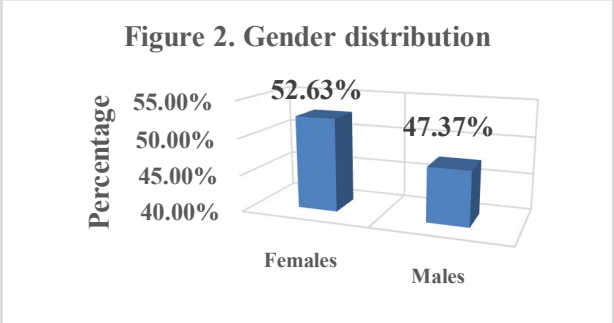
The FDCs was analysed for the different pattern of prescribing and rationalism. The results were expressed as percentages. The percentage of FDCs prescribed in different departments were found out in this study. The pharmacological categories of FDCs prescribed as per WHO guidelines for rationality were found out in this study. Total number of FDCs will be taken as "n". All the results were expressed as percentages and the data calculations were done by Microsoft Excel 2016.

Results:

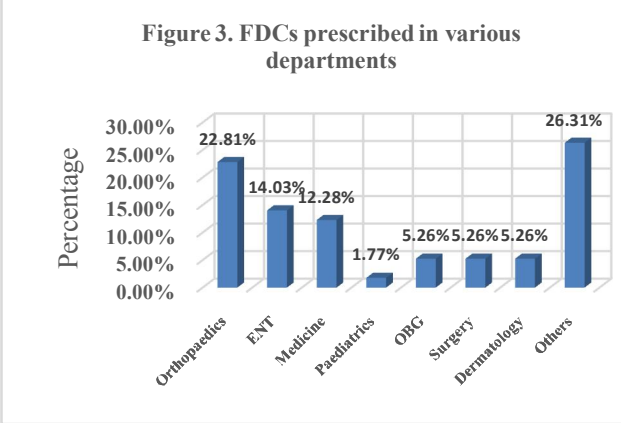
From figure 1, out of 114 FDCs prescribed, 79% were found to be rational and 21% were found to be irrational.



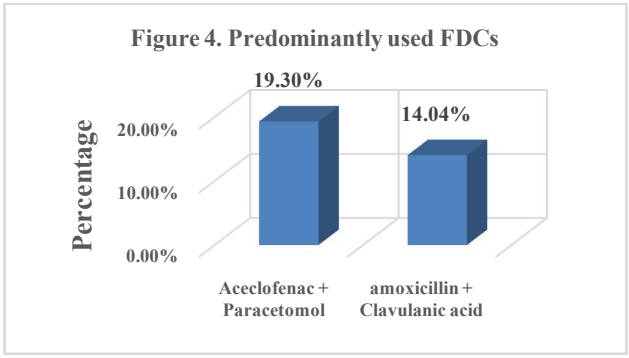
From figure 2, it is clear that females were prescribed 52.63% of total FDCs.



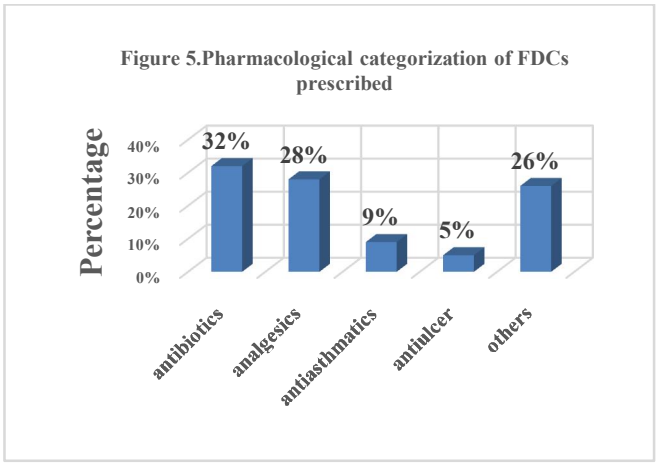
From Figure 3, the FDCs were maximum from the department of orthopaedics (22.81%), followed by ENT (14.03%) and medicine (12.28%).



From Figure 4, the most commonly prescribed FDCs were aceclofenac with paracetomol (19.30%) and amoxicillin with clavulanic acid (14.04%).



From Figure 5, the antibiotics FDCs were predominant with 32% followed by 28% with analgesics.



Discussion:

The study evaluated the prescribing trend of FDCs during a tertiary care hospital. Irrational FDCs is a problem worldwide. At Present, India's exact data is not known. Hence, this study was done to see the details of prescribing FDCs in a tertiary care hospital. The study showed that majority of prescribed FDC's were rational FDCs. Approximately; seventy nine percent of the FDCs were rational as they fulfilled

the WHO criteria. The most commonly used FDCs were aceclofenac plus paracetomol and amoxicillin plus clavulanic acid. The FDCs were maximum from the department of orthopaedics (22.81%), followed by ENT (14.03%) and medicine (12.28%). The antibiotics FDCs were predominant with 32% followed by 28% with analgesics. Females were prescribed 52.63% of total FDCs.

Twenty one percent FDCs were either pharmacologically incompatible or their pharmacokinetic parameters did not match or their APIs interacted with each other or the combination produced increase in adverse reactions. They didn't fulfil the WHO criteria for rationality. In this study few of the irrational FDCs are as follows. Nimesulide + Diclofenac combination is having same mechanism of action and is highly irrational. Combining two NSAIDs may increase the side effects of both the NSAIDs. There is little documentary evidence that a preparation containing more than one analgesic is more effective than a single ingredient preparation [13.] Enalapril + Losartan - Combining two drugs affecting the same pathway is irrational; it doesn't add to efficacy [14.] Amoxycillin + Cloxacillin- Amoxycillin is inactive against staphylococcus, as most strains produce ß-lactamase and cloxacillin is not so active against streptococci. For any given infection, one of the components is useless but adds to cost and adverse effect. Since amount of each drug is halved, efficacy is reduced and chances of selecting resistant strains is increased [15.] In Domperidone + Esomeprazole combination, the role of prokinetic agent domperidone isn't clear as peptic ulceration disease isn't always related to nausea and vomiting [15.]

According to similar study by Rayasam SP et al, majority of FDC were found to be irrational[3.] But in this study, we found the majority of FDC to be rational. In another similar study by Balasubramaniam R et al, majority of FDC were found to be rational [16.] In this study also, we found the majority of FDC to be rational. In another study by N. KASTURY et al, majority of FDC were found to be irrational [3.] But in this study, we found the majority of FDC to be rational [12.]

Health care professionals should keep themselves updated about irrational drugs and banned drugs by the DCGI [17.] There's also a requirement for sensitization of the under graduate and post graduate students about the rational FDCs. The pharmacological basis of combining each ingredient in the formulation should be taught. Selection of P drugs, rational drug

use, use of rational drug combinations and ethical laboratory practices should be inculcated within the student's curriculum during their clinical training [18.] Limitation of this study is no adverse effects were identifiable during the analysis due to irrational FDCs from the Pharmacy prescription copy as it was a retrospective study.

Conclusion:

The results of this study clearly demonstrate that majority of FDCs dispensed in the pharmacy were found to be rationale in accordance with WHO seven-point criteria. However still irrational FDC's are still prescribed. All physicians and students should be trained about how to evaluate a fixed dose combination using WHO seven-point criteria to minimize the chances of prescribing an irrational FDC.

References:

1. WHO drug information volume 17 [internet]. Geneva: WHO; 2003. Available at: http://apps.who.int/medicinedocs/en/d/Js4955e/7.html.
2. Baiardini. I, Guerra. L, Pasquali, M, Bonadonna. P, Pasalaqua. G, Canonica. G.W. Quality of Life in Patients with Adverse Reactions to Drugs: Preliminary Results from a New Questionnaire. J Allergy Clin Immunol 2004; 113(2): s70.
3. Rayasam SP et al. The irrational fixed dose combinations in the Indian drug market: an evaluation of prescribing pattern using WHO guidelines Int J Basic Clin Pharmacol. 2013 Aug; 2(4):452-457.
4. WHO Model List of Essential Medicines 20th List, accessed 5th march 2021, <https://www.who.int/medicines/publications/essentialmedicines/20th_EML2017.pdf?ua=1>.
5. National List of Essential Medicines 2015, accessed 5th march 2021, <https://www.nhp.gov.in/NHPfiles/NLEM%2C%202015.pdf>.
6. Neetesh K Jain et al. Rationality of fixed dose combinations: an indian scenario The Pharma Research Year: 2009, Vol: 01.
7. Sreedhar D, Manthan DJ, Virendra SL, Mohapatra S, Ganguly R and Udupa N. Fixed dose combinations: Rational or irrational. Current Science 2008; 95(5): 581-583.
8. Sen A. Indian Market's Fixation with Fixed Dose Combinations. Rational Drug Bulletin. 2002, 12 (1): 1-2.

9. ICH E4 Dose response information to support drug registration (CPMP/ICH/378/95).

10. Panda J, Tiwari P, Uppal R, Evaluation of the rationality of some FDCs: Focus on antihypertensive drugs, 'Indian J Pharm Sci', 68, 5, 2006, 647-648.

11. Kasturi N, Singh S, Ansari KU. An audit of prescriptions for rational use of fixed-dose drug combinations. Indian J Pharmacol. 1999; 31: 367-69.

12. Tripathi KD. Essentials of medical Pharmacology. 6th edition. New Delhi; Jaypee brothers Medical Publishers (P) Ltd, 2008.

13. Gautam C S, Aditya S. Irrational drug combinations: Need to sensitize undergraduates. Indian J Pharmacol 2006; 38:169-70

14. Dhaneria SP. Rational and Irrational Drug Combinations. Drug Bulletin 2010 April; volume 35(2): 1-15.

15. Balasubramaniam R et al. A Study on Evaluation of Rationality of Fixed Dose Combinations. American Journal of PharmTech Research 2013.

16. Hindoliya M, Sharma PK, Dhaneria SP. Prescribing Trends of Fixed Dose Combinations in Teaching and Non Teaching Hospitals of Ujjain District. Journal of Pharmacy Research 2012; Volume 5(7): 3503-3505.

17. Gautam CS, Aditya S. Irrational drug combinations: Need to sensitize undergraduates. Indian J Pharmacol 2006; 38:169-70.

Annexure

Data collection form

Serial number:

Prescription number:

Department:

Sex of Patient:

Prescribing department:

Composition of FDC:

Pharmacological group:

WHO criteria score:

Rational/Irrational/Absurd/Banned:

WHO CRITERIA	Yes	No	Score
1. APIs with complementary mechanism of action.			
2. Decrease the occurrence of resistance for antimicrobial agents (AMA).			
3. Increase the efficacy of the combination.			
4. Decrease the occurrence of adverse drug reactions or toxicity.			
5. Increase the compliance of the drug therapy with decrease pill burden.			
6. Decrease the total cost of the therapy and			
7. Dose of each API should be appropriate for defining or larger groups of populations.			
Total Score			

Date received: 08/01/2021 **Date revised:** 02/02/2021 **Date accepted:** 05/03/2021

IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 4 Ser.3 (April. 2021), PP 51-55
www.iosrjournals.org

Sero surveillance of Scrub typhus in a tertiary care hospital at Madurai, Tamilnadu, South India.

Dr. Jhansi Charles M.D., *Professor and Head, Dept. of Microbiology*
Dr. Ramesh M.D., *Professor of Microbiology,*
Dr. Rajendran ,*Associate Professor of Microbiology*
Dr. Vithiya, *Associate Professor of Microbiology*
Velammal Medical College Hospital and Research Institute, Madurai, Tamilnadu

Abstract
Introduction: *Scrub typhus is a rickettsial infection which is caused by Orientia tsutsugamushi and transmitted by the bite of the chigger of a mite. Delay in diagnosis can be fatal otherwise the treatment is simple, doxycycline being the drug of choice. Indirect immunoflurescence is considered gold standard but it is not used in India as it is costly and also not available. There is need for rapid, economic and simple test for the diagnosis of scrub typhus. This study was taken up to study the seroprevalence of scrub typhus in Southern districts of Tamilnadu and to compare two commonly used serological methods; rapid test and IgM ELISA.* ***Materials and methods:*** *This is a prospective study in which 842 serum samples from clinically suspected cases collected over a period of 12 months and they were processed for the detection of IgM antibodies for scrub typhus by ELISA and Rapid test. Samples were also tested for leptospirosis and dengue fever which are the other common causes of fever prevalent in this region.* ***Results:*** *Total number of samples processed was 842 out of which 477 were males and 365 were females. Among the 842 samples 76 were sero positives. Positivity was higher in males in the age group of patients between 41 and 60 yrs of age. There was 100% correlation between ELISA and rapid method. There is a peak incidence during the months November and December. Fever was the most common manifestation and eschar was seen in 12 cases and no mortality reported.* ***Conclusion:*** *Scrub typhus is on the rise in southern part of Tamilnadu and it is considered to be one of the endemic diseases coming under pyrexia of unknown origin. The geographical distribution is not confined to any particular area. It is widespread in almost all districts around Madurai. The peak incidence is during post monsoon in the months of November and December. Since IgM ELISA and Rapid immunochromatography tests show 100% correlation, rapid test can be used for quick diagnosis of Scub typhus.*
Keywords: *Elisa-enzyme linked immunosorbent assay, rapid test, scrub typhus*

Date of Submission: 22-03-2021 Date of Acceptance: 06-04-2021

I. Introduction

Scrub typhus is an acute febrile illness prevalent all over the world .Nowadays, cases are reported in many states of India including Tamilnadu. But diagnosis is still lacking in many states .Scrub typhus is a rickettsial infection which is caused by *Orientia tsutsugamushi* and transmitted by some species of trombiculid mites ("chiggers", particularly a *Leptotrombidium deliense*).. The bite of this mite leaves a characteristic black eschar that is useful to the doctor for making the diagnosis[1]. The observation of the eschar is often missed and other signs and symptoms of the disease are not characteristic thus posing the problem of delayed diagnosis by the clinician. Failure of timely diagnosis leads to significant morbidity and mortality . With timely diagnosis treatment is easy, affordable and often successful with dramatic response to antimicrobials. As antimicrobials effective for rickettsial diseases are usually not included in empirical therapy of nonspecific febrile illnesses, treatment of rickettsial diseases is not provided unless they are suspected. Several tests are available with their own advantages and limitations[2]. Among all the serological tests available, Weil-Felix test is the cheapest and easily available, but this is unreliable. Indirect immunofluorescence test, the gold standard is beyond affordability specially in poor countries and needs expertise for interpretation as the choice of cut-off values for positive diagnosis is influenced by several factors such as antibody kinetics, geography, negative seroconversion and seasonality[3].

IgM ELISA has been evaluated and found to be quite satisfactory, but samples need to be pooled for ELISA which can lead to delayed diagnosis thus influencing the overall outcome. Rapid tests have come into vogue which are economic, rapid and single tests can be carried out.

This study was carried out to know the seroprevalence of scrub typhus in clinically suspected patients and to compare a rapid test which is simple, and economic test with IgM ELISA for the diagnosis of scrub typhus.

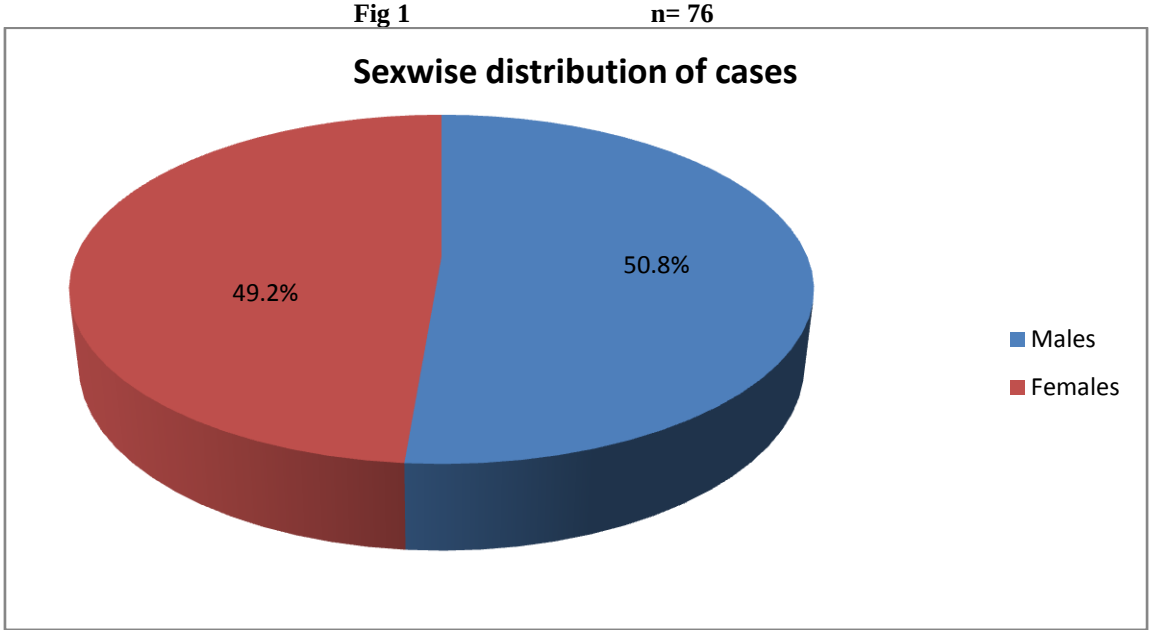
II. Material and Methods

This is a cross-sectional study carried out on serum samples from clinically suspected cases received over a period of 12 months extending from January 2018 to January 2019. The samples were collected from the cases of Pyrexia of unknown origin admitted in Velammal Medical college hospital in Madurai, Tamilnadu.The samples were screened for the presence of IgM antibodies to scrub typhus by the rapid test followed by confirming the presence of IgM antibodies by ELISA test. Samples were also tested for dengue fever, typhoid fever, leptospirosis, tuberculosis and malaria which are the other causes of pyrexia of unknown origin. Detection of IgM antibodies by ELISA- was done using Scrub typhus Detect™ IgM ELISA InBios kit which is a system for the detection of IgM antibodies in human serum to OT derived recombinant antigen. This test is to aid in the detection of human exposure to Orientia tsutsugamushi species. Detection of IgM antibodies by Rapid method was done using SD Biosensor Standard Q Tsutsugamushi, one-step rapid immunochromatographic assay for qualitative detection of IgM/ IgG antibodies to Orientia tsutsugamushi in human serum. Clinical features of the patients were retrieved from hospital medical records. Statistical analysis was done using SPSS 11.5 version. *P*-value was calculated using Chi-square test.

III. Results

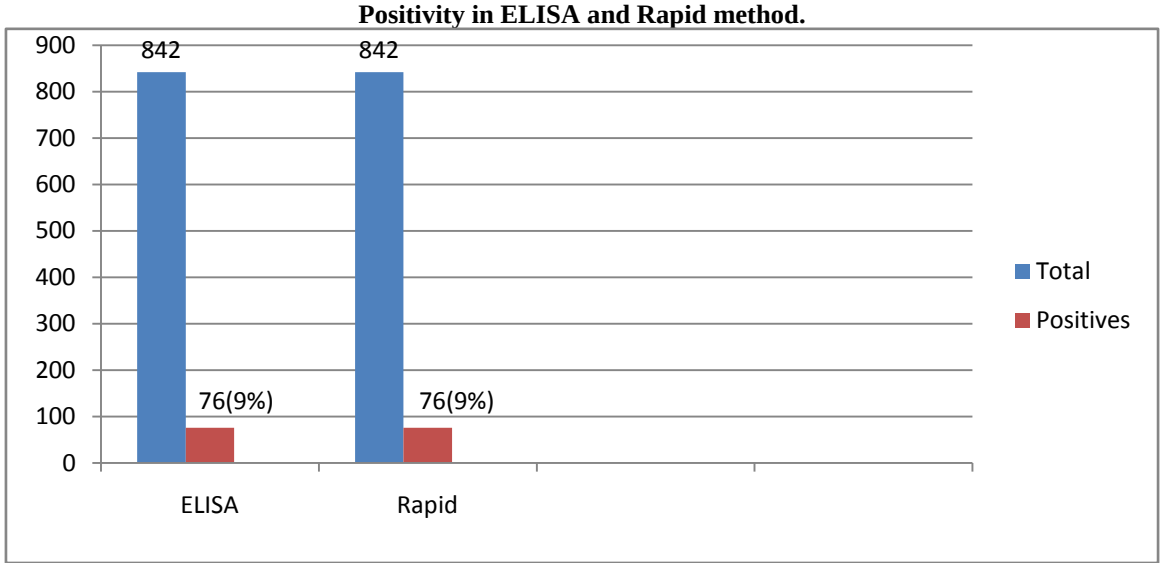
Out of the 842 samples tested, 428 were samples from males(50.8%) and 414 (49.2%) were from females and this is shown in Figure1. It is shown that both sexes were affected almost equally with a slight predominance by the males.

Fig 1 **n= 76**



Among the 842 samples tested, 76 were positive by both ELISA and Rapid test. This is given in Figure 2. It is shown that 9% of the samples were positive for IgM antibodies to Orientia tsutsugamushi by both Rapid test which was used as a screening test and ELISA which was used as a confirmatory test.

Fig 2
Positivity in ELISA and Rapid method.



It was observed in the study that 8 males and females were positive in the age group 1-20 yrs.(10.5%), 8 males(10.5%) and 10 females(13.2%) in the age group 21-40 yrs,18 males(23.6%) and 12 females(15.7%) in the age group 41-60 yrs and 5 males (6.6%)and 7 females(9.2%) were positive for IgM antibodies to Orientia tsutsugamushi. This is given in table no.1

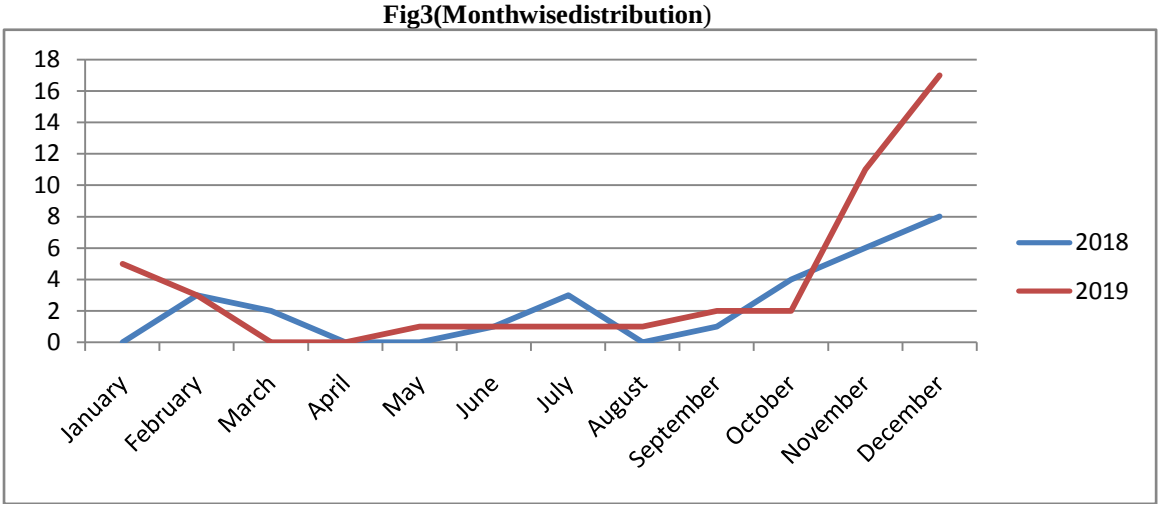
Table 1
Agewise distribution

Age group	**Males (%)**	**Females(%)**
1-20 yrs.	8(10.5%)	8(10.5%)
21-40 yrs	8(10.5%	10(13.2%)
41-60 yrs	**18(23.6%)**	**12(15.7%)**
Above 60 yrs	5(6.6%)	7(9.2%)

It is observed from the table that both males and females in the age group 41-60 yrs. were more commonly involved and above 60 yrs. less commonly involved . Males predominated females in the age group 41-60 yrs and females predominated males in the age group more than 60 yrs . In the age group 1-20 yrs. both the sexes were affected equally.

The cases were more common in the months November and December. There were 109 PUO cases during these months in 2018 and 14 (6+8)were positive for scrub typhus(12.8%) . There were 222 PUO cases during these months in 2019 and 28 (11+17)were positive for scrub typhus(12.8%). There were no cases reported in April in both the years. This is given in fig.3

Fig3(Monthwisedistribution)



It is observed that in both the years 12.8% of the PUO Cases were Scrub typhus.

In this study, 42 of the positive cases were admitted with fever, myalgia and headache as common symptoms, 12 of them with fever and eschar formation, 10 of them with fever and vomiting and 12 of them with fever and rashes. Mortality was nil during the study period. This is given in the following table no.2

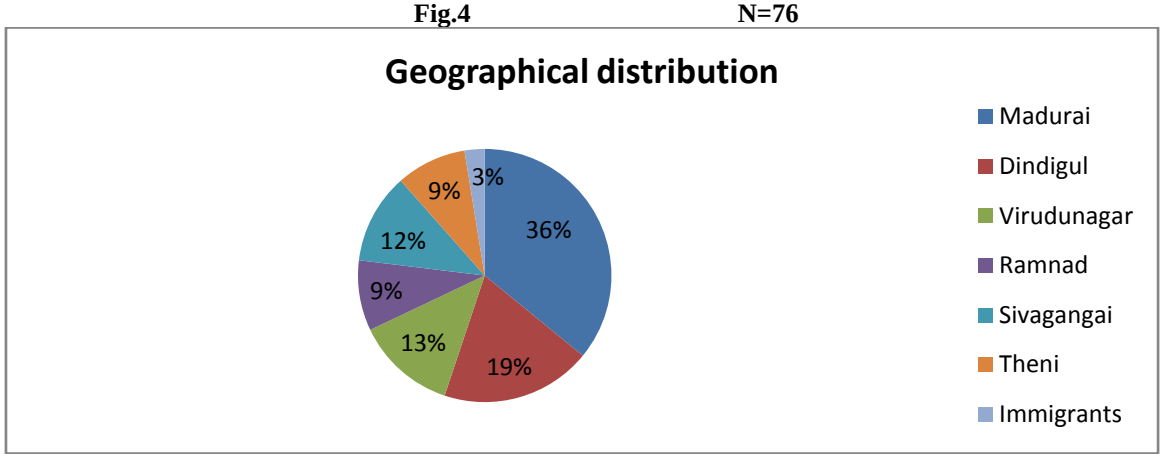
Table 2
Symptomwise distribution n=76

Symptoms	**No.(%)**
Fever, myalgia, headache	42(55.3%)
Fever and Eschar formation	12(15.7%)
Fever and vomitting	10(13.2%)
Fever with rashes	12(15.7%)

It was observed that all patients had invariably fever as the common symptom. Eschar was seen in 12 cases.

Among the 76 positive cases admitted in the hospital,28 cases were from within Madurai district ,48 were from neighbouring districts like Dindigul(15), Virudunagar(10), Sivagangai(8), Ramnad(7), Theni(6) and 2 were immigrants from Andhrapradesh.

Fig.4 N=76



From the figure, it is noted that more cases were in Madurai district(36%) and Dindigul district(19%) which are more like urban areas. The remaining districts are still considered as rural areas. The infection seems to have spread from urban to rural area.

IV. Discussion:

Scrub typhus is prevalent in southern parts of India for sometime. There is an increase in the trend in the last 2 years. This study was focused to know the prevalance of infection in a tertiary care hospital situated in the southern part of Tamilnadu. In this study, 9% of the samples collected for the diagnosis of PUO showed antibodies to O.tsutsugamushi. In this study, it was observed that there is not much variation in the sexwise distribution of the infection, males showed only a slight increase in the incidence(50.8% males and 49.2% females). This is in accordance with the study by Abhay kumar, Amit Jog et al**(1**) who showed more or less the same incidence with a slight increase in the incidence of females whereas Jamil et al**(2)** showed an increase in the male incidence .Sex variation is mainly due to their occupation. Since the people in this study were mostly agriculturalists and both sexes go to fields equally,the incidence may be equal in both sexes.

The prevalence of scrub typhus varies from 0-8% to 60% in different countries **(3,4,5)**In a study from Thailand, the positivity for scrub typhus was 59.5% with highest prevalence in 40-49 (77.7%) year age group with no difference between the two sexes. In our study , the prevalence was 9% with highest prevalence in the age group 41-60 years with no sex differences which is almost similar to the Thailand study **(6).** Sarma *et al***.(7),** tested 150 samples from patients with fever of unknown origin of which 52 were found to be positive for OX K antibodies by Weil-Felix test..Gurung *et al.,* **(8)** tested 204 patients with fever of unknown origin of which 63 were confirmed positive of which 42 were males and 21 were females. In our study, among the 850 patients tested 76 were positive. Of these 76 positive patients, 39 were males and 37 were females. Highest seropositivity was observed in 41-60-years age group. Thus there appears to be high variation in the prevalence in various studies. This variation in the prevalence may be due to the variation in the sample size , and the type of tests done. In our study, the sample size was 850 and the tests done were the rapid test and ELISA Test.

Fever with myalgia was the most common presentation in our study which is similar to a hospital-based study in Taiwan and a study by Dass *et al.,* from the state of Meghalaya, India **(9)** Other presentations included vomiting (50%), headache (30%) and eschar formation (15.7%). No mortality was reported **.** Kammili et al **(10)** in their study proved that arthralgia, haemorrhagic manifestations and rash were common clinical symptoms. Boorugu etal **(11)** from Andhrapradesh proved that fever with myalgia , loose stools and dry cough were common in their studies. But none of these studies showed the presence of Eschar formation but our study had 15.7% cases with eschar formation. This may be due to the variability in the infecting serotype , high skin colour in Indian population and high rates of underdetection due to the painless and non itchy charecterestics of the eschar.Chauhan et al **(12**) proved that eschar formation was related to poor prognosis but in our study all cases with eschar recovered with no sequele.

Cases were more commonly seen during monsoons and post monsoons in our study. Similar study by Monika pathania et al **(13)** also showed that their study at sub himalayan region revealed that the cases were more during monsoons and post monsoons. This may be attributed to the increased occupational exposure due to harvesting leading to more people in the fields and for longer periods of the day in the rainy season.

Indirect Immunofluorescence assay (IFA) is a gold standard for diagnosis of scrub typhus but limited by the requirement of standard slides, paired sera etc. Weil-Felix test is widely used but lacks sensitivity and specificity . IgM ELISA and Rapid ICT have been reported to have good sensitivity and specificity. Evaluation of the SD Bioline ICT in Thailand patients in 2012 has shown that it is more sensitive than IFA with specificity as high as 98.4% in diagnosing acute phase samples. In our study a correlation of 100% between IgM ELISA and SD Bioline Tsutsugamushi rapid diagnostic test was reported similar to a study by Ramyasree et al (14) from Andhra who have shown 97% correlation.

V. Conclusion:

Since Scrub typhus is on the rise in Madurai district, it is necessary to investigate all Pyrexias of unknown origin by simple sensitive snd specific test having equivalence with IgM ELISA, ie.Immunochromatographic test. As ICT detects acute samples, early treatment will be possible.As cases were common in monsoon and post monsoon seasons, the people of both sexes working in the fields should be advised to protect them from the bite of mites during this period.

References:

[1]. Abhay kumar et al Scrub typhus in a tertiary care hospital in North India: Am J Med Hyg. 2016 Aug 3: 95(2):447-451

[2]. Jamil et al: Clinical manifestations and complications of sgrub typhus: A hospital based study from North eastern India :Journal of the association of physicians of India Dec.2014 vol.62 ISSN 0004-5772

[3]. Prabhakaran A, Lal S, Biswas S, Vinoth S, Asraf AS, Mittal V. Serological study of rickettsial diseases in human and rodent population in chittoor dist. (A.P.). J Commun Dis 2010;42:209-13.

[4]. Subbalaxmi MV, Chandra N, Teja VD, Lakshmi V, Rao MN, Raju YS. Scrub typhus-experience from a South Indian tertiary care hospital. BMC Infectious Diseases 2012 12(Suppl 1):p77

[5]. V, Gupta N, Bhattacharya D, Kumar K, Ichhpujani RL, Singh S, *et al.* Serological evidence of rickettsial infections in Delhi. Indian J Med Res 2012;135:538-41.

[6]. Wangrangsimakuli et al(2020)The estimated burden of scrub typhus in Thailand from national surveillance date(2003- 2018) PloS Negl Trop Dis 14(4) e 0008233.

[7]. Sharma A, Mahajan S, Gupta ML, Kanga A, Sharma V. Investigation of an outbreak of scrub typhus in the himalayan region of India. Jpn J Infect Dis 2005;58:208-10.

[8]. Gurung S, Pradhan J, Bhutia PY.Outbreak of scrub typhus in North Eastern Himalayan region-Sikkim: An emerging threat. Indian J Med Microbiol 2013;31:72-4.

[9]. Dass R, Deka NM, Guwarah GS, Barman H, Hoque R, Mili D, *et al.* Characteristics of pediatric scrub typhus during an outbreak in the North Eastern region of India: Peculiarities in clinical presentation, laboratory findings and complications. Indian J Pediatr 2011;78:1365-70.

[10]. Kammili N, Swathi A, Devara SM, Anuradha PR. Prevalence of scrub typhus among acute undifferentiated febrile illness cases provisionally diagnosed as Dengue fever. J Evol Med Dent Sci 2013;2:2661-64.

[11]. Boorugu H, Dinaker M, Roy ND, Jude JA. Reporting a case of scrub typhus from Andhra Pradesh. J Assoc Physicians India 2010;58:519.

[12]. Chauhan et al ;Eschar is associated with poor prognosisin Scrub typhus. Indian journal of medical research 2017; vol.145 issue 5 page no.693-696.

[13]. Monika pathania et al:Scrub typhus; overview of demographic variables, clinical profile,and diagnostic issues in the sub himalayan region of India and it comparison to other Indian and Asian studies- J.Family medicine Prim care.2019 March8(3);1189-1195.

[14]. Ramyasree etal; Seroprevalence of scrub typhus at a tertiary car hospital in Andhra pradesh; Indian J Med . Microbiol Jan- March 2015.

[15]. Kamarasu K, Malathi M, Rajagopal V, Subramani K, Jagadeeshramasamy D, Mathai E. Serological evidence for wide distribution of spotted fevers and typhus fever in Tamil Nadu. Indian J Med Res 2007;126:128-30.

[16]. Mathai E, Lloyd G, Cherian T, Abraham OC, Cherian AM. Serological evidence of the continued presence of human rickettsioses in southern India. Ann Trop Med Parasitol 2001;95:395-8.

[17]. Sundhindra BK, Vijaykumar S, Kutti AK, Tholpadi SR, Rajan AS, Mathai E, *et al.* Rickettsial spotted fever in Kerala. Natl Med J India 2004;17:51-2.

[18]. Vivekanandan M, Mani A, Priya YS, Singh AP, Jayakumar S, Purty S. Outbreak of scrub typhus in Pondicherry. J Assoc Physicians India 2010;58:24-8.

(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 4, Issue 5, Page No: 796-799
September-October 2021

IJMSCR

Jobs Syndrome – Hyper IgE Syndrome

P.Niranjan prabhakar[1*], C.Ramesh[2], V.Sriandaal[3]
[1]Senior Resident, [2]Associate Professor, [3]Assistant Professor
[1,2]Department of Respiratory Medicine, [3]Department of Community Medicine
Velammal Medical College Hospital & Research Institute, Madurai-625009 (TamilNadu) India

***Corresponding Author:**
P.Niranjan Prabhakar
Senior Resident, Department of Respiratory Medicine, Velammal Medical College Hospital & Research Institute, Madurai-625009 (TamilNadu) India

Type of Publication: Case Report
Conflicts of Interest: Nil

Abstract

Autosomal dominant hyper-IgE syndrome (AD-HIES), formerly known as Job syndrome, are mainly due to elevated serum IgE levels and recurrent skin infection. The common manifestation is anomalies of dentinogenesis. Diagnosis can be made by laboratory and radiological investigations. If identified early it can be treated. This patient presented to us and diagnosed as Job syndrome and now he is doing well in the follow up.

Keywords: NIL

INTRODUCTION

Autosomal dominant hyper-IgE syndrome (AD-HIES), formerly known as Job syndrome, is a condition that affects several body systems, particularly the immune system. Recurring pneumonia often results in the formation of air-filled cysts (pneumatoceles) in the lungs. Mutations in the STAT3 gene cause most cases of AD-HIES. A shortage of functional STAT3 blocks the maturation of T cells (specifically a subset known as Th17 cells) and other immune cells. Frequent skin infections and an inflammatory skin disorder called eczema are also very common in AD-HIES. Anomalies of dentinogenesis are possible manifestations. Decreased resorption of the roots of the deciduous teeth may result in prolonged retention of the deciduous teeth, preventing the appearance of definitive teeth. About 70% of the patients with Job syndrome have been reported to retain three or more primary teeth.

Case Report:

18-year-old boy, reported to us with increased cough and shortness of breath for the past 1 month, which was present since childhood. On examination bilateral rhonchi and crepts were observed. Chest x ray showed multiple thick-walled cavities. CT showed multiple lung abscesses. Patient provided us with a history of recurrent skin infections in childhood.

Diagnosis:

Immunoglobulin levels were checked and total IgE levels was found to be 57000, Eosinophils 24%.

Management:

Patient was treated with antihistaminic and intravenous steroids and antibiotics after which he drastically improved.

Clinical Implication:

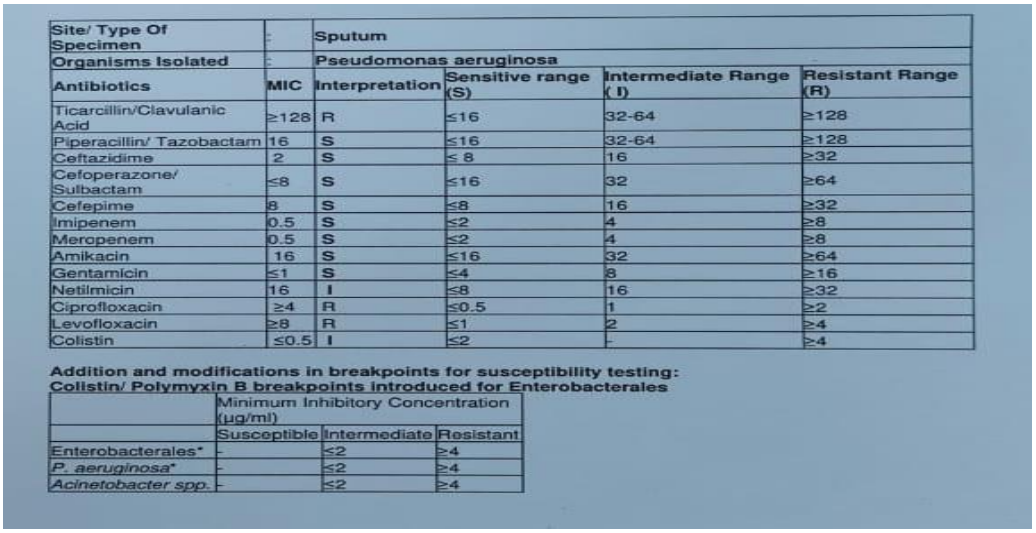
Job Syndrome (Hyper-IgE syndrome) is a rare, primary immunodeficiency distinguished by the

clinical triad of atopic dermatitis, recurrent skin staphylococcal infections, and recurrent pulmonary infections. Thanks to the antibiotics, and if the diagnosis is made early, patient survival can be increased. Bone-marrow transplantation has been associated with mixed results in these patients. Although AD-HIES is associated with high morbidity and mortality, advances in medical care, close monitoring and patient compliance have led to improved prognosis, with survival up to 50 years or more.

References

1. Yong PFK, Freeman AF, Engelhardt KR, Holland S, Puck JM, Grimbacher B. An update on the hyper-IgE syndromes. Arthritis Res Ther. 2012;14(6):1–10.
2. Ghosh S, Bhunia D, Agarwal M, Rudra O, Bi swas S. Systematized linear porokeratosis: A rare clinical entity. Indian J Paediatr Dermatology. 2017;18(1):71.
3. Woellner C, Michael Gertz E, Schäffer AA, Lagos M, PerroM, Glocker E-O, et al. Mutations in the signal transducer and activator of transcription 3 (STAT3) and diagnostic guidelines for the Hyper-IgE Syndrome. J Allergy Clin Immunol[Internet]. 2010;125(2):424–32. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2878129/pdf/nihms180148.pdf.

Figure 1: Sputum gram stain and culture sensitivity showing growth of Pseudomonas



Site/ Type Of Specimen	:	Sputum			
Organisms Isolated	:	Pseudomonas aeruginosa			
Antibiotics	MIC	Interpretation	Sensitive range (S)	Intermediate Range (I)	Resistant Range (R)
Ticarcillin/Clavulanic Acid	≥128	R	≤16	32-64	≥128
Piperacillin/ Tazobactam	16	S	≤16	32-64	≥128
Ceftazidime	2	S	≤ 8	16	≥32
Cefoperazone/ Sulbactam	≤8	S	≤16	32	≥64
Cefepime	8	S	≤8	16	≥32
Imipenem	0.5	S	≤2	4	≥8
Meropenem	0.5	S	≤2	4	≥8
Amikacin	16	S	≤16	32	≥64
Gentamicin	≤1	S	≤4	8	≥16
Netilmicin	16	I	≤8	16	≥32
Ciprofloxacin	≥4	R	≤0.5	1	≥2
Levofloxacin	≥8	R	≤1	2	≥4
Colistin	≤0.5	I	≤2	-	≥4

Addition and modifications in breakpoints for susceptibility testing:
Colistin/ Polymyxin B breakpoints introduced for Enterobacterales

	Minimum Inhibitory Concentration (µg/ml)		
	Susceptible	Intermediate	Resistant
Enterobacterales*	-	≤2	≥4
*P. aeruginosa**	-	≤2	≥4
Acinetobacter spp.	-	≤2	≥4

Volume 4, Issue 5; September-October 2021; Page No 796-799
© 2021 IJMSCR. All Rights Reserved

Figure 2: Chest X-ray PA view showing multiple thick walled cavities

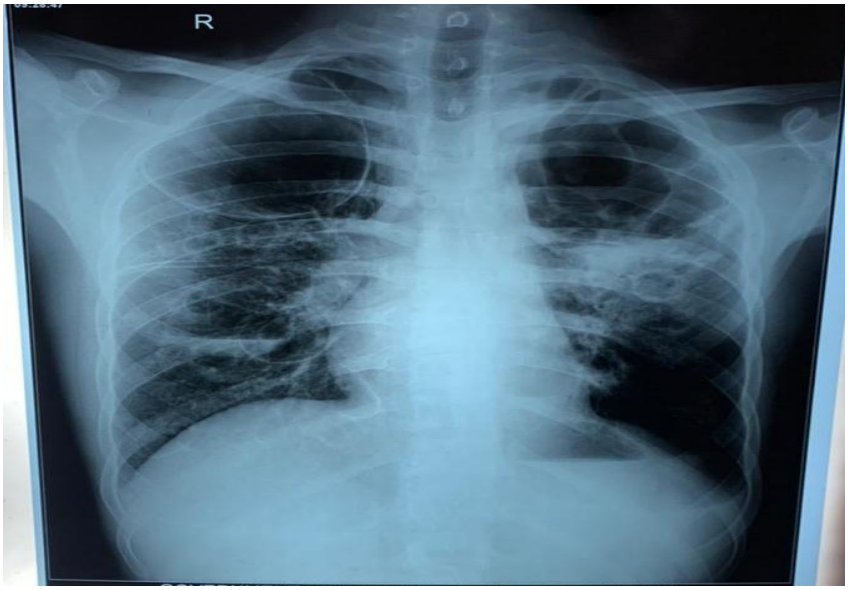


Figure 3: X-ray of teeth revealing retained primary dentitions

Volume 4, Issue 5; September-October 2021; Page No 796-799
© 2021 IJMSCR. All Rights Reserved

Figure 4: High resolution CT thorax showing multiple lung abscesses

Volume 4, Issue 5; September-October 2021; Page No 796-799

© 2021 IJMSCR. All Rights Reserved

ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/355078837

Prevalence and Risk Factors of Hypertension, Overweight and Obesity among School Children in Madurai, Tamil Nadu: A Cross Sectional Study

Article *in* Journal of Krishna Institute of Medical Sciences University · July 2021

CITATIONS
0

READS
238

4 authors, including:

J. Vijay Anto
Velammal Medical College Hospital & Research Institute
16 PUBLICATIONS **1** CITATION

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Reliability Theory View project

All content following this page was uploaded by J. Vijay Anto on 05 October 2021.

The user has requested enhancement of the downloaded file.

ORIGINAL ARTICLE

Prevalence and Risk Factors of Hypertension, Overweight and Obesity among School Children in Madurai, Tamil Nadu: A Cross Sectional Study

Trupti Bodhare[1], Samir Bele[1], Hareini Murugvel[2], J. Vijay Anto[1]*

[1]Department of Community Medicine, Velammal Medical College Hospital & Research Institute, Madurai-625009 (Tamil Nadu) India,[2]Department of Radiation Oncology, Sri Ramachandra Institute of Higher Education and Research, Porur-600116 (Tamil Nadu) India

Abstract:

Background: Most of the Non-communicable Diseases (NCDs) including obesity and hypertension originate in early life, and manifest in adulthood leading to increased morbidity and mortality. Its identification among children has remained neglected area in India. *Aim and Objectives:* To estimate the prevalence of overweight, obesity and hypertension among school children and various risk factors among them to propose sustainable intervention. *Material and Methods:* A cross-sectional study was conducted among 544 school children between the ages of 10 to 14 years in Madurai. A semi-structured questionnaire was used to evaluate the social-demographic characteristics, diet history, and other behavioral risk factors. Anthropometric measurements were recorded using standard equipment and methodology. *Results:* The mean age of the respondents was 11.81 ± 0.041 years and 343 were male and 201 were female students. A total of 49(9%) children were overweight and 5(0.91%) were obese. Stage 1 hypertension was observed among 74(13.60%) children and 15(2.75%) children were having stage 2 hypertension. Children residing in urban area (p=0.001, OR=3.065), belonging to upper socioeconomic class (p=0.001, OR=14.182) having higher systolic (p=0.054, OR=1.022), diastolic blood pressure (p=0.010, OR=1.042), and watching TV>2 hours (p=0.000, OR=4.609) were significantly associated with overweight/obesity. Higher Body Mass Index (BMI) (p=0.001, OR= 1.113), consumption of snack and junk foods (p=0. 0.011, OR =1.255) and watching TV more than 2 hours (p=0.003, OR =1.870) were significant predictors for hypertension. *Conclusion:* The high prevalence of hypertension and its association with overweight/obesity and associated risk factors warrants immediate attention. Regular screening, care of children for NCDs and early identification of its risk factors followed by health education to make them adopt healthy lifestyle is the need of the hour.

Keywords: Overweight, Obesity, Hypertension, Children, Risk Factors

Introduction:

The substantial burden of Non-Communicable Diseases (NCDs), its rising trend, associated high mortality, disability coupled with catastrophic health expenditure warrants immediate attention to design cost effective preventive strategies. Modernization of lifestyle leads to adoption of harmful practices like tobacco use, unhealthy diet, and physical inactivity, resulting in overweight/obesity, raised blood sugar, and raised blood pressure which are major determinants of NCDs [1].

It is an established fact that most of the NCDs originate in early life, progress over time, and manifest in adulthood. The complex interaction between genetics, lifestyle, and environmental factors are attributed to this outcome. Raised

blood pressure in children and adolescent would probably continue in the same track as adults leading to increased cardiovascular morbidity and mortality. Several epidemiological studies have demonstrated this association emphasizing the implementation of prevention strategies in childhood [2]. The risk of adult obesity increases manifold if the obesity is present during childhood [3-4]. Hypertension is one of the major risk factors associated with obesity among children and recent estimates showed an alarming rise in the prevalence of both the diseases [5-6].

Primordial prevention is prevention of the emergence or development of risk factors and has gained significant consideration in the recent years for the prevention of NCDs. The mainstay of primordial prevention lies in health education encouraging people to adopt healthy lifestyles and disown the harmful lifestyle practices especially among child population. Thus, the foundation of lifelong health can be built in childhood through sustained interventions and it is the most cost-effective way to delay the incidence of NCD risk factors and outcomes [7]. There is an urgent need to identify the prevalence of NCDs among children, their lifestyle practices and other risk factors in order to develop and implement a sustainable intervention. Promoting a healthy lifestyle is crucial to halt the rise in overweight/ obesity, hypertension and other NCDs in India.

The present study aimed to estimate the prevalence of hypertension and obesity among school children, its association and the role of various lifestyles and behavioral risk factors in order to educate the children for prevention of NCDs.

Materials and Methods:

A cross-sectional descriptive study was conducted among 544 school children between the age of 10 to 14 years at Velammal Vidyalaya, Madurai, Tamil Nadu selected through purposive sampling. The study was approved by Institutional Ethics Committee. The sample size was calculated based on the approximately 6% the prevalence of hypertension as reported by the study done in similar age group. Considering the level of confidence 95% with precision of 0.02 the estimated sample size was 542.

A written permission was obtained from the Principal of Velammal Vidyalaya. The purpose of the study and informed consent procedure were explained to all students in-detail and they were given informed consent form along with participant information sheet for obtaining informed consent from the parents and written consent was obtained for the children in the presence of class teacher at the time of data collection.

A semi-structured questionnaire was used which consisted of the socio-demographic characteristics, diet history, behavioral risk factors and physical activity related information.

Anthropometric measurements were recorded using standard equipment and methodology. Body Mass Index (BMI) estimation was done by measuring height in an upright position using stadiometer and weight was measured using a standard weighing scale. The waist circumference was measured as the smallest girth between the costal margin and the iliac crest and the Hip circumference as the widest girth.

Overweight and obesity were defined by using the appropriate BMI cutoff values for age and sex provided by the World Health Organization.

Blood pressure was recorded in sitting position in the right arm by auscultatory method. The first and fifth Korotkoff sounds were used for systolic and diastolic blood pressure. The child was considered to be hypertensive if the SBP and/or DBP that are greater than or equal to the 95th percentile for sex, age, and height on three occasions.

The data was entered an excel sheet and analyzed using R Programming. The results were expressed in percentages. The prevalence rates of hypertension and obesity was estimated according to the various categories like age, sex, socioeconomic status, etc. Chi-square test and t test were used appropriately to study the association of hypertension, obesity and its association with various lifestyle related risk factors. Ordinal logistic regression model was used to assess the most predominant risk factors for hypertension and obesity.

Results:

The socio-demographic, anthropometric characteristics and hemodynamic parameters of the participants are shown in Table 1. The mean age of the participant was 11.81 ± 0.041 years and 280

Table 1: Socio-demographic, Anthropometric Characteristics and Hemodynamic Parameters of the Participants

Demographic variables	Male (n=343)	Female (n=201)	Total	*p* value
Age	11.80 ± 0.05	11.81 ± 0.07	11.81 ± 0.041	0.914
Socio-economic status n (%)				
Upper lower	4 (0.7)	3 (0.6)	7 (1.3)	0.873
Lower middle	41 (7.5)	26 (4.8)	67 (12.3)	
Upper middle	124 (22.8)	66 (12.1)	190 (34.9)	
Upper	174 (32.0)	106 (19.5)	280 (51.5)	
Height	146.91 ± 0.50	147.90 ± 8.59	147.27 ± 0.387	0.215
Weight	40.64 ± 0.54	41.10 ± 0.71	40.81 ± 0.430	0.607
BMI	18.69 ± 0.19	18.69 ± 0.26	18.69 ± 0.158	0.978
Waist Circumference	68.94 ± 0.55	68.97 ± 0.68	68.95 ± 0.427	0.979
Hip	78.17 ± 0.55	77.42 ± 0.76	77.89 ± 0.443	0.414
BP-Systolic	110.31 ± 0.56	109.22 ± 0.83	109.91 ± 0.470	0.263
BP-Diastolic	71.90 ± 0.45	71.83 ± 0.53	71.87 ± 0.353	0.930

Values expressed in Mean ± SEM

(51.5%) belonged to upper socioeconomic class. The mean BMI was 18.69 ± 0.158. The mean systolic blood pressure of the participant was 109.91 ± 0.470 mmHg and mean diastolic blood pressure was 71.87 ± 0.353 mmHg. A marginal difference was observed in the context of age, height, weight, BMI, waist circumference and waist hip ratio among both the groups. Systolic and diastolic blood pressures were marginally higher among boys as compared with girls. There was no statistically significant differences observed in the context of gender and socio-demographic, anthropometric characteristics and hemodynamic parameters of the participants.

Table 2 presents the prevalence of obesity and hypertension. Of the total 544 children, 49(9%) children were overweight and 5(0.91%) were obese. Stage 1 hypertension was observed among 74(13.60%) children and 15(2.75) children were having stage 2 hypertension. Pre- hypertension was observed among 60(11.02%) of the children.

Table 3 shows the factors affecting BMI using ordinal logistic regression model. The relationship between BMI (Ordinal scale) and other factors such as gender, age, location, socio-economic status, family history of non-communicable diseases, fruits and vegetable servings per week, snacks and junk food, blood pressure, watching television and physical activity were analyzed through bivariate analysis. On the basis of bivariate analysis, we could identify some potential factors such as blood pressure, number of days of sports activity per week, location, socio-economic status and watching television for performing multivariate modeling.

Table 2: Prevalence of Obesity and Hypertension

Variables		Number of students	Percentage (%)
BMI	**Severe Thinness**	21	3.86
	Thinness	29	5.33
	Normal	440	80.88
	Overweight	49	9.00
	Obesity	5	0.91
Total		544	100
Blood Pressure	**Pre-hypertension**	60	11.02
	Normal	395	72.61
	Stage 1 HTN	74	13.60
	Stage 2 HTN	15	2.75
Total		544	100

Table 3: Factors that Affecting BMI using Ordinal Logistic Regression Model

Variables	OR	95% Confidence Level OR [LL-UL]	*p*-value
Location Urban (Reference category: Rural)	3.065	[1.556-6.031]	0.001**
Socio-economic status			
Upper	14.182	[2.915-68.993]	0.001**
Upper Middle	9.669	[1.972-47.417]	0.005**
Middle (Reference category: Lower Middle)	5.512	[1.062-28.617]	0.042*
Systolic Blood Pressure	1.022	[0.998-1.046]	0.054
Diastolic Blood Pressure	1.042	[1.01-1.076]	0.010**
Number of days of sports activity per week	1.055	[0.953-1.169]	0.297
Watch TV>2 hours (Reference category: Watch TV<=2 hours)	4.609	[2.726-7.791]	0.000**

**Significant at 0.05 level (2-tailed), **Significant at 0.01 level (2-tailed)Dependent Variable: BMI (Ordinal Scale)*
Nagelkerke R-square: 0.194

The location of the children is significant predictor for the level of BMI i.e., the odds of urban children to be high level of BMI is 3.065 times that of rural children (p=0.001). Similarly, the odds of upper class children to be high level of BMI is 14.182 times that of lower middle class children (p=0.001), the odds of upper middle class children to be high level of BMI is 9.669 times that of lower middle class children (p=0.005) and the odds of middle class children to be high level of BMI is 5.512 times that of lower middle class children (p=0.042). The blood pressure both systolic (p= 0.054)} and diastolic (p=0.01) were one of the significant predictors for higher BMI level i.e., one unit increase in systolic blood pressure, we expect 1.022 increases in the odds of being higher level of BMI. Similarly, one unit increase in diastolic blood pressure, we expect 1.042 increases in the odds of being higher level of BMI. Finally, the odds of children who watch TV more than 2 hours to be high level of BMI is 4.609 times that of children who watch TV less than 2 hours.

Table 4 shows the factors that affecting hypertension using ordinal logistic regression model. On the basis of bivariate analysis, we could identify some potential factors such as BMI, number of day's involved in sport activities per week, consumption of fruits and vegetables per week, snacks and junk food per week and watching TV for performing multivariate modeling.

Table 4: Factors that Affecting Hypertension using Ordinal Logistic Regression Model

Variables	OR	95% Confidence Level OR [LL-UL]	*p*-value
BMI	1.113	[1.055-1.173]	0.001**
Number of days of sports activity per week	0.991	[0.902-1.088]	0.846
Fruits and Vegetable serving per week	0.817	[0.505-1.322]	0.410
Snacks and junk food consumption per week	1.255	[0.450-0.126]	0.011**
Watch TV>2 hours (Reference category: Watch TV<=2 hours)	1.870	[1.232-2.835]	0.003**

**Significant at 0.05 level (2-tailed), **Significant at 0.01 level (2-tailed)Dependent Variable: Hypertension (Ordinal Scale) Nagelkerke R-square: 0.107*

BMI was found to be significant predictors (p=0.001, OR =1.113) for enhancing blood pressure level i.e., one unit increase in BMI, we expect 1.113 increases in the odds of being higher level of blood pressure. Consumption of snack and junk foods (p=0.011, OR =1.255) and watching TV more than 2 hours (p=0.003, OR =1.870) were also significant predictors for the hypertension. However, no significant association was observed between consumption of fruits and vegetables per week and number of days of sports activity per week with hypertension among children.

Discussion:

The current study aimed to estimate the burden of NCDs and its risk factors particularly in younger age group. The younger age group is critical since attitudes and behavioral patterns are formed during this period and it is crucial to identify, encourage and empower these children to make their own choice for adopting a healthy lifestyle and practices.

In our study, we observed 9% children were overweight and 0.91 were obese. A systematic review of childhood overweight and obesity in India conducted by Ranjani *et al*. reported wide variation among prevalence rate from 3 to 24.7% for overweight and obesity ranged from 1.5 to 14 % among adolescent population and a combined prevalence of 19.3 among children [8]. The variation may be attributed to various cut off points defining overweight/obesity, geographical location and socio-demographic differences. Our study contributed to the literature by reporting on the prevalence measured using WHO cut off values. Similarly, in our studied sample 11.02% were pre-hypertensive and 16.35% were hypertensive. A systematic review and meta-analysis conducted by Daniel reported a range of 2% to 20.5%, with a pooled estimate of 7.6% prevalence among adolescents in India [9]. The possible reason for differences in the estimation might be due to differences in the number of blood pressure

readings by various researchers, geographical and socio-demographic variation among the studied population. A high prevalence 21.5% was observed by Sunder *et al*. in Chennai among urban school children similar to our study [10].

We evaluated several risk factors of hypertension, overweight and obesity using multivariate regression analysis. We observed the significant statistical association between BMI and both systolic and diastolic blood pressure values. The association between overweight, obesity and hypertension is well documented in several epidemiological studies and may be mediated in part by Sympathetic Nervous System (SNS) hyperactivity and act as risk factors for later coronary disease [11]. A school-based cross-sectional study was conducted by Mohan *et al*. in Ludhiana, Punjab showed that a higher BMI was significantly associated with increasing blood pressure values and a study conducted by Kaur among school children belonging in Delhi reported that children with more body weight had increased systolic and diastolic blood pressure. The positive association was observed between overweight and elevated blood pressure in a study conducted by Mani *et al*. among adolescent school students in Vellore district of Tamil Nadu. Our findings were consistent with the findings of these studies [12-14].

In our study, the children belonging to urban areas, upper socioeconomic class were more overweight and obese. Watching TV for more than 2 hours was one of the significant risk factors associated with both overweight/obesity and hypertension. Children consuming snacks and junk food frequently showed higher prevalence of hypertension. These findings ascertain the effect of socio-economic influence and unhealthy lifestyle practices contributing to the higher prevalence of overweight/obesity and hypertension and are consistent with the finding of the other studies [13-15].

Limitations:

The cross-sectional nature of this study and self-reporting of lifestyle activities restricts in establishing a causal relation between high blood pressure, overweight/obesity and lifestyle related risk factors. The purposive sampling technique owing to constrained resources limits the generalizability of the study findings.

Conclusion:

The current study showed high prevalence of hypertension, and its association with overweight/obesity. The children of affluent class having unhealthy dietary and lifestyle practices were having more prevalence of hypertension and overweight/obesity. A scalable model of screening and care of children for NCDs is warranted which can be implemented at school level including empowering children with the knowledge and life skills to make effective and sustainable behavior changes that address the underlying causes of disease and promote healthy lifestyle.

Acknowledgement:

We would like to acknowledge the ICMR STS, New Delhi, for granting funds for this study. We are thankful to the Principal of Velammal Vidyalaya for permitting us to conduct the study and the students for their participation in the study.

References

1. World Health Organization, Noncommunicable diseases country profiles 2018. World Health Organization. https://apps.who.int/iris/handle/10665/274512. [Last accessed 14.5.2021].
2. Yang L, Magnussen CG, Yang L, Bovet P, Xi B. Elevated blood pressure in childhood or adolescence and cardiovascular outcomes in adulthood: a systematic review. *Hypertension* 2020; 75(4):948-955.
3. Simmonds M, Llewellyn A, Owen CG, Woolacott N. Predicting adult obesity from childhood obesity: a systematic review and meta-analysis. *Obes Rev* 2016;17(2):95-107.
4. Javedan GA, Salehiniya H, Soheilipour F. Prevalence of obesity and overweight in preschool children in northwest of Tehran, Iran. *J Krishna Inst Med Sci Univ* 2016; 5(4): 58-63.
5. Orlando A, Cazzaniga E, Giussani M, Palestini P, Genovesi S. Hypertension in children: role of obesity, simple carbohydrates, and uric acid. *Front Public Health* 2018; 6:129.
6. Charan J, Buch N, Goyal JP, Kumar N, Parmar I, Shah VB. Prevalence of hypertension in school going children of Surat city, Western India. *J Cardiovasc Dis Res* 2011;2(4):228-232.
7. Chiolero A, Bovet P. Hypertension in children: from screening to primordial prevention. *Lancet Public Health* 2017;2(8): e346-e347.
8. Ranjani H, Mehreen TS, Pradeepa R, Anjana RM, Garg R, Anand K, *et al*. Epidemiology of childhood overweight & obesity in India: A systematic review. *Indian J Med Res* 2016;143(2):160.
9. Daniel RA, Haldar P, Prasad M, Kant S, Krishnan A, Gupta SK, *et al*. Prevalence of hypertension among adolescents (10-19 years) in India: A systematic review and meta-analysis of cross-sectional studies. *PloS One* 2020;15(10): e0239929.
10. Sundar JS, Adaikalam JM, Parameswari S, Valarmarthi S, Kalpana S, Shantharam D. Prevalence and determinants of hypertension among urban school children in the age group of 13- 17 years in Chennai, Tamil Nadu. *Epidemiol* 2011;3(3):130.
11. Sorof J, Daniels S. Obesity hypertension in children: a problem of epidemic proportions. *Hypertension* 2002;40(4):441-447.
12. Mohan B, Verma A, Singh K, Singh K, Sharma S, Bansal R, *et al*. Prevalence of sustained hypertension and obesity among urban and rural adolescents: a school-based, cross-sectional study in North India. *BMJ Open* 2019;9(9): e027134.
13. Kaur S, Sachdev HP, Dwivedi SN, Lakshmi R, Kapil U, Sareen N. Association of obesity with hypertension amongst school-age children belonging to lower income group and middle income group in national capital territory of Delhi. *Indian J Comm Med* 2013;38(3):175.
14. Mani G, Balaji SM. Profile of selected lifestyle disease risk factors among adolescent school students in an industrial area of Vellore District, Tamil Nadu. *J Krishna Inst Med Sci Univ* 2019; 8(4):76-88.
15. Tharkar S, Viswanathan V, Thomas O. Impact of socioeconomic status on prevalence of overweight and obesity among children and adolescents in urban India. *Open Obesity J* 2009; 1:9-14.

Author for Correspondence:
Dr. Trupti Bodhare, Department of Community Medicine, Velammal Medical College Hospital & Research Institute, Madurai-625009 Tamil Nadu
Email:drtruptib@gmail.com Cell: 9052408271

How to cite this article:
Bodhare T, Bele S, Murugvel H, Anto JV. Prevalence and Risk Factors of Hypertension, Overweight and Obesity among School Children in Madurai, Tamil Nadu: A Cross Sectional Study. *J Krishna Inst Med Sci Univ* 2021;10(3):74-81.

Submitted: *01-Mar-2021* ***Accepted:*** *29-May-2021* ***Published:*** *01-Jul-2021*

View publication stats

Predictive Accuracy of Procalcitonin in Diagnosing Bacteraemia in Adult Patients in a Tertiary Hospital in Madurai, India

Virgin Joena[1]

[1]Department of General Medicine, Velammal Medical College Hospital and Research Institute, Madurai, Tamil Nadu, India.

ABSTRACT

BACKGROUND

Bacteraemia is the presence of bacteria in the bloodstream that are alive and capable of reproducing. The incidence of bloodstream infections (BSI) either of the community-acquired origin or of hospital-acquired origin has dramatically increased. Identifying patients with high risk of bacteraemia in emergency department (ED) using predictive models is needed. The present study was conducted to evaluate the efficacy of procalcitonin as well as other biomarkers as diagnostic, predictive markers of bacteraemia in an adult patient population in India.

METHODS

A descriptive observational study was conducted at the ED of a tertiary care hospital in India. Fifteen years or older patients who were ready to give at least two samples of blood for blood culture were recruited. Data on demographic variables, predisposing conditions, clinical presentations, laboratory tests, and presumptive diagnosis was analysed using SPSS and P value of 0.05 was considered statistically significant. A logistic model was built using an iterative procedure which was later simplified into a coefficient-based scoring system.

RESULTS

Out of 78 patients, (66.67 %) from the emergency department and (33.33 %) from out-patient department (OPD) were enrolled. Among the study population, 40 (51.28 %) were with bacteraemia, and the remaining 38 (48.72 %) had no bacteraemia. There was no statistically significant difference in levels of procalcitonin, pulse rate, respiratory rate, systolic blood pressure, diastolic blood pressure, SPO2, total count, MCV, RDW, MPV, albumin, urea, creatinine between bacteraemia and no bacteraemia. (P value > 0.05). The mean procalcitonin was 33.02 ± 43.46.

CONCLUSIONS

Although, increased PCT levels can be useful as predictors of bacteremias in the emergency department, interpretation should be made carefully when deciding the prescription of antibiotics.

KEYWORDS

Procalcitonin, Bacteraemia, PCT levels

Corresponding Author:
Dr. Virgin Joena,
#437, LIG Colony,
Anna Nagar – 625016,
Madurai, Tamil Nadu, India.
E-mail: joenaxavier@gmail.com

DOI: 10.18410/jebmh/2021/323

How to Cite This Article:
Joena V. Predictive accuracy of procalcitonin in diagnosing bacteremia in adult patients in a tertiary hospital in Madurai, India. J Evid Based Med Healthc 2021;8(21):1711-1716. DOI: 10.18410/jebmh/2021/323

Submission 03-07-2020,
Peer Review 13-07-2020,
Acceptance 08-04-2021,
Published 24-05-2021.

Copyright © 2021 Virgin Joena et al. This is an open access article distributed under Creative Commons Attribution License [Attribution 4.0 International (CC BY 4.0)]

BACKGROUND

The presence of bacteria in the bloodstream that are alive and capable of reproducing is known as bacteraemia. The range of occurrence of bloodstream infections (BSI) either of the community-acquired origin or of hospital-acquired origin has dramatically increased. It is mainly due to an imbalance between the invading microorganisms and the host defence mechanisms. Bacteraemia causes a high mortality rate of 16 % of the world population and 21 % of the world global burden of the diseases.[1] Recent worldwide laboratory-based surveillance report said that an attributable mortality rate of 35 – 50 % from bacteraemia alone despite the emergence of newer antibiotics and improvement in supportive care.[2] With advancements in the medical field, even now, the morbidity and mortality in the rural population are under-reported in most of the developing countries including India.

Detection of bacteraemia is needed as quickly as possible.[3] The gold standard for bacteraemia is blood culture which takes between 24 - 48 hours, within which the patients can develop fatal septicaemia. Several protocols such as white blood cell counts and serum C-reactive protein (CRP), along with various biomarkers have been tested to determine the cause of bacteraemia so that it can be diagnosed at the earliest. Though, an ideal biomarker is missing.

Serum procalcitonin (PCT) is a 116-amino-acid peptide, and elevated levels of this peptide are strongly associated with systemic bacterial infections.[4] Serum PCT measurement relies on a quick and routine lab test that takes only 2 to 6 hours to be detected and confirm the presence of bacteremia.[5] Likewise, it's been reported that the extent of elevated PCT is firmly correlated with outcome in critically ill patients.

In this study, we intend to evaluate the efficacy of procalcitonin as well as other biomarkers as diagnostic, predictive markers of bacteraemia in an adult patient population in India.

METHODS

The following descriptive observational study was approved by the research and ethics committee of a tertiary hospital in India. Seventy-eight patients of both genders, suffering SIRS, sepsis, severe sepsis or septic shock according to the criteria established by the ACCP/SCCM Consensus Conference, were included in this study.[6] The sample size was calculated using convenience sampling for the feasibility of the study. Procalcitonin, CRP and microbiological cultures were obtained for each blood sample within the same time (± 24 hours). Patients on antibiotics at the time of blood collection or immunosuppressive drugs or patients with major trauma, severe burns or recent surgery were excluded. Patients diagnosed with small cell lung cancer or thyroid carcinoma (C-cell) were also excluded.

Procalcitonin Measurement and Interpretation

To prepare the blood samples for PCT measurement, EDTA-plasma was separated from whole blood by centrifugation. PCT was measured semi-quantitatively using the "PCT-Q" (BRAHMS Diagnostica, Berlin, Germany). Six drops of plasma were dropped into the round cavity of the assay and left for 30 minutes of incubation at room temperature. Once the incubation period is complete, the validity of the test is determined by checking that the control band is visible. To determine the PCT concentration, the colour intensity of the test band is compared to the colour blocks of the reference card supplied with the kit. The colour intensity of the test band corresponds to the PCT concentration as four categories provided by the reference scale. The interpretations and risk of progression to severe sepsis for each category is shown in Table 1.

Risk of Progression to Severe Systemic Infection (Severe Sepsis)	Interpretation	PCT
Low	The local bacterial infection is possible Systemic infection (sepsis) is not likely	< 0.5 µg/L
Moderate	Systemic infection (sepsis) is possible, but various conditions are known to induce PCT as well	0.5 2 µg/L
High	Systemic infection (sepsis) is likely High risk for progression to severe systemic infection (severe sepsis)	2 - 10 µg/L
High likelihood of severe sepsis or septic shock	Important systemic inflammatory response, almost exclusively due to severe bacterial sepsis or septic shock	> 10 µg/L

Table 1. Interpretation of PCT-Q (BRAHMS) Values and Risk of Progression to Severe Sepsis, Adapted from Meisner et al.[7]

Outcomes

The primary outcome of this study was a clinically significant positive blood culture as independently assessed by three investigators. The definitions of true bacteraemia were adopted from the CDC and MacGregor and Beaty guidelines as one or more of the following[8,9]

1. Two sets of positive blood culture obtained from separate sites;
2. One set positive for a gram-negative bacterial pathogen; or
3. One set positive for a gram-positive pathogen in a patient with an intravascular device and compatible clinical characteristics.

Patients who did not fit for the above criteria were considered to be false bacteraemic and were classified into the non-bacteraemic group for analysis.

Statistical Methods

Culture report was considered as the primary outcome variable. Clinical parameters, sensorium of the patient, nasogastric tube, urinary catheters, central vein catheters, hemodynamic parameters, etc., considered explanatory variables. Descriptive analysis for quantitative variables was represented as mean and standard deviation and frequency and proportion for categorical variables. All quantitative

variables were checked for normality distribution using visual inspection of histograms, Q-Q plots and Shapiro-Wilk test. P value of > 0.05 was considered as a normal distribution. Independent sample t-test (2 groups) was used to compare the mean values between the study groups. Categorical outcomes were compared between study groups using chi square test. Univariate binary logistic regression analysis was performed to test the association between the explanatory variables and outcome variables. Unadjusted odds ratio along with 95 % CI was presented. The utility of procalcitonin in predicting culture was assessed by Receiver Operative curve (ROC) analysis. Area under the ROC curve along with its 95 % CI and P value were presented. The sensitivity, specificity, predictive values and diagnostic accuracy of the screening test with the decided cut off values along with their 95 % CI were presented value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.[10]

RESULTS

Seventy-eight subjects were considered in final analysis. The mean age was 48.24 ± 18.66 years. The minimum age was 1.5 year, and the maximum was 85 years. 41 (52.56 %) were male, and 37 (47.44 %) were female. 52 (66.67 %) were admitted in the emergency department, and 26 (33.33 %) were admitted through OPD. (Table 2)

	Variables	Frequency
	Age	48.24 ± 18.66 (1.5 to 85)
Gender	Male	41(52.56 %)
	Female	37(47.44 %)
OPD/Emergency Admission	Emergency	52(66.67 %)
	OPD	26(33.33 %)

Table 2. Distribution of Baseline Parameters in the Study Population (N = 78)

	Variables	Frequency
Sensorium of patient	Conscious	72 (92.31 %)
	Altered	6 (7.69 %)
First culture sent from	Blood	65 (83.33 %)
	Urine	12 (15.38 %)
	Catheter tip	1 (1.28 %)
Nasogastric tube	Present	9 (11.54 %)
	Absent	69 (88.46 %)
Urinary catheters	Present	25 (32.05 %)
	Absent	53 (67.95 %)
Central vein catheters	Present	9 (11.54 %)
	Absent	69 (88.46 %)
Peripheral vein catheters	Present	74 (94.87 %)
	Absent	4 (5.13 %)
Other artificial devices	ET	4 (5.13 %)
	ICD	1 (1.28 %)
	Antibiotic given (Mean ± SD)	1.77 ± 2.73 (0 to 22)
Antibiotic started after culture	Yes	67 (85.90 %)
	No	11 (14.10 %)
Antibiotic taken before admission	Yes	10 (12.80 %)
	No	68 (87.20 %)
Recent surgery is done < 30 days	Yes	12 (15.40 %)
	No	66 (84.60 %)
c-reactive protein	Present	1 (1.28 %)
	Absent	77 (98.72 %)
Chills	Present	25 (32.05 %)
	Absent	53 (67.95 %)
Culture report	Bacteraemia	40 (51.28 %)
	No bacteraemia	38 (48.72 %)

Table 3. Distribution of Clinical Parameters in the Study Population (N = 78)

Among the study population, 72 (92.31 %) had conscious sensorium and 6 (7.69 %) had altered sensorium. Among the study population, 65 (83.33 %) patients culture sent from blood, 12 (15.38 %) culture sent from urine and remaining one participant culture sent from the catheter tip. Among the study population, 9 (11.54 %) had a nasogastric tube. Among the study population, 25 (32.05 %) had urinary catheters. Among the study population, 9 (11.54 %) had central vein catheters. Among the study population, 74 (94.87 %) had peripheral vein catheters. Among the study population 4 (5.13 %) ET devices and 1 (1.28 %) had ICD devices. The mean antibiotic given was 1.77 ± 2.73 ranges from 0 to 22. Among the study population, 67 (85.90 %) were started antibiotic after culture. Among the study population, 10 (12.80 %) were taken antibiotics before admission. Among the study population, 12 (15.40 %) has surgery recently < 30 years. Among the study population, 25 (32.05 %) had chills. Among the study population, 40 (51.28 %) were with bacteraemia and the remaining 38 (48.72 %) had no bacteraemia. (Table 3)

Variable	Mean ± SD	Minimum	Maximum
Temperature (N = 27)	101.37 ± 1.52	99.0	105.0
Pulse rate	96.51 ± 20.1	66.0	152.0
Respiratory rate	18.78 ± 3.51	11.0	33.0
Systolic BP (mmHg)	125.27 ± 20.86	80.0	170.0
Diastolic BP (mmHg)	78.33 ± 11.78	60.0	110.0
Spo2	96.59 ± 4.24	68.0	100.0
Total count / µL	12850.64 ± 7787.68	1000.00	34200.00
Mean corpuscular volume (fl)	87.08 ± 8.88	59.20	116.30
Red cell distribution width (%)	17.31 ± 12.54	12.20	123.60
MPV	8.25 ± 0.95	6.30	10.60
Albumin (g / dl)	3.28 ± 0.53	1.90	4.80
Urea (mg / dl)	64.01 ± 64.04	10.00	302.00
Creatinine (mg / dl)	2.43 ± 4.41	0.40	25.00
Procalcitonin (N = 25)	33.02 ± 43.46	0.1	100.0

Table 4. Distribution of Clinical Parameters in the Study Population

The mean temperature was 101.37 ± 1.52. The mean pulse rate was 96.51 ± 20.1. The mean respiratory rate was 18.78 ± 3.51. The mean systolic BP was 125.27 ± 20.86 mmHg. The mean diastolic BP mmHg was 78.33 ± 11.78 ranges from 60 to 110. The mean SPO2 was 96.59 ± 4.24 ranges from 60 to 100. The mean total count was 12850.64 ± 7787.68. The mean MCV was 87.08 ± 8.88. The mean RDW was 17.31 ± 12.54. The mean MPV was 8.25 ± 0.95. The mean albumin was 3.28 ± 0.53. The mean urea was 64.01 ± 64.04. The mean creatinine was 2.43 ± 4.41. The mean procalcitonin was 33.02 ± 43.46. (Table 4)

	Variable	Frequency
Pulse rate	> 90	41 (52.46 %)
	< = 90	37 (47.44 %)
Respiratory rate	> 20	13 (16.67 %)
	<= 20	65 (83.33 %)
Total count	> 11000	45 (57.69 %)
	<= 11000	33 (42.31 %)
Spo2	< 95	11 (14.10 %)
	>= 95	67 (85.90 %)
SBP	>= 80	78 (100 %)
Albumin	< 3.50	48 (61.54 %)
	>= 3.50	30 (38.46 %)
Creatinine	> 1.5	22 (28.21 %)
	<= 1.5	56 (71.79 %)
RDW	> 14	54 (69.20 %)
	<= 14	24 (30.80 %)
MCV	> 100	5 (6.40 %)
	<= 100	73 (93.60 %)
MPV	<= 11	78 (100 %)

Table 5. Distribution of Lab Parameters in the Study Population (N = 78)

Among the study population, 41 (52.46 %) had pulse rate > 90 and 37 (47.44 %) had <=90. Among the study population, 13 (16.67 %) had respiratory rate > 20 and 65 (83.33 %) had <=20. Among the study population, 45 (57.69 %) had total cell count > 11000 and 33 (42.31 %) had <=11000.

Among the study population, 11 (14.10 %) had spo2 and 67 (85.90 %) had >=95. Among the study population, 78 (100 %) had systolic blood pressure >=80. Among the study population, 48 (61.54 %) had albumin < 3.50 and 30 (38.46 %) had albumin >=3.50.

Among the study population, 22 (28.21 %) had creatinine > 1.5 and 56 (71.79 %) had <=1.5. Among the study population, 54 (69.20 %) had RDW > 14 and 24 (30.80 %) had <=14. Among the study population, 5 (6.40 %) had MCV > 100 and 73 (93.60 %) had <=100. Among the study population, all 78 (100 %) had MPV <=11. (Table 5)

The univariate logistic regression analysis had shown a statistically significant association with bacteraemia culture with only one parameter (antibiotic started after culture) as presented in table 6-the mean age in 49.51 ± 18.3 years. The difference in age between culture was statistically not significant. (P value 0.539).

In bacteraemia group majority, 23 (57.5 %) were male participants and shown statistically not a significant association between culture P value 0.371. There was no statistically significant difference in OPD/emergency admission between cultures with P value of 0.873. Among bacteraemia group, majority of 38 (95 %) conscious sensorium and shown statistically insignificant with P value of 0.370.

There was no statistically significant difference in a nasogastric tube, urinary catheters, central vein catheters, peripheral vein catheters, other artificial devices between culture (P value >0.05).

Among bacteraemia group, 31 (77.5 %) were started antibiotics after culture and shown a statistically significant association between culture (P value 0.029). Among bacteraemia group, 5 (12.5 %) were taken antibiotics before admission and shown a statistically insignificant association between culture (P value 0.931).

There was no statistically significant difference in pulse rate, respiratory rate, spo2, lab parameters like total count, albumin, urea, creatinine, CRP, RDW, MCV between culture (P value > 0.05). (Table 6).

There was no statistically significant difference in pulse rate, respiratory rate, systolic blood pressure, diastolic blood pressure, SPO2, total count, MCV, RDW, MPV, albumin, urea, creatinine and procalcitonin between bacteraemia and no bacteraemia. (P value >0.05). (Table 7)

	Parameter	Culture Report		Unadjusted Odds Ratio (95 % CI)	P Value
		Bacteraemia (N = 40)	No Bacteraemia (N = 38)		
	Age Mean ± SD	49.51 ± 18.3	46.89 ± 19.18	1.008 (0.984 to 1.032)	0.539
Gender (Baseline=female)	Male Female	23 (57.5 %) 17 (42.5 %)	18 (47.37 %) 20 (52.63 %)	1.503 (0.615 to 3.674)	0.371
OPD/Emergency admission (Baseline=OPD)	Emergency OPD	27 (67.5 %) 13 (32.5 %)	25 (65.79 %) 13 (34.21 %)	1.080 (0.421 to 2.77)	0.873
Sensorium of patient (Baseline=Altered)	Conscious Altered	38 (95 %) 2 (5 %)	34 (89.47 %) 4 (10.53 %)	2.235 (0.385 to 12.98)	0.370
Nasogastric tube (Baseline=Absent)	Present Absent	4 (10 %) 36 (90 %)	5 (13.16 %) 33 (86.84 %)	0.733 (0.181 to 2.965)	0.663
Urinary catheters (Baseline=Absent)	Present Absent	13 (32.5 %) 27 (67.5 %)	12 (31.58 %) 26 (68.42 %)	1.043 (0.403 to 2.702	0.931
Central vein catheters (Baseline=Absent)	Present Absent	5 (12.5 %) 35 (87.5 %)	4 (10.53 %) 34 (89.47 %)	1.214 (0.300 to 4.909)	0.785
Peripheral vein catheters (Baseline=Absent)	Present Absent	37 (92.5 %) 3 (7.5 %)	37 (97.37 %) 1 (2.63 %)	0.33(0.033 to 3.353)	0.351
Other artificial devices (Baseline=Nil)	ET ICD	1 (2.5 %) 0 (0 %)	3 (7.89 %) 1 (2.63 %)	0.288 (0.029 to 2.91) 0.0	0.292 1.0
Antibiotic started after culture (Baseline=No)	Yes No	31 (77.5 %) 9 (22.5 %)	36 (94.74 %) 2 (5.26 %)	0.191 (0.038 to 0.953)	0.029
Antibiotic taken before admission (Baseline=No)	Yes No	5 (12.5 %) 35 (87.5 %)	5 (13.16 %) 33 (86.84 %)	0.943 (0.250 to 3.557	0.931
Recent surgery done < 30 days (Baseline=No)	Yes No	8 (20 %) 32 (80 %)	4 (10.53 %) 34 (89.47 %)	2.215 (0.583 to 7.748)	0.253
Pulse rate (Baseline <=90)	>90 <=90	24 (60 %) 16 (40 %)	17 (44.74 %) 21 (55.26 %)	1.853 (0.754 to 4.55)	0.179
Respiratory rate (Baseline <=20)	>20 <=20	7 (17.5 %) 33 (82.5 %)	6 (15.79 %) 32 (84.21 %)	1.131 (0.343 to 3.733)	0.839
Total count (Baseline <=11000)	>11000 <=11000	25 (62.5 %) 15 (37.5 %)	20 (52.63 %) 18 (47.37 %)	1.500 (0.608 to 3.7)	0.379
Spo2 (Baseline>=95)	<95 >=95	7 (17.5 %) 33 (82.5 %)	4 (10.53 %) 34 (89.47 %)	1.803 (0.482 to 6.74)	0.376
Albumin (Baseline>=3.50)	<3.50 >=3.50	24 (60 %) 16 (40 %)	24 (63.16 %) 14 (36.84 %)	0.875 (0.351 to 2.182)	0.775
Urea (Baseline <=40)	>40 <=40	18 (45 %) 22 (55 %)	18 (47.37 %) 20 (52.63 %)	0.909 (0.373 to 2.216)	0.834
Creatinine (Baseline<=1.5)	>1.5 <=1.5	12 (30 %) 28 (70 %)	10 (26.32 %) 28 (73.68 %)	1.200(0.446 to 3.227)	0.718
RDW (Baseline<=14)	>14 <=14	27 (67.5 %) 13 (32.5 %)	27 (71.05 %) 11 (28.95 %)	0.846 (0.323 to 2.219)	0.734
MCV (Baseline<=100)	>100 <=100	3 (7.5 %) 37 (92.5 %)	2 (5.26 %) 36 (94.74 %)	1.459 (0.230 to 9.225)	0.688

Table 6. Factors Associated with Culture Report Univariate Logistic Regression (N=78)

Univariate logistic regression analysis was applied (P value >0.05), * Due to 0 subjects in the cells No statistical test was applied

Clinical Parameters	Culture Report Median (IQR) Bacteraemia (N = 40)	No bacteraemia (N = 38)	Mann Whitney U Test (P Value)
Pulse rate	99 (82,116.5)	90 (80,99)	0.099
Respiratory rate	19 (18,20)	18 (16,20)	0.147
Systolic BP	125 (110,134.5)	125 (110,140)	0.363
Diastolic BP	75 (70,90)	80 (70,90)	0.244
SPO2	97.5 (96,98)	98 (96,99)	0.154
Total count / µL	12600 (7800,17475)	11350 (6225,15150)	0.280
Mean corpuscular volume (fl)	85.25 (82.15,88.7)	87.45 (83.95,90.08)	0.204
Red cell distribution width (%)	15.75 (13.65,17.93)	14.8 (13.98,17.13)	0.631
MPV (N=78)	8.3 (7.55,8.85)	8.05 (7.58,8.83)	0.579
Albumin (g / dl)	3.15 (2.83,3.68)	3.25 (3.08,3.53)	0.756
Urea (mg / dl)	39.5 (25.25,77.75)	38 (20.5,68.5)	0.596
Creatinine (mg / dl)	1.1 (0.6,1.85)	1.1 (0.6,2.11)	0.787
Procalcitonin (N = 25)	11.93 (0.75,100)	2.42 (0.61,89.24)	0.544

Table 7. Comparison of Median Lab Parameters between Cultures (N = 78)

DISCUSSION

Bacteremia, in simplest terms, refers to viable bacteria in the blood. Asymptomatic bacteremia can occur in normal daily activities such as conducting oral hygiene procedures and after minor medical procedures.[11] These clinically benign infections are transient and do not cause further consequences in healthy persons. However, when immune response mechanisms fail or become overwhelmed, bacteremia becomes a bloodstream infection that can proceed to life-threatening septicemia.

The clinical appearance in a bacteremic patient is the existence of a fever. Studies have found that the rate of undiagnosed episodes of bacteremia or sepsis in febrile patients ranges from 15 % to 50 %.[12-14] Chills and /or rigours do not need to present. However, the presence of these signs can indicate that a febrile patient is now bacteremic.

In this study, we found that there was no statistically significant difference in pulse rate, respiratory rate, systolic blood pressure, diastolic blood pressure, SPO2, total count, MCV, RDW, MPV, albumin, urea, creatinine between bacteremia and no bacteremia indicating that these parameters cannot be used as predictors of bacteremia.

Blood parameters and microbiological diagnosis in patients with bacteremia are important for effective antimicrobial therapy.[15] Although blood culture is known as the gold standard for the diagnosis of bacteremia, there are some problems, such as differentiating true infection from contamination, interpreting of the results of polymicrobial culture, interpreting the importance of microorganisms that normally has low virulence, etc.[16] Hence, a fast biological marker with high sensivity ans speificity is needed for the identification of bacteremia that which helps to tackle the necessity of experienced staff and a long time for blood culture together with false negative and false positive results. Nowadays, procalcitonin and C-reactive protein are being widely used to predict bacteremia.

Procalcitonin, the precursor of the hormone calcitonin, is produced by C-cells of the thyroid gland or neuroendocrine cells in the lung or intestine.[17,18] Very few PCT molecules are released into circulation in a normal state, serum PCT concentrations increase in patients with bacterial and viral infections.[19] PCT concentration has been reported to be useful for the early diagnosis of bacteraemia and decisive initial antimicrobial therapy. It has been reported that PCT can differentiate bacteraemia from inflammatory sepsis in 77 % of cases with other clinical parameters.[20] Likewise, the present study revealed that PCT levels increased exclusively in bacteraemia cases. Procalcitonin levels were shown to be significantly higher in patients with positive blood cultures and were a better predictor of bacterial sepsis than CRP and other blood parameters.[21] As a result, we consider that further research is needed using multicentric studies to explore the clinical and predictive value of PCT in concluding bacteraemia.

A major limitation in our study is small sample size. This is due to short supply of PCT-Q assays and patient's enrolment was stopped after achieving statistical significance. Further prospective studies are required to generalize our study findings.

CONCLUSIONS

The study concluded that patients' clinical status, PCT and other laboratory markers shuould be evaluated carefully in early assessment of bacteremia. Although, increased PCT levels can be useful as predictors of bacteremias in the emergency department, interpretation should be made carefully when deciding the prescription of antibiotics.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
Financial or other competing interests: None.
Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

REFERENCES

[1] Bhattacharya S. Blood culture in India: a proposal for a national programme for early detection of sepsis. Indian J Med Microbiol 2005;23(4):220-226.
[2] Karchmer AW. Nosocomial bloodstream infections: organisms, risk factors and implications. Clin Infect Dis 2000;31(Suppl 4):S139-143.
[3] Aronson MD, Bor DH. Blood cultures. Ann Intern Med 1987;106(2):246-253.
[4] Christ-Crain M, Muller B. Procalcitonin in bacterial infections--hype, hope, more or less? Swiss Med Wkly 2005;135(31-32):451-460.
[5] Schneider HG, Lam QT. Procalcitonin for the clinical laboratory: a review. Pathology 2007;39(4):383-390.
[6] Levy MM, Fink MP, Marshall JC, et al. 2001 SCCM/ESICM/ACCP/ATS/SIS International sepsis definitions conference. Crit Care Med 2003;31(4):1250-1256.
[7] Meisner M, Brunkhorst FM, Reith HB, et al. Clinical experiences with a new semi-quantitative solid phase immunoassay for rapid measurement of procalcitonin. Clin Chem Lab Med 2000;38(10):989-995.

[8] Albrich WC, Mueller B. Predicting bacteremias by procalcitonin levels in patients evaluated for sepsis in the emergency department. Expert Rev Anti Infect Ther 2011;9(6):653-656.
[9] Arai T, Kumasaka K, Nagata K, et al. Prediction of blood culture results by measuring procalcitonin levels and other inflammatory biomarkers. Am J Emerg Med 2014;32(4):330-333.
[10] Machines IB. IBM SPSS Statistics for Windows, Version 22.0. NY: IBM Corp Armonk 2013.
[11] Smith DA, Nehring SM. Bacteremia. In: StatPearls. Treasure Island (FL): StatPearls Publishing 2020.
[12] Vanderschueren S, Knockaert D, Adriaenssens T, et al. From prolonged febrile illness to fever of unknown origin: the challenge continues. Arch Intern Med 2003;163(9):1033-1041.
[13] Gaeta GB, Fusco FM, Nardiello S. Fever of unknown origin: a systematic review of the literature for 1995-2004. Nucl Med Commun 2006;27(3):205-211.
[14] Bleeker-Rovers CP, Vos FJ, De Kleijn EMHA, et al. A prospective multicenter study on fever of unknown origin: the yield of a structured diagnostic protocol. Medicine (Baltimore) 2007;86(1):26-38.
[15] Llewelyn M, Cohen J, Forum IS. Diagnosis of infection in sepsis. Intensive Care Med 2001;27(Suppl 1):S10-32.
[16] Cohen J, Brun-Buisson C, Torres A, et al. Diagnosis of infection in sepsis: an evidence-based review. Crit Care Med 2004;32(11 Suppl):S466-494.
[17] Jacobs JW, Lund PK, Potts JT, et al. Procalcitonin is a glycoprotein. J Biol Chem 1981;256(6):2803-2807.
[18] Reinhart K, Karzai W, Meisner M. Procalcitonin as a marker of the systemic inflammatory response to infection. Intensive Care Med 2000;26(9):1193-1200.
[19] Endo S, Aikawa N, Fujishima S, et al. Usefulness of procalcitonin serum level for the discrimination of severe sepsis from sepsis: a multicenter prospective study. J Infect Chemother 2008;14(3):244-249.
[20] Yap CYF, Aw TC. The use of procalcitonin in clinical practice. Proceedings in Singapore Healthcare 2014;23(1):33-37.
[21] Hattori T, Nishiyama H, Kato H, et al. Clinical value of procalcitonin for patients with suspected bloodstream infection. Am J Clin Pathol 2014;141(1):43-51.

Content available at: https://www.ipinnovative.com/open-access-journals

IP International Journal of Orthopaedic Rheumatology

Journal homepage: www.ijor.org

Case Report

Excellent outcome of a patient with acute back pain and osteoporotic fracture- A case report

Subramanian Nallasivan[1,2,*], **Raja S Vignesh**[3,4], **Arunkumar Govindarajan**[5]

[1]*Dept. of Rheumatology and Medicine, Rosemary Mission Hospital, Tirunelveli, Tamil Nadu, India*
[2]*Dept. of Rheumatology and Medicine, Velammal Medical College Hospital, Madurai, Tamil Nadu, India*
[3]*Dept. of Neurosurgeon, Thoothukkudi Medical College, Thoothukudi, Tamil Nadu, India*
[4]*NIMS Care Centre, Tirunelveli, Tamil Nadu, India*
[5]*Aarthi Scans and Diagnostics, Tirunelveli, Tamil Nadu, India*

ARTICLE INFO

Article history:
Received 20-05-2021
Accepted 02-06-2021
Available online 24-06-2021

Keywords:
Steroids
Osteoporosis
Vertebral fracture
Zoledronic acid
Rheumatoid arthritis

ABSTRACT

Rheumatoid arthritis is one of the common inflammatory diseases affecting predominantly women. Steroids and anti-inflammatory drugs have been used for decades in managing this condition. Long term steroids have potentially devastating consequences in any multisystem disease and commonly described side effects include Cushing's syndrome, diabetes and osteoporosis. Fragility fractures are more common in these patients.

We report a patient with back pain and osteoporotic vertebral collapse whose neurological weakness was diagnosed and surgical fixation was done to help the patient improve dramatically. Steroids cause an osteoporotic collapse of the vertebra i.e. fragility fracture and appropriate timely intervention would result in an excellent outcome. Collaboration with other specialists greatly helped to get the treatment early even during this covid pandemic.

This is an Open Access (OA) journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Corticosteroids have been used in many inflammatory conditions across different specialities since their invention by Philip Hench in 1950. However, the irrational use of steroids can cause side effects, which can be in multiple systems causing high morbidity and mortality. Long term steroids cause Cushing's syndrome, obesity and diabetes.[1] Osteoporosis and fragility fractures are common in patients taking steroids.[2] This case is presented to highlight the complexity of diagnosis and management of steroid-related osteoporotic vertebral collapse[3] and the need other speciality inputs, especially during the Covid Pandemic.

2. Case Summary

We report a 68-year-old lady with a long history of rheumatoid arthritis and had been on prednisolone 5mg for the last 2 years, and anti-inflammatory drugs presenting with vomiting and unable to tolerate any medicines or food. She didn't have any fever or cough.

She was advised to stop steroids because of gastritis and oral candidiasis before this presentation. During the evaluation, she had features of hypoadrenalism with low sodium (Serum sodium: 128 mEq/L, Blood Pressure: 90/40 mmHg,) hypotension and fatigue, which improved with hydrocortisone injection. She also had recent onset of diabetes for 6 months and developed an abdominal wall wound, which was more like ulceration with clear margins.

* *Corresponding author.*
E-mail address: drsubramanian14@gmail.com (S. Nallasivan).

https://doi.org/10.18231/j.ijor.2021.012
2581-8112/© 2021 Innovative Publication, All rights reserved.

After 3 days she complained of back pain and unable to weight bear. Examination showed paraparesis, with power 2/5 in legs, sensation reduced below L1 and normal bladder and bowel functions. She urgently had MRI of spine (Figure 1) that showed collapsed osteoporotic vertebra and impingement of the cord resulting in leg weakness. She was screened for Covid 19 as per institutional protocol and was found to have an RTPCR test negative. Her CT chest Showed fibrotic strands and no ground glass changes or nodes.

Fig. 1: MRI spine showing collapsed vertebra D11 and L3

She was evaluated for myeloma and metastasis from unknown primary and results were normal. She didn't remember any fall and she came in with features of Addisonian crisis due to sudden withdrawal of long term corticosteroids. While she was being prepared for surgery she had Zoledronic acid infusion. DEXA scan couldn't be done due to urgency. Abdominal wall wound was swabbed for culture.

She underwent urgent spinal decompression and fixation/stabilisation using D12, L1 screws, D11 laminectomy and D10 to L1 stabilisationFigure 2 and she was making slow recovery. Her neurological recovery was fast with passive and active movements of her legs.

3. Discussion

Corticosteroids are the main drugs in the therapeutic armamentarium of various inflammatory diseases across various specialities. Steroids causing complications have been proven for years and can have devastating consequences to the patients like fracture femur or spine,

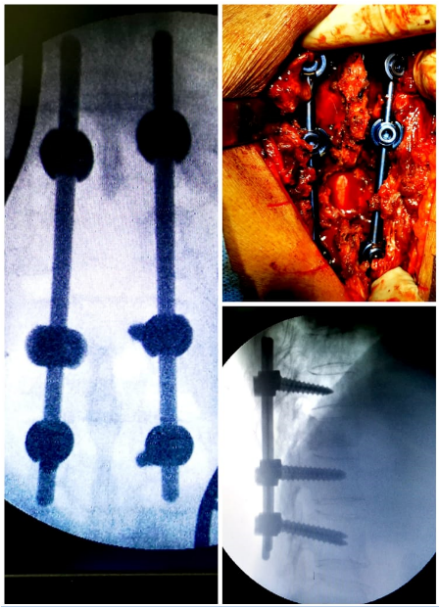


Fig. 2: Operative imaging showing stabilised spine

diabetes and risk of cardiovascular disease[4] Over the counter remedies also do have steroids. Non Allopathic doctors too prescribe allopathic medications. Systemic steroids have to be used only for the short term. Our patient had steroids for 2 years and now had a total collapse of a vertebra with neurological consequences which was managed at the right time.[5]

4. Conclusion

Early and appropriate diagnosis with other specialist involvement helped to solve this patient's back pain. It is advised to review all medicines whenever patients come for consultation and flag up those Medicines for the patients to reconsider if the risk outweighs the benefit.

4.1. Learning points

1. Any consultation will be incomplete unless the doctor reviews all medications for the patient
2. Long term steroids cause innumerable problems like diabetes, infections, fragile skin, osteoporosis and fragility fractures, hypertension, and obesity, to mention a few of the complications.[6,7]
3. Osteoporosis and fractures need acute intervention and long term treatment as National Osteoporosis Framework guidance.[4]

5. Acknowledgements

I would like to thank the patient and family, the specialists involved in this patients care and the neurosurgeon for a swift response during covid too.

6. Source of Funding

No financial support was received for the work within this manuscript.

7. Conflict of Interest

The authors declare they have no conflict of interest.

References

1. van Staa T, Leufkens H, Cooper C. The Epidemiology of Corticosteroid-Induced Osteoporosis: a Meta-analysis. *Osteoporos Int*. 2002;13(10):777–87. doi:10.1007/s001980200108.
2. Kanis JA, Johansson H, Oden A, Johnell O, de Laet C, Melton LJ, et al. A Meta-Analysis of Prior Corticosteroid Use and Fracture Risk. *J Bone Miner Res*. 2004;19(6):893–9. doi:10.1359/jbmr.040134.
3. Liu D, Ahmet A, Ward L. A practical guide to the monitoring and management of the complications of systemic corticosteroid therapy. *All Asth Clin Immun*. 2013;.
4. Cosman F, Beur SJD, Leboff MS, Lewiecki EM, Tanner B, Randall S, et al. Clinician's Guide to Prevention and Treatment of Osteoporosis. *Osteoporos Int*. 1925;(10):2359–81.
5. Buckley L, Guyatt G, Fink HA, Cannon M, Grossman J, Hansen KE, et al. American College of Rheumatology Guideline for the Prevention and Treatment of Glucocorticoid-Induced Osteoporosis. *Arthritis Care Res (Hoboken)*. 1969;69(8):1095–110.
6. Porter JL, Varacallo M. Osteoporosis; 2020. Available from: https://www.ncbi.nlm.nih.gov/books/NBK441901/.
7. Johnston CB, Dagar M. Osteoporosis in Older Adults. *Med Clin North Am*. 2020;104(5):873–84. doi:10.1016/j.mcna.2020.06.004.

Author biography

Subramanian Nallasivan, Assistant Professor and Consultant Rheumatologist https://orcid.org/0000-0002-1840-0518

Raja S Vignesh, Consultant Neurosurgeon

Arunkumar Govindarajan, Consultant Radiologist

Cite this article: Nallasivan S, Vignesh RS, Govindarajan A. Excellent outcome of a patient with acute back pain and osteoporotic fracture- A case report. *IP Int J Orthop Rheumatol* 2021;7(1):50-52.

International Journal of Contemporary Pediatrics
Karthikraj T et al. Int J Contemp Pediatr. 2021 Feb;8(2):354-359
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20210128

Original Research Article

Spectrum of febrile thrombocytopenia among children in a tropical country-a hospital based observational study in South India

Karthikraj T.*, Jenish Rajma J., Jeyabalaji R. V., Shivani Kuttuva

Department of Pediatrics, Velammal Medical College Hospital, Madurai, Tamil Nadu, India

Received: 15 December 2020
Accepted: 16 January 2021

***Correspondence:**
Dr. Karthikraj T.,
E-mail: karthikrajmmc@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Febrile thrombocytopenia is a common reason for pediatric admission. Though infections are the major cause, noninfectious causes are not uncommon. This study was done to estimate the prevalence of thrombocytopenia as a presentation in pediatric fever cases, to analyze the various etiologies, presentations and relationship between platelet count and the severity of disease and prognosis.
Methods: Retrospective observational study done by collecting data from hospital records of children admitted in Velammal Medical college hospital from January 2016 to December 2017. Children in the age group of 6 months to 15 years with fever and thrombocytopenia at admission were included in the study. Children on treatment with anti-platelet drugs, other chronic diseases and infants less than 6 months were excluded.
Results: Out of 2523 fever cases admitted, 372 children fulfilled this criterion. 70% had positive dengue serology, other infectious causes were other viral hemorrhagic fevers, complicated enteric fever, scrub typhus and sepsis. The predominant non-infectious causes were hematological malignancies, Idiopathic thrombocytopenic purpura and Hemolytic uremia syndrome.
Conclusions: Febrile thrombocytopenia is a common clinical presentation in children in dengue endemic areas. Most viral fevers have leukopenia but presence of thrombocytopenia with warning signs like pain abdomen, vomiting or oliguria should prompt suspicion of dengue. Infections like enteric fever, scrub typhus or chikungunya may also mimic similar findings. Rarely diseases like leukemia, Idiopathic thrombocytopenic purpura, Hemolytic uremic syndrome or Sepsis may also present as febrile thrombocytopenia. The need for antibiotics or blood products is very minimal.

Keywords: Febrile thrombocytopenia, Tropical country, Dengue

INTRODUCTION

Febrile thrombocytopenia is the thrombocytopenia (platelet count <1,00,000 cells/cu.mm) associated with fever. Diseases which commonly present with fever and thrombocytopenia are infectious diseases like malaria, leptospirosis, rickettsia infections (scrub typhus), septicemia, typhoid, borreliosis, arboviral infections such as dengue or yellow fever, rodent-borne virus infections such as Hanta and Lassa fever, human immunodeficiency virus (HIV), visceral leishmaniasis, leukemia, lymphomas, idiopathic thrombocytopenic purpura and thrombotic thrombocytopenic purpura-hemolytic uremic syndrome. Various infections have been found to be endemic in certain geographic locations and also seasonal epidemics occur every year in different parts of the world.

The study was done by collecting epidemiological data of prevalence of thrombocytopenia in fever cases of pediatric population in South India. This study was intended to know the underlying etiology of febrile thrombocytopenia in children in tropical countries, the various presentations and relationship between platelet

count and severity of disease and its prognosis. This information may be utilized to devise a clinical examination-based investigation protocol for children presenting with febrile thrombocytopenia which will help in developing a cost-effective management strategy with minimum necessary investigations, thereby providing the correct protocol-based management.

The primary objectives of our study were to study the prevalence of thrombocytopenia (<1,00,000 cells/cu.mm) as a presentation in pediatric population in overall fever cases and to analyze various etiology of febrile thrombocytopenia in children in our hospital. We also studied the overall presentation and relationship between platelet count and severity of disease and prognosis.

METHODS

The study design was a retrospective observational study, done by collecting the data from the hospital records of children admitted in pediatric ward of Velammal medical college hospital, Madurai with fever from January 2016 to December 2017. The patients were to be selected based on inclusion and exclusion criteria. Children in the age group of 6months to 15 years with fever presentation and thrombocytopenia (platelet count <1,00,000 cells/cu.mm) at admission were included in the study. Children on treatment with anti-platelet drugs and other drugs causing thrombocytopenia, Children who were previously diagnosed to have chronic diseases like malignancy, chronic liver diseases or chronic kidney disease and Infants less than 6 months of age were excluded from the study.

Data of selected patients were collected from medical records and complete history; clinical findings and investigations were noted in a structured proforma. The data collected were entered in MS excel software and summary statistics were obtained which are presented below as proportions. Ethical clearance from the institutional ethical committee board was obtained.

RESULTS

Out of the total 8817 In-patient admissions to the pediatric ward, 2523 children were admitted with a diagnosis of fever in the study period (2016 to 2017), of which, 372 children in the age group of 6 months to 15 years, fulfilled the study criteria for febrile thrombocytopenia. Nearly 45% of these cases (168) were admitted during 2017 dengue epidemic. The predominant age group was 6 to 10 years (34%), followed by 11 to 15 years (29%) and 1 to 5 years (25%). Infants (6 months to 1 year) included were 6.5 % of the total study population. Male:Female ratio was almost equal at 1.1:1.

The most common symptomatology at presentation was fever which was present in all cases. Table 1 nearly half of them (48%) had high grade fever on presentation. The average duration of fever was 4 to 6 days with the maximum duration being 14 days. Constitutional symptoms and warning symptoms (vomiting, abdominal pain) were the next common symptoms at presentation. Other uncommon presentations included those with respiratory symptoms and loose stools. Around 3% had a neurological symptom like seizure or altered sensorium at presentation.

Table 1: Common symptomatology of febrile thrombocytopenia.

Symptoms	Variables
Fever- high grade	182
Low grade (<101*F)	190
Duration	Average 4 to 6 days, max 14 days
Myalgia, poor appetite, headache	152 (40.8)
Cough/cold	48 (12.9)
Pain abdomen and vomiting	164 (44.1)
Loose stools	27 (7.25)
Facial puffiness	98 (26.3)
Melena	70 (18.8)
Hematemesis	13 (3.5)
Oliguria	123 (33.3)
Other mucosal bleeds (gum bleeds/epistaxis/skin bleeds)	74 (19.8)
Atypical CNS (seizures, encephalopathy)	12 (3.2)

Examination showed that erythematous rash was the most common clinical finding seen in almost 51% of the study population at some point of the illness during admission. Table 2 shows hepatomegaly with right hypochondrial tenderness was the next common clinical finding in 45%, followed by fluid leak (ascites, pleural effusion) in 39%, periorbital puffiness (29%), subcutaneous bleeds (20%), conjunctival congestion (11%) and splenomegaly (4.5%) as shown below.

Table 2: Clinical signs in febrile thrombocytopenia cases.

Clinical sign	Cases
Periorbital puffiness	108
Conjunctival congestion	43
Petechiae/purpura	76
Erythematous skin rash	190
Hepatomegaly/right hypochondriac tenderness	169
Splenomegaly	17
Ascites/pleural effusion	146

Blood investigations done showed that total leucocyte count below 5000 was more suggestive of viral fever like dengue. Table 3 shows dengue fever with warnings signs also called as dengue hemorrhagic fever (DHF) was mostly associated with hemoconcentration and elevated transaminases. Few children (23/372) had hemoglobin

less than 10 at admission, among which 10 were later diagnosed to have leukemia or hemolytic uremic syndrome. Only 8 of the 23 had positive serology for dengue and they were all stable without any warning signs. The average maximum hematocrit during the hospital stay of all febrile thrombocytopenia cases was 38.9 and it came down to 35.1 at discharge. The hematocrit values were very high in adolescent males (more than 50 in 4 children between 11 to 14 years of age) and all of them had both IgG and IgM for dengue positive.

Table 3: Basic lab investigations in febrile thrombocytopenia cases.

Lab investigations	Values
Hemoglobin	5 to 17.2 (mean12.1±1.85), median 11.9 mode 11.7
Total leucocyte count	Median 5100, range 2200-70300
Hematocrit at admission	37±5.33 (mean/SD)
Maximum hematocrit	38.9±5.23
Hematocrit at discharge	35.1±5.4

Nearly 43 % children were found to have severe thrombocytopenia during hospital stay. Table 4 shows the incidence was more common in boys than girls. Figure 1 shows among the 37 children who had platelet count less than 10,000 only 2 had significant gastrointestinal bleeding manifestation. Others had only mucocutaneous bleeds or skin bleeds only. Nearly 33% had platelet counts 20,000 to 50,000. Significantly low platelet count (<20,000) with high total counts was also noted in scrub typhus, leukemia and sepsis, the latter 2 being associated with poor prognosis. In case of severe sepsis, at admission though the laboratory investigations were not grossly abnormal, these children were more toxic with hemodynamic compromise and the platelet count had more significant fall or clinical bleeds after 48 to 72 hours of admission.

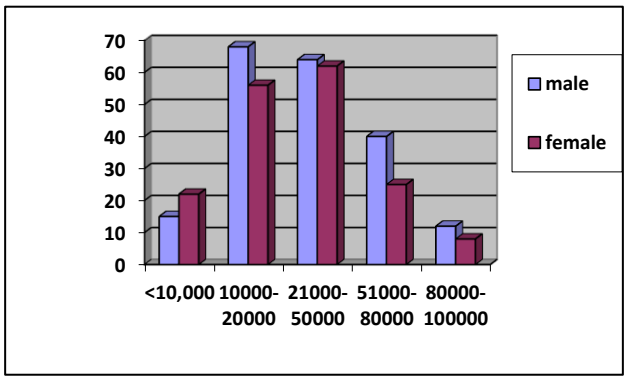


Figure 1: Severity of thrombocytopenia in children among both genders.

Table 4: Platelet count at admission in febrile thrombocytopenia cases.

Platelet count (per cu.mm)	No. of children
<10000	37
10-20000	124
20000-50000	126
51000-80000	65
80000 to 100000	20

The range of liver enzymes was widely varying from aspartate transaminase 15 to 1119 and alanine transaminase was 13 to 515. The higher the value of liver enzyme, the severe was the course of the disease.

The diagnostic panel done in children with fever less than 5 days included dengue serology (Ns1, IgM, IgG), smear for malarial parasite at admission and they were given supportive care according to the severity of the illness. If fever was persisting beyond 7 days WIDAL, scrub typhus serology, leptospirosis serology was done and antibiotics given according to the diagnosis-doxycycline in scrub typhus and ceftriaxone for enteric fever. Few children who had abnormal finding in the peripheral smear were further evaluated and diagnosed as hemolytic uremic syndrome (HUS) or hematologic malignancy. Only 17 out of the 372 children (4.5%) had non infective cause for febrile thrombocytopenia. Bone marrow study was done in 10 children to confirm leukemia or idiopathic thrombocytopenic purpura (ITP) while in 5 of them there was hyper-leukocytosis or plenty of blasts in peripheral smear itself. Hence flowcytometry was done from peripheral blood itself to confirm the diagnosis.

Table 5: Diagnostic investigations.

Diagnosis	Findings
Dengue NS1 Ag +ve	129
Dengue NS1 Ag and IgM +ve	94
Dengue IgM and IgG +ve	33
VHF (serology negative)	30
PS for malaria positive	5
WIDAL (>1:320) +ve	32
Scrub typhus serology +ve	19
Leptospirosis serology +ve	5
PS/BMA suggestive of leukemia	8
PS suggestive of HUS	5
Sepsis with DIC	8
ITP	4

Diagnosis was reached in almost 80% of the cases with the initial panel of investigations (CBC with peripheral smear, dengue serology). When fever persisted beyond 5 to 7 days or child had some atypical symptoms like splenomegaly, eschar or abnormal peripheral smear the second line investigations were done.

The predominant diagnosis was dengue fever in 253 children (69%), followed by other viral haemorrhagic

fevers (8%), scrub typhus fever (5%), malaria (1%), leukemia (2%), sepsis with disseminated intravascular coagulation (DIC) (2%), HUS (1.3%) and leptospirosis (1%) Figure 2.

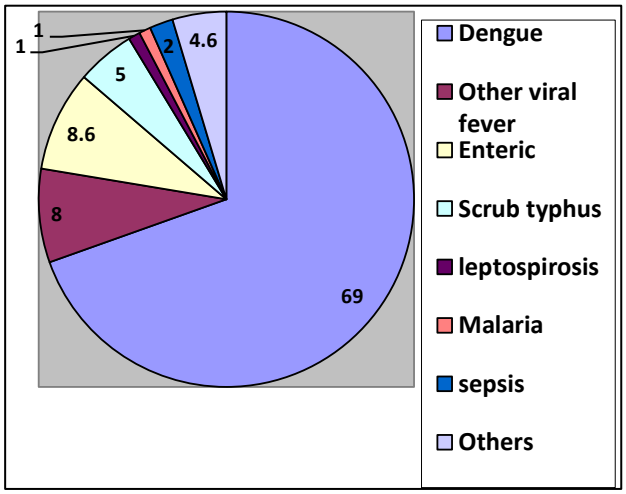


Figure 2: Percentage distribution of the various diagnoses of febrile thrombocytopenia among children.

Among dengue those with warning signs were 152 (53%) were the majority, followed by those without warning signs-101 (35%). 29 children (10.2%) were diagnosed to have severe dengue. Among this 29, 15 (50%) had significant bleeding, 8 (27.5%) had Dengue shock syndrome and 6 (20.6%) had severe respiratory distress with metabolic abnormalities.

All the viral fever cases were managed as per protocol (WHO dengue protocol) and others according their specific diagnoses.

A total of 246 cases (66%) required fluid challenge. 45 cases (12%) required platelet rich plasma (PRP) transfusion for whom the diagnoses were Dengue with warning signs (71%) in PICU care, dengue shock syndrome (DSS) (6.6%) and leukemia (33.3%). The average hospital stay was 8 days and the maximum duration was 22 days. 124 (33.33%) children required PICU care during their course of treatment. The clinical outcome was positive in 367 cases, while 5 children (3-DHF, 2-sepsis) expired in the course of their treatment.

DISCUSSION

Fever is one of the commonest presenting symptoms for most of the hospital visits in children. Thrombocytopenia may be an important laboratory finding in a febrile child as it needs further evaluation regarding the etiology. Various infectious agents like dengue, chikungunya, *Plasmodium* species and *Salmonella typhi* can present with febrile thrombocytopenia in tropical countries. Identifying the exact etiologic agent is important as the management protocol is different for different infections.

In addition to infections, noninfectious causes for febrile thrombocytopenia, though rare, do exist in all countries. Thrombocytopenia is defined as platelet count less than 150000/µl while severe thrombocytopenia is defined as platelet count less than 50000/µl.[1]

In our study, out of the total fever cases admitted (2523) in the pediatric wards, around 15% had febrile thrombocytopenia at admission. Some children had normal platelet counts at admission but they developed thrombocytopenia during the hospital stay but they were not included in this study. Almost 70% of the children who were included in the study had positive dengue serology. Incidence of dengue has increased 230-fold with increasing geographic expansion and the rapidly expanding global footprint of dengue is a public health challenge in many developing countries.[2] Though it occurs in seasonal epidemics, many areas have also become endemic to dengue virus resulting in cases throughout the year. In the age distribution, almost two third were between 6 years to 15 years of age. Two third of these children improved with fluid therapy alone, either oral or intravenous, given according to WHO protocol for dengue management. Antibiotics were not started in children with fever less than 4 days duration, if the blood counts had evidence of leucopenia along with thrombocytopenia at admission and clinical evidence of viral fever with no foci of bacterial infection. This sort of antibiotic stewardship is essential in developing countries to prevent antibiotic resistance and misuse of antibiotics in viral infections. Also imaging studies like ultrasound abdomen were not routinely done in all cases of fever more than 3 days. It was done only in sick children and if the initial diagnostic workup was not confirmatory.

In a pediatric study done by Ramabhatta et al at Bangalore, 20% of children with fever had associated thrombocytopenia.[3] A total of 306 children were included in the study and 280 children definite diagnosis was made out, of which more than 80% had dengue fever. A study done at the university of Munich hospital by Herbinger et al showed increased incidence of EBV, CMV along with arboviral infections.[4] Another study by Malik et al showed that complicated Enteric fever is an important cause for febrile thrombocytopenia in developing countries.[5] In our study, 69% of the children had dengue fever while enteric fever was the second common cause for febrile thrombocytopenia. In a similar pediatric study done by Nair et al published from North India, viral fevers other than Dengue and chikungunya were more common while Enteric fever had an incidence of around 12%.[6] We did not evaluate for other viruses like chikungunya, *Ebstein Barr* virus due to cost issues and unavailability of the tests in our institute. But most of the cases of febrile thrombocytopenia had positive dengue serology in our study (69%) and only 8% were viral fever with negative dengue serology.

In a study by Phakhounthong most significant factor in predicting severe dengue was low hematocrit, followed

by a GCS of 11 or hematocrit was greater than 28 or platelet count of 146,000 per mm^3.[7] The correlation between degree of thrombocytopenia and severity of the disease is not directly analyzed in our study but skin bleeds were seen in only 20% of the study group and it was mostly present when platelet counts was less than 20,000. But in children with features of severe dengue, 50% had significant bleeding manifestations like hematemesis, Malena and pulmonary hemorrhage. The tendency to bleed was not correlating to the platelet count as few children had bleeding manifestations in spite of having platelet counts more than 50,000. The bleeding manifestations were not directly proportional to the degree of thrombocytopenia and the need for blood products transfusion was predominantly for hemodynamic compromise. We could also infer that sick children had significant rise in transaminases, hematocrit and deranged coagulation profile. Nair el.[6] also had similar findings in their study. Also, in few adult studies like those done by Harsha and Radhika et al showed that infections like dengue, septicemia and malaria were the predominant causes of febrile thrombocytopenia.[8,9] In a study by Subramanian et al bleeding manifestations were noted predominantly in children with counts 20000 to 100000/µl and they contributed to nearly 70% of all the bleeding manifestations.[10] In a study by Kshirsagar et al thrombocytopenia, elevated serum hepatic enzymes, abnormal renal function tests, low sodium, hypoalbuminemia, hypoglycemia, abnormal radiological findings were found to be the predictors of severity.[11] Our study was not designed to develop the predictors for disease severity but the severe cases had evidence of fluid overload or multiorgan dysfunction like oliguria, respiratory distress or encephalopathy or shock within the first 24 to 48 hours of admission itself.

The mortality rate in our study was 0.01% (5 out of 372) which was both due to severe dengue and severe sepsis with disseminated intravascular coagulation. Dengue shock syndrome was recognized in 22 cases at admission and most of them responded well to intravenous fluids given as per WHO protocol and only few required colloid or platelet rich plasma (PRP) for further resuscitation.

The duration of hospital stay was 8 to 12 days in most of the dengue serology positive cases. In a study done by Selvan et al the duration of hospital stay was similar and male children in the age group of 10-18 years were more affected.[12] Few children with other alternative diagnosis, who required further investigations or those who had secondary problems during the hospital stay like abscess, sepsis with blood culture positivity or infection associated hemophagocytic syndrome had a prolonged stay lasting 2 to 3 weeks on an average.

The limitations of our study were that we did not include children admitted with fever who developed thrombocytopenia in the course of hospital stay and we also did not attempt to diagnose the exact etiology of other viral hemorrhagic fevers.

CONCLUSION

Febrile thrombocytopenia is a common clinical presentation in children especially during rainy seasons in dengue endemic areas. In addition to dengue, few other infections like enteric fever, scrub typhus or chikungunya may also mimic similar findings. Rarely diseases like leukemia, idiopathic thrombocytopenic purpura, hemolytic uremic syndrome or sepsis may present as febrile thrombocytopenia, but a proper peripheral smear or serial hemograms will help us to arrive at the right diagnosis. In our study 15% of children with fever had febrile thrombocytopenia of which around 70% were confirmed to be dengue and less than 5% had underlying noninfective etiology. Two third of the children required only fluid therapy and the degree of thrombocytopenia was not directly related to the severity of the viral fever. Most sick children had significant rise in transaminases, hematocrit and deranged coagulation profile. Though most of the viral fevers can have leukopenia, presence of thrombocytopenia along with warning signs like pain abdomen, vomiting or oliguria should prompt the treatment protocol as advised by WHO. Judicious use of antibiotics and radiologic tests will result in a cost-effective management of the common prevalent infections in tropical countries.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee on 04/04/2017, IEC REF NO:VMCIEC/23/2017

REFERENCES

1. Nagler M, Keller P, Siegrist D, Alberio L. A case of EDTA dependent pseudo-thrombocytopenia: simple recognition of under diagnosed and misleading phenomenon. BMC Clin Pathol. 2014;14:19.
2. Simmons CP, Farrar JJ, Nguyen V, Wills B. Dengue. N Engl J Med. 2012;366:1423-32.
3. Sujatha R, Pushpalatha K, Bharathi K, Udaya R, Hareesh S. An aetiological profile of febrile thrombocytopenia in children. Sri Lanka J Child Health. 2018;47;146-8.
4. Herbinger KH, Schunk M, Nothdruft HD, Von Sonnenburg F, Loscher T, Bretzel G. A comparative study on infection induced thrombocytopenia among returned travellers. Infection. 2012;40:373-9.
5. Malik AS. Complications of bacteriologically confirmed typhoid fever in children. J Trop Paediatr. 2002;48:102-8.
6. Nair Bindu T, Kuldeep S, Sandeep PD. A study of clinical and laboratory profile of febrile children presenting with thrombocytopenia. Int J Contem Pediatr. 2017;4(6):2114-9.
7. Phakhounthong K, Chaovalit P, Jittamala P. Predicting the severity of dengue fever in children on admission based on clinical features and laboratory

indicators: application of classification tree analysis. BMC Pediatr. 2018;18:109.
8. Harsha NS, Thimma Reddy TR, Shruthi M, Ravishankar SN, Madhuvan HS. A Study of Clinical and Laboratory Profile of Fever with Thrombocytopenia. J clin biomed sci. 2016;6:121-4.
9. Radhika BV, Sooraj CS, Kamath V. Section: Medicine A Study of Febrile Thrombocytopenia Section. Medicine. 2019;6:21-5.
10. Subramanian V, Santosh K. Thrombocytopenia in children: a clinico-etiological profile in an urban tertiary care hospital. Int J Contem Pediatr. 2018;6:131.
11. Kshirsagar P, Chauhan S, Samel D. Towards Developing a Scoring System for Febrile Thrombocytopenia. The J Asso Physicians India. 2016;64(2):14-8.
12. Selvan T, Nagaraj MV, Saravanan P, Somashekar. A study of clinical profile of dengue fever in children. Int J Contemp Pediatr. 2017;4:534.

Cite this article as: Karthikraj T, Rajma JJ, Jeyabalaji RV, Kuttuva S. Spectrum of febrile thrombocytopenia among children in a tropical country-a hospital based observational study in South India. Int J Contemp Pediatr 2021;8:354-9.

International Journal of Contemporary Pediatrics
Karthikraj T et al. Int J Contemp Pediatr. 2021 Feb;8(2):354-359
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20210128

Original Research Article

Spectrum of febrile thrombocytopenia among children in a tropical country-a hospital based observational study in South India

Karthikraj T.*, Jenish Rajma J., Jeyabalaji R. V., Shivani Kuttuva

Department of Pediatrics, Velammal Medical College Hospital, Madurai, Tamil Nadu, India

Received: 15 December 2020
Accepted: 16 January 2021

***Correspondence:**
Dr. Karthikraj T.,
E-mail: karthikrajmmc@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Febrile thrombocytopenia is a common reason for pediatric admission. Though infections are the major cause, noninfectious causes are not uncommon. This study was done to estimate the prevalence of thrombocytopenia as a presentation in pediatric fever cases, to analyze the various etiologies, presentations and relationship between platelet count and the severity of disease and prognosis.
Methods: Retrospective observational study done by collecting data from hospital records of children admitted in Velammal Medical college hospital from January 2016 to December 2017. Children in the age group of 6 months to 15 years with fever and thrombocytopenia at admission were included in the study. Children on treatment with anti-platelet drugs, other chronic diseases and infants less than 6 months were excluded.
Results: Out of 2523 fever cases admitted, 372 children fulfilled this criterion. 70% had positive dengue serology, other infectious causes were other viral hemorrhagic fevers, complicated enteric fever, scrub typhus and sepsis. The predominant non-infectious causes were hematological malignancies, Idiopathic thrombocytopenic purpura and Hemolytic uremia syndrome.
Conclusions: Febrile thrombocytopenia is a common clinical presentation in children in dengue endemic areas. Most viral fevers have leukopenia but presence of thrombocytopenia with warning signs like pain abdomen, vomiting or oliguria should prompt suspicion of dengue. Infections like enteric fever, scrub typhus or chikungunya may also mimic similar findings. Rarely diseases like leukemia, Idiopathic thrombocytopenic purpura, Hemolytic uremic syndrome or Sepsis may also present as febrile thrombocytopenia. The need for antibiotics or blood products is very minimal.

Keywords: Febrile thrombocytopenia, Tropical country, Dengue

INTRODUCTION

Febrile thrombocytopenia is the thrombocytopenia (platelet count <1,00,000 cells/cu.mm) associated with fever. Diseases which commonly present with fever and thrombocytopenia are infectious diseases like malaria, leptospirosis, rickettsia infections (scrub typhus), septicemia, typhoid, borreliosis, arboviral infections such as dengue or yellow fever, rodent-borne virus infections such as Hanta and Lassa fever, human immunodeficiency virus (HIV), visceral leishmaniasis, leukemia, lymphomas, idiopathic thrombocytopenic purpura and thrombotic thrombocytopenic purpura-hemolytic uremic syndrome. Various infections have been found to be endemic in certain geographic locations and also seasonal epidemics occur every year in different parts of the world.

The study was done by collecting epidemiological data of prevalence of thrombocytopenia in fever cases of pediatric population in South India. This study was intended to know the underlying etiology of febrile thrombocytopenia in children in tropical countries, the various presentations and relationship between platelet

count and severity of disease and its prognosis. This information may be utilized to devise a clinical examination-based investigation protocol for children presenting with febrile thrombocytopenia which will help in developing a cost-effective management strategy with minimum necessary investigations, thereby providing the correct protocol-based management.

The primary objectives of our study were to study the prevalence of thrombocytopenia (<1,00,000 cells/cu.mm) as a presentation in pediatric population in overall fever cases and to analyze various etiology of febrile thrombocytopenia in children in our hospital. We also studied the overall presentation and relationship between platelet count and severity of disease and prognosis.

METHODS

The study design was a retrospective observational study, done by collecting the data from the hospital records of children admitted in pediatric ward of Velammal medical college hospital, Madurai with fever from January 2016 to December 2017. The patients were to be selected based on inclusion and exclusion criteria. Children in the age group of 6months to 15 years with fever presentation and thrombocytopenia (platelet count <1,00,000 cells/cu.mm) at admission were included in the study. Children on treatment with anti-platelet drugs and other drugs causing thrombocytopenia, Children who were previously diagnosed to have chronic diseases like malignancy, chronic liver diseases or chronic kidney disease and Infants less than 6 months of age were excluded from the study.

Data of selected patients were collected from medical records and complete history; clinical findings and investigations were noted in a structured proforma. The data collected were entered in MS excel software and summary statistics were obtained which are presented below as proportions. Ethical clearance from the institutional ethical committee board was obtained.

RESULTS

Out of the total 8817 In-patient admissions to the pediatric ward, 2523 children were admitted with a diagnosis of fever in the study period (2016 to 2017), of which, 372 children in the age group of 6 months to 15 years, fulfilled the study criteria for febrile thrombocytopenia. Nearly 45% of these cases (168) were admitted during 2017 dengue epidemic. The predominant age group was 6 to 10 years (34%), followed by 11 to 15 years (29%) and 1 to 5 years (25%). Infants (6 months to 1 year) included were 6.5 % of the total study population. Male:Female ratio was almost equal at 1.1:1.

The most common symptomatology at presentation was fever which was present in all cases. Table 1 nearly half of them (48%) had high grade fever on presentation. The average duration of fever was 4 to 6 days with the maximum duration being 14 days. Constitutional symptoms and warning symptoms (vomiting, abdominal pain) were the next common symptoms at presentation. Other uncommon presentations included those with respiratory symptoms and loose stools. Around 3% had a neurological symptom like seizure or altered sensorium at presentation.

Table 1: Common symptomatology of febrile thrombocytopenia.

Symptoms	Variables
Fever- high grade	182
Low grade (<101*F)	190
Duration	Average 4 to 6 days, max 14 days
Myalgia, poor appetite, headache	152 (40.8)
Cough/cold	48 (12.9)
Pain abdomen and vomiting	164 (44.1)
Loose stools	27 (7.25)
Facial puffiness	98 (26.3)
Melena	70 (18.8)
Hematemesis	13 (3.5)
Oliguria	123 (33.3)
Other mucosal bleeds (gum bleeds/epistaxis/skin bleeds)	74 (19.8)
Atypical CNS (seizures, encephalopathy)	12 (3.2)

Examination showed that erythematous rash was the most common clinical finding seen in almost 51% of the study population at some point of the illness during admission. Table 2 shows hepatomegaly with right hypochondrial tenderness was the next common clinical finding in 45%, followed by fluid leak (ascites, pleural effusion) in 39%, periorbital puffiness (29%), subcutaneous bleeds (20%), conjunctival congestion (11%) and splenomegaly (4.5%) as shown below.

Table 2: Clinical signs in febrile thrombocytopenia cases.

Clinical sign	Cases
Periorbital puffiness	108
Conjunctival congestion	43
Petechiae/purpura	76
Erythematous skin rash	190
Hepatomegaly/right hypochondriac tenderness	169
Splenomegaly	17
Ascites/pleural effusion	146

Blood investigations done showed that total leucocyte count below 5000 was more suggestive of viral fever like dengue. Table 3 shows dengue fever with warnings signs also called as dengue hemorrhagic fever (DHF) was mostly associated with hemoconcentration and elevated transaminases. Few children (23/372) had hemoglobin

less than 10 at admission, among which 10 were later diagnosed to have leukemia or hemolytic uremic syndrome. Only 8 of the 23 had positive serology for dengue and they were all stable without any warning signs. The average maximum hematocrit during the hospital stay of all febrile thrombocytopenia cases was 38.9 and it came down to 35.1 at discharge. The hematocrit values were very high in adolescent males (more than 50 in 4 children between 11 to 14 years of age) and all of them had both IgG and IgM for dengue positive.

Table 3: Basic lab investigations in febrile thrombocytopenia cases.

Lab investigations	Values
Hemoglobin	5 to 17.2 (mean12.1±1.85), median 11.9 mode 11.7
Total leucocyte count	Median 5100, range 2200-70300
Hematocrit at admission	37±5.33 (mean/SD)
Maximum hematocrit	38.9±5.23
Hematocrit at discharge	35.1±5.4

Nearly 43 % children were found to have severe thrombocytopenia during hospital stay. Table 4 shows the incidence was more common in boys than girls. Figure 1 shows among the 37 children who had platelet count less than 10,000 only 2 had significant gastrointestinal bleeding manifestation. Others had only mucocutaneous bleeds or skin bleeds only. Nearly 33% had platelet counts 20,000 to 50,000. Significantly low platelet count (<20,000) with high total counts was also noted in scrub typhus, leukemia and sepsis, the latter 2 being associated with poor prognosis. In case of severe sepsis, at admission though the laboratory investigations were not grossly abnormal, these children were more toxic with hemodynamic compromise and the platelet count had more significant fall or clinical bleeds after 48 to 72 hours of admission.

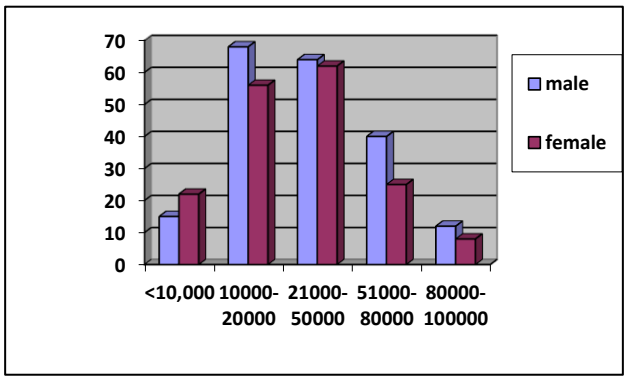


Figure 1: Severity of thrombocytopenia in children among both genders.

Table 4: Platelet count at admission in febrile thrombocytopenia cases.

Platelet count (per cu.mm)	No. of children
<10000	37
10-20000	124
20000-50000	126
51000-80000	65
80000 to 100000	20

The range of liver enzymes was widely varying from aspartate transaminase 15 to 1119 and alanine transaminase was 13 to 515. The higher the value of liver enzyme, the severe was the course of the disease.

The diagnostic panel done in children with fever less than 5 days included dengue serology (Ns1, IgM, IgG), smear for malarial parasite at admission and they were given supportive care according to the severity of the illness. If fever was persisting beyond 7 days WIDAL, scrub typhus serology, leptospirosis serology was done and antibiotics given according to the diagnosis-doxycycline in scrub typhus and ceftriaxone for enteric fever. Few children who had abnormal finding in the peripheral smear were further evaluated and diagnosed as hemolytic uremic syndrome (HUS) or hematologic malignancy. Only 17 out of the 372 children (4.5%) had non infective cause for febrile thrombocytopenia. Bone marrow study was done in 10 children to confirm leukemia or idiopathic thrombocytopenic purpura (ITP) while in 5 of them there was hyper-leukocytosis or plenty of blasts in peripheral smear itself. Hence flowcytometry was done from peripheral blood itself to confirm the diagnosis.

Table 5: Diagnostic investigations.

Diagnosis	Findings
Dengue NS1 Ag +ve	129
Dengue NS1 Ag and IgM +ve	94
Dengue IgM and IgG +ve	33
VHF (serology negative)	30
PS for malaria positive	5
WIDAL (>1:320) +ve	32
Scrub typhus serology +ve	19
Leptospirosis serology +ve	5
PS/BMA suggestive of leukemia	8
PS suggestive of HUS	5
Sepsis with DIC	8
ITP	4

Diagnosis was reached in almost 80% of the cases with the initial panel of investigations (CBC with peripheral smear, dengue serology). When fever persisted beyond 5 to 7 days or child had some atypical symptoms like splenomegaly, eschar or abnormal peripheral smear the second line investigations were done.

The predominant diagnosis was dengue fever in 253 children (69%), followed by other viral haemorrhagic

fevers (8%), scrub typhus fever (5%), malaria (1%), leukemia (2%), sepsis with disseminated intravascular coagulation (DIC) (2%), HUS (1.3%) and leptospirosis (1%) Figure 2.

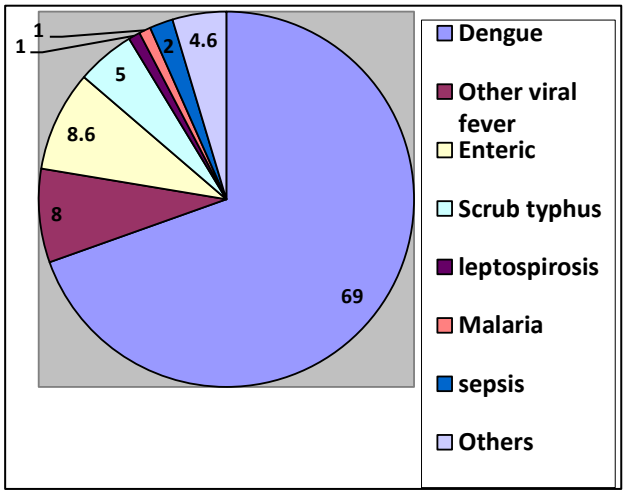


Figure 2: Percentage distribution of the various diagnoses of febrile thrombocytopenia among children.

Among dengue those with warning signs were 152 (53%) were the majority, followed by those without warning signs-101 (35%). 29 children (10.2%) were diagnosed to have severe dengue. Among this 29, 15 (50%) had significant bleeding, 8 (27.5%) had Dengue shock syndrome and 6 (20.6%) had severe respiratory distress with metabolic abnormalities.

All the viral fever cases were managed as per protocol (WHO dengue protocol) and others according their specific diagnoses.

A total of 246 cases (66%) required fluid challenge. 45 cases (12%) required platelet rich plasma (PRP) transfusion for whom the diagnoses were Dengue with warning signs (71%) in PICU care, dengue shock syndrome (DSS) (6.6%) and leukemia (33.3%). The average hospital stay was 8 days and the maximum duration was 22 days. 124 (33.33%) children required PICU care during their course of treatment. The clinical outcome was positive in 367 cases, while 5 children (3-DHF, 2-sepsis) expired in the course of their treatment.

DISCUSSION

Fever is one of the commonest presenting symptoms for most of the hospital visits in children. Thrombocytopenia may be an important laboratory finding in a febrile child as it needs further evaluation regarding the etiology. Various infectious agents like dengue, chikungunya, *Plasmodium* species and *Salmonella typhi* can present with febrile thrombocytopenia in tropical countries. Identifying the exact etiologic agent is important as the management protocol is different for different infections.

In addition to infections, noninfectious causes for febrile thrombocytopenia, though rare, do exist in all countries. Thrombocytopenia is defined as platelet count less than 150000/µl while severe thrombocytopenia is defined as platelet count less than 50000/µl.[1]

In our study, out of the total fever cases admitted (2523) in the pediatric wards, around 15% had febrile thrombocytopenia at admission. Some children had normal platelet counts at admission but they developed thrombocytopenia during the hospital stay but they were not included in this study. Almost 70% of the children who were included in the study had positive dengue serology. Incidence of dengue has increased 230-fold with increasing geographic expansion and the rapidly expanding global footprint of dengue is a public health challenge in many developing countries.[2] Though it occurs in seasonal epidemics, many areas have also become endemic to dengue virus resulting in cases throughout the year. In the age distribution, almost two third were between 6 years to 15 years of age. Two third of these children improved with fluid therapy alone, either oral or intravenous, given according to WHO protocol for dengue management. Antibiotics were not started in children with fever less than 4 days duration, if the blood counts had evidence of leucopenia along with thrombocytopenia at admission and clinical evidence of viral fever with no foci of bacterial infection. This sort of antibiotic stewardship is essential in developing countries to prevent antibiotic resistance and misuse of antibiotics in viral infections. Also imaging studies like ultrasound abdomen were not routinely done in all cases of fever more than 3 days. It was done only in sick children and if the initial diagnostic workup was not confirmatory.

In a pediatric study done by Ramabhatta et al at Bangalore, 20% of children with fever had associated thrombocytopenia.[3] A total of 306 children were included in the study and 280 children definite diagnosis was made out, of which more than 80% had dengue fever. A study done at the university of Munich hospital by Herbinger et al showed increased incidence of EBV, CMV along with arboviral infections.[4] Another study by Malik et al showed that complicated Enteric fever is an important cause for febrile thrombocytopenia in developing countries.[5] In our study, 69% of the children had dengue fever while enteric fever was the second common cause for febrile thrombocytopenia. In a similar pediatric study done by Nair et al published from North India, viral fevers other than Dengue and chikungunya were more common while Enteric fever had an incidence of around 12%.[6] We did not evaluate for other viruses like chikungunya, *Ebstein Barr* virus due to cost issues and unavailability of the tests in our institute. But most of the cases of febrile thrombocytopenia had positive dengue serology in our study (69%) and only 8% were viral fever with negative dengue serology.

In a study by Phakhounthong most significant factor in predicting severe dengue was low hematocrit, followed

by a GCS of 11 or hematocrit was greater than 28 or platelet count of 146,000 per mm^3.[7] The correlation between degree of thrombocytopenia and severity of the disease is not directly analyzed in our study but skin bleeds were seen in only 20% of the study group and it was mostly present when platelet counts was less than 20,000. But in children with features of severe dengue, 50% had significant bleeding manifestations like hematemesis, Malena and pulmonary hemorrhage. The tendency to bleed was not correlating to the platelet count as few children had bleeding manifestations in spite of having platelet counts more than 50,000. The bleeding manifestations were not directly proportional to the degree of thrombocytopenia and the need for blood products transfusion was predominantly for hemodynamic compromise. We could also infer that sick children had significant rise in transaminases, hematocrit and deranged coagulation profile. Nair el.[6] also had similar findings in their study. Also, in few adult studies like those done by Harsha and Radhika et al showed that infections like dengue, septicemia and malaria were the predominant causes of febrile thrombocytopenia.[8,9] In a study by Subramanian et al bleeding manifestations were noted predominantly in children with counts 20000 to 100000/µl and they contributed to nearly 70% of all the bleeding manifestations.[10] In a study by Kshirsagar et al thrombocytopenia, elevated serum hepatic enzymes, abnormal renal function tests, low sodium, hypoalbuminemia, hypoglycemia, abnormal radiological findings were found to be the predictors of severity.[11] Our study was not designed to develop the predictors for disease severity but the severe cases had evidence of fluid overload or multiorgan dysfunction like oliguria, respiratory distress or encephalopathy or shock within the first 24 to 48 hours of admission itself.

The mortality rate in our study was 0.01% (5 out of 372) which was both due to severe dengue and severe sepsis with disseminated intravascular coagulation. Dengue shock syndrome was recognized in 22 cases at admission and most of them responded well to intravenous fluids given as per WHO protocol and only few required colloid or platelet rich plasma (PRP) for further resuscitation.

The duration of hospital stay was 8 to 12 days in most of the dengue serology positive cases. In a study done by Selvan et al the duration of hospital stay was similar and male children in the age group of 10-18 years were more affected.[12] Few children with other alternative diagnosis, who required further investigations or those who had secondary problems during the hospital stay like abscess, sepsis with blood culture positivity or infection associated hemophagocytic syndrome had a prolonged stay lasting 2 to 3 weeks on an average.

The limitations of our study were that we did not include children admitted with fever who developed thrombocytopenia in the course of hospital stay and we also did not attempt to diagnose the exact etiology of other viral hemorrhagic fevers.

CONCLUSION

Febrile thrombocytopenia is a common clinical presentation in children especially during rainy seasons in dengue endemic areas. In addition to dengue, few other infections like enteric fever, scrub typhus or chikungunya may also mimic similar findings. Rarely diseases like leukemia, idiopathic thrombocytopenic purpura, hemolytic uremic syndrome or sepsis may present as febrile thrombocytopenia, but a proper peripheral smear or serial hemograms will help us to arrive at the right diagnosis. In our study 15% of children with fever had febrile thrombocytopenia of which around 70% were confirmed to be dengue and less than 5% had underlying noninfective etiology. Two third of the children required only fluid therapy and the degree of thrombocytopenia was not directly related to the severity of the viral fever. Most sick children had significant rise in transaminases, hematocrit and deranged coagulation profile. Though most of the viral fevers can have leukopenia, presence of thrombocytopenia along with warning signs like pain abdomen, vomiting or oliguria should prompt the treatment protocol as advised by WHO. Judicious use of antibiotics and radiologic tests will result in a cost-effective management of the common prevalent infections in tropical countries.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee on 04/04/2017, IEC REF NO:VMCIEC/23/2017

REFERENCES

1. Nagler M, Keller P, Siegrist D, Alberio L. A case of EDTA dependent pseudo-thrombocytopenia: simple recognition of under diagnosed and misleading phenomenon. BMC Clin Pathol. 2014;14:19.
2. Simmons CP, Farrar JJ, Nguyen V, Wills B. Dengue. N Engl J Med. 2012;366:1423-32.
3. Sujatha R, Pushpalatha K, Bharathi K, Udaya R, Hareesh S. An aetiological profile of febrile thrombocytopenia in children. Sri Lanka J Child Health. 2018;47;146-8.
4. Herbinger KH, Schunk M, Nothdruft HD, Von Sonnenburg F, Loscher T, Bretzel G. A comparative study on infection induced thrombocytopenia among returned travellers. Infection. 2012;40:373-9.
5. Malik AS. Complications of bacteriologically confirmed typhoid fever in children. J Trop Paediatr. 2002;48:102-8.
6. Nair Bindu T, Kuldeep S, Sandeep PD. A study of clinical and laboratory profile of febrile children presenting with thrombocytopenia. Int J Contem Pediatr. 2017;4(6):2114-9.
7. Phakhounthong K, Chaovalit P, Jittamala P. Predicting the severity of dengue fever in children on admission based on clinical features and laboratory

indicators: application of classification tree analysis. BMC Pediatr. 2018;18:109.
8. Harsha NS, Thimma Reddy TR, Shruthi M, Ravishankar SN, Madhuvan HS. A Study of Clinical and Laboratory Profile of Fever with Thrombocytopenia. J clin biomed sci. 2016;6:121-4.
9. Radhika BV, Sooraj CS, Kamath V. Section: Medicine A Study of Febrile Thrombocytopenia Section. Medicine. 2019;6:21-5.
10. Subramanian V, Santosh K. Thrombocytopenia in children: a clinico-etiological profile in an urban tertiary care hospital. Int J Contem Pediatr. 2018;6:131.
11. Kshirsagar P, Chauhan S, Samel D. Towards Developing a Scoring System for Febrile Thrombocytopenia. The J Asso Physicians India. 2016;64(2):14-8.
12. Selvan T, Nagaraj MV, Saravanan P, Somashekar. A study of clinical profile of dengue fever in children. Int J Contemp Pediatr. 2017;4:534.

Cite this article as: Karthikraj T, Rajma JJ, Jeyabalaji RV, Kuttuva S. Spectrum of febrile thrombocytopenia among children in a tropical country-a hospital based observational study in South India. Int J Contemp Pediatr 2021;8:354-9.

Springer Link Search Log in

Original Article | Published: 22 April 2021

Safety of Percutaneous vs Open Tracheostomy on Intubated Patients in ICU Setting: Which One is Better?

S. Maheshwaran, Sara V. Thomas, Gopala Krishnan Raman & S. Pookamala

Indian Journal of Otolaryngology and Head & Neck Surgery (2021)

48 Accesses | **2** Citations | Metrics

Abstract

To study the safety of percutaneous vs open tracheostomy approaches on patients requiring long term ventilation in ICU setting. It is a prospective study done over a period of 2 years on 105 patients requiring long term ventilation in ICU set up in a tertiary care hospital. Patients were subjected to either open approach or percutaneous tracheostomy bedside in ICU itself. Then patients were followed during their hospital stay to look for any tracheostomy related complications. Data regarding age, gender, indications of long term ventilation and complications were compiled and analysis was done. It was found that most of the patients were of male gender (88.6%) in the age group of 50–59 years of age. The most common cause for tracheostomy was head injury secondary to road

traffic accident, seen in 79 out of 105 cases. On comparing complications rate, there was no statistically significant difference in both the groups. However rate of peristomal infection is more with open approach group ($P < 0.05$). Percutaneous tracheostomy can be performed safely in ICU as a bedside procedure. There is significant reduction in peristomal infection with percutaneous tracheostomy and there is no significant difference in other complications between the two groups. Thus percutaneous tracheostomy is as safe as an open approach tracheostomy in properly selected cases.

This is a preview of subscription content, access via your institution.

Access options

Buy article PDF

39,95 €

Price includes VAT (India)

Instant access to the full article PDF.

Rent this article via DeepDyve.

Learn more about Institutional subscriptions

DOI: 10.7860/IJARS/2021/46070:2642

Original Article

Radiology Section

Association between MRI Findings and Histopathological Examination in Carcinoma Cervix: A Retrospective Study

YOGARAJ[1], KUMARAN[2]

BY-NC-ND

ABSTRACT

Introduction: Staging of cervical cancer plays a major role in the treatment and prognosis of the patients. Preoperative Magnetic Resonance Imaging (MRI) is widely reviewed as a method to stage cervical cancer.

Aim: To evaluate the role of MRI in the staging of cervical cancer in correlation with Histopathological Examination (HPE).

Materials and Methods: A retrospective observational hospital-based study was done on 48 patients with Carcinoma Cervix attending the Velammal Medical College Hospital and Research Institute, Madurai, Tamilnadu. The patients, who had undergone MRI (on 1.5 Tesla Unit) of abdomen and pelvis from June 2018 to July 2019 were included in the study. Tumour location, size, vaginal, parametrial extension, pelvic sidewall involvement, pelvic and retroperitoneal lymphadenopathy, spread to adjacent pelvic organs and distant organs following retroperitoneal lymphadenopathy were reviewed from reports, and histopathology reports were analysed. International Federation of Gynaecology and Obstetrics (FIGO) staging was done for all the cases. HPE findings and MRI findings were assessed for correlation. IBM SPSS version 22.0 was used for statistical analysis. Descriptive analysis was carried out, and values were represented as mean with standard deviation for quantitative variables, frequency and proportion for categorical variables.

Results: The mean age was 54.46±9.29 years. The majority 42 (87.5%) of the patients had Squamous cell carcinoma of the cervix on HPE. The majority 23 (47.91%) of the patients had stage IB carcinoma of the cervix. MRI revealed pelvic lymphadenopathy in 04 (8.33%) of cases, pelvic lymph nodal metastasis was seen in 02 (4.16%) of the HPE cases.

Conclusion: MRI is useful in staging of Carcinoma cervix in stage IB or greater and for planning of treatment. Hence, MRI has the potential to be used as a one-stop-shop diagnostic tool for cervical cancer.

Keywords: Cervical cancer, Correlation, Extension, International federation of gynaecology and obstetrics staging, Lymphadenopathy, Magnetic resonance imaging, Vagina

INTRODUCTION

Malignant (cancer) cells can be formed in the tissues of the cervix, the lower, narrow end of the uterus to result in cervical cancer [1]. Cervical cancer is the fourth most frequent cancer amongst women globally. The burden faced by low and middle-income countries is significantly greater than in high-income countries. The disparity is a direct result of the differences in resources. In developed countries, the new cases and deaths due to cervical cancer have reduced by half compared to thirty years back. This was attributed to the induction of formal screening for cervical cancer [2]. Nearly, all cervical cancers are caused by specific types of Human Papillomavirus (HPV). Prophylactic vaccination for HPV provides the most effective method of primary prevention against HPV-related diseases. The use of the Papanicolaou (Pap) test and HPV test, according to published guidelines, provides the most effective means of screening for cervical cancer [3].

Cancer of the cervix uteri is the second most common cancer (after breast cancer), and the third leading cancer mortality (after lung and breast cancer) among women worldwide [4]. Almost 75% of all the cervical cancers are squamous cell carcinomas. Other histological variants like adenocarcinoma, adenosquamous cell carcinoma forms the 10-15% and remaining by other subtypes [5,6].

Histopathological Examination (HPE) of the cervical biopsy remains the most commonly utilised diagnostic tool of cervical cancers [7]. It determines the treatment of cancer and pre-cancer through classifying into diagnosis of the patterns of microscopic organisation of cells in tissue sections from a biopsy or surgical specimens. MRI can be utilised as an efficient imaging tool for the diagnosis and staging of cervical cancer. Lymph node involvements can be assessed. The decision to port site can be made, and follow-up scans can be done to study the treatment impact [8,9]. In 2018, The former International Federation of Gynaecology and Obstetrics (FIGO) revised the 2014 FIGO staging system of cervical cancer. The former FIGO staging system of cervical cancer was mainly based on characteristics of primary tumours and did not take into account the characteristics of positive lymph nodes into consideration while the revised staging system defined patients with regional lymph node metastasis as stage IIIC [10,11].

MRI is optimal for evaluation of important prognostic factors such as lesion volume and metastatic lymph node involvement. MRI being non-invasive supersedes the use of invasive techniques like cystoscopy and proctoscopy. It is an imperative tool in staging cervical cancer to differentiate early disease (stage IIA) from complex disease (stage IIB or greater). MRI has been in advance use for pre-treatment staging of uterine cervical carcinoma; however, it is not yet acknowledged as a Gold Standard [12-15]. The objective of this study was to evaluate the role of MRI in the staging of Carcinoma cervix and to assess the correlation of MRI findings with that of HPE.

MATERIALS AND METHODS

A retrospective observational hospital-based study was done on 48 patients with Carcinoma Cervix attending the Velammal Medical College Hospital and Research Institute, Madurai, Tamilnadu.

Sample size calculation: The sample size was calculated assuming the proportion of squamous cell carcinomas 73.3% as per the study by Shweel MA et al., [16]. The other parameters considered for sample size calculation were 13% absolute precision and a 95%

confidence level. An infinite population correction was applied. The following formula was used for sample size calculation [17].

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where, n=Sample size

Z=Z statistic for a level of confidence,

P=Expected prevalence of proportion (If the expected prevalence was 73.3%, then P=0.733), and

d=Precision (If the precision was 13%, then d=0.13).

The required number of subjects as per the above mentioned calculation was 45. To account for a non-participation rate of about 5% (2 subjects), it was decided to sample about 48 subjects for the study.

The clinical data of all patients diagnosed with carcinoma cervix and who had undergone MRI Study (on 1.5 Tesla Unit) of abdomen and pelvis over a period of 14 months from June 2018 to July 2019 was reviewed. The MRI of our hospital was GE- Optima MR 360 1.5 T 16 channel. Standard MRI protocol includes. Pelvis-3 Plane T2, T1 axial, STIR axial, diffusion. Post-contrast-T1FS pre, dynamic contrast for uterus, 3 Plane T1 FS, Axial lava, Coronal lava. Screening of upper abdomen-T2FS Axial, Coronal T2 Haste, diffusion. Contrast agent-Gadopentetate Dimeglunine Injection USP-10 mL. Composition-Gadopentetate Dimeglunine 469 mg in 10 mg. Contrast study was not performed in patients with elevated renal parameters, previous history of contrast allergy and unwillingness for contrast from patient or primary consultant side.

Inclusion criteria: All the patients falling into the sampling frame irrespective of the age, gender, stage of cancer, metastasis or other factors were included in the study since it was only a hospital record-based study.

Exclusion criteria: Patients unable to undergo MRI for any reason were excluded from the study.

The confidentiality of the patient details was maintained throughout the study. The staging was done by 2018 FIGO revised staging system of cervical cancer [11]. HPE findings and MRI findings were assessed.

STATISTICAL ANALYSIS

All the statistical analysis was done using SPSS version 22.0. Descriptive analysis was carried out, and values were represented as mean with standard deviation for quantitative variables, frequency and proportion for categorical variables.

RESULTS

A total of 48 subjects were included in the final analysis.

The mean age of the study population was 54.46±9.29 years. The youngest patient was 33-year-old, while the oldest was 73-year-old.

In HPE, 47.91% had a mass lesion of the cervix, 16.66% had with the involvement of upper 2/3rd of the vagina, and 4.16% had micro-invasive carcinoma cervix and pelvic lymph nodes for each respectively. In MRI, 47.91% had a mass lesion of cervix confined to the cervix, 16.66% had an extension to upper two-thirds of the vagina. Approximately, 2% and 4% had bladder and rectal invasion, respectively [Table/Fig-1,2].

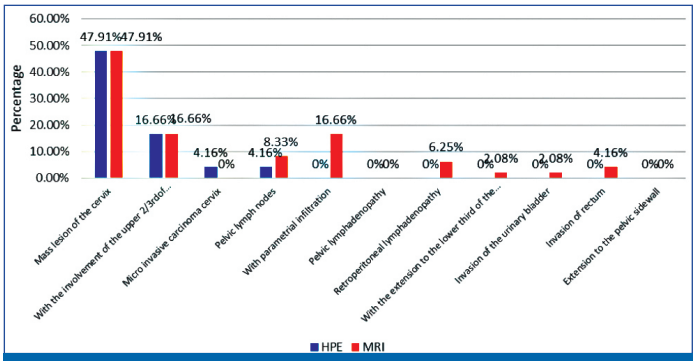
By FIGO staging of carcinoma cervix, majority of the patients (47.91%) were stage IB and 16.67% patients were stage II A and stage II B for each, respectively [Table/Fig-3].

The majority 42 (87.5%) of the patients had squamous cell carcinoma on HPE. Two (4.2%) participants had poorly differentiated carcinoma-cervix, while another 2 (4.2%) had squamous/adenocarcinoma. 1 (2.1%) participant had adenocarcinomas, and another 1 (2.1%) had carcinoma in situ [Table/Fig-4].

Among the people with chief complaints, majority of 30 (62.5%) participants had white discharge, followed by postmenopausal bleeding were 29 (60.4%), lower abdominal pain was 23 (47.9%), dysmenorrhea was 8 (16.7%) and other complaints, fatigue and back pain was 6 (12.55%), 5 (10.4%) and 4 (8.3%), respectively [Table/Fig-5].

Involvement/extension	Frequency (n)	Percentages (%)
Histopathological Examination (HPE) findings		
Mass lesion of the cervix	23	47.91
With the involvement of the upper 2/3rd of the vagina	8	16.66
Micro invasive carcinoma cervix	2	4.16
Pelvic lymph nodes	2	4.16
MRI findings Involvement/Extension		
Mass lesion of cervix confined to the cervix	23	47.91
With the extension to upper two-thirds of the vagina	8	16.66
With parametrial infiltration	8	16.66
Pelvic lymphadenopathy	4	8.33
Retroperitoneal lymphadenopathy	3	6.25
With the extension to the lower third of the vagina	1	2.08
Invasion of the urinary bladder	1	2.08
Invasion of rectum	2	4.16
Extension to the pelvic sidewall	0	0%

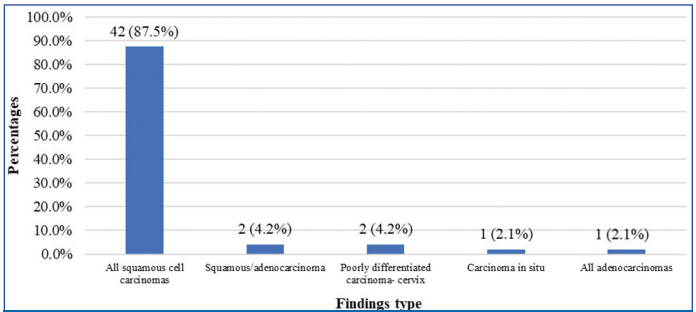
[Table/Fig-1]: Descriptive analysis of histopathological and MRI findings involvement/extension in the study population* having the common features.
*multiple complaints in same participants; MRI: Magnetic resonance imaging



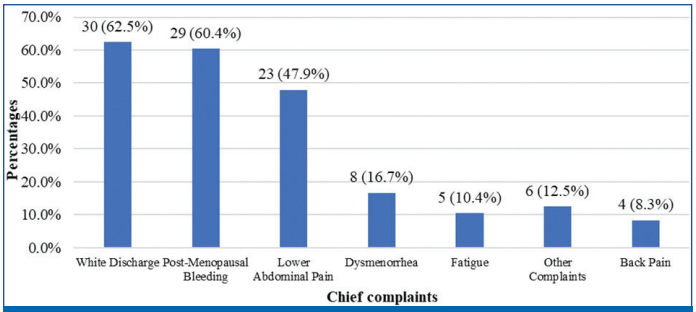
[Table/Fig-2]: Histogram depicting the comparison between MRI staging of uterine cervical carcinoma and pathological stage of cervical carcinoma.
HPE: Histopathological examination; MRI: Magnetic resonance imaging

FIGO staging	Summary N (%)
Stage I B	23 (47.91)
Stage II A	8 (16.67)
Stage II B	8 (16.67)
Stage I A	2 (4.16)
Stage III C1	2 (4.16)
Stage III C2	2 (4.16)
Stage IV A	2 (4.16)
Stage III A	1 (2.08)

[Table/Fig-3]: FIGO Staging of carcinoma cervix in the study population- distribution of patients (N=48).
FIGO: International federation of gynaecology and obstetrics



[Table/Fig-4]: Bar chart of Histopathological Examination (HPE) findings in the study population (N=48).



[Table/Fig-5]: Bar chart of chief complaints in the study population.

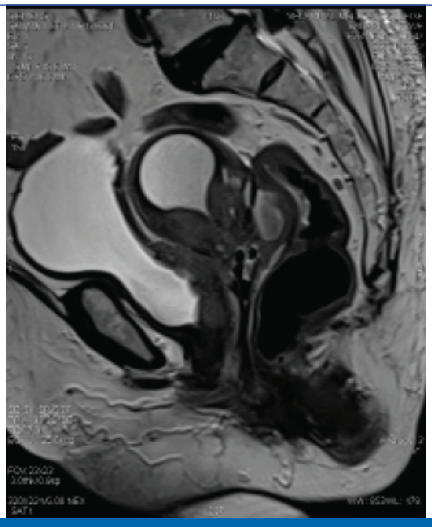
When compared, MRI (mass lesion of the cervix) had a sensitivity of 47.83% in predicting HPE, specificity was 52%, and the total diagnostic accuracy was 50.00%. When compared, MRI (with the involvement of the upper 2/3rd of, the vagina) had sensitivity, specificity, positive predictive value, negative predictive value and the total diagnostic accuracy of 100% in predicting HPE. When compared, MRI (pelvic lymph nodes) had a sensitivity of 50% in predicting HPE, specificity was 92.50%, and the total diagnostic accuracy was 90.48% [Table/Fig-6]. The MRI image showing the cervical cancer lesion has been illustrated in [Table/Fig-7].

findings were compatible with studies conducted by Shweel MA et al., Collettini F and Hamm B, who reported that about 80-90% of cervical carcinomas were squamous cell carcinoma cases in their study [16,22]. The majority (47.91%) had stage IB carcinoma of the cervix in our study, while 16.67% had stage IIB and another 16.67% had stage II A carcinoma of the cervix. Shweel MA et al., in their study observed that only 6.6% had stage IB carcinoma of the cervix, 40.3% had Stage IIA, 26.6% had Stage IIB and another 26.6% had Stage IVA carcinoma [16]. There was a high percentage of stage IB in the present study, as this study being a retrospective study, probably during the given period, there were higher stage IB patients. Two patients have been reported as stage IA in this study. In both the patients, MRI was normal to study and no abnormality was detected.

The correlation between HPE findings and MRI was high in this study. MRI was highly accurate as HPE in detecting the involvement or extension of the carcinoma of the cervix. In both HPE and MRI, 47.91% had a mass lesion of the cervix, and 16.66% had with the involvement of upper 2/3rd of the vagina. A 4.16% had metastatic involvement of pelvic lymph nodes on HPE among the 8.33% of the patients who had pelvic lymphadenopathy detected on MRI. Parametrial

Findings	Sensitivity	Specificity	FPR	FNR	PPV	NPV	Overall diagnostic accuracy
Mass lesion of the cervix	47.83%	52%	48%	52.17%	47.83%	52%	50%
With the involvement of the upper 2/3rd of the vagina	100%	100%	0%	0%	100%	100%	100%
Pelvic lymph nodes	50%	92.50%	7.50%	50.00%	25%	97.37%	90.48%

[Table/Fig-6]: Diagnostic accuracy of MRI as compared to Histopathology among the study population.
FPR: False positive rate; FNR: False negative rate; NPV: Negative predictive value; PPV: Positive predictive value



[Table/Fig-7]: MRI illustrating carcinoma cervix.

DISCUSSION

Cervical cancer is the commonest cancer cause of death among women in developing countries [18] in India, the mortality due to cervical cancer is high, and nearly 122,844 new cases are diagnosed, and almost 67,477 deaths occur every year. India, with a high proportion of the population aged 15 years and above, is at risk of developing cervical cancer. Cervical cancer in women aged 15-44 years is the second most common cancer, with the highest standardized mortality rate. Therefore, it is vital to understand the epidemiology of cervical cancer in India [19-21]. Currently, there are two types of diagnostic tests for cervical cancer screening: Papanicolaou test and HPV test. In locally advanced disease, pelvic MRI and Positron Emission Technology-Computed Tomography (PET-CT) are performed for diagnosis [20]. In the present study, the most common pathological type of the examined cervical mass was squamous cell carcinoma. The majority (87.5%) had squamous cell carcinoma on HPE while 4.2% had poorly differentiated carcinoma of the cervix. Only one subject (2.1%) had carcinoma in situ. These infiltration, invasion of the rectum, urinary bladder, extension to the lower third of the vagina, retroperitoneal lymphadenopathy were identified by MRI. Magnetic Resonance Imaging staging of cancer cervix was also comparable with histopathologic staging in the study by Shweel MA et al., [16]. Still in their study, MRI over staging was observed in their study on one patient with Stage IIA disease and one patient with Stage IIB disease.

In the study by Shweel MA et al., MRI was highly sensitive (100%) and specific (100%) in determining tumour extension to the stroma, urinary bladder, and rectum [16]. Morimura Y et al., in their study also observed that MRI showed very high specificity (99.2%) and high sensitivity (88.5%) in detecting cervical stromal invasion [23]. Shweel MA et al., and Rockall AG et al., in their studies have postulated that the absence of bladder or rectal invasion can be diagnosed with sufficient confidence using MRI (NPV=100%) [16,24]. The low sensitivity of MRI in another study can be due to its inability to identify metastasis in normal-sized lymph nodes [25]. Invasion of the parametrium is an important factor in the evaluation of cancer cervix that significantly influences staging and treatment [26], Shweel MA et al., in their study found the sensitivity of MRI was 100%, with a specificity of 85.7% in detecting parametrial involvement [16]. In the present study, MRI detected parametrial infiltration in 16.66% of subjects. Besides being a non-invasive modality, MRI findings in the present study had a high correlation with HPE.

Limitation(s)

The present study was only a retrospective record-based study with small sample size, only including the subjects falling under our sampling frame. The external validity of our results is poor.

CONCLUSION(S)

To summarise, MRI is the imaging modality of choice for the assessment of tumour location, its size, presence of invasion into parametrium, pelvic sidewall or adjacent pelvic organ invasion cases of carcinoma cervix and to determine the treatment strategy which is dependent on the tumour stage.

Acknowledgement

We acknowledge the technical support in data entry, analysis and manuscript editing by “Evidencian Research Associates”.

REFERENCES

[1] Pisani P, Parkin DM, Bray F, Ferlay J. Estimates of the worldwide mortality from 25 cancers in 1990. Int J Cancer. 1999;83(1):18-29.
[2] Vu M, Yu J, Awolude OA, Chuang L. Cervical cancer worldwide. Curr Probl Cancer. 2018;42(5):457-65.
[3] Cohen PA, Jhingran A, Oaknin A, Denny L. Cervical cancer. Lancet. 2019;393(10167):169-82.
[4] Kessler TA. Cervical cancer: prevention and early detection. Semin Oncol Nurs. 2017;33(2):172-83.
[5] Parkin DM, Bray FI, Devesa SS. Cancer burden in the year 2000. The global picture. Eur J Cancer. 2001;37 (Suppl 8):S4-66.
[6] Vizcaino AP, Moreno V, Bosch FX, Muñoz N, Barros-Dios XM, Parkin DM. International trends in the incidence of cervical cancer: I. Adenocarcinoma and adenosquamous cell carcinomas. Int J Cancer. 1998;75(4):536-45.
[7] Vizcaino AP, Moreno V, Bosch FX, Muñoz N, Barros-Dios XM, Borras J, et al. International trends in incidence of cervical cancer: II. Squamous-cell carcinoma. Int J Cancer. 2000;86(3):429-35.
[8] Singh N, Arif S. Histopathologic parameters of prognosis in cervical cancer-A review. Int J Gynecol Cancer. 2004;14(5):741-50.
[9] Jenkins D. Histopathology and cytopathology of cervical cancer. Dis Markers. 2007;23(4):199-212.
[10] Mahajan A, Sable NP, Popat PB, Bhargava P, Gangadhar K, Thakur MH, et al. Magnetic resonance imaging of gynecological malignancies: Role in personalized management. Semin Ultrasound CT MR. 2017;38(3):231-68.
[11] Sala E, Rockall AG, Freeman SJ, Mitchell DG, Reinhold C. The added role of MR imaging in treatment stratification of patients with gynecologic malignancies: What the radiologist needs to know. Radiology. 2013;266(3):717-40.
[12] Bhatla N, Aoki D, Sharma DN, Sankaranarayanan R. Cancer of the cervix uteri. Int J Gynaecol Obstet. 2018;143(Suppl 2):22-36.
[13] Liu X, Wang J, Hu K, Zhang F, Meng Q, Wang W, et al. Validation of the 2018 FIGO Staging system of cervical cancer for stage iii patients with a cohort from China. Cancer Manag Res. 2020;12:1405-10. PMID: 32161492.
[14] Okamoto Y, Tanaka YO, Nishida M, Tsunoda H, Yoshikawa H, Itai Y. MR imaging of the uterine cervix: Imaging-pathologic correlation. Radiographics. 2003;23(2):534-35.
[15] Testa AC, Ludovisi M, Manfredi R, Zannoni G, Gui B, Basso D, et al. Transvaginal ultrasonography and magnetic resonance imaging for assessment of presence, size and extent of invasive cervical cancer. Ultrasound Obstet Gynecol. 2009;34(3):335-44.
[16] Shweel MA, Abdel-Gawad EA, Abdelghany HS, Abdel-Rahman AM, Ibrahim EM. Uterine cervical malignancy: Diagnostic accuracy of MRI with histopathologic correlation. J Clin Imaging Sci. 2012;2:42. PMID: 22919556.
[17] Zand KR, Reinhold C, Abe H, Maheshwari S, Mohamed A, Upegui D. Magnetic resonance imaging of the cervix. Cancer Imaging. 2007;7(1):69-76.
[18] Sahdev A, Sohaib S, Wenaden A, Shepherd J, Reznek RJ. The performance of magnetic resonance imaging in early cervical carcinoma: A long-term experience. Int J Gynecol Cancer. 2007;17(3):629-36.
[19] Denny L. Cervical cancer: Prevention and treatment. Discov Med. 2012;14(75):125-31.
[20] Bruni L, Barrionuevo-Rosas L, Albero G, Serrano B, Mena M, Gómez D, et al. ICO information centre on HPV and cancer (HPV information centre). Human papillomavirus and related diseases in the world. Summary Report. 2015;4(08).
[21] Tsikouras P, Zervoudis S, Manav B, Tomara E, Iatrakis G, Romanidis C, et al. Cervical cancer: screening, diagnosis and staging. J buon. 2016;21(2):320-25.
[22] Collettini F, Hamm B. Uterine cervical cancer: Preoperative staging with magnetic resonance imaging.Der Radiologe. 2011;51(7):589-95.
[23] Morimura Y, Soeda S, Hashimoto T, Takano Y, Ohwada M, Yamada H, et al. The value of pre-operative diagnostic procedures for cervical involvement in uterine corpus carcinoma. Fukushima J Med Sci. 2000;46(1-2):01-11.
[24] Rockall AG, Ghosh S, Alexander-Sefre F, Babar S, Younis MT, Naz S, et al. Can MRI rule out bladder and rectal invasion in cervical cancer to help select patients for limited EUA? Gynecol Oncol. 2006;101(2):244-49.
[25] Sala E, Wakely S, Senior E, Lomas D. MRI of malignant neoplasms of the uterine corpus and cervix. AJR Am J Roentgenol. 2007;188(6):1577-87.
[26] Greco A, Mason P, Leung AW, Dische S, McIndoe GA, Anderson MC. Staging of carcinoma of the uterine cervix: MRI-surgical correlation. Clin Radiol. 1989;40(4):401-05.

PARTICULARS OF CONTRIBUTORS:
1. Associate Professor, Department of Radiodiagnosis, Velammal Medical College Hospital and Research Institute, Madurai, Tamil Nadu, India.
2. Assistant Professor, Department of Radiodiagnosis, Velammal Medical College Hospital and Research Institute, Madurai, Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Kumaran,
2/586, Alli Street 6th Main Road, Gomathipuram, Madurai, Tamil Nadu, India.
E-mail: rkumaran666@yahoo.co.in

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jul 26, 2020
- Manual Googling: Jan 06, 2021
- iThenticate Software: Feb 22, 2021 (21%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? NA
- Was informed consent obtained from the subjects involved in the study? NA
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jul 23, 2020**
Date of Peer Review: **Oct 21, 2020**
Date of Acceptance: **Jan 06, 2021**
Date of Publishing: **Apr 01, 2021**

Profile of Road Traffic Accident Injuries in a Tertiary Care Teaching Hospital – An Institution Based Cross Sectional Observational Study in Velammal Medical College Hospital and Research Institute, Tamil Nadu

Kumaran R.[1], Yogaraj S.[2]

[1, 2] Department of Radio Diagnosis, Velammal Medical College Hospital and Research Institute, Madurai, Tamilnadu, India.

ABSTRACT

BACKGROUND

Road traffic accidents (RTA) account for most of the injury patients encountered in the department of emergency resulting in significant death and morbidity. The current research was conducted to analyse the demographic, clinical and radiological profile of patients presenting with RTA to a tertiary care teaching hospital (Velammal Medical College Hospital and Research Institute).

METHODS

This cross-sectional observational study was done among 68 subjects presenting with RTA to the department of emergency medicine. Detailed history taking, clinical & radiological investigations including plain radiographs, ultrasound and computed tomography (CT) were done. Site of injury was considered as primary outcome of the study. The data was analysed statistically by deriving mean and standard deviation. International Business Machines Statistical Package for the Social Sciences (IBM SPSS) version 22 was used for statistical analysis.

RESULTS

Among the study population, the mean age was 36.18 ± 13.73 years. 83.82 % were males. Individuals aged less than 40 years of age were greatly involved in RTA. Majority (77.9 %) had abdominal injuries followed by 36.7 % with craniofacial trauma, 25 % had thoracic trauma, 17.6 % had spinal trauma, and 10.2 % had extremity and pelvic bone injuries. In abdominal trauma, spleen (26.4 %) was the commonly affected organ. Liver (25 %) and renal injuries (16.17 %) were next commonly observed. A significant difference (P-value < 0.05) was found in abdominal injuries due to different types of vehicles.

CONCLUSIONS

RTIs are common in the younger population. The predominance of the male population was seen. The most common organ to be injured was spleen. Proper understanding of the pattern of trauma may help in improving the outcome. Early diagnosis, aggressive resuscitation and timely surgical intervention were essential in improving the outcome in trauma patients.

KEYWORDS

Road Traffic Accidents, Road Traffic Injuries, Head Injury, Blunt Abdominal Trauma, CT Scan

Corresponding Author:
Dr. Yogaraj S.,
 # 2 / 586, Alli Street 6th Main Road, Gomathipuram, Madurai - 625020, Tamilnadu, India.
E-mail: dryogarajs@gmail.com

DOI: 10.18410/jebmh/2021/176

How to Cite This Article:
Kumaran R, Yogaraj S. Profile of road traffic accident injuries in a tertiary care teaching hospital – an institutional based cross sectional observational study in Velammal medical college hospital and research institute, Tamil Nadu. J Evid Based Med Healthc 2021;8(14):904-908. DOI: 10.18410/jebmh/2021/176

Submission 29-09-2020,
Peer Review 06-10-2020,
Acceptance 11-02-2021,
Published 05-04-2021.

Copyright © 2021 Kumaran R. et al. This is an open access article distributed under Creative Commons Attribution License [Attribution 4.0 International (CC BY 4.0)]

BACKGROUND

Road traffic accidents (RTA) are multifactorial with multidimensional issues caused by a combination of factors involving the person driving and the environment comprising of the road & the vehicles leading to road traffic injuries (RTI).[1] The environmental predisposing factors like rainy and foggy climate increases the risk of RTA.[2] In weekend days and holidays, there is an increased incidence of road traffic accidents.[3] Head is the most vulnerable part to get fatally injured in RTA. Young males are at increased risk of head injury in RTA riding two-wheelers.[4] Blunt abdominal trauma (BAT) is also associated with significant morbidity and mortality in RTA and Other injuries such as bony injuries may require immobilisation and contribute to significant morbidity. Nearly 75 % of BAT are resulted due to motor vehicle, falls, accidents or road / pedestrian accidents.[5,6] Unrecognised intraabdominal injury remains a distressingly frequent cause for preventable death in a patient with blunt injury abdomen.[7] It requires a high level of suspicion, urgent evaluation and time management to decrease morbidity and mortality.[8]

Abdomen is a very vulnerable site with many vital organs, and abdominal injuries are often life-threatening.[9] Assessment of polytrauma patients poses a significant diagnostic challenge to emergency physicians. The term "polytrauma" has been frequently defined in terms of a high injury severity score (ISS) and has been generally used interchangeably with terms such as "severely injured" or "multiple trauma.[10] The internationally accepted threshold of an ISS ≥ 16 is based on the description as being predictive of a mortality risk above 10 %.[11]

The haemodynamic status of the patient should be considered while using diagnostic tests. The subjects are considered to be unstable, if the blood pressure drops to less than 90 mm Hg, heart rate greater than 120 beats per min with clinical signs of peripheral vasoconstriction which causes coldness, altered awareness and reduced breathing capacity. In such cases, primary diagnostic aids such as radiographs and ultrasonography are suggested.

In cases of haemodynamically stable patients or in haemodynamically restored patients, CT-scan of full body (a gold standard) should be considered as it inspects full body. A study done by Jayant V et al. showed a sensitivity of 97.3 % and specificity 75 % with positive predictive value for CT scan.[12] Ultrasound scan and radiographs were used in preliminary diagnosis when the patient was in serious condition. In such situations, radiologist plays an important role in providing initial diagnostic validation of life-threatening state. Diagnostic test such as radiographs of chest and pelvis in anteroposterior, cervical spine radiograph with a lateral view, extended focused assessment with sonography for trauma scan (E-FAST) requires patient to be stabilised in supine position with the help of maneuvers and resuscitators at bedside.

However, a full body CT scan is the gold standard for evaluating injured person. The present study was conducted to assess demographic and clinical profile (injured organs) of road traffic accident victims.

METHODS

This cross-sectional observational study was done on 68 subjects presenting with RTA and immediate care to the Department of Emergency Medicine of a tertiary hospital from January 2018 to January 2019. Only cases coming to the Department of Emergency Medicine were included as subjects presenting with minor ailments were treated as outpatient itself. All subjects who presented with RTA during the study period, irrespective of their age were included in the study. The sampling was purposive. All the subjects in the sampling frame were included. Subjects who have been admitted for reasons other than RTA and other cause of injury such as gun shots, penetrating, stab and paediatric population were excluded from the study.

Ethical approval for the study was obtained from the institutional ethical committee. After admission, a detailed history was taken from the patient or the relatives accompanying them. Detailed clinical examination followed by relevant investigations were done. Detailed radiological investigations were done which included plain radiographs, ultrasound and CT. (Figures 1, 2, 3). The site of injury including head injury, spinal trauma, thoracic & abdominal trauma, pelvis and extremity trauma were the primary outcome variables. The descriptive data was analysed by standard deviation and mean values and quantitative data was analysed by proportion and frequency. International Business Machines Statistical Package for the Social Sciences (IBM SPSS) version 22 was used for statistical analysis.[13]

Figure 1. Horseshoe Kidney with Grade 4 Renal Injury

Figure 2. Grade 3 Splenic Injury

Figure 3. Grade 4 Liver Injury

RESULTS

A total of 68 subjects were included in the final analysis.

Parameter	Summary
Age (Mean ± SD) in Years	36.18 ± 13.73
Gender	(No and %)
Male	57 (83.82 %)
Female	11 (16.18 %)

Table 1. Descriptive Analysis of Demographic Variables in the Study Population (N = 68)

Among the study population, the mean age was 36.18 ± 13.73 years. The majority of the study population (83.82 %) were males and 16.18 % were females. (Table 1)

Road Traffic Injuries	Number (%)
Abdominal injury	53 (77.9 %)
Craniofacial trauma	25 (36.7 %)
Thoracic trauma	17 (25.0 %)
Spinal trauma	12 (17.6 %)
Extremity and pelvic bone injuries	7 (10.2 %)

Table 2. Descriptive Analysis of Road Traffic Injuries in the Study Population (N = 68)

The abdominal injury was the most common in our study, followed by craniofacial trauma, thoracic trauma, spinal & extremity trauma and pelvic bone injuries. (Table 2)

Injured Abdominal Organ / Structure	Number (%)
Spleen	18 (26.4 %)
Liver	17 (25 %)
Kidney	11 (16.17 %)
Mesentery	2 (2.94 %)
Adrenals	2 (2.94 %)
Pancreas	2 (2.94 %)
Anal sphincter complex injury	1 (1.47 %)

Table 3. Descriptive Analysis of the Spectrum of Abdominal Injury in the Study Population (N = 68)

Among the patients with an abdominal injury, the spleen was the most frequently injured organ, followed by liver and renal injuries. Injuries in the pancreas, adrenal and mesentery were less common. A case also had an anal sphincter complex injury. (Table 3)

Road Traffic Injuries	Pedestrian (N = 10)	2-Wheeler (N = 37)	4-Wheeler Light Weight Vehicles (N = 16)	4-Wheeler Heavy Weight Vehicles (N = 5)	P-Value
Abdominal injury	3 (30 %)	32 (86.49 %)	15 (93.75 %)	3 (60 %)	< 0.001
Craniofacial trauma	2 (20 %)	11 (29.73 %)	9 (56.25 %)	3 (60 %)	0.123
Thoracic trauma	2 (20 %)	8 (21.62 %)	5 (31.25 %)	2 (40 %)	0.731
Spinal trauma	1 (10 %)	7 (18.92 %)	3 (18.75 %)	1 (20 %)	0.924
Extremity and pelvic bone injuries	1 (10 %)	3 (8.11 %)	2 (12.5 %)	1 (20 %)	0.853

Table 4. Comparison of Type of Vehicle with Road Traffic Injuries

The abdominal injury was most significant in light weight vehicle accidents compared to other type of vehicles. The difference in abdominal injuries due to different types of vehicles was found to be significant with a P-value of < 0.05. Although there was no significant difference among the type of injury occurred due to different mode of transportation, heavy weight vehicle accidents were found to cause the most types of injuries compared to other mode of transportation. The difference in type of road traffic injuries due to different types of vehicles was found to be insignificant with a P-value of > 0.05, with majority of participates injured by light weight vehicles.

Injured Abdominal Organ / Structure		Pedestrian (N = 10	2-Wheeler (N = 37)	4-Wheeler Light Weight Vehicles (N = 16)	4-Wheeler Heavy Weight Vehicles (N = 5)	P-Value
Spleen	Yes	2 (20 %)	8 (21.62 %)	6 (37.5 %)	2 (40 %)	0.545
	No	8 (80 %)	29 (78.38 %)	10 (62.5 %)	3 (60 %)	
Liver	Yes	2 (20 %)	9 (24.32 %)	4 (25 %)	2 (40 %)	0.863
	No	8 (80 %)	28 (75.68 %)	12 (75 %)	3 (60 %)	
Kidney	Yes	3 (30 %)	6 (16.22 %)	1 (6.25 %)	1 (20 %)	0.453
	No	7 (70 %)	31 (83.78 %)	15 (93.75 %)	4 (80 %)	

Table 5. Comparison of Type of Vehicle with Injured Abdominal Organ / Structure

The difference in injured abdominal organ / structure due to different types of vehicles was found to be insignificant with a P-value of > 0.05, with majority of participants injured by light weight vehicles. In our study we found no death among the study population.

DISCUSSION

Trauma is the major and one of the topmost aetiology for mortality and disability in low-middle-income countries. Among the population aged 45 of age, trauma has been the leading cause of demise, with 5th most common cause of mortality in overall population. Blunt trauma, also called wide impact trauma is the most common type of injury which occurs as a result of vehicle accidents. Other causes for injury were related to work and home related accidents which resulted as crush, blast injuries and fall from a reasonable height. With an increase number of mechanical vehicles and poor implementation of traffic safety regulations, there is a rapid increase in the incidence of road traffic accidents and associated RTI. Multisystem trauma is a characteristic of motor vehicle accidents. Nearly 75 % of injury in RTA are blunt abdominal injury.[6] Similarly, in our study, we found abdominal injury in majority which was in comparison to Mohapatra et al. and by Curie et al. studies.[14,15]

However, in our study we found light weight vehicle accidents leading to abdominal injury in majority of them, whereas the mentioned studies showed fall from height as the leading cause for abdominal injury. Certain cases of injury may require immediate surgery. Abdominal injuries require surgery in about 25 % of cases. The current study revealed more males were affected than females. In a study by Adejumo AA et al. 75.3 % of males were affected.[16] Another study presented male to female ratio (M: F) of 3.7:1.[17] Similarly, 75 % patients were males in a study by Shahzad M et al.[18] Current results and the previous literature showed that males were more prone for RTI than females as a consequence of risky driving behaviour and violation of traffic rules more commonly seen in males. In the present study, the majority (77.9 %) of the injuries were abdominal

injuries. It has been determined that 20 % of traumas due to road accidents occurred in the abdomen.[19]

In the study by Yangala R et al.[20] it was found that 60 % of the participants had RTA as a cause of abdominal injury. Saini S et al.[21] and Bhandari V et al.[22] in their research concluded that road traffic accident was the most common cause of injury and abdominal traumas were blunt.[23,24] young people were affected more as they are the people who move from one place to the other for their family needs.[25] Similarly, in the present study, majority of the population were young adults with the mean age of 36.18 ± 13.73 years. Kumar A et al. in their study had also reported that the highest number of deaths were in the 21 - 30 years age group, 37 (24.7 %) out of 150 cases.[26] The higher incidence of abdominal trauma in this age group reflects more active and outdoor life of the young people. Majority of abdominal injuries (30.3 %) were as a result of RTAs in the study by Adejumo A.A. et al.[16] This can be due to poor road infrastructure, rash and careless driving habits specially by young generation and non-compliance of motorists with standard safety measures.

In the present study, spleen (26.4 %), liver (25 %) and kidneys (16.17 %) were the majorly affected abdominal organs. In the study by Adejumo AA et al. the spleen was the most common organ injured as an isolated injury as seen in 29.8 % of participants.[16] In another study, spleen was the most common organ injured in 42.1 % of patients and liver in 31.57 % of patients.[27] Although, we found no statistically significant spleen involvement across the type of motor vehicle accidents, we found spleen involvement common in all vehicles causing RTA. (Table 5)

The status and co-existing injuries which may distract the attending surgeon from properly assessing difficulties in diagnosis arises from the factors like delay in reaching the hospital, altered mental status of the patient and co-existing injuries.[28]

CONCLUSIONS

The present study results conclude that RTI is more common in the younger population. Males were more commonly involved. Abdominal injury was the most common type of injury among all the vehicles but significant in four-wheeler light vehicle accidents. Spleen was the most common internal organ involved in RTA. Road traffic injuries lead to multisystem trauma. The extent of trauma caused by RTA should always be assessed by using appropriate diagnostic imaging tools such as ultrasound scan, x-ray or full body scan followed by required blood investigations. However, before these investigations, it is very vital that subjects are haemodynamically stable with immediate life support. Further, in stable subjects, non-surgical and a conservative approach is suitable to reduce complications. However, in cases of abdominothoracic injuries, head injuries and fractures, the prognosis is not good. Hence, proper understanding of the pattern of trauma may help in improving the outcome. Early diagnosis, aggressive resuscitation and timely surgical intervention are essential in improving the outcome in trauma patients.

Limitations

Small sample size is a limitation of this study. This is a single study centre. Although, few patients had recorded the grade of organ injury, few didn't. We strongly recommend that similar multi-centric studies should be conducted with a larger sample size.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
Financial or other competing interests: None.
Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.
We acknowledge the technical support in data entry, analysis and manuscript editing by "Evidencian Research Associates"

REFERENCES

[1] Mitra S, Sarkar AP, Saren AB, et al. Road traffic injuries: a study on severity and outcome among inpatients of a tertiary care level hospital of West Bengal, India. J Emerg Trauma Shock 2018;11(4):247-252.
[2] Jones AP, Haynes R, Kennedy V, et al. Geographical variations in mortality and morbidity from road traffic accidents in England and Wales. Health Place 2008;14(3):519-535.
[3] Manochehr FASL, Ali B. Analysis of deathly road accidents in Novrooz holidays of year 2007 with climatic approach (in Persian). Geography and Development 2012;10(26):21-23.
[4] Urfi, Amir A, Hoda Mf, et al. Pattern of head injuries among victims of road traffic accidents in a tertiary care teaching hospital. Indian J Community Health 2013;25(2):126-133.
[5] Isenhour JL, Marx J. Advances in abdominal trauma. Emerg Med Clin North Am 2007;25(3):713-733, ix.
[6] Neeki MM, Hendy D, Dong F, et al. Correlating abdominal pain and intra-abdominal injury in patients with blunt abdominal trauma. Trauma Surg Acute Care Open 2017;2(1):e000109.
[7] Patel P, Gadhavi J, Parmar H. A study of blunt and penetrating abdominal trauma, its various patterns of injuries, and its management. Int J Med Sci Public Health. 2016;5(7):1309-1313.
[8] Trehan V, Kumar SS. Blunt abdominal trauma: a tertiary care experience. Int J Surg 2018;5(3):975-978.
[9] Abhilash KPP, Kirubairaj MA, Meenavarthini K. Splenic injuries in blunt trauma of the abdomen presenting to the emergency department of a large tertiary care hospital in South India. Curr Med Issues 2017;15(4):278-281.
[10] Butcher NE, D'Este C, Balogh ZJ. The quest for a universal definition of polytrauma: a trauma registry-based validation study. J Trauma Acute Care Surg 2014;77(4):620-623.
[11] Boyd CR, Tolson MA, Copes WS. Evaluating trauma care: the TRISS method. Trauma score and the injury severity score. J Trauma 1987;27(4):370-378.
[12] Jayant V, Sharma P, Nayak A, et al. Role of computed tomography in the evaluation of blunt injury abdomen. IJSS J Surg 2017;3(3):34-39.

[13] Machines IB. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp 2013.
[14] Bhandari V, Bhandari M. Comprehensive study of blunt injury abdomen in single center. International Surgery Journal 2020;7(3):4.
[15] Currie RA, Watne AL, Heiskell EF Jr, et al. Blunt abdominal trauma. Am J Surg 1964;107(2):321-328.
[16] Adejumo AA, Thairu Y, Egenti N. Profile of abdominal trauma in federal teaching hospital, Gombe, North-east, Nigeria: a cross sectional study. Int J Innov Med Health Sci 2015;4:41-45.
[17] Mehta N, Babu S, Venugopal K. An experience with blunt abdominal trauma: evaluation, management and outcome. Clin Pract 2014;4(2):599.
[18] Shahzad M, Azeem IS, Ahmad M. Splenic injury in blunt abdominal trauma. Pak J Surg 2019;35(1):8-11.
[19] Motie M, Behnampour N, Alinezhad H. Epidemiology of blunt abdominal trauma in Gorgan-Iran (2001-05). J Gorgan Uni Med Sci 2009;10(4):55-86.
[20] Yangala R, Sundaragiri S. Epidemiological profile of fatal blunt abdominal trauma at a tertiary care teaching hospital in south India. Indian J Med Forensic Med Toxicol 2019;13(2):149-152.
[21] Saini S, Joshi M. Spectrum and outcome of blunt abdominal trauma in a teaching hospital, Bikaner, Rajasthan. Int J Med Biomed Sci 2019;3(7):25-27.
[22] Bhandari V, Bhandari M. Comprehensive study of blunt injury abdomen in single center. Int J Surg 2020;7(3):710-713.
[23] Van der Vlies CH, Olthof DC, Gaakeer M, et al. Changing patterns in diagnostic strategies and the treatment of blunt injury to solid abdominal organs. Int J Emerg Med 2011;4:47.
[24] Karamercan A, Yilmaz TU, Karamercan MA, et al. Blunt abdominal trauma: evaluation of diagnostic options and surgical outcomes. Ulus Travma Acil Cerrahi Derg 2008;14(3):205-210.
[25] Osime C, Oludiran O. Penetrating abdominal injury cases admitted in University of Benin teaching hospital. Ann Biomed Sci 2004;3(1):39-44.
[26] Kumar A, Tiwari KP, Kumar Ray S, et al. Epidemiological study of blunt abdominal trauma in road-traffic-accident in Varanasi region. Pharma Innov J 2018;7(3):359-362.
[27] Preethi RG, Mariappan M, Madhusudhanan J, et al. Role of CT imaging in patients sustaining blunt injury of abdomen, retrospective analysis from a tertiary care hospital. IAIM 2016;3(9):79-86.
[28] Morton JH, Hinshaw JR, Morton JJ. Blunt trauma to the abdomen. Ann Surg 1957;145(5):699-711.

Check for updates

A Road to Physiological Pacing

Indian Journal of Clinical Cardiology
7–9
© The Author(s) 2021
Reprints and permissions:
in.sagepub.com/journals-permissions-india
DOI: 10.1177/26324636211001585
journals.sagepub.com/home/occ
SAGE

Shunmuga Sundaram Ponnusamy[1]

Incidence of conduction system disease will continue to grow worldwide as the age of the population increases. Cardiac pacing is the standard and effective therapy for the management of patients with symptomatic bradycardia. It is estimated that nearly 1 million new pacemaker implantations will be done annually in the next decade and the numbers will continue to swell with the availability of more sophisticated tools to diagnose the conduction system disease at an early stage.

Right Ventricle as a Site for Pacing

Right ventricle (RV) has been the standard pacing site for the past 60 years. Ease of access through subclavian vein, the trabeculations at the apex, and the lead design favored RV apex as an automatic first choice. RV apical pacing (RVAP) is a safe, time-tested, and well-tolerated procedure flourished with plenty of clinical data. Though a gold standard technique, RVAP is fraught with reduction in left ventricular (LV) systolic function, heart failure (HF), and increased mortality. RV pacing produces left bundle branch (LBB) block morphology on the surface electrocardiography (ECG), resulting in nonphysiological activation of the LV due to pre-excitation of the interventricular septum.[1] Nonphysiological pacing is the likely cause of poor hemodynamic output in RVAP as compared to sinus rhythm and adverse mechanical effects of cardiac function. This results in myofibrillar disarray, increased fibrosis, and reduced LV ejection fraction putting the patient at risk of arrhythmias and HF hospitalizations.[2]

Quest for an Alternative Site

The pursuit for an alternative site of pacing tasted limited success as pacing the septum or outflow tract failed to overcome the pacing-related complications. During the early 1990s, there was a considerable interest in the concept of "physiological pacing," which denoted dual chamber as opposed to single chamber pacing. By allowing atrioventricular (AV) synchrony, dual-chamber pacing was thought to promote physiological ventricular function. Despite great belief in the concept, the advantages were modest in terms of reduction in incidence of atrial fibrillation in patients with sinus node dysfunction.[3] Large randomized studies failed to demonstrate the superiority of dual chamber in avoiding the pacing-related complications. It is the dyssynchronous ventricular contraction that decides the long-term consequences of RVAP rather than lack of atrial contribution during ventricular pacing. With the evidences accumulating on the deleterious effect of chronic RV pacing, efforts were made to minimize the ventricular pacing by various algorithms. The ultimate goal of pacing is to develop a strategy which would mimic as closely as possible to normal ventricular activation in terms of electrical and mechanical synchrony. In other words, a strategy wherein the cardiac conduction system is directly captured is the holy grail of pacing.

His Bundle Pacing

Though Kosowsky et al[4] showed the physiological advantage of direct His bundle pacing (HBP) in 1968, it was not until 2000 when Deshmukh et al[5] first published the clinical feasibility of permanent HBP. Direct HBP was successful in 12 of 14 patients with atrial fibrillation with dilated cardiomyopathy. LV-ejection fraction improved from 20% to 31% with significant reduction in LV-end diastolic diameter. This landmark study subsequently rekindled the interest of conduction system pacing, resulting in exploration of His bundle (HB) as an alternative pacing site. HB, a narrow band of fibers extending from the AV node in the Koch's triangle

[1] Department of Cardiology, Velammal Medical College Hospital and Research Institute, Madurai, Tamil Nadu, India

Corresponding author:
Shunmuga Sundaram Ponnusamy, Department of Cardiology, Velammal Medical College Hospital and Research Institute, Velammal Village, Madurai, Tamil Nadu 625009, India.
E-mail: shunmuga.pgi@gmail.com

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (http://www.creativecommons.org/licenses/by-nc/4.0/) which permits non-Commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

till the crest of ventricular septum, can be targeted anywhere along the membranous septum. Direct capture of HB results in electrically and mechanically synchronized activation of the ventricles with normal-paced QRS morphology. A 4.1-F sized 3830 SelectSecure lumenless pacing lead (Medtronic Inc, Minneapolis, MN) is used along with C315 sheath for deploying the lead. Mapping of the HB is done to get a site with sharp His signal and ventricular electrogram with a normal HV interval (35-55 ms) before placing the lead. Pacing maneuvers must be done to make sure that the lead is positioned distal to site of diseased HB. Vijayaraman et al[6] showed 84% success rate for HBP in patients with AV block. AV nodal block patients had a higher correction rate (93%) as compared to those with infranodal block (76%). The proposed mechanism for the correction of infranodal block is (a) pacing distal to the site of block, (b) virtual electrode polarization effect, and (c) differential source-sink relationship.

Hitting the HB for Resynchronization Therapy

With the availability of better tools, HBP gathered momentum in the earlier part of the last decade globally and considered no longer a difficult procedure. With the support from several multicenter observational studies and social media platform (#dontdisthehis), HBP revived the interest in conduction system pacing. The concept of predestined fibers bundled inside the HB created a window of opportunity for correcting the bundle branch block morphology in the surface ECG. Though biventricular devices (BiV) were extensively tested in randomized trials for patients with cardiomyopathy and wide QRS duration, the rate of nonresponders remains high (30-40%).[7] Moriña-Vasquez et al[8] first demonstrated the feasibility of permanent HBP for bundle branch block correction. Sharma et al[9] showed 90% success rate for HBP in 106 cardiac resynchronization therapy (CRT)-eligible patients. QRS duration was reduced from 157 to 117 ms along with improvement in LVEF from 30% to 43% during a mean follow-up of 14 months. Lead-related complications were noted in 7.3%. Upadhyay et al[10] showed superior electrical resynchronization and higher echocardiographic response in patients receiving HIS-CRT as compared to BiV-CRT. HBP gained another surge as an alternative to BiV devices for cardiac resynchronization therapy.

LBB Pacing—a Serendipity

With widespread adoption of physiological pacing technique, the limitations of HBP were soon recognized. Lead dislodgements, high-capture threshold, ventricular undersensing, atrial oversensing, premature battery depletion, and incomplete correction of distal conduction system disease have to be considered before making HBP as a workhorse pacing technique. While the search was on to overcome the limitations, Huang suggested an excellent alternative by direct capture of LBB fibers by deep septal placement of the pacing lead.[11] A 3830 SelectSecure lead is placed deep inside the proximal interventricular 1 to 1.5 cm below the HB along an imaginary line connecting distal His signal to RV apex.[11,12] Paced QRS morphology, unipolar pacing impedance, and current of injury on the lead electrogram are continuously monitored. A "qR" pattern in lead V1 along with LBB potential, demonstration of nonselective to selective capture of LB, short and constant peak left ventricular activation, or programmed deep septal stimulation to demonstrate the change in QRS morphology, axis, and duration, confirm the capture of LBB.

Left bundle branch pacing (LBBP) is an alternative to RV pacing for patients with symptomatic bradyarrhythmia. Li et al[13] showed 90% success rate for patients with AV conduction system disease. We showed 91% acute procedural success for patients with AV block (40 of 44) in our prospective observational study in Indian population.[14] As the distal conduction disease could be effectively corrected by LBBP, it is emerging as an alternative to BiV device therapy for CRT. In a largest retrospective study involving 8 international centers by Vijayaraman et al[15] which included 325 CRT eligible patients, LBBP was successful in 85% of the patients. A total of 44% of patients had ischemic cardiomyopathy. QRS duration was reduced from 152 to 137 ms along with improvement in LVEF from 33% to 44%. Improvement was seen in both ischemic and nonischemic cardiomyopathy and similarly in LBBB and non-LBBB subjects.

Physiological Pacing—Where Do We Stand?

LBBP provides optimal pacing parameters along with excellent lead stability. The probability of correcting distal conduction system disease is better as compared to HBP at no additional hardware requirement. But is that enough to make LBBP an automatic first choice pacing strategy? It is a recent innovation which is yet to be tested in randomized controlled trials. Evidences so far published are from single or multicenter observational or nonrandomized studies which cannot be extrapolated to the general population. Lead damage due to myocardial contraction, coronary arterial injury, dislodgement into the LV cavity, and thromboembolic episodes are potential complications to be monitored during follow-up. Lead extraction is another major concern as the currently available tools may not be suitable to extract the deeply placed pacing lead.

A balanced approach would be the need of the hour weighing the risks and benefits of both the modes of physiological pacing. Pacing-induced cardiomyopathy occurs in significant proportion of patients requiring >40% committed ventricular pacing. Conduction system pacing would help in this group of patients by providing synchronized physiological activation of the ventricle. In patients with symptomatic AV block, HBP has a higher success rate if the

level is nodal as compared to infranodal. HBP can be accepted if the capture threshold is <1.5 V at 1 ms pulse width. Any values higher than this would require placing the lead in LBB area to capture the conduction system. As an alternative for CRT, HBP could be an acceptable option if the bundle branch block correction threshold is <1.5 V at 1 ms pulse width. LBBP has a higher chance for correcting bundle branch block at low capture threshold (<1 V at 0.5 ms pulse width). If there is no complete correction by either HBP or LBBP, optimization can be done by placing additional lead in coronary sinus (His optimized-CRT/LBBP optimized-CRT) to achieve better resynchronization. Patients who had undergone LBBP need periodic screening to monitor the lead position and thromboembolic complications.

Physiological pacing has witnessed a tremendous growth in the last 10 years. LBBP is a surprising addition to the armamentarium with excellent mid-term results. Randomized trials involving multiple centers are warranted in cementing the role of HBP or LBBP as a workhorse pacing strategy.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

Ethical Statement

The study was conducted after getting the ethical committee's approval.

References

1. Tops LF, Schalij MJ, Bax JJ., The effects of right ventricular apical pacing on ventricular function and dyssynchrony implications for therapy. *J Am Coll Cardiol*. 2009;54:764-776.
2. Prinzen FW, Hunter WC, Wyman BT, McVeigh ER., Mapping of regional myocardial strain and work during ventricular pacing: experimental study using magnetic resonance imaging tagging. *J Am Coll Cardiol*. 1999;33:1735-1742.
3. Healey JS, Toff WD, Lamas GA, et al Cardiovascular outcomes with atrial-based pacing compared with ventricular pacing: meta-analysis of randomized trials, using individual patient data. *Circulation*. 2006:114:11-17.
4. Kosowsky BD, Scherlag BJ, Damato AN., Re-evaluation of the atrial contribution to ventricular function: study using His bundle pacing. *Am J Cardiol*. 1968;21:;518-524.
5. Deshmukh P, Casavant DA, Romanyshyn M, et al Permanent, direct His-bundle pacing: a novel approach to cardiac pacing in patients with normal His-Purkinje activation. *Circulation*. 2000;101:;869-877.
6. Vijayaraman P, Naperkowski A, Ellenbogen KA, et al Electrophysiologic insights into site of atrioventricular block. *JACC Clin Electrophysiol*. 2015;1:;571-581.
7. Brignole M, Auricchio A, Baron-Esquivias G, et al 2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy: the Task Force on Cardiac Pacing and Resynchronization Therapy of the European Society of Cardiology (ESC). Developed in collaboration with the European Heart Rhythm Association (EHRA). *Eur Heart J*. 2013;34:;2281-2329.
8. Moriña-Vásquez P, Barba-Pichardo R, Venegas-Gamero J, et al Cardiac resynchronization through selective His bundle pacing in a patient with the so-called InfraHis atrioventricular block. *Pacing Clin Electrophysiol*. 2005;28:726-729.
9. Sharma PS, Dandamudi G, Herweg B, et al Permanent His bundle pacing as an alternative to biventricular pacing for cardiac resynchronization therapy: a multicenter experience. *Heart Rhythm*. 2018;15:413-420.
10. Upadhyay GA, Vijayaraman P, Nayak HM, et al On-treatment comparison between corrective His bundle pacing and biventricular pacing for cardiac resynchronization: a secondary analysis of His-SYNC Pilot Trial. *Heart Rhythm*. 2019;16(12):;1797-1807.
11. Huang W, Su L, Wu S, et al A novel pacing strategy with low and stable output: pacing the left bundle branch immediately beyond the conduction block. *Can J Cardiol*. 2017;33:1736.e1-3.
12. Ponnusamy SS, Arora V, Namboodiri N, et al Left bundle branch pacing: a comprehensive review. *J Cardiovasc Electrophysiol*. 2020;31(9):;2462-2473.
13. Li X, Li H, Ma W, et al Permanent left bundle branch area pacing for atrioventricular block: feasibility, safety, and acute effect. *Heart Rhythm*. 2019;16:;1766-1773.
14. Ponnusamy SS, Muthu G, Kumar M, et al Mid-term feasibility, safety and outcomes of left bundle branch pacing—single center experience. *J Interv Card Electrophysiol*. 2020. doi:10.1007/s10840-020-00807-w.
15. Vijayaraman P, Ponnusamy SS, Cano O, et al Left bundle branch area pacing for cardiac resynchronization therapy: results from international LBBAP collaborative study group. *JACC Clin Electrophysiol*. 2021;7:;135-147.